# A REVISION OF THE GENUS *ANNAPHILA* GROTE (LEPIDOPTERA, PHALAENIDAE)

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# INTRODUCTION

THE GENUS *Annaphila* forms a compact and distinctive group of species within the Phalaenidae (Noctuidae). These moths, with their brightly colored hind wings, are all day flyers, and are usually rather poorly represented in most collections, with the possible exception of three species. This apparent scarcity, together with a gross similarity in maculation between the species, has led to some confusion in the proper application of specific names. It is the purpose of this paper to try to reevaluate this group of moths, to propose a more satisfactory systematic arrangement of the species, and to present what little is known about their habits and life histories.

This study was begun by the late Claude I. Smith as part of his entomological studies in the Division of Entomology and Parasitology at the University of California at Berkeley. After his untimely and tragic death in 1949, his entire collection and a manuscript revision of this genus were presented to the University of California (Hurd, 1950). At the request of Dr. E. G. Linsley of the Division of Entomology and Parasitology at that institution, the senior author agreed to complete this work. The present paper is based, in part, upon the unpublished manuscript of Claude Smith and upon the specimens he had gathered together for this study.

Several facts quickly became apparent from this revision. Much more collecting is needed before any clear picture can be obtained of the distribution on a specific or subspecific level, the extent of intraspecific variation within the different species, and the full extent of flight periods of the adults. There is a particular need for life history work, and the careful study of the early stages as an aid in the proper placement and relationships of this genus within the Phalaenidae.

## HISTORICAL BACKGROUND

This group of beautiful, day-flying moths was of particular interest to Henry Edwards and Grote; between the two, they named by far the majority of the species. Edwards, during his stay in California and Nevada, captured most of the specimens named. Grote, in addition to describing the genus and many species, made several lists of the known forms.

The initial flurry of descriptions after the group became known produced 14 names between the years 1873 and 1881. After this, little additional descriptive work took place, although Edwards described *casta* in 1890 from some of Lord Walsingham's material. J. B. Smith, in his "Catalogue of the lepidopterous superfamily Noctuidae found in Boreal America" (1893), made the next listing of the species in this genus. This was an annotated check list, more or less, and not a critical review of the group. Fifteen years after the above was published, J. B. Smith added two more specific names to the genus. The next listing was in Dyar's "List of North American Lepidoptera" (1903); it had several changes in position of the species within the genus, but otherwise was similar to the list by Smith.

The first and only actual revision was done by Hampson in volume 9 of his monumental "Catalogue of the Noctuidae in the collection of the British Museum" (1910). Here all the species were redescribed and illustrated, and a key to the species was given. Unfortunately, the colored figures are not entirely satisfactory; while they do convey the general picture of the type of maculation and some of the specific characters, they lack some details of color and pattern.

Strand, in part 5 of the "Lepidopterorum catalogus, Noctuidae: Agaristinae" (1912), gives a bibliographical listing of the species in alphabetical order. In so doing, Strand is unique in placing *Annaphila* in the agaristids, as no one else has done so; there is apparently no evidence available now to justify this action.

Hampson's work formed the basis of the listings in both the Barnes and McDunnough "Check list of the Lepidotera of Boreal America" (1917) and the McDunnough "Check list of the Lepidoptera of Canada and the United States of America" (1938). The latter included the one species described in *Annaphila* in the period between these last two lists.

Draudt, in volume 7 of Seitz' "Macrolepidoptera of the world, the Macrolepidoptera of the American region, Noctuiformes," also followed Hampson. This work includes three or four lines of description under each

specific heading and gives colored illustrations of every species. The figures are slightly better than those given by Hampson, but even these are not entirely satisfactory.

## Materials and Methods

Materials Studied: This revision is based on a study of the specimens in some of the major eastern and western museums and the private collections of several individuals; these are referred to specifically under the section on acknowledgments. Nearly all the type specimens in this country have been studied; the sole exception is the type of *astrologa* Barnes and McDunnough. In this case, however, a paratype was examined, and this specimen was compared with the type by J. G. Franclemont. None of the Grote and Harvey types, now in the British Museum (Natural History), have been studied. However, through the generous cooperation of Mr. W. H. T. Tams of that institution, color photographs were made of all these types, as well as photomicrographs of the genitalia of all these type specimens, and these have been carefully studied.

More than 700 specimens have been studied; somewhat unfortunately, however, over one-third of this number belonged to the three commonest species (*depicta* Grote, *decia* Grote, and *diva* Grote). A considerable number of genitalic slides have been prepared by both authors; these include those of nearly all the types in this country.

Field Work: Adult moths of this group were collected throughout the state of California by the junior author, and notes on their flight habits, flower preferences, etc., were taken. Several unsuccessful attempts were made by him to work out life histories; much work needs to be done in this respect.

Descriptions: A binocular dissecting microscope was used throughout when the descriptions of the adults and genitalia were written, this work having been done by the senior author. The use of such an instrument is strongly recommended to future workers in this group, as some of the best specific diagnostic characters are to be found in the structure of the front and hence are clearly distinguished only under considerable magnification. The same basic patterns of descriptions have been followed throughout this paper for all specific descriptions. All species are characterized by a detailed description of the adult male, with comparative notes on the female, and full descriptions of the genitalia of both sexes are given.

Genitalic Figures: Drawings of the genitalia were prepared by the senior author. In all cases, the genitalia of each sex were drawn to the same scale and received a uniform reduction; however, the genitalic organs of the two sexes were not drawn to the same scale. Some caution must be taken in the use of these figures, as in some instances insufficient material was available to make dissections in series. Consequently, it was not always possible to ascertain the limits of individual variability within the species and, further, it was not possible to check and recheck some of the finer structural details. When more material becomes available, it may be necessary to amend either the genitalic descriptions or the drawings, or both.

## Acknowledgments

The authors wish to acknowledge with thanks the cooperation and aid of the following men who have allowed them to study the types and specimens in their charge: Dr. E. G. Linsley and Dr. P. D. Hurd, Jr., of the Division of Entomology and Parasitology, University of California, Berkeley; Mr. J. G. Franclemont of the United States National Museum; Dr. E. S. Ross of the California Academy of Sciences; Mr. L. M. Martin of the Los Angeles County Museum; Mr. D. F. Hardwick of the Division of Entomology, Department of Agriculture, Ottawa; Dr. J. Bequaert of the Museum of Comparative Zoölogy, Harvard University; Dr. J. B. Schmitt of Rutgers University; Dr. C. L. Remington of the Osborn Zoological Laboratory, Yale University; and Dr. J. A. G. Rehn of the Academy of Natural Sciences of Philadelphia. A special word of thanks is given to Mr. W. H. T. Tams of the British Museum (Natural History) for his hearty cooperation in making photographs of the types in that institution, and for making genitalic preparations and photomicrographs of them. Thanks also go to Mr. William R. Bauer of Petaluma, California; Mr. John L. Sperry of Riverside, California; Mr. Christopher Henne of Pasadena, California; Mr. Frank P. Sala, Jr., of

Los Angeles, California; Mr. James Baker of Baker, Oregon; Mr. Edward C. Johnston of Seattle, Washington; and Mr. Otto Buchholz of Roselle Park, New Jersey, for the privilege of studying specimens from their private collections. The authors are most grateful to Mr. William H. Evans of Sun Valley, California, who most generously lent specimens for study and who provided field notes on the early stages of the species reared by him.

# SYSTEMATIC DESCRIPTIONS

## GENUS ANNAPHILA GROTE

*Annaphila* GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 149; 1874, *ibid.*, vol. 2, p. 35; 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183; 1882, Illustrated essay on the Noctuidae of North America, p. 60. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. DYAR, 1903, Bull. U. S. Natl. Mus., vol. 52, p. 208. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 472. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. BARNES AND MCDUNNOUGH, 1917, Check list, p. 74. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 328. MCDUNNOUGH, 1938, Check list, p. 102. SALA, "1950" [1951], Lepidopterists' News, vol. 4, p. 71.

Head, front projecting, forming rounded or flattened prominence, delimited ventrally by small sclerotized ridge, rarely with dorsal sclerotized ridge; eyes broadly elliptical, each one-half as wide as front between eyes; ocelli well developed; antennae of male ciliated to apex, of female simple; tongue present; labial palpi extending slightly beyond front, thickly covered with long, hair-like scales, terminal segment slightly shorter than length of eye. Thorax covered with rough scales and long, hair-like scales, without tufts. Legs, all femora and tibiae with long, hair-like scales; fore tibiae without claws or spines and with strong process. Abdomen without crests, with lateral fringes of hair-like scales near posterior end. Forewings short and broad, apex rounded, outer margin curved, 12 veins, with one areole; $R_1$ from top of cell; $R_2$ to $R_4$ forming areole, $R_2$ from top of areole, $R_{3+4}$ and $R_5$ from end of areole, arising near one another, at same point, or rarely stalked; $M_1$ from cross vein near upper angle of cell; $M_2$ and $M_3$ from near lower angle of cell; $Cu_1$ from lower angle; $Cu_2$ arising approximately three-quarters of distance from base on lower margin of cell. Hind wings broad, outer margin rounded; frenulum strong in both sexes; Sc anastomosed with R for one-fourth of length of cell; R and $M_1$ from upper angle of cell; $M_2$ obsolescent, from just below middle of dc; $M_3$ from lower angle of cell; $Cu_1$ from just below lower angle; $Cu_2$ from well before lower angle. Forewings and hind wings contrastingly colored; forewings black or dark brown, with rather obscure maculation; hind wings white, orange, or red, with black outer margin. Beneath both wings broadly suffused with color of hind wings above, with dark outer margins and other maculation. Slight sexual dimorphism present in maculation of some species.

MALE GENITALIA: Uncus broad, elongate, clothed with long hairs, tapering to point at apex, the latter with small spine; gnathos weakly developed or absent; tegumen well developed, sometimes elongate; peniculus absent; vinculum projecting short distance beyond base of valves, variable in shape; valves varying from simple to rather complex structures, symmetrical or asymmetrical, all with fringe of long hairs along outer margin; cucullus undifferentiated, with single spine at or near apex, or with one or more costal arms, the basad of these sometimes with second small appendage at its base, and with apex of valve often produced into more or less elongate arm; central portion of valves usually undifferentiated; sacculus with small clavus or undifferentiated; juxta elongate; aedeagus elongate, in length slightly shorter to slightly longer than combined length of tegumen and vinculum, slender to moderately wide, both ends rounded or with distal end bluntly pointed; vesica armed with large or moderate number of spines.

FEMALE GENITALIA: Sternum of segment VII with posterior margin weakly or heavily sclerotized. Ostium simple, or with variously shaped sclerotized plates present; operculum absent; ductus bursae short, weakly sclerotized, and with longitudinal striations, or more heavily sclerotized; ductus seminalis arising near junction of ductus bursae and bursa copulatrix or from distal lobe of bursa copulatrix on right side; bursa copulatrix membranous, elongate, rarely short, longer than ductus bursae, enlarged into small lobe on right side of junction with ductus bursae, sometimes either this lobe or basal portion of ductus bursae, or both, with an irregularly shaped mass of corneous material, rarely with the lobe sclerotized.

EARLY STAGES: Mr. William H. Evans has succeeded in rearing several species of the genus; while so doing, he kept field notes and preserved both mature larvae and pupae. All notes and descriptions of the early stages in

this paper are from his material. It might be noted here that most of the species reared have fed entirely or in part on the buds or flowers of the food plants rather than the leaves.

EGGS: Undescribed.

LARVAE, FIFTH INSTAR: Head, first adfrontal seta ($Adf_1$) at middle of clypeus, second adfrontal seta ($Adf_2$) at branching of epicranial suture; first posterior seta ($P_1$) below level of $Adf_2$, second posterior seta ($P_2$) vertically above $P_1$, these three setae forming an acute angle; lateral seta ($L_1$) on the same level as $P_1$; first anterior seta ($A_1$) on level with ocelli three and four, second anterior seta ($A_2$) on level with ocellus one and forming an almost straight line with $A_1$ and $P_1$, third anterior seta ($A_3$) slightly higher than $A_2$ and above inner margin of ocellus three, the three anterior setae forming slightly more than a right angle; all six ocelli well developed, with ocelli three and four tending to be contiguous, ocellus five closer to ocellus six than to ocellus four; second ocellar seta ($O_2$) on level with, or slightly above, ocellus one, third ocellar seta ($O_3$) posterior to ocellus six, the three ocellar setae forming less than a right angle; subocellar seta ($SO_2$) posteriad or posteroventrad to lowest ocellus. Skin of body smooth; spiracles small; setae inconspicuous. Thorax, prothorax with shield, with setae 1a, 1b, and 2a, 2b well separated; seta 3 double, higher than spiracle; seta 4 on level with lower rim of spiracle; seta 5 approximate; setae 6 and 7 approximate, in a horizontal plane. Mesothorax, setae 1b and 2b slightly anterior to setae 1a and 2a; seta 3 posterior to setae 1 and 2; seta 4 slightly lower than 3; seta 5 slightly anterior to, and lower than, 4; seta 6 ventral to 3. Metathorax similar to mesothorax. Abdomen, segment I, seta 1 above posterior rim of spiracle; seta 2 posteroventrad;

TABLE 1

DISTRIBUTION OF THE SPECIES[a]

| | Texas | New Mexico | Arizona | Nevada | California | Oregon | Washington | British Columbia | Idaho | Utah |
|---|---|---|---|---|---|---|---|---|---|---|
| *danistica* | — | — | — | x | x | x | x | x | x | x |
| *hennei* | — | — | — | — | x | — | — | — | — | — |
| *mera mera* | — | — | — | — | x | — | — | — | — | — |
| *mera eremia* | — | — | — | — | x | — | — | — | — | — |
| *pustulata* | x | — | x | — | — | — | — | — | — | — |
| *arvalis* | — | — | — | — | x | x | x | — | — | — |
| *abdita* | — | — | — | — | x | — | — | — | — | — |
| *baueri* | — | — | — | — | x | — | — | — | — | — |
| *astrologa* | — | — | x | — | x | — | — | — | — | — |
| *ida* | — | — | — | — | x | — | — | — | — | — |
| *divinula* | — | — | — | — | x | — | — | — | — | — |
| *lithosina* | — | — | — | — | x | — | — | — | — | — |
| *miona* | — | — | — | — | x | — | — | — | — | — |
| *casta* | — | — | — | — | x | — | — | — | — | — |
| *depicta depicta* | — | — | — | — | x | — | x | — | — | — |
| *depicta morula* | — | — | — | — | x | — | — | — | — | — |
| *decia* | — | — | — | — | x | x | x | x | — | — |
| *diva* | — | — | — | — | x | x | x | x | — | — |
| *superba* | — | — | — | — | x | — | — | — | — | — |
| *spila* | — | — | — | — | x | — | — | — | — | — |
| *evansi* | — | — | — | — | x | — | — | — | — | — |

[a] The symbols signify the following: —, no known records; x, specimens examined.

TABLE 2

FLIGHT PERIODS OF ADULT MOTHS[a]

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *danistica* | — | — | x | x | — | x | — | — | — | — | — | — |
| *hennei* | — | — | x | x | x | — | — | — | — | — | — | — |
| *mera mera* | — | — | — | x | x | — | — | — | — | — | — | — |
| *mera eremia* | — | x | x | x | — | — | — | — | — | — | — | — |
| *pustulata* | — | — | x | x | — | — | — | — | x | — | x | — |
| *arvalis* | x | x | x | x | — | — | — | — | — | — | — | — |
| *abdita* | — | x | x | x | — | — | — | — | — | — | — | — |
| *baueri* | — | x | x | — | — | — | — | — | — | — | — | — |
| *astrologa* | — | x | x | x | — | — | x | — | — | — | — | — |
| *ida* | — | — | — | — | x | — | — | — | — | — | — | — |
| *divinula* | — | x | x | x | — | — | — | — | — | — | — | — |
| *lithosina* | — | x | — | x | x | x | — | — | — | — | — | — |
| *miona* | — | — | — | — | x | x | x | — | — | — | — | — |
| *casta* | — | — | — | — | x | — | — | — | — | — | — | — |
| *depicta depicta* | — | — | x | x | — | — | — | — | — | — | — | — |
| *depicta morula* | — | x | x | — | — | — | — | — | — | — | — | — |
| *decia* | — | x | x | x | x | x | — | — | — | — | — | — |
| *diva* | — | — | x | x | x | x | x | — | — | — | — | — |
| *superba* | — | — | x | x | — | — | — | — | — | — | — | — |
| *spila* | — | — | x | x | — | — | — | — | — | — | — | — |
| *evansi* | — | — | x | x | x | — | — | — | — | — | — | — |

[a] The symbols signify the following: —, no known records; x, specimens examined.

seta 3 above anterior rim of spiracle; seta 4 posterior to spiracle; seta 5 below spiracle, ventrad to 3; seta 6 ventrad to 4; seta 7 anteroventrad to 6, below 5. Segments II to VI similar, but with setae 1 and 3 anterior to spiracle; seta 4 on level with lower rim of spiracle. Prolegs with crochets uniordinal, on interior half of prolegs only. Segment VII similar, but with seta 1 above or slightly posterior to spiracle; seta 3 above spiracle; seta 4 further from spiracle, posteroventral. Segment VIII similar to VII, except seta 4 more as in segments II to VI; seta 5 more anterior than in VII.

PUPAE: Head prominent, extending forward of thorax; epicranial suture absent; antennae approximately 0.4 mm. shorter than maxillae, the latter slightly longer than the wing cases; labial palpi elongate, narrow. Thorax, metathorax about one-fourth of length of mesothorax on dorsal surface; mesothoracic spiracle narrow, with small ridge; mesothoracic wings extending to posterior margin of fourth abdominal segment; metathoracic wings extending to junction of segments III and IV; prothoracic legs approximately one-half of length of maxilla, femora not exposed; mesothoracic legs slightly shorter than antennae, not extending caudad to eye pieces. Abdomen, spiracles slightly raised, without furrows; cremaster without spines, being a rounded protuberance. (Described from one example of *Annaphila depicta* Grote, from southern California.)

GENOTYPE: *Annaphila diva* Grote (Grote, 1874).

DISTRIBUTION: All the known species of this genus of moths are confined to western North America, with the distribution centered in California. All the species and subspecies, with one exception, occur in that state. At least five of the species occur in the other Pacific coast states, ranging as far north as southern British Columbia. The genus is very poorly represented in the central Rocky Mountain states, as only one species is known

from that area. The genus is represented in Arizona and as far east as western Texas, but no specimens have been seen from Mexico as yet.

The moths are found from sea level to the higher mountains, and in a variety of habitats ranging from cool forested canyons to semi-desert areas. The species are all diurnal and will feed on such flowers as are present in the local flora. They usually favor protected canyons for their flight; in the semidesert areas they are found in dry washes, avoiding unprotected flats. Notes on the flight habits and difficulties in capturing the adults have been given by Sala (1951). It appears that each canyon or wash has its own local population; this factor may be of considerable importance when the evolution of the group is considered. Another noticeable feature of the genus as a whole is the tendency for the specimens found in southern California to differ from the central and northern California populations. Of the six species and two subspecies described as new in this paper, three of the species and both subspecies are from southern California.

The adults are usually on the wing in the late winter or early spring months; only one species is known to fly in the fall of the year. This very early flight period, together with the usually restricted habitats of the species, is a factor to be considered when one is collecting these moths.

### Key to Adults

1. Hind wings above orange . . . . . .2
— Hind wings above white or crimson. . 17
2 (1). Lower surface of forewings with large, black, quadrate patch between orbicular and reniform, without median cross line. (Subgenus *Proannaphila*), 3
— Lower surface of forewings without black patch between orbicular and reniform, these latter not being defined, but with median cross line . . . . . (Subgenus *Annaphila*), 7
3 (2). Hind wings above with very narrow, black, terminal band of even width, being 0.4 mm. or less wide . . . . .4
— Hind wings above with wider, black, terminal band, being 0.9 mm. or more wide, increasing in thickness on vein $M_2$ and below vein $Cu_2$ . . . . . .5
4 (3). Hind wings above with postmedian line present, represented at least in lower part of wing . . . . . *danistica*
— Hind wings above without postmedian line . . . . . *hennei*
5 (3). Front broadly projecting, rounded, prominent . . . . . .6
— Front slightly projecting, flattened . . . . . *pustulata*
6 (5). Forewings above with ground color black or blackish brown; central California . . . . . *mera mera*
— Forewings above with ground color gray-brown, with some gray suffusion; southern California . . . *mera eremia*
7 (2). Forewings and hind wings beneath not concolorous, the former being orange and the latter orange-brown . . . .8
— Forewings and hind wings beneath concolorous, orange . . . . . 10
8 (7). Front strongly raised, with apex truncate . . . . . .9
— Front with strong transverse ridge across top and bottom . . . . . *abdita*
9 (8). Forewings above with ground color dull black-gray, suffused with grayish blue, and with maculation obscure . *arvalis*
— Forewings above with ground color brownish black, suffused with orange-brown, and with maculation discernible . . . . . *baueri*
10 (7). Forewings above with reniform white or grayish white, set in and forming part of prominent white or light gray-brown band crossing forewing . . . . . 11
— Forewings above with reniform gray or gray-brown, the forewings not crossed by prominent, light-colored band . 15
11(10). Forewings above with band crossing outer part of wing white . . . . . 12
— Forewings above with band crossing outer part of wing light gray-brown . . . 14
12(11). Front with strong transverse ridge across top and bottom . . . . . *ida*
— Front without transverse ridge . . . 13
13(12). Hind wings below with terminal black band complete; expanse 17 to 24 mm. . . . . *astrologa*
— Hind wings below with terminal black band absent in center of wing; expanse 14 to 17 mm. . . . . *divinula*
14(11). Forewings above with reniform a large, broad, semi-oval, white area, its central region not darkened . . . . *lithosina*
— Forewings above with reniform kidney shaped, darkened in center . . *miona*
15(10). Forewings above with dark brown median band basad of reniform, and with light brown band beyond reniform, both crossing wing . . . . . 16

— Forewings above with median band basad of reniform of ground color, and with faint, diffuse, grayish white band beyond reniform . . . . . *decia*

16(15). Forewings above with median cross line black, thin, sometimes partially obsolescent; hind wings above with outer margin narrow, 0.5 mm. or less in width . . . . . *depicta depicta*

— Forewings above with median cross line black, prominent, complete; hind wings above with outer margin prominent, 0.7 mm. or more in width. . . . . *depicta morula*

17 (1). Hind wings above white . . . . . 18

— Hind wings above crimson . . . . . 19

18(17). Front projecting, forming rounded prominence; under surface and hind wings above creamy white . . . . . *diva*

— Front strongly projecting and rounded, forming conical prominence; under surface and hind wings above pure white . . . . . *casta*

19(17). Front strongly raised, with slight to prominent transverse ridge across top; forewings beneath without complete median cross line . . . . . 20

— Front raised, conical, without transverse ridge across top; forewings beneath with complete median cross line . . *superba*

20(19). Front brown, two-thirds of the area between eyes strongly and broadly raised; forewings beneath with small rounded dot in place of median cross line . *spila*

— Front black, almost entire width between eyes strongly raised; forewings beneath without median cross line . . *evansi*

### Key to Male Genitalia[1]

1. Valves simple, with cucullus undifferentiated and with single spine at or near apex . . (Subgenus *Proannaphila*), 2

— Valves more complex, cucullus with or without one or more costal arms and without single apical spine . . . . . (Subgenus *Annaphila*), 5

2 (1). Aedeagus without scobinate patch on right side at distal end . . . . . .3

— Aedeagus with scobinate patch on right side at distal end . . . . . .4

3 (2). Aedeagus with vesica armed with more than 50 stout spines, none exceeding one-half of length of aedeagus. . . . . *danistica*

— Aedeagus with vesica armed with one heavy spine, much enlarged at base, approximately two-thirds of length of aedeagus and with 36 to 48 smaller spines . . . . . *hennei*

4 (2). Aedeagus with central portion of vesica armed with one heavy spine, its width being subequal to maximum width of uncus . . . . . *mera*

— Aedeagus with central portion of vesica armed with one slender spine, its width being approximately one-third of maximum width of uncus. . . . *pustulata*

5 (1). Anellus with two sclerotized spines near distal end extending posterolaterally or ventromedially . . . . . .6

— Anellus without spines as above . . .8

6 (5). Cucullus with narrow costal arm arising one-third or one-fourth of distance from base . . . . . .7

— Cucullus without narrow costal arm near base . . . . . *divinula*

7 (6). Central one-third of cucullus projecting as very broad arm, with steep sides and with apex produced ventrally and posteromedially . . . . . *lithosina*

— Central one-third of cucullus projecting as very broad arm, with slanting sides and with inner one-half of apical portion folded over ventrally . . *miona*

8 (5). Cucullus with two more or less elongate costal arms, and with apex of valve produced into an elongate projection extending as far as, or farther distad than, arms of cucullus . . . . . .9

— Valves without above combination of characters . . . . . 11

9 (8). Cucullus with a long, narrow, costal arm arising in basal half of valve, and having a second smaller arm at base of this costal arm . . . . . *arvalis*

— Cucullus with basal costal arm not having a secondary projection at base . . 10

10 (9). Valves broad, triangular; cucullus with basal costal arm narrow, curving, arising one-third of distance from base . . . . . *abdita*

— Valves narrow, elongate; cucullus with basal costal arm short, straight, arising one-half of distance from base . *baueri*

11 (8). Cucullus in form of sclerotized band, curving sharply distad to form costal arm . . . . . 12

— Cucullus not differentiated as sclerotized band . . . . . 13

12(11). Apex of uncus tapering to point; costal arm of cucullus bifurcate, extending farther distad than apex of valve . *ida*

— Apex of uncus bulbous; costal arm of cucullus simple, with apex of valve extending well posterior to it . *astrologa*

[1] No material available for *casta*.

13(11). Valves asymmetrical, with apex of right valve produced into elongate arm, apex of left valve not so modified . . . 14
— Valves symmetrical . . . . . 15
14(13). Apex of right valve extended into long, narrow, curving, spine-like arm, approximately twice length of uncus; cucullus of left valve extended into elongate pointed arm arising from most distad portion of valve . . . . *depicta*
— Apex of right valve extended into broad elongate arm; cucullus of left valve with costal arm arising near middle of valve . . . . . *diva*
15(13). Cucullus with prominent costal arm arising in basal half of valve . . *decia*
— Cucullus without costal arm . . . . 16
16(15). Apex of valves with broad terminal protuberance occupying more than one-half of width of apex, this protuberance being much wider than high; terminal group of spines in aedeagus located ventrally . . . . . 17
— Apex of valves with narrow terminal protuberance occupying one-fourth or one-third of width of apex, this protuberance being as high as wide; terminal group of spines in aedeagus on right side . . . . . *superba*
17(16). Small arm on outer margin of valves near apex extending medially across inner surface of valves . . . . . *spila*
— Small arm on outer margin of valves near apex not extending medially . *evansi*

KEY TO FEMALE GENITALIA

1. Ductus bursae lightly sclerotized, with longitudinal striations . . . . . (Subgenus *Proannaphila*), 2
— Ductus bursae heavily sclerotized, without longitudinal striations . . . . . (Subgenus *Annaphila*), 5
2 (1). Ductus bursae enlarged basally on left side and dorsally into large, irregularly shaped mass of corneous material . .3
— Ductus bursae without corneous material . . . . . .4
3 (2). Ostium with dorsal sclerotized plate subtriangular in outline . . . . *danistica*
— Ostium with dorsal sclerotized plate rounded basally and with distal side deeply cleft. . . . . *hennei*
4 (2). Ostium with ventral sclerotized plate of equal width . . . . . *mera*
— Ostium with ventral sclerotized plate widened medially . . . . . *pustulata*
5 (1). Segment VII with posterior margin of sternum straight, weakly sclerotized .6
— Segment VII with posterior margin of sternum concave, bilobed, or convex, usually heavily sclerotized . . . . .8
6 (5). Bursa copulatrix elongate, membranous.7
— Bursa copulatrix transversely or diagonally situated, lightly sclerotized, with anterior portion membranous. . . . . *baueri*
7 (6). Bursa copulatrix with anterior portion broadly rounded and situated on left side, the bursa hence appearing to be diagonally situated . . . . . *arvalis*
— Bursa copulatrix with anterior portion situated medially, the long axis of the bursa hence being longitudinal .*abdita*
8 (5). Segment VII with posterior margin of sternum bilobed. . . . . .9
— Segment VII with posterior margin of sternum concave or rounded . . . 14
9 (8). Ostium with dorsal surface a simple, flat, sclerotized plate. . . . . 10
— Ostium with dorsal surface a concave or curved sclerotized plate . . . . . 13
10 (9). Ductus bursae a smoothly sclerotized, symmetrical structure, constricted medially; posterolateral margins of segment VII without furrow . *astrologa*
— Ductus bursae asymmetrical, enlarged on left side anteriorly, the surface with ridges or folds; posterolateral margins of segment VII with furrow . . . 11
11(10). Ostium with dorsal surface a sclerotized plate, in outline appearing as an elongate flattened ellipse, with the lateral edges truncate . . . . . *lithosina*
— Ostium with dorsal surface a sclerotized plate, non-elliptical in outline . . 12
12(11). Ductus bursae with sclerotized band basad of lobe on right side . . *miona*
— Ductus bursae without sclerotized band at base of lobe on right side . . *casta*
13 (9). Ductus bursae sclerotized in two lateral columns, separated medially and bounded laterally by less heavily sclerotized areas, the left side not exceeding the right in length . *divinula*
— Ductus bursae evenly sclerotized, the left side extending nearly twice as far anteriorly as right side . . . . *depicta*
14 (8). Segment VII with posterior margin of sternum concave . . . . . 15
— Segment VII with posterior margin of sternum convex . . . . . 17
15(14). Ductus bursae straight . . . . . 16
— Ductus bursae curving sharply to right to form junction with bursa copulatrix . . . . . *diva*
16(15). Ductus bursae evenly increasing in width

to join bursa copulatrix, with left side not noticeably longer than right side. . . . . *ida*

— Ductus bursae not evenly increasing in width anteriorly, with left side almost twice as long as right side . . . *decia*

17(16). Ductus bursae constricted below ostium . . . . . 18

— Ductus bursae constricted in middle. . . . . *evansi*

18(17). Dorsal plate of ostium tending to be broadly attached laterally to broad, U-shaped plate . . . . . *superba*

— Dorsal plate of ostium with lateral portions narrow, separated by membranous area from broad, U-shaped plate . . . . . *spila*

SUBGENUS **PROANNAPHILA**, NEW SUBGENUS

Slight sexual dimorphism present in maculation. Lower surface of forewings with large, black, quadrate patch between orbicular and reniform, without t. a. and median cross lines; forewings and hind wings beneath not concolorous.

MALE GENITALIA: Valves symmetrical; cucullus undifferentiated, with single spine at or near apex of valves.

FEMALE GENITALIA: Sternum of segment VII with posterior margin weakly sclerotized. Ductus bursae weakly sclerotized, with longitudinal striations; ductus seminalis arising near junction of ductus bursae and bursa copulatrix; bursa copulatrix at or near junction with ductus bursae, or, on the latter, with an irregularly shaped mass of corneous material.

TYPE SPECIES: *Annaphila danistica* Grote.

**Annaphila (Proannaphila) danistica** Grote

Figures 1A, 6A

*Annaphila danistica* GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 151; 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 297. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 747, pl. 147, fig. 2. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 328, pl. 47d.

MALE: Head, vertex and front gray-brown, with numerous dark brown, hair-like scales; front projecting, forming rounded prominence, not extending dorsad to between antennal bases; antennae dark brown, sometimes with whitish scales near base at distal portions of segments; palpi black-brown, with scattered gray scales, and with numerous dark brown, hair-like scales tipped with gray. Thorax, dorsal surface dark brown, the scales tipped with gray, with admixed gray-brown scales; ventral surface gray-brown. Legs black-brown, with numerous grayish scales and hair-like scales; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface dark brown, with scattered orange-brown scales, posterior margins of segments narrowly marked with orange-gray scales; ventral surface dark brown, heavily overlain with gray scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dark brown, suffused with black and gray, veins sometimes slightly darkened, the markings tending to be obscure; basal line absent; t. a. line indistinct or obsolescent, black-brown, best defined below cell, shaded with light gray basally, with patch of grayish white below cubital vein, outwardly oblique, with basal bends on cubital and anal veins; orbicular elongate, light gray, faintly defined by brown, interior of ground color, connecting with faint gray patch on costa; claviform absent, or with patch of brown scales extending distad of thickening of t. a. line below cubital vein; median line absent, or suggested by faint traces of dark scales; reniform light gray, sometimes faintly shaded basally with brown, interior of ground color, distal portion tending to become obsolescent, connecting with faint gray patch on costa; t.p. line indistinct, varying from dark gray to light grayish white, broadly outcurved opposite reniform, best defined below reniform where black basal shading is present; s. t. line indistinct, dark, indicated by lighter scales on outer side; apex darkened; s. t. area more or less shaded with gray or grayish white scales; terminal line black-brown, interrupted on veins; fringe dark gray-brown in basal portion, lighter externally, the scales being tipped with gray. Hind wings orange; basal, costal, and inner areas suffused with gray-brown scales, overlain with pale orange, hair-like scales; intradiscal line absent; discal dot prominent, black, elongate; postmedian line black, prominent in lower portion of wing but fading out in

costal area, sinuous, with small basal curve on vein $M_2$, strongly incurved below vein $Cu_2$ and at anal margin; outer margin marked by narrow black band of even width; fringe black in basal portion, orange gray in outer part.

UNDER SURFACE OF WINGS: Forewings, ground color orange yellow, yellowish white in cell, overlain with dark brown scales; costa suffused with brown and gray scales to postmedian line; orbicular yellowish white, with elongate, narrow, brown-black center, bordered distally by large, black, quadrate patch, the latter with brown-black scaling ventrodistally; reniform yellowish white, with large, elliptical, black patch in center; inner margin suffused with grayish orange scales, with elongate band of brown scales anteriorly, running distally as far as postmedian line; postmedian line brown-black, narrow, sometimes partially obsolescent, beginning on costa above reniform, sharply but evenly outcurved around reniform, swinging basally in lower portion of wing; terminal area brown-black, broadly suffused in outer portion by gray, beginning on costa two-thirds of distance from base, curving evenly across wing and tapering to point at anal angle; s. t. line absent; terminal line black, narrow; fringe as above. Hind wings pale orange-brown, speckled with dark brown scales; basal area not differentiated; intradiscal line absent; discal dot black, as above; postmedian line dark brown, diffuse or sometimes partially obsolescent, strongly outcurved and subparalleling outer margin, with basal bends at vein $M_2$ and below vein $Cu_2$; a band of ground color without any overlying dark scales distad of this, followed by narrow terminal area, widest near apical angle, consisting of orange-brown and gray-brown scales, narrowing to black terminal line posteriorly; fringe as above. Expanse: 20 to 23 mm.

FEMALE: Similar to male, but forewings above tending to be more clearly and more heavily marked, and with outer portion of wing more strongly suffused with gray; hind wings above more heavily suffused with blackish gray scaling basally and along inner margin, and with postmedian line stronger, extending completely across wing. Under surface of forewings tending to be yellow, with maculation slightly heavier than in male; hind wings as in male, but tending to be more heavily suffused with dark scales. Expanse: 16 to 20 mm.

MALE GENITALIA: Uncus constricted near base, increasing in width distally, then rather sharply and evenly tapering to apex; tegumen evenly tapering distally to base of uncus; vinculum rounded to below base of valves, drawn out into rounded protuberance anteromedially; valves simple, somewhat truncate; cucullus widened at base, with spine at posterodistal angle of cucullus; sacculus with small, sparsely haired, outwardly pointing clavus; juxta with anterior margin pointed or rounded; transtilla broad, bilobed medially; aedeagus exceeding combined length of tegumen and vinculum by one-sixth, ratio of length to width approximately 3.5:1, tending to be slightly curved anteriorly; vesica armed with more than 60 stout spines, ranging in length from one-half of length of aedeagus to one-fifth of width of aedeagus.

FEMALE GENITALIA: Ostium broadly triangular, with subtriangular, dorsal, sclerotized plate, ventral surface membranous; ductus bursae slightly constricted before ostium, with spirally arranged longitudinal striations curving to the right anteriorly on ventral surface, the striations tending to become convoluted anteriorly, ductus enlarged anteriorly on left side and dorsally into large, irregularly shaped mass of corneous material extending basad of ductus; ductus seminalis arising from mediodorsal surface of lobe of bursa copulatrix; bursa copulatrix elongate, membranous, extending distad of junction with ductus bursae as small lobe on right side, the surface very finely wrinkled, with a dorsal, transverse, sclerotized plate, subtriangular in shape, with the acute angle of the triangle on the left side, the bursa somewhat enlarged anteriorly, the length of the bursa being between two and three times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In British Museum (Natural History).

TYPE LOCALITY: "Nevada Territory," according to the original description. The species was described from specimens in the Henry Edwards collection, No. 246. Under this number in the catalogue of the Henry

Edwards collection is the following information: The specimens were captured by Edwards at Virginia City in April, 1868 or 1869; he further writes: "local, found only in few spots, among Artemisia, and frequently alighting on the snow."

RANGE: Pacific coast states, from southern British Columbia to central California; Idaho and Utah. On the wing in March and April, rarely occurring as late as June.

SPECIMENS EXAMINED: *Nevada:* Virginia City, April, 1868 or 1869 (H. Edwards), 3 ♂, 3 ♀. *California:* Mt. Diablo, Contra Costa County, March 13–26, 1949 (C. I. Smith), 7 ♂; Monticello, March 31, 1935 (E. C. Johnston), 1 ♂; Salinas River, near Salinas, March 9, 1941 (B. Weber), 1 ♂; San Luis Obispo, 1 ♀; Summit, Placer County, June, 1903, 3 ♀; Plumas County, June (H. G. Dyar), 1 ♀; "Middle Cala.," 1 ♂; "S. Cal.," 1 ♂; "Cal.," 2 ♂, 1 ♀. *Oregon:* Baker, April 20, 1938 (J. H. Baker), 1 ♀; Central Point, March 22, 1933, 1 ♂. *Washington:* Kamiack Butte, April 19, 1929 (J. F. Clarke), 1 ♂; Satus Creek, Whitman County, April 4, 1942 (E. C. Johnston), 1 ♂, 1 ♀. *Idaho:* Johnson's Bar, Snake River, April 10, 1926 (J. F. Clarke), 3 ♀. *Utah:* Dividend, March 22–April 29 (T. Spalding), 2 ♂, 1 ♀; Stockton, April 8, 1903 (T. Spalding), April 7–26, 2 ♂, 3 ♀; Eureka, March 26–April 16, 1911 (T. Spalding), 1 ♂, 1 ♀. *British Columbia:* Oliver, April 9–13, 1923 (C. B. Garrett), 2 ♂; Rossland, 3800 feet, April 23 (Danby), 1 ♀. *No data:* 1 ♂.

This species has also been reported from Havilah, California, and Camp Watson, Grant County, Oregon (Walsingham), by Hampson, and from Kaslo, British Columbia (Cockle), by Dyar. This last apparently is referable to *decia*, as a Cockle specimen bearing these data in the Canadian National Collection, with the identification label *A. danistica* Grote, is certainly *decia*.

REMARKS: A rather widely ranging species, but one that apparently is seldom captured in any numbers. It can be recognized by the suffused brown primaries, the narrow black terminal band of even width on the secondaries above, plus the postmedian line of the hind wings which is present on the superior surfaces to a greater or lesser degree. The genitalia are distinctive also, the male having the aedeagus without a scobinate patch and with a large number of stout spines, and the female with the dorsal sclerotized plate of the ostium triangular in outline.

**Annaphila (Proannaphila) hennei,** new species
Figures 1D, 6B

MALE: Head, vertex and front black-brown, the scales tipped with gray, with very few hair-like scales; front projecting, forming rounded prominence extending dorsad to between antennal bases; antennae dark brown, rarely with whitish scales at distal portions of segments; palpi covered with grayish white and dark brown scales, terminally darker, with dark brown, hair-like scales tipped with gray. Thorax, dorsal surface black-brown, the scales tipped with gray; ventral surface gray-brown. Legs dark brown, with numerous grayish scales and hair-like scales; tibiae with ring of grayish white scales on distal portions of segments. Abdomen, dorsal surface dark brown, posterior margins of segments narrowly marked with orange-gray scales; ventral surface dark brown, heavily overlain with gray scales and with some gray, hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color gray-black, suffused with gray, the markings tending to be obscure; basal line absent; t. a. line indistinct to obsolescent, black-brown, shaded with light gray basally, outwardly oblique; orbicular elongate, faintly defined by black scales on basal and outer margins, light gray, interior of ground color; claviform absent; central portion of wing between t. a. and t. p. lines darker than basal and terminal areas, with more or less complete black line midway between cubital and anal veins paralleling the latter; median line absent or suggested by faint traces of dark scales; reniform light gray, narrowly bordered with black scales basally, interior of ground color, distal portion tending to become obsolescent; t. p. line light gray, basally shaded with brown-black, broadly outcurved around reniform, meeting inner margin at right angle; s. t. line indistinct to obsolescent, dark, indicated by lighter scales on outer side; s. t. area lightly shaded with gray scales; terminal line black-brown, narrowly interrupted on veins; fringe dark gray-brown in basal portion, lighter externally, the scales being tipped with gray. Hind wings orange; basal, costal, and inner areas suffused with black scales, overlain with orange-brown, hair-like scales; intradiscal line absent; discal dot black, elongate, rarely reduced or absent; post-

median line absent; outer margin marked by narrow black band of more or less even width; fringe gray-black in basal portion, gray-brown in outer part.

UNDER SURFACE OF WINGS: Forewings, ground color orange-yellow, yellowish white in cell, heavily suffused with gray-black scales; costa heavily suffused with gray-black and brown-black scales to postmedian line; base of cell heavily suffused with brown-black; orbicular yellowish white, large, semi-quadrate, with ovoid to elongate black center, bordered distally by large black quadrate patch, the latter with brown-black scaling continued ventrodistally around base and outer margin of reniform, joining postmedian line; reniform yellowish white, oval, sharply defined, with black oval center; inner margin broadly and heavily suffused with black-brown, extending anteriorly almost to cubital vein, leaving only narrow strip of ground color along cubital vein from base to post-median line; postmedian line black-brown, narrow, beginning on costa above reniform, sharply but evenly outcurved around reniform, swinging basally in lower portion of wing, outwardly defined for entire length by band of ground color; terminal area of wing black-brown, with a few gray scales at apex, beginning on costa two-thirds of distance from base, curving evenly across wing to vein $M_3$ or $Cu_1$, then parallel with outer margin to inner margin; s. t. line absent; terminal line not differentiated; fringe as above. Hind wings orange; basal area, costal area from base of wing to apex, and inner area from base of wing to anal angle broadly suffused with gray and brown scales; intradiscal line absent; discal dot black, as above; postmedian line absent, or faintly indicated opposite cell; terminal line black, narrow, complete; fringe as above. Expanse: 17 to 21 mm., holotype 18 mm.

FEMALE: Similar to male, but abdomen more suffused with gray-brown scales; forewings above darker, tending to be more clearly and more heavily marked, with central portion of wing appearing black, the maculation defined by gray, with black patch between orbicular and reniform; under surface of forewings tending to be yellow white, almost pure white in cell. Expanse: 15 to 19 mm., allotype 15 mm.

MALE GENITALIA: Uncus narrowed at base, slightly bulbous distally, curving to apex; tegumen evenly tapering distally to base of uncus; vinculum rounded to below base of valves, produced to rather elongate point anteromedially; valves simple, somewhat bi-truncate, the straight surfaces at posterior and distal margins tending to be more or less equal in length; cucullus widened at base, with small spine at posterodistal angle of cucullus; sacculus with small, sparsely haired, outwardly pointing clavus; juxta with small membranous indentation in center of broad anterior margin; transtilla broad, bilobed; aedeagus exceeding combined length of tegumen and vinculum by one-fifth to one-third, ratio of length to width varying from 4:1 to 6:1, tending to be slightly curved anteriorly; vesica armed with one heavy spine, much enlarged at base, two-thirds of length of aedeagus, and 36 to 48 smaller spines, ranging in length from approximately one-third of length of aedeagus to one-fifth of width of aedeagus.

FEMALE GENITALIA: Ostium broadly triangular, with basal side of sclerotized dorsal plate rounded and with distal side rather deeply and irregularly cleft medially, ventral surface membranous; ductus bursae without constriction before ostium, with longitudinal striations tending to be spirally arranged, curving to the right anteriorly on ventral surface, the striations tending to become convoluted anteriorly, ductus enlarged anteriorly on left side and dorsally into irregularly shaped mass of corneous material extending basad of ductus; ductus seminalis arising from mediodorsal surface of lobe of bursa copulatrix; bursa copulatrix elongate, membranous, the surface with very short, inwardly pointing spines, extending distad of junction with ductus bursae as small lobe on right side, the surface very finely wrinkled, with the posterodorsal area weakly sclerotized and with a small subtriangular plate, the bursa somewhat enlarged anteriorly, the length of the bursa being between two and three times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Bob's Gap, south of Llano, Los Angeles County, California,

March 31, 1948, elevation 4000 feet; allotype, female, same data, April 1, 1948. Paratypes, 14 males and 17 females: same data as holotype, 22 specimens, with the following range of dates: March 27–April 4, 1948; Llano, upper Mojave Desert, Los Angeles County, California, March 26, 1944, March 17, 1946, five specimens; north fork, Chilao Creek, Los Angeles County, California, May 2, 1949, elevation 5715 feet (W. H. Evans); Tapia Camp, Santa Monica Mountains, Los Angeles County, California, March 22, 1947 (L. M. Martin); Deep Canyon, [Riverside County], California, April 2–3, 1933 (C. M. Dammers), two specimens.

Holotype and allotype deposited in the American Museum of Natural History. Paratypes to be distributed as follows: California Academy of Sciences; California Insect Survey collection, Division of Entomology and Parasitology, University of California, Berkeley; Los Angeles County Museum; United States National Museum; the American Museum of Natural History; Canadian National Collection; and collections of Christopher Henne of Pasadena, and William H. Evans of Sun Valley, California.

RANGE: Southern California. On the wing in March, April, and early May.

REMARKS: This species can be recognized by the suffused grayish black primaries, the narrow, black, terminal band of even width on the secondaries above, together with the absence of the postmedial line on the superior surface of the hind wings. In general appearance, *hennei* is closest to *danistica*, but can be distinguished from that species, in addition to the characters noted above, by the shape of the front: in *hennei* the front projects as a rounded prominence extending dorsad to between the antennae, while in *danistica* the swelling of the front does not extend to between the antennal bases. The male genitalia of *hennei* are similar to those of *danistica*, but can be distinguished therefrom by the presence of one large, heavy spine, with the base much enlarged, in the vesica of the aedeagus, plus 36 to 48 smaller spines, and by the usually more elongate and pointed anterior margin of the vinculum. In the female genitalia, the two species are most easily separated by the shape of the dorsal plate of the ostium: in *hennei* the basal side is rounded and the distal side is rather deeply and irregularly cleft medially, while in *danistica* the plate is subtriangular in outline.

The males and females of this species have entirely different methods of flight; on the wing they appear to be entirely different species. The males have the typical *Annaphila* flight, high and fast; the females are slow and erratic. When not feeding, they usually rest on open ground and, when flushed, fly close to the ground. Both sexes of this species have been taken feeding on the flowers of *Coleogyne ramosissima* Torrey at the type locality.

This species is named in honor of our mutual friend and ardent collector, Mr. Christopher Henne of Pasadena, California, who first discovered it and captured most of the type series.

**Annaphila (Proannaphila) mera mera** Harvey

Figures 1B, 6C

*Annaphila mera* HARVEY, 1875, Bull. Buffalo Soc. Nat. Sci., vol. 2, p. 277. GROTE, 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 297. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 474, pl. 147, fig. 3. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 328, pl. 47d.

*Annaphila domina* HENRY EDWARDS, 1875, Proc. California Acad. Sci., ser. 1, vol. 6, p. 138. BEUTENMÜLLER, 1892, Bull. Amer. Mus. Nat. Hist., vol. 4, p. 188. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 297. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 475, pl. 147, fig. 4. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 328, pl. 47e. (New synonymy.)

MALE: Head, vertex and front with mixed black and gray scales and hair-like scales; front broadly projecting, rounded, prominent; antennae black-brown, sometimes lightly marked near base with whitish scales at distal portions of segments; palpi black, with scattered grayish white scales, with numerous black, hair-like scales tipped with gray. Thorax, dorsal surface black, the scales tipped with gray; ventral surface gray-black. Legs blackish, with numerous gray scales and hair-like scales; tibiae with ring of white scales on

distal portions of segments. Abdomen, dorsal surface black-brown, with scattered dull orange-brown scales, posterior margins of segments sometimes weakly marked with orange-brown scales; ventral surface gray-black, overlain with gray scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dull black, with many scales being narrowly tipped with gray; basal line represented by a few black scales in costal half of wing; t. a. line present, tending to be poorly defined or obsolescent in part, black, sometimes lightly shaded with gray basally, with small patch of gray scales below cubital vein, outwardly curving from costa to below cubital vein, swinging basally to anal vein, then outwardly curved to inner margin; orbicular defined on basal and distal margins by black, open above and below, rarely central portion slightly lighter in color, outwardly oblique, more or less elliptical in outline; claviform elongate, partially defined by black, rarely completely so, connected to t. p. line by black dash; median line absent; reniform incompletely defined by black, strongest on basal side, with area between orbicular and reniform slightly darker than adjacent area, rarely central portion slightly lighter in color, distal portion tending to become obsolescent; t. p. line grayish white, usually obsolescent but defined on basal side by black line, broadly outcurved and slightly bidentate opposite reniform, swinging basally below vein $Cu_2$ where t. p. line is sometimes thickened, with black patch basally, then with outward arc on anal vein to inner margin; s. t. line absent or occasionally represented by a few gray scales, sometimes defined on basal side with black; terminal line poorly defined, black; fringe black in basal portion, lighter externally, the scales being tipped with gray. Hind wings orange; basal and inner areas suffused with black, overlain with pale orange, hair-like scales; costal area lightly suffused with orange-brown scales; intradiscal line absent; discal dot black, elongate, prominent; postmedian line absent; outer margin marked by black terminal band, increasing in width at vein $M_2$ and below vein $Cu_2$, connecting with darkened inner margin at anal angle; fringe dull black in basal portion, orange-brown in outer part.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa suffused with black and orange-brown scales; orbicular yellowish white, central portion faintly darkened, outwardly oblique, quadrangular, bordered on basal side by triangular or subrectangular black patch, this sometimes obsolescent, bordered distally by large, quadrate, black patch; reniform yellowish white, with large, narrowly elliptical, black patch in center; inner margin suffused with orange-gray scales, with elongate band of black scales anteriorly, running distally to just beyond postmedian line; postmedian line black, narrow, beginning on costa above outer margin of reniform, evenly curved around reniform, swinging basally in lower portion of wing, tending to fade out before reaching inner margin; terminal area of wing brown-black, beginning on costa three-quarters of distance from base, curving evenly across wing, then subparalleling outer margin, tending to fade out at anal angle; s. t. line absent, sometimes faintly indicated by scattered gray scales; terminal line not differentiated; fringe as above. Hind wings brownish orange, speckled with black and dark brown scales, especially along costal and inner margins; basal area slightly and narrowly darkened; intradiscal line absent; discal dot present, weakly represented, black, elongate; postmedian line varying from complete to obsolescent, black-brown, strongly outcurved, subparalleling outer margin, with small basal bends at veins $M_2$ and $Cu_2$; band of ground color distad of this, concolorous with basal portion of wing or slightly lighter in color; terminal area black, overlain with orange-brown scales, especially in upper part of wing, subparalleling outer margin, increasing in width at veins $M_2$ and $Cu_2$; fringe as above. Expanse: 19 to 22 mm.

FEMALE: Similar to male, but forewings above tending to be slightly browner, more clearly and more heavily marked, and with blackish brown patch between orbicular and reniform; hind wings above more heavily suffused basally and along inner margin with blackish scales, rarely with faint, incomplete postmedian line in lower portion of wing. Under surface of forewings somewhat variable in maculation, center of orbicular varying from heavily marked to not differentiated,

with black patch basad of orbicular prominent to obsolescent; longitudinal black dash above inner margin tending to be thicker; hind wings tending to have dark suffusion restricted to costal and inner areas, leaving central portion of wing of ground color; discal dot tending to be more strongly represented; extradiscal line varying from obsolescent to complete. Expanse: 19 to 21 mm.

MALE GENITALIA: Uncus narrowed at base, somewhat bulbous distally, curving to apex; tegumen evenly tapering distally to base of uncus; vinculum rounded to below base of valves, produced into rather elongate protuberance anteromedially; valves simple, tapering distally, apex bluntly rounded; cucullus slightly widened at base, with strong spine at posterodistal angle of cucullus; sacculus with slight, sparsely haired swelling representing clavus; juxta with anterior margin pointed; transtilla broad, median area membranous; aedeagus subequal in length to combined length of tegumen and vinculum, ratio of length to width approximately 5:1 or 6:1, with lightly scobinate patch on right distal portion of aedeagus; vesica armed with one heavy spine in center, approximately one-third of length of aedeagus, subequal in width to maximum width of uncus, and with group of several dozen closely packed spines at apical end, these being more or less subequal in length to single central spine.

FEMALE GENITALIA: Ostium broadly triangular, dorsal surface membranous, ventral surface broadly sclerotized, with anterior margin tending to be irregularly ridged, basally with membranous area; ductus bursae slightly constricted before membranous area of ostium, with strong longitudinal striations, these tending to be short on ventral surface but elongate on left side dorsally and with small area of convolutions in middle; ductus seminalis arising on left side in area of junction between ductus bursae and bursa copulatrix; bursa copulatrix elongate, the anterior portion membranous, the surface with numerous very short, inwardly pointing spines, enlarged on right side and dorsally of junction with ductus bursae into poorly defined lobe, tending to be weakly sclerotized, and having a more or less rounded mass of corneous material on right side of this lobe, and with a second, lightly sclerotized lobe located on ventral surface at junction of bursa and ductus bursae, the length of the bursa being approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: *Mera*, British Museum (Natural History); described from a single male. *Domina*, the American Museum of Natural History; described from a single female.

TYPE LOCALITY: California (*mera*); San Mateo County, California (*domina*).

RANGE: San Francisco Bay area and Sierra Nevadas of central California. On the wing in April and May.

SPECIMENS EXAMINED: *California:* San Mateo County, May (H. Edwards), 2 ♀; mountains behind Alma (J. G. Grundell), 2 ♀; Anderson Springs, Lake County, April 1–2, 1950 (W. R. Bauer), 6 ♂; Placer County, 2500 feet, 1 ♀.

One of the specimens in the collection of the American Museum of Natural History is labeled Havilah, California, and in addition bears No. 5720 of the Henry Edwards collection. A reference to the catalogue of this collection shows that the locality referable to this number is San Mateo County, California, May; it is the same number as on the type of *domina*. Consequently, it is felt that the Havilah label should be regarded as doubtfully authentic.

REMARKS: A species very poorly represented in most collections. It can be recognized by the dull black forewings, the relatively wide terminal band on the superior surfaces of the secondaries, and by the broadly projecting, prominent front. The genitalia can be distinguished in the male by the scobinate patch on the right side at the distal end, and by the fact that the vesica is armed medially by a single heavy spine; in the female, by the absence of any corneous material on the ductus bursae, and by the fact that the ventral sclerotized plate of the ostium is of equal width.

### Annaphila (Proannaphila) mera eremia, new subspecies

MALE: Head, vertex and front gray brown; palpi mostly white at base, with scattered

brown scales, becoming darker terminally and ventrally. Thorax gray-brown above.

UPPER SURFACE OF WINGS: Forewings, ground color gray-brown, with some gray suffusion; all markings black, shaded with grayish white; claviform obsolescent, not connected to t. p. line; t. p. line with whitish patch above inner margin; s. t. area lightly suffused with grayish white scales; apex darkened; terminal line black; fringe tending to be checkered. Hind wings with black suffusion at base and along inner margin extending to between veins $Cu_2$ and V, sometimes slightly beyond this.

UNDER SURFACE OF WINGS: Forewings with center of orbicular not darkened, without black patch basad of orbicular; longitudinal black dash above inner area greatly reduced; postmedian line absent, or represented by small dark spot on costa only; terminal dark area suffused with gray in apical portion; fringe as above. Hind wings without postmedian line; terminal area more or less of even width, diffuse. Expanse: 22 to 26 mm., holotype 24 mm.

FEMALE: Similar to male, but forewings above more suffused with gray, cross lines and markings outlined with black, the maculation hence being more clearly defined; claviform present; area between orbicular and reniform tending to be darkened; hind wings above tending to have slightly less black suffusion along inner margin. Under surface of forewings with small triangular black patch basad of orbicular; postmedian line present, sometimes partially obsolescent; hind wings with dark suffusion reduced and more or less restricted to costal area, leaving central and lower portion of wing of ground color; postmedian line faintly represented or obsolescent. Expanse: 21 to 22 mm., allotype 22 mm.

MALE GENITALIA: Entire structure larger than in nominate subspecies by approximately one-sixth; vesica with ventral heavy spine tending to be somewhat shorter and thicker than in nominate subspecies.

FEMALE GENITALIA: As in nominate subspecies.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Bob's Gap, southeast of Llano, Los Angeles County, California, April 7, 1948 (W. H. Evans); allotype, female, same data, April 1, 1948. Paratypes, 14 males and five females: same data as holotype, 13 specimens, with the following range of dates: March 27–April 7, 1948 (W. H. Evans, C. Henne, C. I. Smith); Big Rock Wash, south of Llano, Mojave Desert, Los Angeles County, California, March 24, 1946; near Llano, Mojave Desert, Los Angeles County, California, March 31, 1948 (W. H. Evans); Vasquez Rocks, Mojave Desert, California, February 23, 1947; Mint Canyon, Los Angeles County, California, March 9, 1946 (B. Weber), March 6, 1947, and April 4, 1949 (W. H. Evans), three specimens.

Holotype and allotype deposited in the collection of the American Museum of Natural History. Paratypes to be distributed as follows: California Academy of Sciences; California Insect Survey collection, Division of Entomology and Parasitology, University of California, Berkeley; Los Angeles County Museum; United States National Museum; the American Museum of Natural History; and collection of William H. Evans, Sun Valley, California.

RANGE: Southern California. On the wing in February, March, and April.

REMARKS: As far as is known, *eremia* is confined to the semi-arid regions of Mint Canyon and the western portion of the Mojave Desert. This is in sharp contrast with the known localities and habitats of nominate *mera*, occurring in the wetter and more humid San Francisco Bay area. This subspecies can be distinguished from typical *mera* by the gray-brown color of the forewings above, tending to be suffused with gray, and by the more clearly defined maculation.

The junior author has taken this species feeding on the blossoms of *Coleogyne ramosissima* Torrey. This hardy member of the Rosaceae is the first flower to blossom in the spring at the Bob's Gap locality. As a consequence, all the flower-feeding insects on wing at the time are attracted to it, and collecting them is thus a fairly simple matter. The plants grow only in the bed of the dry wash going through Bob's Gap, making a fine concentration of "attractors" in the protected situation preferred by *Annaphila*.

**Annaphila (Proannaphila) pustulata**
Henry Edwards
Figures 1C, 6D

*Annaphila pustulata* HENRY EDWARDS, 1881, Papilio, vol. 1, p. 23. BEUTENMÜLLER, 1892, Bull. Amer. Mus. Nat. Hist., vol. 4, p. 189. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 297. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 476, pl. 147, fig. 5. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 60. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e.

MALE: Head, vertex and front dark brown, with scattered gray scales, and numerous brown, hair-like scales; front slightly projecting, flattened; antennae dark brown, sometimes lightly marked near base with whitish scales at distal portions of segments; palpi covered with mixture of gray and brown scales, tending to become darker apically and dorsally. Thorax, dorsal surface dark brown, the scales tipped with gray; ventral surface gray-brown. Legs dark brown, with numerous grayish scales and hair-like scales; tibiae with ring of gray-white scales on distal portions of segments. Abdomen, dorsal surface gray-brown, with scattered gray scales, posterior margins of segments sometimes weakly marked with gray; ventral surface gray-brown, overlain with gray scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dark brown, suffused with gray, basal line absent; t. a. line black, complete, shaded basally by light gray-brown, outwardly oblique, sinuous, with outward bends on radial vein, below cubital vein, and on anal vein; orbicular defined on basal and distal margins by black, open above and below, grayish white with central portion darker, outwardly oblique, more or less elliptical in outline; claviform absent or weakly represented, partially or completely outlined by black when present, tending to be connected to t. p. line by black dash; median line absent; reniform incompletely defined by black, strongest on basal side, with area between orbicular and reniform slightly darker than adjacent area, central portion shaded with gray-brown, distal portion tending to become obsolescent; t. p. line grayish white, tending to be weakly represented, defined on basal side by black line, broadly outcurved and slightly bidentate opposite reniform, swinging basally below vein $Cu_2$ where t. p. line is thickened, with black patch basally, then with outward arc on anal vein to inner margin; s. t. line weakly represented by a few gray scales, sinuous; apex darkened; terminal line black-brown, somewhat interrupted; fringe black-brown in basal portion, slightly lighter externally, the scales being tipped with gray. Hind wings orange; basal and inner areas broadly suffused with black-brown scales, overlain with pale orange-gray, hair-like scales, black scaling sometimes extending along fold to meet discal dot; costal area lightly suffused with orange-brown scales; intradiscal line absent; discal dot black, prominent, somewhat quadrate in shape; postmedian line absent; outer margin marked by black terminal band, increasing in width at vein $M_2$ and below vein $Cu_2$, connecting with darkened inner margin at anal angle; fringe black-brown in basal portion, dull orange-brown in outer part.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa suffused with brown and orange-gray scales; orbicular grayish orange to yellowish white, central portion faintly or prominently darkened, outwardly oblique, quadrangular, bordered on basal side by triangular or subrectangular black patch, bordered distally by large, quadrate, black patch; reniform grayish orange to yellowish white, with large subelliptical black patch in center; inner margin suffused with orange-brown or orange-gray scales, with elongate band of black scales anteriorly, running well out on wing but not extending to outer margin; postmedian line black, narrow, beginning on costa above outer margin of reniform, evenly curved around reniform, then absent posterior to this; terminal area of wing black-brown, suffused with gray near apex, beginning on costa three-quarters of distance from base, curving evenly across wing, then subparalleling outer margin, narrowing below anal vein; s. t. line absent, sometimes faintly indicated by scattered gray scales; terminal line not differentiated; fringe as above. Hind wings brownish orange, heavily suffused with dark gray and brown-black scales, especially along costal and inner margins; basal area slightly and narrowly darkened; intradiscal

line absent; discal dot black, prominent, as above, or reduced; postmedian line absent or weakly represented, dark brown, strongly outcurved, subparalleling outer margin; band of ground color distad of this, concolorous with basal portion of wing; terminal area brown-black, diffuse, overlain with orange-brown scales, especially in upper part of wing, subparalleling outer margin, increasing in width at vein $M_2$ and below vein $Cu_2$; fringe as above. Expanse: 20 to 21 mm.

FEMALE: Similar to male, but forewings above tending to be more clearly and more heavily marked; claviform usually present, completely outlined in black, strongly connected to t. p. line; black quadrate patch between orbicular and reniform; hind wings above rarely showing faint trace of postmedian line. Under surface of forewings tending to be somewhat more suffused with yellow-orange scales, with postmedian line tending to be more complete, and with more gray scaling near apex of wing; hind wings with dark suffusion much reduced and restricted to costal and inner areas, most of the wing being orange; discal dot tending to be more strongly represented; a streak of orange-brown scales often present along vein $M_2$ between discal dot and outer margin. Expanse: 20 to 24 mm.

MALE GENITALIA: Uncus narrowed at base, somewhat bulbous distally, curving to apex; tegumen evenly tapering distally to base of uncus; vinculum rounded to below base of valves, produced to rather elongate point anteromedially; valves simple, narrowing apically, apex bluntly rounded; cucullus slightly widened at base, with strong spine at posterodistal angle of cucullus; sacculus with slight, sparsely haired swelling representing clavus; juxta with anterior margin pointed; transtilla broad, median area membranous; aedeagus slightly longer than combined length of tegumen and vinculum, ratio of length to width approximately 4:1, with slight median constriction, and with rather heavily scobinate patch at right distal portion of aedeagus; vesica armed with one slender spine in center, approximately three-tenths of length of aedeagus, in width less than one-third of maximum width of uncus, and with group of several dozen closely packed spines at apical end, these being more or less subequal in length to single central spine.

FEMALE GENITALIA: Ostium broadly triangular, dorsal surface membranous, ventral surface broadly sclerotized, increasing in width medially, with anterior margin tending to be irregularly ridged, basally with membranous area; ductus bursae without noticeable constriction at junction with ostium, with strong longitudinal striations, these tending to be relatively short on ventral surface but elongate on left side dorsally and with small area of convolutions in middle; ductus seminalis arising on left side from near distal junction of ductus bursae and bursa copulatrix; bursa copulatrix elongate, the anterior portion membranous, the surface with numerous very short, inwardly pointing spines, enlarged on right side and dorsally of junction with ductus bursae into poorly defined lobe, tending to be weakly sclerotized, and having a more or less rounded mass of corneous material on right side of this lobe, and with a second lightly sclerotized lobe located on ventral surface at junction of bursa and ductus bursae, the length of the bursa being between two and three times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In the American Museum of Natural History; described from a single female.

TYPE LOCALITY: Prescott, Arizona.

RANGE: Arizona to western Texas. On the wing in March, April, September, and November.

SPECIMENS EXAMINED: *Arizona:* Prescott, 1 ♀; Miami, Gila County, March 15–25, 1925, 1 ♂, 1 ♀; White Mountains, September 1–15, 1925, 1 ♂; Pinal County, March, 6 ♀. *Texas:* Alpine, elevation 5000–7000 feet, April 1–15, 1926, 4 ♀; Davis Mountains, November 1–15, 1924, 4 ♀.

REMARKS: This species is apparently confined to the higher elevations in the southwest. The dates of capture extend over a much longer period of time than is usual for most species of this genus; this may or may not indicate that more than one brood is produced per year. In appearance, *pustulata* is closest to *mera*, but can be separated from the latter species by the slightly projecting and flattened front; the two species are quite similar in color and maculation. The genitalia

also show a close relationship to *mera;* the male can be distinguished by the fact that the central portion of the vesica is armed with one slender, short spine, and the female, that the ventral sclerotized plate of the ostium is widened medially.

SUBGENUS **ANNAPHILA** GROTE

No sexual dimorphism present in maculation. Lower surface of forewings without orbicular and reniform, but with median cross line present, very rarely absent; forewings and hind wings beneath concolorous or not.

MALE GENITALIA: Valves symmetrical or asymmetrical; cucullus usually having one or more costal arms, the basad of these sometimes with second small appendage at its base, and with apex of valve often produced into more or less elongate arm.

FEMALE GENITALIA: Sternum of segment VII with posterior margin heavily sclerotized. Ductus bursae sclerotized, without striations; ductus seminalis arising from ventral surface near junction of ductus bursae and bursa copulatrix or from distal lobe of bursa copulatrix on right side; bursa copulatrix and ductus bursae without mass of corneous material.

TYPE SPECIES: *Annaphila diva* Grote.

**Annaphila (Annaphila) arvalis**
Henry Edwards

Figures 1F, 6E

*Annaphila arvalis* HENRY EDWARDS, 1875, Proc. California Acad. Sci., ser. 1, vol. 6, p. 136. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 473, pl. 147, fig. 1. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 328, pl. 47d.

*Annaphila salicis* HENRY EDWARDS, 1881, Papilio, vol. 1, p. 23 (new name for *arvalis*). BEUTENMÜLLER, 1892, Bull. Amer. Mus. Nat. Hist., vol. 4, p. 189. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 297. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 473 (synonymy).

MALE: Head, vertex and front black, with scattered gray scales and grayish white and black hair-like scales; front strongly raised, subtriangular, with apex truncate; antennae black-brown, with distal portions of segments white or not differentiated; palpi covered with mixture of grayish white and black scales and hair-like scales at base, with increasing number of black scales and hair-like scales terminally and dorsally. Thorax, dorsal surface black, with scattered gray scales and hair-like scales; ventral surface light gray. Legs black, with white scales and hair-like scales at base; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, with scattered gray scales and pale hair-like scales, posterior margins of segments narrowly marked with grayish white; ventral surface black, heavily overlain with grayish white scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dull black-gray, suffused with grayish blue, with maculation obscure; basal line absent, or indistinctly represented by a few black scales; t. a. line indistinctly represented, shaded basally by gray, outwardly oblique, sinuous; orbicular, claviform, and reniform absent; median line indistinctly represented by black shade, outwardly oblique, with slight basal angle on vein $Cu_2$; a diffuse postmedian band, grayish blue and grayish white, widest opposite end of cell, slightly incurved below cell and at inner margin; t. p. line absent, or indistinctly represented distad of postmedian band; s. t. line absent; terminal area of wing suffused with grayish blue or grayish white scales, bounded externally by black terminal line; fringe with basal portion black, mixed with some gray scales, terminal half blackish gray. Hind wings orange; basal area and inner margin black, overlain with pale orange, hair-like scales; intradiscal line usually not differentiated from basal area; discal dot absent or slightly indicated; outer margin marked by narrow black band, tending to increase slightly in width below vein $Cu_2$; fringe blackish gray in basal portion, orange-brown in terminal part.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa suffused with black, orange-brown, and gray scales; t. a. line absent; median line black, somewhat diffuse, sometimes interrupted by small patch on costa, outwardly oblique, more sharply angled outward below cubital vein; inner margin varying in color from orange-gray to black, not connecting with terminal band; discal dot absent; terminal area of wing

black, heavily overlain with orange-gray and orange-brown scales, especially in subterminal area; s. t. line absent, but with white spot present on costa; fringe as above, vein endings marked with whitish scales. Hind wings, ground color orange-brown, speckled with black scales; basal area lightly suffused with dark scales; intradiscal line gray-black, completely or partially obsolescent, with outward bends in cell and on anal vein; discal dot gray-black, small; postmedian line gray-black, completely or partially obsolescent, strongly outcurved and subparalleling outer margin, with basal bend below vein $Cu_2$; a band of dull orange or of ground color distad of this, followed by thin, black, terminal area, obsolete between veins $M_3$ and $Cu_2$, with apical portion more or less heavily overlain with orange scales; fringe orange-black in basal portion, orange-brown in terminal part. Expanse: 21 to 24 mm.

FEMALE: Like male. Expanse: 21 to 25 mm.

MALE GENITALIA: Uncus elongate, slightly constricted at one-third of distance from base and again near apex, the latter bluntly, broadly rounded; tegumen evenly tapering distally to base of uncus; vinculum tapering to base of valves, then more sharply tapering to anteromedial point; valves complex, symmetrical; cucullus slightly enlarged at base, with narrow costal arm arising two-fifths of distance from base, in length being slightly longer than length of uncus, with smaller arm arising at base of costal arm, being one-third of length of the latter, and with second costal arm arising four-fifths of distance from base on dorsal surface of valve, tapering, less than one-half as long as basal costal arm; apex of valves produced distally into elongate, bluntly pointed arm; sacculus without clavus; juxta with anterior margin concave; transtilla curving posteriorly, outer margin with two small lobes; aedeagus approximately six-sevenths of combined length of tegumen and vinculum, ratio of length to width varying from approximately 4:1 to 4.5:1, tending to be slightly curved, widest just basad of center; vesica armed with approximately 24 stout spines in distal half of aedeagus, the larger group beginning at center and extending to near distal end of aedeagus, these spines gradually increasing in size distally, with longest spine being at distal end and being approximately three-eighths of length of aedeagus, and with a second smaller group of shorter spines near apex, the longest of these being approximately one-half of width of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin straight; sternum of segment VIII sclerotized, its anterior margin produced basally, and with narrow, median, transverse, membranous area. Ostium broad, dorsal surface sclerotized, broadly triangular, ventral surface with sides extended laterally to form a wide but narrow sclerotized plate, narrowed and concave medially; ductus bursae broad, without any definite demarcation between it and ostium, more heavily sclerotized on right side, with dorsal surface lightly scobinate, increasing in width rather sharply to form junction with bursa copulatrix; ductus seminalis arising from median surface of lobe of bursa copulatrix on right side near ductus bursae; bursa copulatrix membranous, elongate, extending diagonally, the distal end narrowed, in form of small lobe to the right of junction with ductus bursae, the anterior end broadly rounded and located on left side, the surface of the anterior portion with numerous small, inwardly pointing spines, the length of the bursae being between two and one-half and three and one-half times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Mr. William H. Evans has succeeded in rearing this species and has been kind enough to furnish the following notes:

EGGS: Deposited March 8, 1950; hatched March 21, 1950.

LARVAE, THIRD INSTAR: Flesh colored, with a pinkish tinge; a fine, indistinct, lateral line extending the length of the body.

FOURTH INSTAR: Flesh colored, with a greenish tinge on the dorsal area; margins of abdominal segments I to V ringed with pink; lateral stripe cream colored, very thin on thoracic and abdominal segments I through V, approximately 0.5 mm. wide from middle of segment V to anal extremity.

FIFTH INSTAR: Ground color grayish black, with a broad, cream-colored, lateral strip extending the length of the body, and with a few minute, white points in the subdorsal area.

Pupation occurred inside hollow stems, but no attempt was made to seal the openings.

FOOD PLANT: *Montia perfoliata* (Donn) Howell. In the first two instars, the larvae hid among the buds of the food plant but never inside the blossoms or buds. In the last two instars, leaves were occasionally eaten, but the buds and blossoms were preferred.

TYPE: According to the original description, this species was described from at least one male and one female, "coll. Dr. Behr." It is very doubtful if these specimens are still in existence, as they were probably destroyed with the Behr collection at San Francisco in 1906. In the collection of the American Mueum of Natural History is a female, bearing Edwards' handwritten type label, with the locality data "6618. Oregon." Referring to this number in the catalogue of the Henry Edwards collection, the only additional information obtained is that the specimen came from Walsingham. This specimen is undoubtedly not one of the original types, but it may be considered as typical.

TYPE LOCALITY: Sierra Nevada, California.

RANGE: Washington, Oregon, and California. On the wing in late January, February, March, and April.

SPECIMENS EXAMINED: *California:* La Tuna Canyon, Los Angeles County, March 9–11, 1948 (W. H. Evans, C. Henne), 2 ♂; Tapia Park, Los Angeles County, March 20, 1949 (L. M. Martin), 1 ♀; Little Tujunga Canyon, Los Angeles County, March 21, 1949, elevation 1775 feet (W. H. Evans), 1 ♀; Tie Canyon, Angeles Forest Highway, San Gabriel Mountains, Los Angeles County, March 17, 1950, elevation 4590 feet (W. H. Evans), 1 ♀; Mt. Diablo, Contra Costa County, 1900 feet, March 26, 1949 (C. I. Smith), 1 ♀; Anderson Springs, Lake County, January 27–February 26, 1948, March 20, 1949 (W. R. Bauer), 1 ♂, 4 ♀; Ryan Creek, Mendocino County, March 26, 1949 (P. D. Hurd), 2 ♂. *Oregon:* No data, 1 ♀. *Washington:* Satus Creek, April 4, 1942 (E. C. Johnston), 1 ♀. "B. A." (collection Charles Palm), 1 ♀. *No data:* (V. M. Stern), 1 ♂.

Hampson reported the species from Camp Watson, Grant County, Oregon (Walsingham). It is also reported from "Sierra Nevada, California" (type).

REMARKS: Henry Edwards renamed this species *salicis* in 1881, giving as his reason that "*arvalis* is already occupied in the same group, viz., *Axenus arvalis* Grote." No record has been found that the name *arvalis* Henry Edwards has ever been used in or referred to the genus *Axenus*. Consequently, *arvalis* Henry Edwards cannot be considered a homonym of *arvalis* Grote, so Edwards' renaming of his own species was unnecessary, and the earlier name will stand.

This species is one of three that form a small group within the subgenus *Annaphila*, which can be distinguished by the fact that the under side of the hind wings is not concolorous with the under side of the forewings. This character is also present in *Proannaphila*, but the maculation of the lower surface of the primaries easily separates the two. *Arvalis* can be easily distinguished from the other two species in this group by the fact that the forewings above are a dull gray-black, suffused with grayish blue, and with the maculation obscure; in the male genitalia, by the fact that the cucullus has a long, narrow, costal arm arising in the basal half of the valve, and with a second smaller arm at the base of this first arm; in the female genitalia, by the fact that the elongate bursa copulatrix is diagonal in position.

This species has been taken feeding on the flowers of willow in southern California, together with the southern subspecies of *depicta* Grote. The ecology of these two species is apparently different, even though they come to the same plant for feeding. The junior author noticed that *arvalis* came in to feed from off the canyon walls, as if its breeding locality were located in the hill-top chaparral, while the other species invariably approached the flowers from upstream or downstream and never left the bed of the canyon.

**Annaphila (Annaphila) abdita,** new species

Figures 1E, 6F

MALE: Head, vertex and front grayish black, with scattered grayish white scales and grayish white and black hair-like scales; front with strong transverse ridge across top and bottom, more or less circular in outline, with central area raised, rounded; antennae black-brown, with distal portions of segments white or not differentiated; palpi with a mixture of grayish white and brown-gray scales and hair-like scales, with increasing number of dark scales and hair-like scales terminally and dorsally. Thorax, dorsal surface black,

with scattered gray scales and hair-like scales; ventral surface light gray. Legs black-brown, with grayish white scales and hair-like scales at base; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface black-brown, with scattered gray scales and hair-like scales, posterior margins of segments narrowly marked with grayish white; ventral surface black-brown, heavily overlain with grayish white scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color brownish black, suffused with gray and orange-gray scales; veins $R_{3+4}$ and $R_5$ tending to be stalked; basal line black, weakly represented in costal half of wing only; t. a. line black, weakly represented, shaded basally by gray, outwardly oblique, with sharp, inwardly pointing tooth on anal vein; orbicular outlined with black, central portion suffused with gray; claviform absent; median line indistinctly represented by diffuse black band, outwardly oblique, bilobed with basal bends in cell, below cubital vein, and at inner margin, being well separated from t. a. line below orbicular; reniform grayish white, diffuse, central portion darkened, preceded by diffuse whitish patch on costa; t. p. line diffuse, grayish white, shaded externally by faint dark line, deeply bilobed opposite reniform, isolating two patches of ground color at upper and lower extremities of reniform, widening below reniform and shaded basally with black; s. t. line faintly indicated, arising on costa from diffuse whitish patch, appearing as few scattered black scales across wing, shaded distally and in s. t. area by pale orange-brown and grayish scales, its course sinuous; terminal line black, slightly cut at veins with lighter scales; fringe black basally, dark gray in terminal portion. Hind wings orange; basal area and inner margin suffused with black, overlain with pale orange, hair-like scales; intradiscal line usually not differentiated, rarely indistinctly and incompletely indicated by faint orange shading on basal side; discal dot black, elongate; outer margin marked by narrow black band, increasing in width at vein $Cu_2$; fringe blackish gray in basal portion, orange-brown in terminal part.

UNDER SURFACE OF WINGS: Forewings, ground color orange-yellow, overlain with dark scales, especially basad of median line; costa heavily suffused with black and orange gray scales; t. a. line absent; median line dull black, diffuse, interrupted by light patch on costa, broad in anterior portion of wing, much reduced in width below cell, with strong basal arc; inner margin broadly suffused with gray-black, not connecting with terminal band; discal spot dull black, elongate; terminal area of wing dull black, overlain with orange-brown scales, especially in subterminal area; s. t. line absent, or vaguely indicated by gray scales, with white spot present on costa; fringe as above, with vein endings slightly differentiated. Hind wings pale orange-brown, speckled with black scales; basal area lightly suffused with dark scales; intradiscal line dull black, diffuse, tending to be partially obsolescent, with small outward angles on cubital and anal veins; discal spot black, elongate, postmedian line represented by diffuse patches of dull black scales, strongly outcurved and subparalleling outer margin, with basal bend below vein $Cu_2$; a band of ground color without any overlying dark scales distad of this, followed by thin, darkened terminal area, narrowed between veins $M_3$ and $Cu_2$ and at anal angle; s. t. area more or less heavily overlain with orange-brown scales, especially in upper portion of wing; fringe as above. Expanse: 18 to 22 mm., holotype 19 mm.

FEMALE: Like male. Expanse: 17 to 21 mm., allotype 17 mm.

MALE GENITALIA: Uncus elongate, narrow, slightly constricted near middle, with apex tapering to point; tegumen evenly tapering distally to base of uncus; vinculum slightly tapering to base of valves, then more sharply tapering to rounded anteromedial point; valves complex, symmetrical; cucullus slightly enlarged at base, with narrow, curving, costal arm arising one-third of distance from base, in length subequal to width of base of uncus, with second costal arm arising from broad mediad-extending base two-thirds of distance from base of valve, slightly shorter than basal costal arm, with apical region somewhat laterally compressed; apex of valves extending distad to sharp point; sacculus usually with small spinose clavus; juxta with anterior margin cleft medially; transtilla extending basally, in form of twisted

sclerotized bands, these not uniting medially; aedeagus approximately four-fifths of combined length of tegumen and vinculum, ratio of length to width varying from approximately 4:1 to 5:1, tending to be slightly curved and with anteroventral swelling in basal half; vesica in distal portion of aedeagus armed with approximately 12 elongate, ventral spines one-third to one-half of length of aedeagus, and a dorsal group of short spines around base of the elongate spines.

FEMALE GENITALIA: Sternum of segment VII with posterior margin straight; sternum of segment VIII weakly sclerotized laterally. Ostium broad, somewhat funnel shaped, narrowing to unite with ductus bursae, dorsal surface a subtriangular sclerotized plate, with the two distal apices somewhat extended and curved dorsad, ventral surface with sides extended laterally to form a rather broad lip; ductus bursae lightly sclerotized at junction with ostium, broad, sclerotized anteriorly, widening to form junction with bursa copulatrix, the area of demarcation tending to be diagonal, extending farther basad on left side; ductus seminalis arising from median surface of lobe of bursa copulatrix on right side near ductus bursae; bursa copulatrix membranous, elongate, extended distally as small lobe to the right of junction with ductus bursae, anterior end rounded, its surface with many small, inwardly pointing spines, the length of bursa being between three and three and one-half times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Pinnacles, San Benito County, California, March 21, 1948 (C. H. Dickenson); allotype, female, San Benito County, California, March 9, 1928. Paratypes, seven males and five females: same data as holotype, March 21–23, 1948, three specimens; same data as allotype, two specimens; "S. Cal.," *ex* collection Brooklyn Museum, two specimens; south California, No. 11608, collection Henry Edwards; Elysian Park, Los Angeles, California, February 13, 1910 (V. L. Clemence); Lake Pillsbury, Lake County, California, April 21, 1937 (E. C. Johnston); Mendocino County, California; "Was. T., collection B. Neumögen."

Holotype deposited in the American Museum of Natural History; allotype, in the Los Angeles County Museum. Paratypes to be distributed as follows: Los Angeles County Museum; United States National Museum; Canadian National Collection; California Academy of Sciences; the American Museum of Natural History; collection of E. C. Johnston, Seattle, Washington.

RANGE: California, apparently favoring the coastal areas. On the wing in February, March, and April.

REMARKS: The locality label "Was. T., collection B. Neumögen" on one of the paratypes must, at least at this time, be regarded somewhat skeptically. Much more must be learned about the distribution of this species before any definite statements can be made as to the northern limits of its distribution.

This species can easily be separated from its closest relatives, *arvalis* and *baueri*, by the structure of the front. In this species the front has a strong transverse ridge across the top and bottom, while in the other two species the front does not have any transverse ridges. The venation of the primaries also tends to be distinctive in this species, as $R_{3+4}$ and $R_5$ have a decided tendency to be stalked, while this is not the case in the other species except in a very few specimens. The male genitalia show a definite relationship to those of *baueri*, but can be distinguished therefrom by the broad triangular valves, and by the fact that the basal arm of the cucullus is narrow, curving, and arises one-third of the distance from the base. The female genitalia are similar to those of *arvalis* but are distinguishable by the longitudinal rather than the diagonal position of the bursa copulatrix, and by the funnel-shaped ostium.

**Annaphila (Annaphila) baueri,** new species

Figures 2A, 6G

MALE: Head, vertex and front black, with scattered gray scales and grayish white and black hair-like scales; front strongly raised, broadly elliptical or oval, with apex truncate; antennae black-brown, with distal portions of segments white or not differentiated; palpi with grayish white and black scales and hair-like scales at base, with increasing numbers of black-brown scales and hair-like scales terminally and dorsally. Thorax, dorsal surface black-brown, with scattered gray scales

and hair-like scales; ventral surface light gray. Legs black-brown, with grayish white scales and hair-like scales at base; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, with scattered gray scales and pale hair-like scales, posterior margins of segments narrowly marked with grayish white; ventral surface black, heavily overlain with grayish white scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color brownish black, suffused with orange-brown scales; basal line indistinctly indicated by a few dark scales; t. a. line black, weakly represented, shaded basally by gray, outwardly oblique, with sharp, inwardly pointing tooth on anal vein; orbicular lightly outlined by black scales, central portion lightly suffused with gray; claviform absent; median line indistinctly represented by diffuse black band, outwardly oblique, with strong basal bends in cell, below cubital vein, and at inner margin, t. a. and median lines becoming approximated below cubital vein, sometimes connected by black patch; reniform grayish white, central portion darkened, preceded by diffuse whitish patch on costa; t. p. line indistinct, indicated by a few black and white scales in costal portion of wing, appearing below reniform as diffuse, sinuous, grayish white band; s. t. line black, arising on costa from white patch, subparalleling outer margin, with inwardly pointing tooth opposite reniform, with basal bend between cubital veins, and swinging outward again before reaching inner margin; terminal area of wing suffused with grayish white scales, indistinctly bounded externally by black terminal line; fringe black in basal portion, with faint, light-colored, median line, grayish black on external portion, vein endings lightly marked with gray-white scales. Hind wings orange; basal area and inner margin broadly black, overlain with pale orange, hair-like scales; intradiscal line usually not differentiated, rarely indistinctly and incompletely indicated by faint orange shading on basal side; discal dot weakly indicated or absent; outer margin marked by narrow black band, increasing in width at and below vein $Cu_2$; fringe blackish gray in basal portion, orange-brown in terminal part.

UNDER SURFACE OF WINGS: Forewings, ground color dull orange, overlain with dark scales, especially basad of median line; costa dull black, with scattered orange and gray scales; t. a. line absent; median line black, diffuse, outwardly oblique; inner margin broadly suffused with gray-black, not connecting with terminal band; discal spot absent; terminal area of wing dull black, overlain with gray scales, especially in subterminal area; s. t. line absent or vaguely indicated by gray scales; fringe as above. Hind wings, ground color orange-brown, speckled with black scales; basal area lightly suffused with dark scales; intradiscal line dull black, diffuse, tending to be partially obsolescent, with outward angles on cubital and anal veins; discal dot black, small; postmedian line dull black, diffuse, tending to be partially obsolescent, strongly outcurved and subparalleling outer margin, with basal bend below vein $Cu_2$; a band of dull orange distad of this, followed by a thin, blackish, terminal area, narrowed between cubital veins and at anal angle; s. t. area more or less heavily overlain with orange-brown scales, especially in upper portion of wing; fringe with pale line at base, tending to be orange in upper portion of wing, posteriorly changing to grayish in basal portion. Expanse: 24 to 25 mm., holotype 24.5 mm.

FEMALE: Like male. Expanse: 20 to 26 mm., allotype 23 mm.

MALE GENITALIA: Uncus elongate, slightly narrowed near apex, the latter being flattened and bluntly pointed; tegumen elongate, tapering distally to base of uncus; vinculum elongate, extending distad of base of cucullus as relatively narrow projection, increasing in width anterior to cucullus, being widest at anterior base of valves, then sharply tapering to blunt anteromedial point; valves complex, symmetrical, elongate, and narrow; cucullus slightly enlarged at base, with short, thumb-like, costal arm arising one-half of distance from base, in length being slightly shorter than maximum width of uncus, with second costal arm arising from broad base, slightly more than two-thirds of distance from base on inner surface of valve, tapering, in length subequal to, or slightly shorter than, basal costal arm; apex of valves produced distally into elongate arm, with apices narrow, semi-truncate; sacculus with small swelling at

clavus, the former extending distally and demarked with low sclerotized ridge anterior to basal costal arm; juxta with anterior margin slightly rounded; transtilla broadened medially, approximated at midline; aedeagus subequal in length to combined lengths of tegumen and vinculum, ratio of length to width approximately 5:1, tending to be slightly curved, widest in central portion; vesica armed with approximately 36 to 48 stout spines in distal half or two-thirds of aedeagus, arranged in one or more rows, closely set, with some scattered spines, the longest spines being the most anterior and being approximately one-third of length of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin straight. Ostium, dorsal surface sclerotized, subtriangular in outline, apex of triangle distad, sometimes rounded, ventral surface a wide, broad, sclerotized plate, anterior edge concave medially; ductus bursae with short membranous area at junction with ostium, then sclerotized, short, the distal margin somewhat serrate, increasing in width to form junction with bursa copulatrix; ductus seminalis arising from median surface of lobe of bursa copulatrix on right side; bursa copulatrix lightly sclerotized, with anterior portion more membranous, transversely or diagonally situated, produced posteriorly at right of ductus bursae to form a small lobe, to the left of the ductus bursae on dorsal surface at junction with ductus bursae a small lobe followed by a rather deep fold ventrally, then ventral surface on left side anteriorly in form of larger lobe, the length of the bursa being approximately twice that of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Anderson Springs, Lake County, California, March 9, 1948 (W. R. Bauer); allotype, female, same data and collector, February 26, 1948. Paratypes, one male and seven females: same data and collector as holotype, with the following range of dates: February 26–March 27, 1948, March 20–26, 1949.

Holotype and allotype deposited in the American Museum of Natural History. Paratypes to be distributed as follows: California Insect Survey collection, Division of Entomology and Parasitology, University of California, Berkeley; the American Museum of Natural History; and collection of William R. Bauer, Petaluma, California.

RANGE: Known only from the type locality. On the wing in February and March.

REMARKS: While similar in maculation to *abdita*, *baueri* can easily be distinguished from that species by the structure of the front. In this species the front is strongly raised, with the apex truncate, while in *abdita* the front has a strong transverse ridge across the top and bottom. The male genitalia also show a close relationship to *abdita*, but can be distinguished therefrom by the narrower and more elongate valves, and by the fact that the basal arm of the cucullus is short, straight, and arises one-half of the distance from the base. The female genitalia are unique in the genus in having the bursa copulatrix transversely or diagonally situated, and being lightly sclerotized with the anterior portion membranous.

This species is named in honor of our friend and ardent collector, Mr. William R. Bauer of Petaluma, California, who first discovered it and captured the type series.

### Annaphila (Annaphila) astrologa
Barnes and McDunnough

Figures 2C, 7A

*Annaphila divinula* BARNES AND MCDUNNOUGH (not Grote), 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, pp. 18, 53, pl. 7, fig. 22, pl. 25, fig. 10.

*Annaphila astrologa* BARNES AND MCDUNNOUGH, 1918, Contributions to the natural history of the Lepidoptera of North America, vol. 4, p. 109, pl. 19, fig. 11. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e.

MALE: Head, vertex and front black, with gray scales and orange-brown, hair-like scales; front strongly raised, subtriangular, apex flattened; antennae black-brown, with distal portions of segments white; palpi white at base, with increasing number of black scales terminally and dorsally. Thorax, dorsal surface black-brown, with scattered gray scales; ventral surface whitish. Legs black-brown, heavily covered with white hair-like scales basally; tibiae with ring of white scales

on distal portions of segments. Abdomen, dorsal surface black, posterior margins of segments narrowly marked with grayish white; ventral surface black, heavily overlain with grayish white, hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dull black, suffused with gray; basal line black, present in costal region only; t. a. line black, faintly shaded basally with grayish white, zigzag, with strong, outwardly projecting angles on radial vein, below cubital vein and at inner margin; orbicular outlined with black, centrally shaded with grayish white over ground color; claviform absent; median line black, obsolescent, outwardly oblique, reaching inner margin with two outward arcs; reniform white, suboval, central portion darkened, connected to costa by white patch, continued posteriorly by white band to inner margin, with sharp, inwardly pointing tooth just below vein $Cu_2$; area distal to reniform of ground color, with two patches of same narrowly delimited by white at upper and lower external portions of reniform; t. p. line absent, or very slightly indicated by a few gray-black scales in upper portion of wing; terminal portion of wing of ground color, interrupted by indistinct s. t. line, arising on costa from white spot, its course indicated by scattered gray-white scales, with elongate white patch above anal angle; fringe sometimes with faint pale line at base, black in basal portion, gray-black in terminal area, vein endings sometimes indicated by lighter scales. Hind wings orange; basal one-third of wing and inner margin black, overlain with orange-gray, hair-like scales; intradiscal line absent; discal dot absent or indicated by a few black scales; outer margin marked by broad black band, meeting basal black area on costa and at anal angle, sometimes separated from latter by narrow orange strip, increasing in width along outer margin at vein $M_2$ and below vein $Cu_2$; fringe sometimes with faint pale line at base, black in basal portion, gray-black in outer portion, apex and vein endings marked with whitish scales.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa suffused with black and grayish white scales; t. a. line sometimes present, black, broad; median line black, broad, diffuse, outwardly oblique, occasionally interrupted by small orange patch on costa, sometimes connected with t. a. line by black dash through cell; inner margin broadly black and gray-black, not connecting with black terminal area; discal spot absent or indicated by black scales; terminal area of wing black, beginning on costa two-thirds of distance from base, curving across wing to veins $M_3$ or $Cu_1$, then parallel with outer margin to inner margin; s. t. area white, arising on costa from third and largest white spot, forming series of broad patches, these sometimes interrupted by veins, reduced or absent between veins $M_3$ and $Cu_2$, with orange-white patch above anal angle; terminal line black; fringe gray-black, with faint dark center line, vein endings marked by lighter scales. Hind wings concolorous with forewings; basal area suffused with black, sometimes filled in solidly to intradiscal line; intradiscal line black, rarely absent, somewhat diffuse, with slight outward bends near costal and inner margins; discal dot small, black; extradiscal line absent; terminal area broadly black, as above, but not connected to black basal and inner areas, and interrupted by narrow, broken, orange-white s. t. line near outer margin; fringe black in basal half, gray-black in distal half, with apex and vein endings marked with white. Expanse: 18 to 23 mm.

FEMALE: Like male. Expanse: 17 to 24 mm.

MALE GENITALIA: Uncus elongate, constricted before bulbous apex; gnathos sometimes in form of lightly sclerotized ring, with medial posterior extension, not always differentiated; tegumen slightly tapering to base of uncus; vinculum elongate, narrow, widest at anterior base of valves, rounded beyond this, with truncate or concave anterior margin; valves complex, symmetrical; cucullus in form of broad sclerotized band extending to form small pointed costal arm at middle of valve, the latter being markedly increased in width at this point; apex of valves produced posteriorly into elongate pointed arm, extending well posterior to costal arm, and broadly connected to base thereof, sometimes with small sclerotized spine medially between apex and costal arm; sacculus with small swelling representing clavus; juxta with anterior margin concave; transtilla produced medially as two pointed arms; aedeagus sub-

equal in length to combined length of tegumen and vinculum, ratio of length to width varying from approximately 4:1 to 5:1, tending to be narrowed basally, widest at distal end; vesica armed with a large number of slender elongate spines in posterior half of aedeagus, and with a variable number of shorter, heavier spines on right side.

FEMALE GENITALIA: Sternum of segment VII with posterior margin bilobed, sometimes weakly so. Ostium, dorsal surface a transverse sclerotized plate, with median portion slightly angled anteriorly, the ends truncate, ventral surface a larger, subrectangular, sclerotized plate, with posterior margin thickened and extending laterad of body of plate; ductus bursae slightly constricted medially, decreasing in width on left side before uniting with bursa copulatrix; ductus seminalis from ventral surface of bursa copulatrix near ductus bursae, arising from small fold on surface of lobe; bursa copulatrix elongate, membranous, dorsally at junction with ductus bursae with a lobe extending to beyond lateral margins of ductus bursae, the projection on left side being farther anterior than the one on the right side, the bursa consequently assuming a somewhat diagonal appearance, the anterior portion of bursa copulatrix with its surface with numerous very fine spines, the length of the bursa being approximately three times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In United States National Museum; described from four females, and illustrated with original description.

TYPE LOCALITY: Redington, Arizona.

RANGE: Southern Arizona; southern California, extending up the coast to the vicinity of the San Francisco Bay area. On the wing in late February, March, April, and July.

SPECIMENS EXAMINED: *Arizona:* No further data, 1 ♀ paratype; base of Pinal Mountains, March (D. K. Duncan), 1 ♀; Pinal Mountains, March 25, 1939, 1 ♂. *California:* Bob's Gap, south of Llano, Los Angeles County, March 31–April 1, 1948 (C. Henne), April 8, 1949 (W. H. Evans), 3 ♂, 2 ♀; Mint Canyon, Los Angeles County, elevation 2600 feet, March 16, 1947 (C. I. Smith), 1 ♀; Los Angeles, April 15, 1907, March 31, 1 ♂, 1 ♀; San Felipe Wash, San Diego County, February 20, 1937 (L. M. Martin), 1 ♂; Palm Springs, March 8, 1922 (K. R. Coolidge), 1 ♀; Providence Mountains, San Bernardino County, April 20, 1938 (C. Henne), 1 ♀; Morongo Valley, Riverside County, March 6, 1937 (C. Dammers), 1 ♀; Whitewater, March 8, 1929 (C. Dammers), 1 ♀; Gavilan Hills, Riverside County, March 10, 1946 (C. Henne), April 30, 1930 (G. H. and J. L. Sperry), 2 ♀; Gavilan, March 21, 1938 (D. Bulgrin), April 10, 1938 (G. H. and J. L. Sperry), 2 ♀; Riverside, March 9, 1934 (C. Dammers), 1 ♀; south California, No. 11617 collection Henry Edwards, 1 ♀; "S. Cal.," 1 ♂; Monterey, July, 1941 (B. Weber), 1 ♀. *No data:* 2 ♂, 1 ♀.

REMARKS: More topotypical material is needed before adequate comparisons can be made between the California and Arizona specimens. As far as can be told from the three Arizona specimens examined, the California material certainly appears to be conspecific; whether the latter will prove to be of subspecific value or not remains to be seen.

This species begins a group of six that is distinguished by the fact that the forewings above have the reniform white or grayish white, set in, and forming part of a prominent light-colored band that crosses the forewing. This group can be subdivided further on the color of this band across the primaries; in this first group it is pure white. This includes *astrologa*, *ida*, and *divinula*. The maculation of *astrologa* and *divinula* is quite similar. However, the terminal black band on the under side of the secondaries is complete and broad in *astrologa*, while in *divinula* it is greatly reduced or absent in the center of the wing. There is also a marked size difference between these two species, as the specimens of *astrologa* before me measure from 17 to 24 mm. from wing tip to wing tip, while the expanse of *divinula* ranges from 14 to 17 mm. In the male genitalia, *astrologa* appears to show a closer relationship to *ida* than to *divinula*, as the first two do not have the two external sclerotized spines near the distal end of the anellus that are present in *divinula*. *Astrologa* can be distinguished from *ida* by the fact that the apex of the uncus is bulbous, and by the simple costal arm of the cucullus, which has the apex of the valve extending well posterior to it. In the female genitalia, *astrologa* can be separated from the other known species by the bilobed nature of the

posterior margin of the sternum of segment VII, and by the smoothly sclerotized, symmetrical ductus bursae.

The male genitalia appear to be rather variable. In some examples the apex of the valves is more elongate and not so broad as shown in the figure, and the small median spine may be completely absent or rather prominent. The transtilla is usually more prominent than shown in the drawing, appearing more like that of *ida*. The spining in the aedeagus appears to be rather variable, with the large central patch of very thin elongate spines being somewhat reduced in size and number in some examples.

The junior author captured this species feeding on the blossoms of *Coleogyne ramosissima* Torrey at Bob's Gap.

**Annaphila (Annaphila) ida,** new species

Figures 2B, 7B

MALE: Head; vertex and front black, with gray scales and orange-brown, hair-like scales; front with strong transverse ridge across top and bottom, dorsal rim slightly sloping laterally, indented below, with central area raised, in form of rounded transverse ridge; antennae black-brown, with distal portions of segments white; palpi white at base, with increasing number of black-brown scales terminally and dorsally. Thorax, dorsal surface black-brown, with scattered gray scales; ventral surface whitish. Legs black-brown, heavily covered with white, hair-like scales basally; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, posterior margins of segments narrowly marked with grayish white; ventral surface black, heavily overlain with grayish white, hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dull black, suffused with gray; basal line absent or marked by a few gray scales; t. a. line black, shaded basally by narrow gray line, with strong, outwardly projecting arc below cubital vein, and meeting inner margin with outward angle; orbicular indicated by black scales, central portion with gray scales; claviform absent; median line black, partially obsolescent, outwardly oblique, reaching inner margin with two outward arcs; reniform white, kidney shaped, central portion darkened, incompletely connected to costa by white patch, continued posteriorly by narrow white band to inner margin, with small, inwardly pointing tooth just below vein $Cu_2$; area distad of reniform of ground color, with one patch of same narrowly delimited by white at lower external portion of reniform, and with another at upper external portion of reniform weakly indicated; t. p. line absent, or very slightly indicated by a few gray-black scales in upper portion of wing; terminal portion of wing of ground color, the scales having a metallic luster; s. t. line indistinct, arising on costa from white spot, its course indicated by gray-white scales, with elongate gray-white patch above anal angle; fringe black in basal portion, gray-black in terminal area, vein endings indicated by lighter scales. Hind wings orange; basal one-fifth of wing and inner margin black, overlain with orange-gray, hair-like scales; intradiscal line absent; discal dot indicated by a few black scales; outer margin marked by broad black band, not connected with either basal black area or black area along inner margin, increasing in width along outer margin at vein $M_2$ and below vein $Cu_2$; fringe as on primaries, but with outer portion gray-white, checkered with dark.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa suffused with black and grayish white scales; t. a. line absent; median line black, broad, diffuse, outwardly oblique, interrupted by small grayish orange patch on costa, fading out before reaching inner margin; inner margin orange-gray; discal dot blackish, elongate, narrow; area between median line and terminal area sometimes with narrow, indistinct, orange-gray line running from distad of discal dot to inner margin; terminal area of wing black, beginning on costa five-eighths of distance from base, going across costa to cell, turning distad and paralleling costal margin for a distance slightly longer than that from costa to angle, then curving across wing to vein $Cu_1$, then parallel with outer margin to inner margin, usually broken above anal angle; s. t. area arising on costa from third and largest white spot, continued posteriorly as indistinct gray-white or orange-gray patches or band, absent between veins $M_3$ and $Cu_2$, with orange-white patch above anal angle; ter-

minal line blackish gray; fringe with light-colored line at base, black-gray in basal portion, gray-black in outer part, vein endings marked by white scales. Hind wings concolorous with forewings; basal area only slightly suffused with black; intradiscal line absent, indicated only by a few dark scales near costal and inner margins; discal dot black, small; extradiscal line absent; terminal area black, as above, broadly interrupted by grayish orange s. t. line near margin in anterior half of wing; terminal line black; fringe with light-colored line at base, gray-black in basal portion, grayish white in outer portion at apex and in anterior half of wing, checkered, turning grayish black posteriorly. Expanse: 18 to 20 mm., holotype 20 mm.

FEMALE: Like male. Lower surfaces tending to be more broadly marked with white in outer portions of wings. Expanse: 18 to 19 mm., allotype 18 mm.

MALE GENITALIA: Uncus elongate, evenly tapering to rounded apex; tegumen broad, constricted before base of uncus and above point of attachment to vinculum; vinculum elongate, widest at anterior base of valves, rounded beyond this, with slightly indented anterior margin; valves complex, symmetrical; cucullus in form of narrow sclerotized band, curving distad to form bifurcate arm, the apices of the branches well separated, the basad of these projecting ventrally (when valves are opened), the longer slender branch of arm projecting distad; apex of valves slightly produced posteriorly to form short, blunt, spine-like arm not extending posterior to bifurcate arm, and rather broadly connected to distad branch of this arm; sacculus without clavus; juxta with anterior margin cleft; transtilla produced medially as two pointed arms; aedeagus slightly shorter than combined length of tegumen and vinculum, ratio of length to width approximately 5:1, tending to be narrowed basally and bluntly pointed distally; vesica armed with two separate groups of spines, one being located medially, consisting of approximately 12 short spines, all shorter than width of aedeagus, the second located in distal portion of aedeagus, consisting of approximately 12 spines, these increasing in length distally, the longest equal to width of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin concave, with the median portion tending to be truncate. Ostium, dorsal surface a transverse plate, swollen medially, the lateral portions tapering and uniting with a broad, sclerotized, shallowly U-shaped plate, the latter with the apices posterodorsal and tapering to points, continued mediad to form sides of ostium, and with ventral surface thereof a sclerotized plate, decreasing in width anteriorly, with posterior side convex; ductus bursae well sclerotized, wide, connected to ostium by a narrow, more membranous area, increasing in width to form junction with bursa copulatrix; ductus seminalis arising from apex of lobe of bursa copulatrix on right side; bursa copulatrix elongate, membranous, extending slightly posteriorly on right side as a lobe, anterior end of bursa broadly rounded, the surface of the bursa with numerous very fine spines, the length of the bursa approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: Holotype, male, Newcomb's Ranch, north of Chilao, San Gabriel Mountains, Los Angeles County, California, elevation 5800 feet, May 1, 1948 (C. I. Smith). Allotype, female, north fork of Chilao Creek, Los Angeles County, California (latitude 34° 20′ 57″ N., longitude 118° 00′ 30.6″ W.), elevation 5715 feet, May 5, 1949 (W. H. Evans). Paratypes, one male and one female: same data and collector as allotype.

Holotype and allotype deposited in the collection of the American Museum of Natural History. Paratypes, in collection of William H. Evans, Sun Valley, California.

RANGE: Known only from the type series.

REMARKS: This species is one that is characterized by a prominent white band extending across the forewings above. The structure of the front immediately distinguishes *ida*, as there is a strong transverse ridge across the top and bottom of the front, while in *astrologa* and *divinula* the front is without a ridge. In maculation and size, *ida* is somewhat intermediate between these other two species. The pattern of the forewings above is distinctive in occasionally having only one small patch of ground color delimited by white at the lower external portion of the

reniform; in *astrologa* and *divinula* there are always two such patches at both external margins of the reniform. The lower surface of the secondaries in *ida* is without an intradiscal line, while this is usually present in the other two species. The male genitalia appear closest to those of *astrologa*, in that the cucullus is in the form of a sclerotized band, curving sharply distad to form the costal arm. However, the uncus in *ida* tapers to a point, and the costal arm of the cucullus is bifurcate and extends farther distad than the apex of the valve. The female genitalia, on the other hand, do not have the posterior margin of the sternum of segment VII bilobed as do the other species with white-banded forewings. Instead, the margin is concave, with the median portion straight. In several respects, the female genitalia are similar to those found in the *superba* group; this is the only species, for example, with a broad, U-shaped plate around the ostium, except for those species with red secondaries.

This beautiful species is named in honor of the widow of the late junior author, Mrs. Ida Smith.

**Annaphila (Annaphila) divinula** Grote

Figures 3B, 7C

*Annaphila divinula* GROTE, 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 476, pl. 147, fig. 11. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. BARNES AND MCDUNNOUGH, 1918, Contributions to the natural history of the Lepidoptera of North America, vol. 4, p. 110, pl. 19, fig. 13. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e.

MALE: Head, vertex and front black, with gray scales and black-brown hair-like scales; front rather strongly projecting, forming rounded protuberance; antennae black-brown, with distal portions of segments white; palpi white at base, with increasing number of black-brown scales terminally and dorsally. Thorax, dorsal surface black-brown, with scattered gray scales and reddish brown, hair-like scales; ventral surface whitish. Legs black-brown, heavily covered with white, hair-like scales basally; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, posterior margins of segments narrowly marked with grayish white; ventral surface black-brown, heavily overlain with grayish white scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dull black, suffused with gray; basal line absent or marked by a few gray scales; t. a. line indistinct, showing mainly on posterior part of wing as black scales, but course indicated across wing by faint, gray, basal shading, with outwardly projecting arc below cubital vein, and meeting inner margin with outward angle; orbicular and claviform absent, the former rarely indicated by a few black scales; median line black, partially obsolescent, outwardly oblique, reaching inner margin with two outward arcs; reniform white, suboval, central portion darkened, connected to costa by white patch, continued posteriorly by white band to inner margin, with small, inwardly pointing tooth just below vein $Cu_2$; area distal to reniform of ground color, with two patches of same narrowly delimited by white at upper and lower external portions of reniform; t. p. line obsolescent, indicated by gray scales distad of white band and separated therefrom by narrow line of ground color, outwardly bidentate opposite reniform; terminal portion of wing of ground color, the scales having a metallic luster; s. t. line arising on costa from white spot, its course indicated by grayish white and gray-blue scales, waved, with sharp, inwardly pointing tooth opposite reniform, continued above anal angle as white patch; fringe sometimes with faint pale line at base, unicolorous blackish gray or with terminal portion lighter. Hind wings orange; basal one-third of wing and inner margin black, overlain with orange-gray, hair-like scales; intradiscal line absent; discal dot black, elongate; outer margin marked by black band, meeting basal black area on costa but separated from black shading along inner margin by narrow orange strip, slightly increasing in width along outer margin at vein $M_2$ and below vein $Cu_2$; fringe as on primaries.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa suffused with black and grayish white scales; t. a. line

sometimes represented by a few black scales; median line black, broad, outwardly oblique, occasionally interrupted by small orange patch on costa; inner margin broadly black and gray-black, not connecting with black terminal area; discal spot black, elongate; terminal area of wing black, beginning on costa three-fifths of distance from base, curving across wing to vein $Cu_1$, then obsolete, reappearing as small black spot above inner margin; s. t. area arising on costa from large white patch, continued posteriorly as broad band of ground color, decreasing in width to cubital veins; terminal line black, interrupted by veins; fringe with light-colored line at base, black in basal portion, gray-black in outer half. Hind wings concolorous with forewings; basal area suffused with black; intradiscal line black, rarely partially interrupted, with slight outward bends near costal and inner margins; discal dot black, elongate; extradiscal line black, connected to terminal area by elongate black patch near costa, swinging sharply outward opposite discal dot, lacking in center of wing, present above anal angle; terminal area black, as above, but lacking in center of wing, interrupted by broken orange-white s. t. line near outer margin; terminal line black; fringe as on forewings. Expanse: 14 to 16 mm.

FEMALE: Like male. Expanse: 14 to 17 mm.

MALE GENITALIA: Uncus broadly triangular, the base broadly and deeply excavated medially on ventral surface, uncus broadened above base, the sides slightly concave and tapering to apex, the latter tipped with sclerotized spine; tegumen broadest near junction with vinculum, tapering to base of uncus; vinculum relatively broad, slightly increasing in width anteriorly to near base of valves, then narrowing, anterior margin rounded or bluntly pointed; valves complex, symmetrical; cucullus slightly enlarged at base, with rounded swelling one-third of distance from base, cucullus produced distally as large, sclerotized, pointed, subtriangular protuberance; apex of valves produced into slightly curved, slender arm, not attaining length of cucullus protuberance, and connected on basal side by sclerotized ridge to rounded swelling of cucullus; sacculus without noticeable clavus; juxta with anterior margin finely cleft; anellus with band near distal end extending laterodistally as two pointed, sclerotized, elongate spines; transtilla enlarged medially and connected at midline; aedeagus slightly longer than combined length of tegumen and vinculum, ratio of length to width approximately 9:1, tending to be widest distally and with slight swelling at one-third of distance from base; vesica armed with approximately 18 small spines in one patch in distal portion of aedeagus, and with several longitudinal, sclerotized lines.

FEMALE GENITALIA: Sternum of segment VII with posterior margin bilobed, with the sclerotized portion being quite narrow. Ostium, dorsal surface a concave sclerotized plate, the lateral edges projecting ventrally, the anterior margin entire or trilobed, the posterior margin with numerous fine teeth, ventral surface produced on both sides as elongate sclerotized plates, and produced ventrally as a shorter sclerotized area connecting the lateral plates and the venter of segment VII; ductus bursae heavily sclerotized on both sides but separated medially and bounded laterally by less heavily sclerotized areas; ductus seminalis arising from median surface near apex of lobe of bursa copulatrix on right side; bursa copulatrix membranous, rounded, produced into small lobe on right side and somewhat dorsally near junction with ductus bursae, dorsal surface near junction with ductus bursae with sclerotized piece extending to the right side of the small lobe, the surface of the bursa with numerous very fine spines, the length of the bursa varying between three to five times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In British Museum (Natural History).

TYPE LOCALITY: California; described from one female, not a male as stated in the original description.

RANGE: California, occurring in the coastal regions the length of the state, and in the inland portions of southern California. On the wing in February, March, and April.

SPECIMENS EXAMINED: *California:* Witch Creek, February 16, 1906, 1 ♀; Idyllwild, April 23, 1930 (G. H. and J. L. Sperry), 1 ♀; Gavilan Hills, Riverside County, March 22, 1942 (C. I.

Smith, C. Henne), March 9–10, 1946, April 4–14, 1948 (C. Henne), 3 ♂, 5 ♀; Gavilan, March 15–24, 1938, April, 1931 (G. H. and J. L. Sperry), February 23, 1937, March 21, 1938 (C. Dammers), 2 ♂, 5 ♀; Riverside, March 10, 1938 (C. Dammers), 1 ♀; Snow Creek, Riverside County, February 22, 1938 (D. Bulgrin), 1 ♂; Angeles Crest Highway, Los Angeles County, elevation 4500 feet, March 29, 1942, 1 ♂; Vasquez Rocks, Mojave Desert, February 11, 1945, 1 ♀; Verdugo Hills, Los Angeles County, March 24, 1940 (D. Bauer), 1 ♀; Sierra Madre, Los Angeles County, March 4, 1948, 1 ♂; Azusa, Los Angeles County, March 14, 1939 (W. D. Dyer), 1 ♀; Mint Canyon, Los Angeles County, March 6, 1947 (W. H. Evans), 1 ♂; Santa Cruz, Santa Cruz County, 1 ♀; Mill Valley, Marin County, March 17, 1923, 1 ♀; Napa, Napa County, March 1–4, 1943, 2 ♂; Anderson Springs, Lake County, March 9, 1948, March 20, 1949 (W. R. Bauer), 1 ♂, 1 ♀; Mendocino County, No. 11617, collection Henry Edwards, 1 ♀; "S. Cal.," 1 ♂. No data, 1 ♀.

REMARKS: The pattern on the wings of this, the smallest species in the genus, is quite similar to that found in *astrologa;* this point has been discussed above under the latter species. In the male genitalia, *divinula* can be distinguished by the presence of two external sclerotized spines at the distal end of the anellus, similar to those found in *lithosina* and *miona*, but can be separated from the last two by the fact that the cucullus does not have a narrow costal arm near the base of the valve. The female genitalia of *divinula* are unique in the nature of the ductus bursae, as the sclerotization is in two lateral columns, separated medially and bounded laterally by less heavily sclerotized areas. The ovipositor lobes are specialized, the sclerotized area being reduced to the dorsolateral surfaces only.

In the Gavilan Hills area this species is greatly attracted to the blossoms of *Lomatium dasycarpum* (Torrey and Gray), an umbelliferous annual. It has also been taken on the flowers of *Ceanothus cuneatus* (Hooker) Nuttall in the same locality.

**Annaphila (Annaphila) lithosina** Henry Edwards

Figures 3A, 7D

*Annaphila lithosina* HENRY EDWARDS, 1875, Proc. California Acad. Sci., ser. 1, vol. 6, p. 137. BEUTENMÜLLER, 1892, Bull. Amer. Mus. Nat. Hist., vol. 4, p. 189. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 297. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 479, pl. 147, fig. 10. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. HOLLAND, 1917, Moth book, p. 246, pl. 29, fig. 21. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e.

*Annaphila variegata* J. B. SMITH, 1908, Ann. New York Acad. Sci., vol. 18, p. 122. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 479 (synonymy).

MALE: Head, vertex and front black-brown, with gray scales and orange-brown, hair-like scales; front strongly raised, rhomboidal, apex flattened; antennae black-brown, with distal portions of segments white; palpi white at base, with increasing number of black-brown scales terminally and dorsally. Thorax, dorsal surface black-brown, with some scales being gray distally; ventral surface whitish. Legs white, with scattered darker scales; tibiae dark brown, with ring of white scales on distal portions of segments. Abdomen, dorsal surface black-brown, with increasing amount of pale orange-white scaling and hair-like scales posteriorly, posterior margins of segments narrowly marked with orange-white; ventral surface pale orange-white, with scattered darker scales.

UPPER SURFACE OF WINGS: Forewings, ground color brownish gray, broadly suffused with blue-black medially and with grayish white beyond, some of the scales having a metallic luster; basal line black, present in costal region only; t. a. line geminate, inner line tending to be weakly represented, separated from outer line by gray-brown stripe, outer line black, slightly outcurved below costa, very strongly bent outward to beyond orbicular below the cell, swinging basally to cross anal vein, then meeting inner margin with slight outward bend; orbicular partially or completely defined by black, centrally shaded with gray-brown or grayish white scales; claviform absent; the area between t. a. and median lines broadly suffused with metallic blue-black scales except on costa and inner margin; median line black, crossing costa at right angle, bending outward across cell to meet lower edge of reniform, swinging sharply basad to meet outward bend of t. a. line, the two lines connected by small patch of black scales, then swinging sharply outward and

meeting inner margin after a smaller basal curve; reniform pure white, large, broad, connected to costa by whitish patch, delimited on inner and lower portion of outer sides by narrow line of brown-black scales; area distal to and below reniform light gray-brown, with semicircle of brownish scales extending from posterodistal portion of reniform, bordered basally below reniform to inner margin by black line subparalleling course of median line; t. p. line pale brown, with metallic cupreous tinge, tending to become reduced or obsolescent in lower half of wing, crossing costa at right angle, outwardly bidentate opposite reniform, with strong basal arc below this, then meeting inner margin at right angle; t. p. line shaded distally by band of same color in upper portion of wing, sometimes with narrow band of light gray-brown between, with two small white spots on costa demarking origin of these bands; distad of this, black, broadly suffused with pale blue scales, lower one-third of wing concolorous with t. p. line, and separated therefrom by patch of brownish white scales; s. t. line marked on costa by white patch, indistinct, sinuate, formed of light blue scales, sometimes augmented by pale brown scales below patch of this latter color opposite reniform; terminal line black, tending to become obsolescent before reaching hind angle; fringe with basal portion black-brown, with narrow light shade at base and at outer margin of basal portion, terminal half lighter in color. Hind wings orange; basal area lightly suffused with black scales and overlain with pale orange, hair-like scales, extending distally along cubital and anal veins; intradiscal line black, tending to be somewhat diffuse, broken or complete; discal dot absent; patch of black scales on inner margin between intradiscal line and anal angle; outer margin marked by wide black band, increasing in width on veins $M_2$ and $Cu_2$; fringe gray-black in basal half, checkered light gray and brown in outer portion.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa lighter in color, with occasional dark scales; t. a. line absent; median line black, broad, outwardly oblique, interrupted by small orange-white patch on costa and by patch of ground color at inner margin, the distal arm thus formed by the latter not reaching inner margin; discal spot absent; terminal area of wing black, beginning on costa two-thirds of distance from base, curving across wing, with a median, inwardly pointing tooth, to vein $Cu_1$, posterior to this obsolete or represented by small patches of black scales on veins, being subparallel to outer margin; s. t. area yellow-orange near apex, arising on costa from third and largest white spot, narrowing in center of wing; terminal line black, interrupted on veins; fringe with white line at base, dark median line, vein endings marked with orange-gray scales. Hind wings concolorous with forewings; basal area only very slightly suffused with dark scales; intradiscal line black, lacking in cell, with basal bend between cubital and anal veins; discal spot absent; postmedian line black, represented by patches of scales on costal and inner margins and above anal vein; terminal area black, as above, but interrupted by broad s. t. line of ground color, completely obliterating black terminal area between veins $Cu_1$ and $Cu_2$; terminal line black, interrupted at veins; fringe with narrow light line at base, basal portion gray-black, terminal portion checkered grayish white and orange-brown. Expanse: 22 to 25 mm.

FEMALE: Like male. Expanse: 21 to 25 mm.

MALE GENITALIA: Uncus broadly triangular, the base broadly and deeply excavated medially on ventral surface, the sides more or less evenly tapering to sclerotized spine at apex; tegumen only slightly tapering distally to base of uncus; vinculum broad, slightly increasing in width anteriorly to base of valves, then broadly, flatly rounded to slight anteromedial point; valves complex, symmetrical; cucullus slightly enlarged at base, with narrow costal arm arising one-fourth to one-third of distance from base, in length being slightly shorter than width of base of uncus, with second costal arm very broad, occupying central one-third of valve, abruptly arising from dorsal surface, apex semitruncate, produced ventrally and posteromedially, with slight fringe of elongate hairs medially; apex of valves produced distally into elongate pointed arm; sacculus with small triangular clavus; juxta with anterior margin convex; anellus with slightly scobinate band near distal end, produced ventromedially

as two pointed, sclèrotized, elongate spines, with several small teeth at base; transtilla in the form of an inverted V; aedeagus approximately five-sixths of combined length of tegumen and vinculum, ratio of length to width varying from approximately 5:1 to 6:1, tending to be slightly curved, widest medially, distal end tending to be bluntly pointed; vesica armed with approximately 24 short spines, tending to be arranged vertically, in one patch in distal portion of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin bilobed, the posterolateral margins with well-defined furrow. Ostium, dorsal surface a transverse sclerotized plate, in outline an elongate flattened ellipse, with the lateral edges somewhat truncate, with an irregularly V-shaped membranous area posteromedially, ventral surface produced laterally and ventrally as a sclerotized subtriangular plate, the edges on the ventral surface folded over basally; ductus bursae constricted below ostium, sclerotized, the surface with several somewhat irregular folds or creases, increasing in width on left side basad of middle of ductus; ductus seminalis arising from ventromedial surface of lobe of bursa copulatrix on right side near ductus bursae; bursa copulatrix membranous except for lightly sclerotized lobe to the right of ductus bursae, the bursa elongate, its surface with numerous very fine spines, the length of the bursa being between one and one-half and two and one-half times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown. One specimen in the collection of the United States National Museum bears the label: "Larvae feeding in numbers on larvae of wasps. Sacramento, Calif. Harry S. Smith. Febr. 16, 1915." The wings of this specimen, a male, are rudimentary, but a genitalic preparation shows that it is properly referred to this species.

TYPES: According to the original description of *lithosina*, the specimen upon which the name was based was in "coll. Dr. Behr." It is very doubtful if this specimen is still in existence, as it was probably destroyed with the Behr collection at San Francisco in 1906. In the collection of the American Museum of Natural History are two males, one bearing Edwards' handwritten type label, with the locality data "Havilah, California" and the number 6617. A reference to this number in the catalogue of Henry Edwards collection adds only that the material came from Stretch. Consequently, the specimen with this type label cannot be considered one of the original types, but it can be accepted as typical. *Variegata*, in the collection of Rutgers University.

TYPE LOCALITIES: Sierra Nevada, California (*lithosina*); Placer County, California (*variegata*).

RANGE: Northern and central California. On the wing in February, April, May, and June.

SPECIMENS EXAMINED: *California:* Havilah, 2 ♂; Mt. Diablo, April 5, 1905 (F. X. Williams), 1 ♂; San Jose, April 2, 1948 (P. H. Arnaud), 1 ♀; Sacramento, February 16, 1915 (H. S. Smith), 1 ♂; Shasta County, June 11, 1903, 1 ♀; Shasta Retreat, Siskiyou County, June 1–7, 1 ♀; Keddie, June 8 (F. M. Jones), 3 ♀; Colfax, May 10, 1935 (E. C. Johnston), 1 ♀; Placer County, 2500 feet, 15 ♂, 10 ♀; Sierra City, 1 ♀; no data except California, 1 ♂, 4 ♀. *No data:* 1 ♂.

This species has been reported from the Pinnacles, San Benito County, California, March, by C. H. Dickenson (*in litt.*); and by Hampson from Camp Watson, Grant County, Oregon. This latter record, if verified, will extend the known distribution considerably to the north. Holland says the specimen figured by him came from "southern California."

REMARKS: From the locality data available on the specimens, it would appear that the species is rather widespread and, further, that it is an uncommon occurrence when more than one individual is taken at one time. It is also most interesting to note that the caterpillars have been reported feeding on the larvae of wasps. If this is the case, it raises the question as to whether this is the normal habit of the species and, if so, whether or not others in this genus also have developed the same habits.

This beautiful species begins the second group of species, which is distinguished by the fact that the forewings above have the reniform white or grayish white, set in and forming part of a prominent light-colored band that crosses the forewing. This group can be subdivided further on the color of this band across the primaries; in *lithosina*

and *miona* the band is a light gray-brown, while in the other species it is a pure white. The reniform can be used to separate *lithosina* and *miona*. In the former it is a very large, broad, semi-oval, white area, not darkened in the center, while in *miona* the reniform is of the usual shape and size, and is darkened in the middle. Genitalically, these two species show also a rather close relationship. The shape of the middle one-third of the cucullus in the male is characteristic; in *lithosina* this area projects as a very broad arm, steep sided, with the apex produced both ventrally and posteromedially, while in *miona* the sides of this arm are slanting and the inner half of the apical portion is folded over ventrally. The group of six species with the light band across the forewings can usually be distinguished in the female genitalia by the bilobed nature of the posterior margin of the sternum of segment VII, although this character does not hold for *ida*. The posterolateral margins of segment VII have a prominent furrow in *lithosina*, *miona*, and *casta;* in addition, these species have asymmetrical ductus bursae and a simple flat plate for the dorsal surface of the ostium. The shape of this plate is of value in separating these species. In *lithosina* it is shaped like an elongate, somewhat flattened ellipse, with the lateral edges truncate, while in *miona* and *casta* the anterior edges of the plate are tapered laterally, forming a dull point on each side on the lateral boundaries.

**Annaphila (Annaphila) miona** J. B. Smith

Figures 5A, 7F

*Annaphila miona* J. B. SMITH, 1908, Ann. New York Acad. Sci., vol. 18, p. 121. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 480, pl. 147, fig. 11. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 60. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e.

MALE: Head, vertex and front black-brown, with a few gray scales and orange-brown hair-like scales; front strongly raised, conical, with apex truncate; antennae black-brown, with distal portions of segments white; palpi white at base, with increasing number of black-brown scales terminally and dorsally. Thorax, dorsal surface black-brown, with scattered gray and red-brown scales; ventral surface whitish. Legs white, with scattered darker scales; tibiae ranging in color from light tan to dark brown, with ring of white scales on distal portions of segments. Abdomen, dorsal surface black-brown, with increasing amount of pale orange scaling posteriorly, posterior margins of segments narrowly marked with white; orange laterally; ventral surface pale orange-white.

UPPER SURFACE OF WINGS: Forewings, ground color brownish gray, suffused with black and red-brown scales, with gray-white cross band beyond middle of wing, some scales having a metallic luster; basal line black, present in costal region only; t. a. line black, shaded basally with gray-brown, with outward curve from costa to cubital vein, bent strongly outward below this but swinging basally on anal vein, then strongly outwardly oblique to inner margin; orbicular absent or very faintly indicated; claviform absent; area between t. a. and median lines of ground color, not differentiated; median line black, diffuse, outwardly oblique across cell to meet lower edge of reniform, concave to anal vein but well separated from t. a. line, curving basally to meet inner margin; reniform of normal shape, white or grayish white, with central portion darkened, connected to costa by brownish white patch; area distal to and below reniform light gray-brown to brownish white, with small patch of ground color at anterodistal portion of reniform and with larger bilobed patch of same color at posterodistal portion of reniform, with small tooth of ground color directly posterior to reniform, then light-colored band bordered basally by narrow black line to inner margin, subparalleling course of median line; t. p. line pale brown, with metallic, cupreous, red tinge, tending to become reduced or obsolescent in lower half of wing, crossing costa at right angle, outwardly bidentate opposite reniform, with basal arc below this, meeting inner margin at right angle; t. p. line shaded distally by band of same color in upper portion of wing, usually with narrow band of light gray-brown between, with traces of two white spots on costa demarking origin of these bands; distad of this, black, lightly suffused with pale blue and red-brown scales, lower one-third of wing concolorous with t. p. line, and separated therefrom by narrow grayish white line or

patch; s. t. line indistinct, sinuate, formed by light blue and red-brown scales, marked on costa by white patch; terminal line black, diffuse, tending to become obsolescent before reaching anal angle; fringe with basal portion black-brown, with narrow light shade at base and at outer margin of basal portion, terminal half lighter in color. Hind wings orange; basal area suffused with black scales and lightly overlain with pale orange, hair-like scales, extending distally in cell; intradiscal line black, diffuse, obsolescent; discal dot absent; outer margin marked by moderate black band, with cupreous luster, with inner edge tending to be evenly curved but with some increase in width of band at veins $M_3$ and $Cu_2$; fringe concolorous with band or slightly grayer in color.

UNDER SURFACE OF WINGS: Forewings, ground color orange; edge of costa suffused with black in basal portion of wing, grayish orange medially; t. a. line absent; median band black, very broad, diffuse, irregular, interrupted by small orange patch on costa, produced distally below cell and above inner margin; discal dot weakly indicated; terminal area of wing black, beginning on costa two-thirds of distance from base, curving across wing, with median, inwardly pointing tooth, to vein $M_3$ or $Cu_1$, turning and subparalleling outer margin, obsolescent near inner angle; s. t. area marked by series of yellow patches, these sometimes reduced or obsolescent, originating on costa with white patch; fringe black, vein endings slightly marked with orange-brown scales. Hind wings concolorous with forewings; basal area not darkened; intradiscal line entirely absent or partially present, black; discal spot absent or indicated by a few black scales; postmedian line absent or represented by patch of black scales on costa only; terminal area black, as above, sometimes interrupted by series of subterminal orange spots; fringe as on primaries. Expanse: 21 mm.

FEMALE: Like male. Expanse: 19 to 22 mm.

MALE GENITALIA: Uncus elongate, tapering to sclerotized spine at apex; tegumen only slightly tapering distally to base of uncus; vinculum slightly increasing in width anteriorly to base of valves, then broadly rounded to slight anteromedial point; valves complex, symmetrical; cucullus slightly enlarged at base, with narrow costal arm arising one-fourth of distance from base, in length being slightly shorter than width of base of uncus, with second costal arm very broad, occupying central one-third of valve, arising from dorsal surface, the sides sloping and with inner one-half of apical portion folded over ventrally, without fringe of elongate hairs; apex of valves produced distally into slender, elongate, pointed arm; sacculus with small triangular clavus; juxta with anterior margin cleft; anellus with slight band near distal end, extending ventromedially as two pointed, sclerotized, elongate spines, with several smaller teeth at base; transtilla in form of an inverted V; aedeagus approximately five-sixths of combined length of tegumen and vinculum, ratio of length to width approximately 5:1; vesica armed with 24 to 36 short heavy spines in one patch in distal half of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin bilobed, the posterolateral margins with well-defined furrow. Ostium, dorsal surface an elongate, narrow, transverse, sclerotized plate, the anterior edges tapering laterally, the median section membranous, ventral surface produced laterally and ventrally as a sclerotized, bluntly rounded plate, the edges on the ventral surface folded over basally; ductus bursae slightly constricted below ostium, sclerotized, the dorsal surface with two longitudinal ridges, increasing in width basally, extending farther anterior on left side than on right; ductus seminalis arising from ventral surface of lobe of bursa copulatrix on right side; bursa copulatrix membranous except for lightly sclerotized band at base of bluntly rounded lobe to right of ductus bursae, the bursa elongate, its surface with numerous very fine spines, the length of the bursa being between two and three times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In Rutgers University collection.

TYPE LOCALITY: Plumas County, California.

RANGE: Sierra Nevada range of California. On the wing in May, June, and July.

SPECIMENS EXAMINED: *California:* Plumas County, June, 1 ♀; Mohawk, Plumas County,

June 15–18, 1946, July 1, 1946 (W. R. Bauer), 1 ♂, 2 ♀; Johnsville, Plumas County, July 10, 1946 (W. R. Bauer), 4 ♀; Huntington Lake, Fresno County, elevation 6950 feet, July 28, 1930 (L. M. Martin), 1 ♀; Cedar Crest, Huntington Lake, July 29, 1930, 1 ♀; Yosemite Valley, May 28, 1921 (E. C. Van Dyke), 1 ♀; Plumas County, June 8–15, 1 ♀; Buck's Lake, Plumas County, June 23, 1949 (C. I. Smith), July 1, 1949 (R. L. Langston), 2 ♀.

REMARKS: This species shows a close relationship to *lithosina*, both in maculation and in the structure of the genitalia. Refer above to *lithosina* for a discussion of these characters.

**Annaphila (Annaphila) casta** Henry Edwards

Figure 7E

*Annaphila casta* HENRY EDWARDS, 1890, Ent. Amer. vol. 6, p. 114. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 482, pl. 147, fig. 12. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47f.

MALE: Unknown.

FEMALE: Head, vertex and front black-brown, with a few scattered white scales and hair-like scales; front strongly projecting and rounded, forming a conical prominence; antennae black, with distal portions of segments white; palpi white at base, with increasing number of black-brown scales terminally. Thorax, dorsal surface black-brown, with scattered white scales and reddish brown, hair-like scales; ventral surface pure white. Legs white, with a few brown scales; tibiae brown, with ring of white scales on distal portions of segments. Abdomen, dorsal surface dull black-brown, with increasing amount of white scaling and white hair-like scales posteriorly, posterior margins of segments marked with white; ventral surface pure white.

UPPER SURFACE OF WINGS: Forewings, ground color dark grayish brown; basal line incomplete, represented by a few black scales; t. a. line black, complete, tending to be broadly shaded with grayish white basally, outwardly oblique, with strong basal bends on radial and anal veins; orbicular round, small, rather weakly defined by dull black scales, sometimes incompletely so; claviform absent or weakly represented by a row of brown-black scales between t. a. line and median shade; median cross line obsolescent, appearing as small, slightly darkened patches basad of broad white band, most prominent below radial and cubital veins; a narrow band of ground color beyond median line, followed by prominent broad band of white scales extending completely across wing; inner margin of this latter sharply defined, arising on costa one-half of distance from base, being very slightly inwardly oblique, and extending halfway across cell, then swinging rather sharply outward to form a sharp, prominent, tooth-like projection on vein $Cu_2$, evenly convex below this to inner margin, meeting the latter about three-fourths of distance from base; reniform not distinguished from this white band, its center weakly marked with grayish white scales; small patches of ground color, surrounded by white, distal to reniform at upper and lower extremities, the lower being the larger; outer margin of white area not so sharply defined as inner margin, more or less delimited by indistinct, brown, t. p. line in upper half of wing, the latter sharply indented beyond middle of reniform, obsolescent below vein $Cu_1$, being vaguely indicated by diffuse pale brown patches; t. p. line shaded distally by grayish white scales extending completely across wing to hind angle; s. t. line represented by patch of white scales on costa, below this by a few scattered, whitish gray or bluish white scales; fringe concolorous with wing, distal portion slightly grayer than basal portion, vein endings tending to be marked with lighter scales. Hind wings pure white; basal area black-brown, with a few scattered white scales and overlain with white, hair-like scales, bordered distally by poorly defined, black-brown, intradiscal line; central area of wing without black scaling on costal and inner margins; discal dot absent; outer margin marked by black-brown band, not increasing in width at vein $M_2$ but widened below vein $Cu_2$; fringe black at apex, completely white below this.

UNDER SURFACE OF WINGS: Forewings, ground color pure white; costa faintly marked with black; a wide, black-brown, median band extending across wing, indistinctly interrupted by a few grayish white scales on

costa, not narrowed below cell but retaining same width across wing, becoming slightly broader and somewhat diffuse below cubital vein; discal spot black-brown, elongate; a black-brown patch at outer lower extremity of discal spot, weakly connected to median band by a few dark scales; terminal area of wing broadly black-brown, beginning on costa slightly more than one-half of distance from base, going obliquely across wing to vein $M_3$, then running parallel with outer margin; terminal area with two small white spots on costa, and white s. t. line, the latter arising as large white spot on costa, and continued across wing by a series of white patches; fringe tending to become white in lower portion of wing. Hind wings concolorous with forewings; intradiscal line black-brown, tending to be somewhat interrupted in center of wing by white scales; discal dot weakly represented by a few dark scales; terminal area black-brown, similar to upper surface but with white scales broadly interrupting same in costal half of wing and medially; fringe as above. Expanse: 24 to 26 mm.

FEMALE GENITALIA: Sternum of segment VII with posterior margin strongly bilobed, the posterolateral margins with well-defined furrow. Ostium, dorsal surface an elongate, sclerotized, transverse plate, the anterolateral edges rounded, the median section membranous, ventral surface an elongate, shallowly U-shaped plate, the apices produced posteriorly; ductus bursae slightly constricted below ostium, then broadened to join bursa, extending farther to right side than to left; ductus seminalis arising from median surface near apex of lobe of bursa copulatrix on right side near ductus bursae; bursa copulatrix elongate, membranous, extending slightly posteriad on right side to form small lobe near ductus bursae, the left side of bursa rounded, with the anterior portion bluntly rounded, its surface with numerous very fine spines, the length of the bursa approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In British Museum (Natural History).

TYPE LOCALITY: As given in the original description, the type locality was merely indicated as "Oregon, Camp 9." Hampson stated the type locality to be Rancheni [Rancheria?] Creek, Mendocino County, California. A further elucidation can be obtained from Essig (1941, p. 104) where the following appears: "Camp 9. Clearing in redwoods near Navarro River, Mendocino Co., Cal. 29. V. 1871."

RANGE: Coastal regions of northern California.

SPECIMENS EXAMINED: One female from type series, through the kindness and cooperation of Mr. Tams; Sonoma County, California, May, 2 ♀.

REMARKS: While superficially very similar in appearance to *diva*, there are a number of things that can be used to distinguish these two species. Two of the most obvious are size and color. In wing expanse, *diva* ranges from 18 to 23 mm. by the measurements of the senior author, and from 22 to 24 mm. according to Hampson; the three specimens of *casta* examined measure from 24 to 26 mm. in expanse, while Hampson gives 26 to 30 mm. as the range. In color, *casta* is a pure white on the under side and on the superior surface of the secondaries, while *diva* is a more yellowish white. There is a slight difference in the shape of the front, as in this species it is more strongly projecting and more conical than in *diva*. The abdomen in *casta* is duller and a browner black than in *diva*, and is more prominently marked with white above. The maculation of the superior surfaces shows the following points of differentiation: In *casta* the primaries have the t. a. line more bowed and more broadly shaded basally, the median cross line is obsolescent, the postmedian white band is wider and more prominent, and the reniform is weaker; the secondaries in *casta* are pure white, the terminal band is not widened at vein $M_2$, and the fringe is all white. On the lower surfaces, *casta*, in addition to having the ground color pure white, has the median band of the forewings not decreasing in width, and has a complete intradiscal line on the hind wings.

An examination of the female genitalia shows that *casta* has its closest relationships with the *lithosina-miona* group rather than with *diva*. As mentioned above, *lithosina*, *miona*, and *casta* can be distinguished by the bilobed nature of the sternum of segment

VII, and by the presence of a well-defined furrow on each posterolateral margin thereof. The genitalia of *casta* and *miona* are very similar; however, there are a number of small differences that can be used to distinguish them. The sternum of segment VII appears to be more deeply bilobed in *casta;* the dorsal plate of the ostium has the posterior margin more deeply excavated and the plate is not so sharply tapering as in *miona;* the ventral plate of the ostium tends to be more U-shaped in *casta;* the ductus bursae tends to be more asymmetrical on the left side in *miona;* and there is no sclerotized band at the base of the lobe of the bursa copulatrix in *casta.*

**Annaphila (Annaphila) depicta depicta** Grote

Figures 4A, 8A

*Annaphila depicta* GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 150, pl. 4, fig. 13; 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 478, pl. 147, fig. 9. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e.

MALE: Head, vertex and front covered with a mixture of black-brown scales tipped with gray and black-brown, hair-like scales; front strongly projecting, truncate; antennae black-brown, with distal portions of segments white; palpi grayish brown, with increasing number of darker scales terminally. Thorax, dorsal surface dark gray-brown; ventral surface grayish white. Legs grayish white, with scattered darker scales; tibiae dark brown, with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, with scattered grayish white scales and hair-like scales, posterior margins of segments marked with white; ventral surface largely grayish white, with scattered darker scales.

UPPER SURFACE OF WINGS: Forewings, ground color purplish gray, shaded with dull reddish brown in outer portion; basal line absent or represented by a few dark scales in costal region; t. a. line rather weak, reddish brown, shaded inwardly with gray, strongly zigzag, with inwardly pointing teeth on cubital and anal veins and at inner margin; orbicular and claviform absent; median cross line black, thin, sometimes partially obsolescent, evenly sinuate, curving slightly basally across cell and again before reaching inner margin; median shade dull brown or reddish brown, prominent, widest just below base of reniform, delimited by black line in lower third of wing; reniform gray-brown, darker in center; area between median shade and t. p. line gray-brown or rarely yellow-brown, with brown scales from median shade extending distad to reniform; t. p. line brown, outwardly bidentate opposite reniform, with strong basal arc below this and with a small basal bend to inner margin; s. t. line sinuate, subparalleling course of t. p. line, most prominent near costa; subterminal area of ground color, lighter in hue than s. t. and terminal lines, with brown-black patch on outer margin at vein $Cu_2$; apex of wing suffused with dark gray scales, preceded by small white patch on costa; terminal line black, fine; fringe with dark line at middle, followed by thin whitish line, vein endings lightly marked with whitish scales. Hind wings orange; basal area lightly suffused with black-brown scales and overlain with pale orange, hair-like scales; intradiscal line black, thin, usually straight; discal dot prominent, black, elongate, tending to be slightly crescent shaped; patch of black scales on inner margin between intradiscal line and anal angle; outer margin marked by narrow black band, 0.5 mm. or less in width, increasing in width on vein $Cu_2$ and at anal angle, rarely also on vein $M_2$; fringe gray-black in basal half, dull orange distally and along inner margin.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa lighter in color, with occasional dark scales; t. a. line absent; median line black, rather narrow, curving sharply inwardly from costa to cell, then extending obliquely across wing to inner margin, decreasing in width posteriorly, sometimes fading out before reaching inner margin; discal spot black, prominent, tending to become slightly enlarged distally between veins $M_2$ and $Cu_1$; a black patch above discal dot on costa; a few black scales sometimes present below discal dot in lower portion of wing between median line and terminal area; terminal area of wing black, beginning on

costa seven-tenths of distance from base, going obliquely across wing to below vein $M_3$, then narrowing to point at hind angle, with inward swelling between cubital veins; terminal area yellow-orange, broadest near apex, not reaching hind margin; terminal line black, cut by light-colored veins; fringe gray-black basally, gray distally, vein endings marked with light-colored scales. Hind wings concolorous with forewings; basal area lightly suffused with dark scales; intradiscal line black, rarely partially incomplete, running at right angle to costal margin, with small inward bend in cell, turning sharply to meet inner margin one-half of distance from base; discal dot black, prominent, as above; postmedian line black, sometimes obsolescent, arising on costa above discal dot, running sharply outward, then bilobed, with strong, inwardly pointing tooth opposite discal dot, broadly curving basally on vein $Cu_2$, swinging outward again and then inward to meet inner margin just before anal angle; terminal line black, expanding into black patches opposite cell and above anal angle; fringe orange, with basal portion slightly darker, with whitish line at base. Expanse: 19 to 24 mm.

FEMALE: Like male. Expanse: 18 to 24 mm.

MALE GENITALIA: Uncus elongate, slender, the base broad at junction with tegumen, narrowed above this and tapering to apex, the latter tipped with sclerotized spine; tegumen elongate, broadest at junction with vinculum, tapering, with slight constriction below base of uncus; vinculum shorter than tegumen, widest basally, constricted below base of valves and extending as elongate anteromedial point; valves complex, asymmetrical; cucullus of both valves with small costal arm near base, in length subequal to width of base of uncus, the arm on right valve sometimes slightly longer than that on left valve; right valve with cucullus extended as elongate, narrow, pointed arm, arising one-half to two-thirds of distance from base, in length longer than length of uncus, and with apex of valves extended into long, narrow, curving, spine-like arm well separated at origin from arm of cucullus, in length approximately twice the length of uncus; left valve with cucullus extended into elongate pointed arm, farther distad in position and shorter and broader than arm on right valve, with small, sclerotized, spine-like projection arising on outer surface at base of arm on left side, this spine-like projection being one-half of length of cucullus arm, and with apex of valves truncate, without any arm; sacculus without clavus; juxta with anterior margin bluntly pointed, sometimes finely cleft; transtilla usually weakly sclerotized, extending distally as two elongate arms; aedeagus approximately four-fifths of combined length of tegumen and vinculum, ratio of length to width approximately 6:1, with slight swelling at one-third of distance from base, and with distal end tending to be produced into dull point; vesica armed with band of mediodistally pointing spines, 36 to 48 in number, occupying distal half of aedeagus, and with approximately 18 more spines near distal end on dorsal surface and extending around on right side of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin bilobed, the posterolateral margins with shallow furrow. Ostium, dorsal surface a heavily sclerotized transverse plate, situated vertically, the ends curving posteriorly and dorsally, the dorsolateral angles being produced dorsally as thumb-like projections, extending medially on posterior side as rounded swelling, ventral surface a less heavily sclerotized plate, narrower than dorsal plate, wider than long, anterior margin rounded, lateral margins bluntly pointed, posterior margin bilobed, approximating shape of posterior margin of segment VII; ductus bursae connected with ostium by membranous area, then heavily sclerotized, enlarged on left side near membranous area, then constricted, the sclerotized portion of ductus extending approximately twice as far anteriorly on left side as on right, and with narrow covering of corneous material; ductus seminalis arising ventrally on midline at junction with ductus bursae and bursa copulatrix; bursa copulatrix sclerotized posteriorly, membranous anteriorly, produced into rather large sclerotized lobe on right side of junction with ductus bursae, this lobe extending to midline, from whence ductus seminalis arises, membranous anterior portion of bursa rounded, the surface with numerous very fine spines, the length of the bursa varying between two and one-half

to three times the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In British Museum (Natural History); described from a female.

TYPE LOCALITY: California, according to the original description; based on a specimen bearing Henry Edwards' No. 2260. A reference to his catalogue under this number gives the following data: San Mateo County, April, collected by Henry Edwards in woods. This, then, can be accepted as the type locality, rather than "Sonome" [Sonoma] County as given in Hampson.

RANGE: Northern and central California, especially in the coastal areas but also reaching the foothills of the Sierra Nevadas in Butte County; Washington. On the wing in March and April.

SPECIMENS EXAMINED: *California:* San Mateo County, April (H. Edwards), 1 ♂, 1 ♀; Alpine Creek Road, San Mateo County, March 16–April 4, 1939 (S. H. and F. H. Rindge), 4 ♂, 1 ♀; San Mateo (A. Agassiz), 2 ♂, 2 ♀; San Mateo, San Mateo County, 1 ♂; Portula, April 1, 1909, 1 ♀; San Francisco, April, 1918, 1 ♂; Alameda, 1 ♂; Mt. Diablo, Contra Costa County, elevation 1900–2000 feet, March 26, 1949 (C. I. Smith), 4 ♂, 3 ♀; March Creek, Mt. Diablo, Contra Costa County, March 10, 1930, 1 ♂, 1 ♀; Fish Ranch, Contra Costa County, April 10, 1902, 1 ♀; Marin County, April 4, 1 ♀; Guerneville, Sonoma County, March, 1 ♀; Kenwood Springs, Sonoma County, March 3, 1949 (C. I. Smith), 2 ♀; Kenwood, March 26, 1946 (E. C. Johnston), 1 ♀; The Geysers, Sonoma County, March 19, 1939, 1 ♂; Spring Mountain, April 10, 1938 (E. C. Johnston), 2 ♀; Napa, Napa County, March 4–April 22, 1928, 1 ♂, 1 ♀; Egan Ranch, Napa County, April 10, 1933, 1 ♂, 2 ♀; St. Helena, Napa County, April 7, 1937, 1 ♂; Monticello, March 31, 1935 (E. C. Johnston), 1 ♂, 1 ♀; Lake Pillsbury, Lake County, April 21, 1937 (E. C. Johnston), 1 ♂, 2 ♀; Anderson Springs, Lake County, March 9–27, 1948, April 2–3, 1950 (W. R. Bauer), 4 ♂, 4 ♀; Pentz, Butte County, April 5, 1926, 1 ♂; Pulga, Butte County, April, 1942 (B. Weber), 1 ♂; Pinnacles, San Benito County, March 21, 1948 (C. H. Dickenson), 3 ♀; Atascadero, San Luis Obispo County, March 27–29, 1932, 2 ♂, 1 ♀; Havilah, 2 ♀. *Washington:* Satus Creek, Yakima County, April 4, 1942 (E. C. Johnston), 1 ♂, 1 ♀. *No data:* 11 ♀.

REMARKS: This species is distinctive in having the forewings above gray, with a prominent brown band crossing them basad of the reniform. In worn specimens the gray ground color tends to become a brownish gray, and on such specimens the brown median band loses its prominence. The two Washington specimens have the outer half of the primaries above much browner and with less distinct maculation than in the typical subspecies from central California; they are tentatively placed under this name until more material from the northwest can be studied. The male genitalia are very distinctive in having the valves strongly asymmetrical, being similar in this respect to those of *diva*. However, *depicta* can be separated from the latter species by the long, narrow, curving, spine-like arm at the apex of the right valve, and by the fact that the cucullus of the left valve is extended into an elongate pointed arm arising from the most distad portion of the valve. The female genitalia can be recognized by the bilobed nature of the sternum of segment VII, the rather complex dorsal plate of the ostium, and an evenly sclerotized asymmetrical ductus bursae.

### Annaphila (Annaphila) depicta morula, new subspecies

Figure 4C

*Annaphila depicta* EVANS, 1949, Lepidopterists' News, vol. 3, p. 74.

MALE: Head, vertex and front tending to be brownish black, with numerous hair-like scales. Abdomen, dorsal surface brownish black, with numerous grayish white scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color purplish gray, lightly suffused with light gray, shaded with reddish brown in outer portion of wing; median cross line black, prominent, complete; median shade dark brown or reddish brown; area between median shade and t. p. line yellow-brown; apex of wing suffused with blackish scales. Hind wings with basal area rather heavily suffused with black scales; intradiscal line black, prominent; discal dot black, very heavy; outer margin marked by prominent black band, 0.7 mm. or more in width, increasing in width on veins $M_2$, $Cu_2$, and at anal angle.

UNDER SURFACE OF WINGS: All maculation tending to be heavier and more prominent. Expanse: 19 to 22 mm., holotype 20 mm.

FEMALE: Like male. Expanse: 20 to 21 mm., allotype 20 mm.

MALE GENITALIA: Valves asymmetrical; cucullus of both valves with minute costal arm near base, varying in length from barely being indicated to slightly more than one-half of width of base of uncus; left valve with cucullus extended into elongate pointed arm, with sclerotized spine-like projection long and narrow, arising near middle of apex of valve, well separated from cucullus arm, the former being subequal to, or slightly shorter than, length of the latter.

FEMALE GENITALIA: Ostium, dorsal plate with dorsolateral angles extended as points rather than as thumb-like projections, ventral plate approximately twice as wide as long, the anterolateral edges tending to be concave.

EARLY STAGES: Mr. William H. Evans has reared this subspecies from females obtained in the type locality. He has been kind enough to furnish the following notes:

EGGS: Deposited March 11, 1950; hatched March 20, 1950.

LARVAE, FOURTH INSTAR: Ground color dark green above the spiracles, light green below, with a whitish dorsal line and a very fine, whitish, subdorsal line.

FIFTH INSTAR: Head black, mottled with gray and cream. Ground color light green immediately after molt, turning brownish black in a few hours, with the color becoming lighter as the larva grows older; dorsal line whitish, wider than in previous instars, turning brownish yellow, and extending entire length of body; a row of black dashes adjacent to the dorsal line on thoracic segments and abdominal segments I to VIII inclusive; segments I, II, and VII usually with small, white, subdorsal dots on outer edges of black dashes; prothorax with a narrow, cream-colored dash extending from anterior edge of segment to center; segment VII with a small, brown, subdorsal dash extending from rear of white spot to posterior margin of segment; posterior margin of segment VIII with an irregular, tan, transverse band extending across dorsal stripe to subdorsal area on either side, and with an indistinct broken band of same color extending from either end of transverse band to anal extremity; spiracular line grayish, very faint.

Pupation occurred inside small hollowed stems of dead *Sambucus* twigs, the larvae forming thin plugs of chewed pith above and below to form pupation chambers.

FOOD PLANT: *Nemophila Menziesii* Hooker and Arnott. Oviposition occurs on the under side of the leaves (Evans, 1949). The larvae feed on the leaves in all instars, and the flowers, although sometimes eaten, appear not to be essential.

TYPES: Holotype, male, La Tuna Canyon, Los Angeles County, California, March 7, 1947 (W. H. Evans); allotype, female, same data and collector. Paratypes, 23 males and 11 females: same data as holotype, with the following range of dates: March 20, 1941, March 11, 1945, February 22–March 7, 1947 (W. H. Evans), March 9–27, 1948, March 17, 1949, March 4, 1950 (W. H. Evans, C. I. Smith, C. Henne), 29 specimens; Dark Canyon, Los Angeles County, California, *ex ova* March 22, 1950 (W. H. Evans), one female; Little Tujunga Canyon, Los Angeles County, California, elevation 1775 feet, March 18–21, 1949 (W. H. Evans), four specimens.

Holotype and allotype in the collection of the American Museum of Natural History. Paratypes to be distributed as follows: the American Museum of Natural History; United States National Museum; California Academy of Sciences; the California Insect Survey collection, Division of Entomology and Parasitology, University of California, Berkeley; the collections of C. Henne, Pasadena, and William H. Evans of Sun Valley, California.

RANGE: Known only from Los Angeles County, California. On the wing in February and March.

REMARKS: This subspecies differs from the nominate one by the more prominent and brighter maculation. The primaries above have the transverse brown band tending to be a brighter, more contrasting brown, with the black median cross line wider and quite prominent. On the secondaries the maculation is heavier, with the intradiscal line, discal dot, and outer margin being more heavily indicated than in the nominate subspecies. There are also differences in the genitalia

between the two subspecies. In the male the sclerotized spine at the apex of the left valve arises near the middle of the apex in *morula*, being well separated from the cucullus arm, and is subequal to the length of the latter; in nominate *depicta* this arm arises on the outer surface of the base of the cucullus arm, and is approximately one-half of the length of the latter. In the female genitalia, differences appear in the shape of the ostial plates; these are described above.

It is thought advisable to describe this insect in a subspecific category at the present time, notwithstanding the considerable differences between it and the typical *depicta*. As *morula* is obviously an offshoot of the *depicta* stock, the relationship between the two is indicated. When early-stage material of the two can be carefully compared, it will be interesting to see what differences, if any, are manifested.

### Annaphila (Annaphila) decia Grote

Figures 3C, 8F

*Annaphila decia* GROTE, 1875, Canadian Ent., vol. 7, p. 47; 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 478, pl. 147, fig. 8. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e.

*Annaphila amicula* HENRY EDWARDS, 1875, Proc. California Acad. Sci., ser. 1, vol. 6, p. 137; 1875, *ibid.*, ser. 1, vol. 6, p. 138 (synonymy).

*Annaphila germana* HENRY EDWARDS, 1875, Proc. California Acad. Sci., ser. 1, vol. 6, p. 138. BEUTENMÜLLER, 1892, Bull. Amer. Mus. Nat. Hist., vol. 4, p. 189. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 477, pl. 147, fig. 7. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47e. (New synonymy.)

*Annaphila danistica* DYAR (not Grote), 1904, Proc. U. S. Natl. Mus., vol. 27, p. 876.

MALE: Head, vertex and front black, the former with scattered gray scales and black, hair-like scales; front raised, slightly projecting centrally, with strong ridge across top; antennae black, with distal portions of segments white; palpi grayish white, with increasing number of black scales and brown-black, hair-like scales terminally and dorsally. Thorax, dorsal surface with a mixture of black and grayish white scales and brown-black, hair-like scales; ventral surface grayish white, with a few darker scales. Legs grayish white to gray-black, darkening distally; tibiae black, with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, with scattered gray scales, with increasing amount of grayish white scaling and hair-like scales posteriorly, posterior margins of segments narrowly marked with grayish white; ventral surface largely grayish white, with some dark scaling.

UPPER SURFACE OF WINGS: Forewings, ground color blackish brown; basal line incomplete or obsolescent, represented by a few black scales in costal region; t. a. line black, shaded inwardly with grayish white in lower half of wing, outwardly oblique and sinuous, with strong, inwardly pointing tooth on anal vein; orbicular round, partially or completely outlined with black scales, interior of ground color or shaded with reddish brown or grayish white scales; claviform absent; median cross line black, roughly paralleling course of t. a. line, sinuous, with outward bends on cubital and anal veins; reniform grayish white, darker in center, often outlined basally and distally by narrow black line, preceded at costa by narrow to rather broad patch of light-colored scales; t. p. line grayish white, rather diffuse, sinuous, shaded inwardly in lower portion of wing by narrow black line; s. t. line weakly represented or obsolescent, arising from white patch on costa, black and outwardly shaded by grayish white in center of wing, continued to hind angle as whitish line, apex of wing suffused with blackish scales; terminal line black, interrupted at veins with grayish white scales, with brown-black patch on outer margin at vein $Cu_2$; fringe dark or with basal portion suffused with grayish brown scales, with dark line at middle, vein endings marked with whitish scales. Hind wings orange; basal area and inner margin black, overlain with orange, hair-like scales; intradiscal line black, prominent, varying from evenly excurved to dentate; discal dot prominent, black, elongate; outer margin marked by wide black

band, increasing in width on veins $M_2$ and $Cu_2$; fringe black at base, lighter in outer portion, vein endings sometimes marked with orange-white scales.

UNDER SURFACE OF WINGS: Forewings, ground color orange; costa somewhat lighter in color, lightly suffused with black and grayish orange scales; t. a. line absent; median line black, outwardly oblique, almost straight but with small basal bend below vein $Cu_2$; discal spot black, prominent, elongate, preceded by a black patch on costa; postmedian line black, rarely present between discal dot and terminal area, strongest at inner margin; terminal area of wing black, beginning on costa two-thirds of distance from base, curving obliquely across wing to below vein $M_3$, then paralleling outer margin to hind angle, slightly concave between veins; s. t. line yellowish white, arising on costa from third and largest white spot, prominent or obsolescent in center of wing, broadly interrupting black terminal area at hind angle; fringe grayish black, with dark central line, vein endings marked with whitish scales. Hind wings concolorous with forewings; basal area lightly suffused with dark scales; intradiscal line black, running at right angle from costal margin to center of cell, then outwardly bidentate to inner margin; discal dot black, prominent, as above; post-median line usually represented by small black spots on costal and inner margins only; when completely present, arising as black patch on costa just distad of origin of intradiscal line, turning and going subparallel with costal margin to beyond discal dot, turning posteriorly, indented opposite discal dot, then broadly sinuate to inner margin near anal angle; terminal area black, as above, but with some subterminal orange-white markings usually present; fringe black, as on primaries. Expanse: 17 to 22 mm.

FEMALE: Like male. Expanse: 16 to 21 mm.

MALE GENITALIA: Uncus elongate, broad, tapering in distal portion to bluntly pointed apex; tegumen increasing in width at junction with vinculum, and with small constriction near base of uncus; vinculum longer than tegumen, slightly tapering past base of valves, then rounded, with median portion flattened; valves complex, symmetrical; cucullus sometimes slightly enlarged at base, with broad, sclerotized, costal arm, arising one-third of distance from base, at inception being subequal to width of base of uncus, with distal portion produced outwardly, arm on left valve tending to be slightly thicker and longer than arm on right valve; apex of valves truncate or bluntly rounded; harpe present as elongate narrow plate, terminating in erect arm, slightly shorter than width of base of uncus, tending to be somewhat swollen or bulbous apically; sacculus with small clavus; juxta with anterior margin bluntly pointed, finely cleft; transtilla in form of two elongate, narrow strips extending distally and tending to meet in midline; aedeagus approximately four-fifths of combined length of tegumen and vinculum, ratio of length to width approximately 6:1, tending to be slightly curved, with distal portion bluntly pointed; vesica armed with approximately 36 to 48 elongate thin spines near distal end of aedeagus, these being one and one-half to two times as long as maximum width of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin concave. Ostium, dorsal surface a sclerotized T-shaped plate, the transverse piece being posteriad of, and narrower than, longitudinal piece, ventral surface a broad, subrectangular, sclerotized plate, slightly wider than dorsal plate, the dorsolateral portions being pointed and extending farther posteriad than vertical, concave, median area, ventrally slightly rounded; ductus bursae connected to ostium by short membranous area, then heavily sclerotized, increasing in width on left side anteriorly, the left side being longer than the right side; ductus seminalis arising from median surface of lobe of bursa copulatrix near ductus bursae; bursa copulatrix elongate, membranous, extending posteriorly into lobe on right side near junction with ductus bursae, anterior portion of bursa rounded, its surface with numerous very fine spines, the length of the bursa approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: *Decia*, in British Museum (Natural History); described from two specimens, the type being a female. *Amicula* and *germana*, in the American Museum of Natural History.

TYPE LOCALITIES: Grote described *decia* from two Henry Edwards specimens bearing No. 2587; this number is also on the type of *amicula*. Apparently the specimens sent to Grote also carried a Havilah, California, label, as this is quoted by Hampson as being the type locality; one specimen in the American Museum of Natural History also bears this combination of labels. However, turning once again to the catalogue of the Henry Edwards collection, the data after No. 2587 read San Mateo County, California, May, collected by H. Edwards; this also agrees with the original description of *amicula*. Therefore, it is believed that these latter data, rather than Havilah, should be accepted as the type locality for both *decia* and *amicula*. The type locality for *germana* is Napa County, California, June (H. Edwards).

RANGE: Pacific coast states, from southern British Columbia to southern California. On the wing in February, March, and April; rarely as late as May or June.

SPECIMENS EXAMINED: *California:* Los Angeles County (Coquillet), 1 ♂; Mint Canyon, Los Angeles County, March 16, 1947 (C. I. Smith), 1 ♀; Gavilan, April, 1931 (G. H. and J. L. Sperry), 1 ♀; San Luis Obispo, March (A. H. Vachell), 1 ♂; Atascadero, April 2, 1922 (V. L. Clemence), 1 ♂, 1 ♀; Monterey, March 30, 1927, 1 ♂; mountains behind Alma, 1 ♂; Santa Clara, 1 ♀; San Mateo (A. Agassiz), 1 ♂; San Mateo County, May, 3 ♀; Half Moon Bay, San Mateo County, March 27, 1938, 1 ♀; Berkeley, 1 ♀; Fish Ranch, Contra Costa County, April 12, 1904, 1 ♂; Stream Trail, Oakland Hills, Alameda County, April 4, 1949 (T. Davies), 1 ♂; Marin County, May 3, 1905, 1 ♀; Mill Valley, Marin County, March 22, 1926, 1 ♂; Ross, Marin County, March 31, 1918, 1 ♂; Fairfax, April 11, 1915, 1 ♂; Two Rock, Sonoma County, April 3, 1938 (E. C. Johnston), 1 ♂; Kenwood, March 30, 1937, March 26, 1938 (E. C. Johnston), 3 ♂, 5 ♀; Guerneville, Sonoma County, February 2, 1926, March 11, 1928, 3 ♂, 12 ♀; Skaggs, 1 ♀; Sonoma County, May, 2 ♀; Napa County, June, 1 ♂; Napa, Napa County, March 15, 1939, March 30, 1937 (H. B. Leech, M. Cazier), April 22, 1929, 2 ♂, 2 ♀; St. Helena, April 15, 1938 (E. C. Johnston), 1 ♂; Egan Ranch, Napa County, April 10, 1933, 1 ♂; Blue Lakes, April 27, 1 ♀; Anderson Springs, Lake County, April 1, 1950 (W. R. Bauer), 1 ♂; Mt. St. Hedron, Lake County, April 27, 1939 (E. C. Johnston), 2 ♂, 2 ♀; Hopland, April 20, 1937 (E. C. Johnston), 1 ♀; Yankee Hill, Butte County, March 20, 1938 (H. H. Keifer), 1 ♂; Placer County, 2500 feet, 2 ♀; Colfax, Placer County (H. G. Dyar), 1 ♂; Plumas County, June, 1 ♂; south California, 3 ♀; California, 1 ♂, 2 ♀. *Oregon:* Medford, April 15, 1932, 1 ♂, 1 ♀. *Washington:* Pullman (C. V. Piper), 1 ♀; Cowiche Creek, Yakima County, May 14, 1922, 1 ♀. *British Columbia:* Crawford Bay, Kootenay Lake, (J. W. Cockle), 1 ♀; Wellington, Vancouver Island, May 22, 1899 (Taylor), 1 ♀; British Columbia, April 22, 1905 (Taylor) 1 ♂. *No data:* 4 ♂.

Hampson reported it from Camp Watson, Grant County, Oregon (Walsingham). The specimen referred to by Dyar as being in the Cockle collection as *A. danistica* is apparently now in the Canadian National Collection. It bears the following labels: "Annaphila danistica Grt.," "Kaslo, B. C., Coll. J. W. Cockle," and "Crawford Bay, Kootenay L., Coll. J. Wm. Cockle." This specimen obviously is not *danistica* but is referable to this species.

REMARKS: This widespread species tends to be somewhat variable, but can be distinguished by the fact that the gray-brown forewings are crossed by a diffuse grayish white band beyond and including the reniform, and that the intradiscal line of the hind wings above is excurved or dentate. This latter line may be somewhat variable in its location on the wings; usually it is curved and well separated from the base of the wing, with the intervening space orange. However, in at least one specimen the intradiscal line tends to be almost straight, with the outer margin somewhat dentate, and with the area between it and the base of the wing greatly reduced in size and with practically no orange scaling present; a specimen with this type of maculation served as the basis for *germana*. No genitalic differences have been noted between these two forms.

The genitalia can be distinguished, in the male, by the fact that the cucullus has a broad, sclerotized, costal arm, as wide as the base of the uncus at its inception, and with what is presumed to be the harpe differentiated as an elongate narrow plate, terminating in an erect arm. The female can be separated from the other species by the concave nature of the posterior margin of the sternum of segment VII, by the fact that the ductus bursae is straight, and with the left side almost twice as long as the right side.

The junior author captured specimens

feeding on *Baeria chrysostoma gracilis* (De Candolle) Hall in Mint Canyon, Los Angeles County, California.

**Annaphila (Annaphila) diva** Grote

Figures 4B, 8C

*Annaphila diva* GROTE, 1873, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 150, pl. 4, fig. 14; 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 481, text fig. 299. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. HOLLAND, 1917, Moth book, p. 246, pl. 29, fig. 20. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47f. EVANS, 1949, Lepidopterists' News, vol. 3, p. 74.

*Annaphila diva* ab. *yosemitensis* STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 59. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329. (New synonymy.)

MALE: Head, vertex and front black, with scattered white scales and brown hair-like scales; front projecting, forming rounded prominence; antennae black, with distal portions of segments white; palpi white, with increasing number of black scales terminally. Thorax, dorsal surface covered with a mixture of black and white scales and brown hair-like scales; ventral surface white or cream white, with a few darker scales. Legs white, with a few darker scales; tibiae black, with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, with increasing amount of white scaling and white hair-like scales posteriorly, posterior margins of segments narrowly marked with white; ventral surface creamy white, with a few darker scales.

UPPER SURFACE OF WINGS: Forewings, ground color blackish brown, sometimes lightly suffused with reddish brown; basal line incomplete, represented by a few black scales; t. a. line black, complete or obsolescent in posterior portion of wing, tending to be shaded basally with white or gray scales below cell, outwardly oblique but with strong basal bow on anal vein; orbicular round, defined by black scales, sometimes incompletely so; claviform absent or weakly indicated; median cross line black, usually rather well defined, touching both orbicular and claviform; a narrow band of ground color beyond median line, followed by prominent broad band of white scales extending completely across wing; inner margin of this latter sharply defined, arising on costa slightly beyond one-half of distance from base, going to top of cell at right angle or inwardly oblique, evenly concave across cell, continuing distally to form a sharp, tooth-like projection on vein $Cu_2$, swinging outward again below this to just above anal vein, then going to inner margin at right angle four-fifths of distance from base; reniform usually not distinguished from this white band, but its center prominently marked with gray scales; small patches of ground color, surrounded by white, distal to reniform at upper and lower extremities, the lower being the larger; outer margin of white area not so sharply defined as inner margin, more or less delimited by indistinct t. p. line, consisting largely of dark brown scales, shaded with white and gray-white scales distally, especially near costa and posterior to vein $Cu_1$, where the white scaling reaches the hind angle and includes some rather indistinct darker areas; s. t. line represented by patch of white scales on costa, below this by black spot, and then continuing posteriorly very faintly as a narrow grayish line, not reaching inner margin; apex of wing suffused with black scales; subterminal area lightly marked with grayish scales; fringe concolorous with wing, distal portion slightly grayer than basal portion, vein endings marked with lighter scales. Hind wings creamy white; basal area black-brown, with a few scattered white scales and overlain with white, hair-like scales, bordered distally by black intradiscal line; central area of wing with small or obsolescent patches of black scales on costal and inner margins, the latter being more prominent than the former, and with small or obsolescent dark discal dot; outer margin marked by black-brown band, increasing in width at vein $M_2$ and below vein $Cu_2$; fringe black at apex, black basally, with outer portion white in center of wing, and all white at anal angle and along inner margin.

UNDER SURFACE OF WINGS: Forewings, ground color creamy white; costa faintly marked with black; t. a. line absent; a broad, black, median band extending across wing, interrupted by white patch on costa, narrow-

ing and dividing below cell, one arm reaching inner margin, and the other extending for a short distance along vein $Cu_2$ below cell, between ends of these arms an indistinct blackish patch; discal spot black, elongate; terminal area of the wing broadly black, beginning on costa three-fifths of distance from base, going obliquely across wing to below vein $M_3$, then running parallel with outer margin; terminal area with two small white spots on costa and white s. t. line, the latter arising as larger white spot on costa, obsolescent below this but increasing in strength in lower part of wing, appearing first as scattered white scales and then as white patches; fringe as above. Hind wings concolorous with forewings; intradiscal line black, usually incomplete, extending at right angle to costal margin, turning sharply to meet inner margin one-half of distance from base; discal dot black; terminal area black, similar to upper surface but with white scales interrupting same medially and next to outer margin; fringe as above. Expanse: 18 to 23 mm.

FEMALE: Like male. Expanse: 18 to 22 mm.

MALE GENITALIA: Uncus elongate, slightly increasing in width medially, then tapering to bluntly pointed apex; tegumen elongate, slightly widened at junction with vinculum, with slight constrictions near vinculum and near base of uncus; vinculum shorter than tegumen, the sides tending to be subparallel, with basal portion rounded and flattened medially; valves complex, with apices asymmetrical; cucullus sometimes slightly enlarged at base, with prominent, sclerotized, costal arm, arising near base, at inception being slightly less than width of base of uncus, with distal portion curved ventrally and outwardly, arm on left valve tending to be slightly thicker and longer than arm on right valve; harpe present on both valves as elongate narrow plate, terminating in erect arm, slightly longer than width of base of uncus, tending to be swollen or bulbous apically; apex of right valve produced into elongate arm extending distad of cucullus arm; apex of left valve semitruncate or somewhat concave, the outer corners slightly projecting but not extending distad of cucullus arm; sacculus without clavus; juxta with anterior margin bluntly pointed, with apex finely cleft; transtilla in form of two elongate, narrow strips extending distally; aedeagus approximately five-sevenths of combined length of tegumen and vinculum, ratio of length to width approximately 6:1 or 5:1, tending to be slightly curved, with basal portion somewhat narrowed and distal portion bluntly pointed; vesica armed with two groups of spines: the first, median in position, consisting of approximately 24 slender elongate spines, in length the entire group being about twice as long as width of aedeagus; the second, apical in position, consisting of from two to five heavier spines, in length being subequal to width of aedeagus.

FEMALE GENITALIA: Sternum of segment VII with posterior margin concave. Ostium, dorsal surface a sclerotized T-shaped plate, the transverse piece being dorsoposteriad and with its ends concave and widened, the longitudinal piece being bilobed on anteroventral margin and increasing in width at junction with transverse piece, ventral surface an elongate sclerotized plate, rounded medially and produced laterally as narrow, somewhat twisted side pieces, the latter being of slightly greater width than the lateral extensions of the dorsal plate; ductus bursae connected to ostium by short membranous area, then heavily sclerotized, curving sharply to the right anteriorly at junction with bursa copulatrix; ductus seminalis arising from median surface near apex of lobe of bursa copulatrix near ductus bursae; bursa copulatrix elongate, membranous, extending posteriorly into small lobe on right side near junction with ductus bursae, the anterior portion of bursa rounded, its surface with numerous very fine spines, the length of the bursa approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: This species has been reared by Mr. William H. Evans and he has kindly furnished the following notes:

EGGS: Deposited April 4, 1950; hatched April 11, 1950.

LARVAE, FOURTH INSTAR: Ground color bluish gray, gray-green on ventral surface; dorsal stripe consisting of two fine, dark gray lines extending entire length of body; subdorsal stripe of two fine gray lines on thoracic segments, indistinctly indicated on abdominal segments; subspiracular line white,

broad; anterior portion of thoracic segment I with four black spots in addorsal and subdorsal regions.

FIFTH INSTAR: Head, amber colored, with black spots. Body brownish gray; dorsal stripe consisting of indistinct, double, blackish lines made up of small, irregularly shaped dots on thoracic and abdominal segments I to III, posteriorly with a few scattered spots in dorsal area; subdorsal stripe on thoracic segments whitish, mottled with brown, and edged on each side with black; on anterior portion of segments I to VII a round black spot interrupts the subdorsal stripe, leaving a whitish spot, mottled with brown, on posterior one-third of segments, these black spots becoming smaller and less conspicuous posteriorly; an oval, subdorsal, whitish spot, mottled with brown, extending from posterior one-third of segment VII to the anterior portion of segment VIII; a whitish bar extending across posterior edge of segment VIII to dorsolateral area; posterior to this, a cream-colored triangular spot extending to anal extremity; subspiracular line grayish white, narrow on thoracic segments, then broader, edged above by an irregular black line running through the spiracles and extending to anal segments; an inverted black crescent on mesothoracic and metathoracic segments on upper edge of subspiracular line.

Pupation occurred in a small cocoon consisting of small particles of dirt stuck together with silk, and attached at one side to a twig lying on damp soil.

FOOD PLANT: *Montia perfoliata* (Donn) Howell. In the first two instars the larvae fed on the flowers and buds only, remaining hidden in same; in the last three instars the leaves as well as the flowers were eaten.

TYPES: Both *diva* and *yosemitensis* in British Museum (Natural History).

TYPE LOCALITIES: Of *diva*, California, being described from specimens "Coll. Theo. L. Mead; Hy. Edwards, No. 198." This last reference, in the catalogue of the Henry Edwards collection, gives the following additional data: "Alameda County, April, Hy. Edwards; on flowers of *Sambucus*." Of *yosemitensis*, Yosemite Valley, California.

RANGE: Pacific coast states, from southern British Columbia to southern California. On the wing from March to July.

SPECIMENS EXAMINED: *California:* Temecula, Riverside County, April 7, 1928, 1 ♀; Angeles Crest Highway, Los Angeles County, March 17, 1946, March 30, 1942, April 23, 1945, elevation 4500 feet (C. I. Smith), 3 ♂, 1 ♀; Woodwardia Canyon, Angeles Crest Highway, Los Angeles County, March 16–23, 1946, elevation 3000 feet (C. Henne), 3 ♂, 1 ♀; Dark Canyon, Angeles Crest Highway, San Gabriel Mountains, Los Angeles County, March 27–April 18, 1948, elevation 2300 feet (C. Henne, C. I. Smith), 2 ♂, 1 ♀; Arroyo Seco, Pasadena, March 16, 1929, 1 ♀; Pasadena, March 14, 1905, 1 ♂; Tapia Camp, Santa Monica Mountains, March 22, 1948, 1 ♂; Atascadero, San Luis Obispo County, March 15, 1932 (V. L. Clemence), March 27, 1948 (C. H. Dickenson), 1 ♂, 1 ♀; Carmel, Monterey County, April 5, 1928, 1 ♂; Salinas River, near Salinas, Monterey County, March 9, 1941, 1 ♂; Santa Clara, 2 ♂, 6 ♀; Los Gatos Creek, near Alma, Santa Clara County, April 9, 1949 (C. I. Smith), 1 ♀; Santa Cruz, March 28–April 11, 1923, 1 ♂, 4 ♀; San Mateo County (A. Agassiz), 4 ♂, 4 ♀; Portola, San Mateo County, April 30, 1907, 1 ♂; Alpine Creek Road, San Mateo County, March 18–April 4, 1939 (S. H. and F. H. Rindge), 2 ♂, 2 ♀; Alameda (A. Koebele), 2 ♂, 1 ♀; Niles, Alameda County, April 16, 1916, 1 ♀; Oakland, March 22–April 5, 1905 (G. R. Pilate), 3 ♂, 11 ♀; Stream Trail, Oakland Hills, Alameda County, April 4, 1949 (T. Davies), 1 ♀; Strawberry Canyon, Berkeley, Alameda County, April 8, 1949 (C. I. Smith), 1 ♀; Berkeley, April 16, 1948 (R. Vandegrift), 1 ♀; Fairfax, Marin County, April 2, 1916, 1 ♂; Deer Valley, Marin County, March, April, 3 ♂, 4 ♀; Napa, Napa County, March 6, 1934, March 17, 1930, April 22, 1929, 6 ♂, 6 ♀; Mt. St. Helena, Napa County, April 10, 1935 (E. C. Johnston), 1 ♂, 1 ♀; St. Helena, April 10, 1935 (E. C. Johnston), 2 ♀; Guerneville, Sonoma County, March 3, 1926, 8 ♂, 3 ♀; Kenwood, March 30, 1937 (E. C. Johnston), 3 ♂, 1 ♀; Kenwood Springs, Sonoma County, April 3, 1949 (C. I. Smith), 2 ♂, 3 ♀; Badger, Calaveras County, May 4, 1919, 1 ♀; Plumas County, May, 1 ♂, 2 ♀; Pentz, Butte County, April 5, 1928, 1 ♀; Hayden Public Camp, Trinity County, April 30, 1937, 1 ♂, 1 ♀; Rancheria Creek, southeast of Boonville, Mendocino County, April 30, 1949 (C. I. Smith), 1 ♀; "Middle Cala.," 1 ♂, 2 ♀; "Cal.," 5 ♂, 5 ♀. *Oregon:* Port Orford, May 15, 1917, 2 ♀; Corvallis, May, 1927 (B. G. Thompson), 1 ♀; Durkee, May 16–21, 1940, May 11, 1941, May 6, 1942 (J. H. Baker), 2 ♂, 6 ♀; Durkee, Powell Creek, May 6, 1943 (J. H. Baker), 1 ♂; Homestead, April 18, 1940, 1 ♂, 1 ♀; Wallowa National Forest, Wallowa Lake, July 23, 1940 (J. H. Baker), 1 ♀. *Washington:* Belfair,

May 8, 1949 (E. C. Johnston), 2 ♀. *British Columbia:* Bon Accord, May 26, 1909, 1 ♀; Harrison Hot Springs, June 11, 1933 (J. McDunnough), 1 ♀; Vancouver, 1 ♂, 1 ♀; Squamish, May 12, 1918 (W. B. Anderson), 1 ♀; Wellington, Vancouver Island, May 9, 1902 (G. W. Taylor), 1 ♂; Departure Bay, April 30, 1909, June, 1909 (G. W. Taylor), 2 ♀; British Columbia Biological Station, Departure Bay, May 13, 1909 (G. W. Taylor), 1 ♀; Duncans, April 29, 1906, April 27, 1908, 3 ♀; Corfield, Vancouver, 1 ♀; British Columbia, April 22, 1905, 1 ♂. *No data:* 9 ♀.

Hampson reported the following localities for this species not given above: San Raphael and Yosemite Valley, California.

REMARKS: This species, with its light-colored secondaries, is quite widespread and is one of the most commonly captured species in the genus. The whitish colored secondaries and under side easily distinguish this species from all others, with the exception of the very rare *casta* (see above under *casta* for a discussion of these differentiating characters). Genitalically, the males can be distinguished by the asymmetrical valves, with the apex of the right valve extended into a broad elongate arm, and with the cucullus of the left valve with its costal arm arising near the middle of the valve; in the female, by the rounded posterior margin of the sternum of segment VII, and by the sharply curved ductus bursae.

It is interesting to speculate on the possible ancestral stock of the two species with white secondaries. It is unfortunate that the male of *casta* is unknown as yet, as the male genitalia would probably be very useful in ascertaining possible relationships. However, based on the female genitalia and general maculation, it would appear that *casta* is closely related to the *lithosina-miona* group and probably derived therefrom. On the other hand, the male genitalia and maculation of *diva* show an apparent relationship to the *astrologa-ida* group, and *diva* may possibly be a highly specialized offshoot therefrom. The female genitalia of this latter group tend to be rather variable, with *astrologa* being a more primitive type, showing relationships to the *lithosina-miona* group, and with the genitalia of *ida* showing characters like those found only in the *superba* complex.

So far as can be told from a photograph of the female type of *yosemitensis*, it is, as was originally indicated by Hampson ("Ab. 1"), only a heavily marked specimen of *diva*. A photomicrograph of the genitalia of this type further supports this view, as the genitalic structures are apparently very similar to, if not identical with, the genitalia of the type of *diva*.

In the San Gabriel Mountains of southern California this species has been captured feeding on the blossoms of *Ceanothus* and while circling *Acer macrophyllum* Pursh. Mr. Henne of Pasadena notes that the males generally circle *Quercus chrysolepis* Liebmann in the early afternoon and the females hover over low vegetation in mid-morning.

**Annaphila (Annaphila) superba** Henry Edwards

Figures 5B, 8B

*Annaphila superba* HENRY EDWARDS, 1875, Proc. California Acad. Sci., ser. 1, vol. 6, p. 114. GROTE, 1878, Bull. U. S. Geol. and Geogr. Surv. Terr., vol. 4, p. 183; 1882, Illustrated essay on the Noctuidae of North America, p. 60, pl. 3, fig. 28. BEUTENMÜLLER, 1892, Bull. Amer. Mus. Nat. Hist., vol. 4, p. 188. J. B. SMITH, 1893, Bull. U. S. Natl. Mus., vol. 44, p. 296. HAMPSON, 1910, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 9, p. 482, pl. 147, fig. 12. STRAND, 1912, Lepidopterorum catalogus, pt. 5, p. 60. DRAUDT, 1927, *in* Seitz, Macrolepidoptera of the world, vol. 7, p. 329, pl. 47f.

MALE: Head, vertex and front brown or black-brown, with scattered gray scales and numerous brown, hair-like scales; front brown, strongly raised, conical, the apex truncate; antennae dark brown, with white scaling on dorsal surface of terminal portions of segments; palpi brown, with a few gray scales and hair-like scales at base. Thorax, dorsal surface black-brown, with scattered gray scales and brown hair-like scales; ventral surface gray-brown. Legs dark brown, with numerous gray scales and hair-like scales; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal and ventral surfaces black-brown, with scattered, dark gray-brown, hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color blackish brown, with rather distinct maculation; basal line represented by a few blackish scales in costal portion of

wing; basal dash absent; t. a. line black, shaded basally with grayish white, especially in lower half of wing, outwardly oblique, with outwardly pointing tooth on radial vein, with broad outward projection below cubital vein, then swinging basally to anal vein, then outwardly again to inner margin; orbicular small, defined by black scales, central portion usually not differentiated, rarely filled in with grayish white; claviform absent; median cross line black, zigzag, with outward projections on cubital and anal veins, sometimes approaching or touching t. a. line below cubital vein; reniform white, with central region of ground color, connected with costa by white patch above anterodistal margin of reniform; a white band continuing across wing from this patch to inner margin, outwardly bilobed opposite reniform and connected thereto, enclosing two patches of ground color, the posterior of these being the largest, swinging basally below reniform, with inwardly pointing tooth of white scales on vein $Cu_2$, then swinging slightly outward to cross anal vein, the white band narrowly shaded basally with dark scales; t. p. line absent, or very slightly indicated by grayish scales distad of white band, arising from small white patch on costa, this latter usually being followed by a second and smaller white patch; terminal portion of wing blackish, with faint metallic luster, interrupted by diffuse s. t. line, arising on costa from elongate white striga, its course indicated by scattered gray-white scales, formed into curved line above anal angle; fringe gray-black in basal portion, gray-brown externally, vein endings marked with whitish scales. Hind wings crimson; basal area and inner margin suffused with black scales, overlain with gray-black, hair-like scales; costal margin suffused with gray-black scales; intradiscal line usually present, black, straight, narrowly and weakly separated from basal area; discal dot usually absent, sometimes weakly indicated; outer margin marked by black band, gradually decreasing in width to anal angle; fringe gray-black in basal portion, outer part shaded with whitish along outer margin.

UNDER SURFACE OF WINGS: Forewings, ground color crimson; area between costa and radial vein black, with scattered gray-white scales, as far as discal dot, followed by cream-colored patch; t. a. line absent; median line black, straight or slightly angled; inner margin broadly suffused with black and gray-black scales, not connecting with black terminal area; discal dot black, elongate; terminal area of wing black, sometimes shaded basally by narrow yellowish band, arising on costa two-thirds of distance from base, curving across wing to vein $Cu_1$, then parallel with outer margin to inner margin; s. t. line whitish, arising from third and largest white spot on costa, angled slightly inward as far as vein $R_5$, then angled outward and subparalleling outer margin, absent or obsolescent in lower half of wing; fringe as above. Hind wings concolorous with forewings; basal area and inner margin suffused with black, sometimes rather narrowly so; intradiscal line black, complete, extending straight across wing, rarely absent; discal dot black, small; extradiscal line absent, or sometimes represented by black patches on costal and inner margins; terminal area broadly black, sometimes shaded basally by narrow yellowish band as above, tending to have small, inwardly pointing teeth on median and cubital veins; s. t. line whitish, incomplete, absent in lower part of wing; fringe as above. Expanse: 14 to 20 mm.

FEMALE: Like male; rarely under side of secondaries with complete extradiscal band indicated. Expanse: 16 to 20 mm.

MALE GENITALIA: Uncus elongate, terminal half tapering to bluntly pointed apex; tegumen wide, rather sharply constricted medially, tapering to junctions with vinculum and uncus; vinculum longer than tegumen, increasing in width to anterior bases of valves, with basal portion rounded and forming short anteromedial point; valves complex, symmetrical; cucullus widened at base, in form of elongate sclerotized strip, bordered along internal margin by a more lightly sclerotized fold, the latter extending distad of former, the cucullus terminating in a small, bluntly pointed shoulder; apex of valves tending to be semitruncate, with median protuberance extending distally, occupying central one-fourth or one-third of apex and having its length subequal to its width; outer edge of valve at posterodistal margin of apex with curving, spine-like arm, in length subequal to, or slightly shorter than, length of

median protuberance; sacculus without clavus; juxta with anterior margin bluntly pointed, narrowed posteriorly and then broadly enlarged, roughly Y-shaped; transtilla in form of two narrow strips extending distally and meeting on midline; aedeagus subequal to, or slightly longer than, combined length of tegumen and vinculum, ratio of length to width approximately 8:1, tending to be slightly curved, with small swelling one-third of distance from base; vesica armed with two groups of spines near distal end, the basad consisting of 12 to 24 short thin spines located medially, the distad group consisting of approximately 12 heavier, slightly longer spines on right side.

FEMALE GENITALIA: Sternum of segment VII with posterior margin rounded, with the median portion tending to be truncate or sometimes slightly indented on midline. Ostium, dorsal surface a narrow, transverse, sclerotized plate, narrowed medially, the lateral portion widening and uniting with broad, sclerotized, U-shaped plate, the latter with the apices posterodorsal and tapering to points, continuing mediad to form sides of ostium, and ventrad to form an arch over the ostium, being connected to the ostium by the vertical, sclerotized, ventral plate thereof; ductus bursae heavily sclerotized, the posterior portion with an outer, less heavily sclerotized layer, narrowest below ostium, then with left side rather sharply broadened, and with ductus broadly swollen on left side before being sharply constricted at junction with bursa, the right side of the ductus being practically straight until junction with bursa, this latter area being rather broad, sclerotized, and extending laterally; ductus seminalis arising from apex of small lobe of bursa on right side of ductus bursae; the bursa copulatrix elongate, membranous, extending slightly posteriorly as small lobe on right side near junction with ductus, the bursa tending to be widest medially, with the left side swollen, anterior end broadly rounded, the surface of the bursa with numerous very fine spines, the length of the bursa approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In the American Museum of Natural History. According to the original description, this species was described from both male and female specimens bearing Henry Edwards' No. 4381. The female with Edwards' type label attached, hereby selected as lectotype, is in the American Museum of Natural History. A male bearing the correct data and No. 4381, and agreeing with the original description, is in the United States National Museum collection, *ex* collection Edward Graef and Brooklyn Museum; this is probably the original male specimen.

TYPE LOCALITY: As mentioned above, the type specimens are labeled with Henry Edwards' No. 4381; in the original description, the type localities are given as Marin and Napa counties, California. The Henry Edwards catalogue under No. 4381 gives the following data: San Rafael, [Marin County], California, March (H. Edwards). The type locality is therefore restricted to this latter locality.

RANGE: Coastal regions of central and northern California. On the wing in March and April.

SPECIMENS EXAMINED: *California:* San Rafael, March (H. Edwards), 1 ♂, 1 ♀; Kenwood, March 28–April 4, 1937, March 17–26, 1938 (E. C. Johnston), 8 ♂, 8 ♀; Skaggs, 1 ♀; Egan Ranch, Napa County, April 10, 1933, 2 ♀; Mendocino County, 1 ♂; Yorkville, Mendocino County, April 30, 1924 (E. R. Leach), 1 ♀; "Cal.," 1 ♀.

REMARKS: This is the first species in the small, closely related group of species with bright red secondaries. Superficially, the three species herein recognized are almost impossible to separate at first glance; however, careful study shows that there are a number of characters that can be used for this separation.

The structure of the front is of considerable importance in this regard. In this species it is strongly raised, conical, with the apex truncate, and there are no transverse ridges across either the top or the bottom. In maculation, *superba* can be distinguished by the fact that the under side of the primaries has a complete median cross line, and that the secondaries, on both surfaces, have an intradiscal line, although this latter is not always sharply delimited. The maculation of the primaries above also tends to be better de-

fined than in the other species. There is some variability in the median cross line on the lower surface of the forewings; in the type it is narrowed and rather faint in the center of the wing, while in other specimens it is broad and very distinct. However, on the basis of the material now at hand, it is believed that this is an individual variation only.

The genitalic structures of this small group are easily distinguished from those of the other species in the genus. The males are quickly recognizable by the shape of the valves and by the Y-shaped juxta. On the specific level, differentiation is more difficult. One of the more reliable characters that can be used is the shape of the terminal portion of the valves, including the median protuberance, the outer spine-like arm, and the inner shoulder. In *superba* the median protuberance is relatively narrow and high, and the outer spine-like arm and inner shoulder are well developed. The aedeagus can be used if a further check is necessary, as in *superba* the terminal group of spines in the vesica is located on the right side rather than medioventrally.

The genitalia of the females of this complex are easily recognized by the rounded posterior margin of the sternum of segment VII, by the broad U-shaped plate around the ostium, and by the sharp indentation between the ductus bursae and bursa copulatrix on the left side. Specific separations are more difficult, however; the shape of the dorsal plate of the ostium and the configuration of the ductus bursae can be used. In *superba* the ductus is narrowed below the ostium, and the dorsal plate of the ostium tends to be broadly attached to the large U-shaped plate. Unfortunately, the genitalia of the type were slightly flattened in preparation and hence the sternum of segment VII appears to be broader and narrower than in the other species; this is not true of the species.

The phylogenetic position of the *superba* complex involves considerable speculation. The only other known species in the genus that has genitalia at all like those found here is *ida*, and the female shows this relationship more than the male. It is possible, therefore, that the *superba* complex is a highly specialized offshoot of the *astrologa-ida* group.

**Annaphila (Annaphila) spila,** new species

Figures 5C, 8D

FEMALE: Head, vertex and front dull brown, with scattered gray scales and brown, hair-like scales; front brown, two-thirds of the distance between the eyes strongly raised, rhomboidal, with narrow darkened ridge across top and sometimes indicated on lower margins, central portion flat or slightly raised, and pitted; antennae dark brown, with white scaling on dorsal surface of terminal portions of segments; palpi white at base, with scattered dark brown scales, with increasing number of the latter and brown, hair-like scales terminally and dorsally. Thorax, dorsal surface dull dark brown, some of the scales being narrowly tipped with gray; ventral surface gray-brown. Legs light brown, with numerous gray scales and hair-like scales; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface dull dark brown, posterior margins of segments weakly marked with grayish scales; ventral surface gray-brown, with scattered gray scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color dull brown, with some gray suffusion, with maculation obscure; basal line absent; basal dash light gray; t. a. line absent or weakly indicated by a few dark scales, faintly shaded basally with grayish, strongly outwardly oblique to below cell, then swinging basally; orbicular indicated by a few dark scales; claviform absent; median shade obsolete or indicated by a few scattered black scales; reniform obsolescent, sometimes indistinctly indicated by grayish white scales; a diffuse dull gray band beyond reniform, extending across wing, outwardly oblique to middle of wing, curving basally to vein $Cu_2$, then meeting inner margin at right angle; t. p. line absent; s. t. line weakly indicated by a few scattered grayish scales, sometimes with slightly darkened area basad in upper portion of wing; terminal line dark brown; fringe with light line at base, black in basal portion, gray-black externally, vein endings lightly marked with whitish scales. Hind wings crimson; basal area and inner margin suffused with black scales, overlain with brown-black, hair-like scales; costal margin suffused with gray and black scales; intradiscal line and

discal dot absent; outer margin marked by black band, widest in apical portion of wing; fringe gray-black in basal half, whitish gray in outer portion.

UNDER SURFACE OF WINGS: Forewings, ground color crimson; area between costa and radial vein gray-black as far as discal dot, followed by grayish white patch; t. a. and median lines absent, the latter replaced by small, round, black dot in cell; inner margin broadly suffused with grayish black; discal dot black, elongate; terminal area of wing dull black, sometimes shaded basally by narrow yellowish band, arising on costa two-thirds of distance from base, curving across wing, and becoming parallel with outer margin; s. t. line diffuse, arising from small grayish white spot on costa, suffusing apex of wing, obsolescent or absent in lower half of wing; fringe as above. Hind wings concolorous with forewings; basal area narrowly suffused with black; costal and inner margins grayish black; intradiscal line absent or rarely indicated by a few black scales at costal and inner margins; discal dot black, sometimes weakly represented; extradiscal line absent or weakly represented by black scales; terminal area broadly black, sometimes preceded basally by faint orange or yellow shade, as above but with apical portion shaded with gray-black scales; s. t. line absent; fringe as above. Expanse: 17 to 20 mm., holotype 19 mm.

MALE: Like female. Expanse: 16 mm.

MALE GENITALIA: Uncus elongate, tapering, terminal portion more sharply so, to bluntly pointed apex; tegumen wide, with small constriction medially, tapering to junctions with vinculum and uncus; vinculum longer than tegumen, somewhat narrowed medially, with basal portion rounded and forming short anteromedial point; valves complex, symmetrical; cucullus widened at base, in form of elongate, triangular, sclerotized strip, bordered along internal margin by a more lightly sclerotized fold, the latter extending distad of former, the cucullus terminating in a small pointed arm; apex of valves with large median protuberance extending distally, occupying more than one-half of the width of apex and having its length approximately one-half of its width; outer edge of valve at posterodistal margin of apex, with curving arm, in length subequal to length of median protuberance, its base continued across inner face of valve as weak transverse ridge; sacculus without clavus; juxta with anterior margin bluntly pointed, narrowed posteriorly and then broadly enlarged, roughly Y-shaped; transtilla in form of two narrow strips extending distally and meeting on midline; aedeagus subequal in length to combined length of tegumen and vinculum, ratio of length to width approximately 9:1, tending to be slightly curved; vesica armed with two groups of spines near distal end, the basad consisting of approximately 10 short thin spines located medially, the distad group ventral, consisting of approximately the same number of heavier, slightly longer spines.

FEMALE GENITALIA: Sternum of segment VII with posterior margin rounded, with the median portion tending to be truncate or convex. Ostium, dorsal surface a narrow, transverse, sclerotized plate of equal width throughout, connected with broad, sclerotized, U-shaped plate by membranous area, this plate with the apices posterodorsal and narrowed to points, continuing median to form sides of ostium and ventrad to form an arch over the ostium, this latter with or without a median indentation on posterior side, and connected to the ostium by the vertical, sclerotized, ventral plate thereof; ductus bursae heavily sclerotized, the posterior portion with an outer, less heavily sclerotized layer, narrowest below ostium, then with left side rather sharply broadened, and with ductus broadly swollen on left side before being sharply constricted at junction with bursa, the right side of the ductus being practically straight until junction with bursa, this latter area being rather broad, sclerotized, and extending laterally; ductus seminalis arising from apex of small lobe of bursa on right side of ductus bursae; bursa copulatrix elongate, membranous, extending slightly posterior as small lobe on right side near junction with ductus, the bursa tending to be widest medially, with the left side swollen, anterior end broadly rounded, the surface of the bursa with numerous very fine spines, the length of the bursa approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, female, Bridgeman, Madeira County, California, April 17, 1917; allotype, male, Sonoma County, California. Paratypes, four females: same data as holotype, March 27, 1917; "Middle Cala."; No. 8979, collection H. G. Dyar (Yosemite, California, J. B. Lembert, according to J. G. Franclemont, *in litt.*); Kaweah, California (Hopping).

Holotype deposited in the American Museum of Natural History; allotype in the United States National Museum collection. Paratypes to be placed in these two institutions and the Academy of Natural Sciences of Philadelphia.

RANGE: Central California. On the wing in March and April.

REMARKS: The study of this obscurely marked species is considerably complicated by lack of material. Only one male is known, and this is *ex* collection B. Neumögen. Unfortunately, in order to have a specimen with antennae, a large drop of glue was placed on the front of the head to affix the antennae. This has completely covered the front so that an examination of this structure is impossible at this time; when more males are known, this should be done. In the female the central two-thirds of the front are strongly raised, rhomboidal in outline, with a narrow darkened ridge across the top, and sometimes this is indicated on the lower margins.

The maculation of this species, as far as can be told from the limited material available, is rather obscure, with the forewings above tending to be browner than in the other closely related species. The secondaries in this and the following species are without the intradiscal line. The under side of the primaries is without a median cross line, but in its place is a small, round, black dot.

The male genitalia have the valves with the median protuberance strongly developed, occupying more than one-half of the apex of the valves; the outer spine-like arm is distinctive in the fact that its base is apparently extended transversely across the inner face of the valve, and the inner shoulder is represented by a small, weakly sclerotized arm rather than a more or less well-developed shoulder. It must be kept in mind, however, that only one male is known; consequently it is impossible to have any idea of the individual variation within the species.

The female genitalia are very similar to those of *superba;* however, the dorsal plate of the ostium in this species is narrower and is not attached directly to the U-shaped plate. There is a tendency for the ventral portion of this U-shaped plate to have the posterior margin indented on the midline, but this is not a constant feature.

**Annaphila (Annaphila) evansi,** new species

Figures 5D, 8E

*Annaphila superba* EVANS (not Henry Edwards), 1949, Lepidopterists' News, vol. 3, p. 74.

MALE: Head, vertex and front dull black, with scattered gray scales and black-brown, hair-like scales; front black, more than four-fifths of the distance between the eyes strongly raised, suboval, with transverse ridge across top, flattened below this; antennae black-brown, with white scaling on dorsal surface of terminal portions of segments; palpi white at base, with scattered black-brown scales, with increasing number of the latter and black-brown, hair-like scales terminally and dorsally. Thorax, dorsal surface black, with scattered gray scales; ventral surface covered with mixture of black-brown and gray scales and hair-like scales. Legs black-brown, with numerous gray scales and hair-like scales; tibiae with ring of white scales on distal portions of segments. Abdomen, dorsal surface black, posterior margins of segments narrowly marked with grayish white; ventral surface gray-black, with scattered gray scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings, ground color blackish brown, tending to be suffused with gray, with maculation obscure; basal line absent; basal dash light gray; t. a. line weakly represented or absent; when present, black, faintly shaded basally with grayish, strongly outwardly oblique, meeting median shade below cubital vein, swinging basally to anal vein, then outwardly again to inner margin; orbicular small, defined by black scales, central portion of ground color; claviform absent; median shade black, sometimes partially obsolescent, strongly bilobed, swinging basally below cubital vein and again

at inner margin to meet t. a. line; reniform obsolescent, sometimes indistinctly indicated by grayish white scales; a wide, diffuse, dull gray band beyond reniform extending across wing, outwardly oblique to middle of wing, then narrowing and curving basally to vein $Cu_2$, then meeting inner margin at right angle, sometimes faintly shaded basally with dark scales in lower portion of wing; t. p. line absent; terminal portion of wing concolorous with central portion, interrupted by obsolescent s. t. line, represented by a few scattered grayish scales; terminal line black; fringe with faint light line at base, black in basal portion, gray-black externally, vein endings lightly marked with whitish scales. Hind wings crimson; basal area and inner margin suffused with black scales, overlain with gray-black, hair-like scales; costal margin suffused with gray and black scales; intradiscal line and discal dot absent; outer margin marked by black band, widest in apical portion of wing; fringe blackish in basal portion, outer part gray-black, with a few scattered white scales.

UNDER SURFACE OF WINGS: Forewings, ground color crimson; area between costa and radial vein gray-black, with scattered gray scales, as far as discal dot, followed by cream-colored patch; t. a. and median lines absent, rarely the latter indicated by a few black scales near costal and inner margins; inner margin broadly suffused with black and grayish white scales, not connecting with black terminal area; discal dot black, elongate; terminal area of wing black, sometimes shaded basally by narrow yellowish band, arising on costa two-thirds of distance from base, curving across wing to vein $Cu_1$, then parallel with outer margin to inner margin; s. t. line whitish, diffuse, arising from white spot on costa, suffusing apex of wing, obsolescent or absent in lower half of wing; fringe as above. Hind wings concolorous with forewings, sometimes lightly shaded with yellowish along costal margin; basal area narrowly suffused with black, costal and inner margins with a few scattered black scales; intradiscal line absent, rarely indicated by black patches on costal and inner margins; discal dot black, weakly represented or obsolescent; extradiscal line represented by black patches on costal and inner margins, rarely weakly represented in anterior portion of wing; terminal area broadly black, preceded basally by faint orange or yellow shade, as above, but with apical portion shaded with gray-brown or gray-white scales; s. t. line absent, rarely represented by a few whitish scales; fringe as above, sometimes with faint light line at base. Expanse: 16 to 18 mm., holotype 17 mm.

FEMALE: Like male; sometimes with forewings above with more gray suffusion. Expanse: 15 to 18 mm., allotype 17 mm.

MALE GENITALIA: Uncus elongate, terminal half slightly tapering to broad, bluntly pointed apex; tegumen broad, constricted medially, tapering to junctions with vinculum and uncus; vinculum longer than tegumen, widest at anterior bases of valves, with basal portion rounded and forming a moderate anteromedial point; valves complex, symmetrical; cucullus widening at base, in form of elongate, subtriangular, sclerotized strip, bordered along internal margin by a more lightly sclerotized fold, the latter extending distad of former, the cucullus terminating in a bluntly rounded shoulder; apex of valves with large median protuberance extending distally, occupying more than one-half of the width of apex and having its length approximately one-half of its width; outer edge of valve at posterodistal margin of apex with curving, spine-like arm, in length subequal to length of median protuberance; sacculus without clavus; juxta with anterior margin rounded, narrowed posteriorly and then broadly enlarged, roughly Y-shaped; transtilla in form of two narrow strips extending distally and meeting on midline; aedeagus subequal in length to combined length of tegumen and vinculum, ratio of length to width approximately 10:1, tending to be slightly curved, slightly enlarged one-third of distance from base; vesica armed with two groups of spines near distal end, the basal consisting of approximately 12 short thin spines located medially, the distad group ventral, consisting of approximately the same number of heavier, slightly longer spines.

FEMALE GENITALIA: Sternum of segment VII with posterior margin rounded, with the median portion tending to be truncate or sometimes slightly indented on midline. Ostium, dorsal surface a narrow, transverse,

sclerotized plate, narrowed medially, the lateral portions widening and uniting with broad, sclerotized, U-shaped plate, the latter with the apices posterodorsal and tapering to points, continuing mediad to form sides of ostium and ventrad to form an arch over the ostium, being connected to the ostium by the vertical, sclerotized, ventral plate thereof; ductus bursae heavily sclerotized, the posterior portion with an outer, less heavily sclerotized layer, not narrowing below ostium, with left side sharply swollen as a prominent protuberance, and with ductus broadly swollen on left side before being sharply constricted at junction with bursa, the right side of the ductus with one or two small indentations and narrowing the width of the ductus medially, then extending anteriad to junction with bursa, this latter area being rather broad, sclerotized, and extending laterally; ductus seminalis arising from apex of small lobe of bursa on right side of ductus bursae; bursa copulatrix elongate, membranous, extending slightly posteriorly as small lobe on right side near junction with ductus, the bursa tending to be widest medially, with the left side swollen, anterior end broadly rounded, the surface of the bursa with numerous very fine spines, the length of the bursa approximately twice the length of the apophyses of ovipositor lobes.

EARLY STAGES: This species has been reared by Mr. William H. Evans and he has furnished the following notes:

EGGS: Deposited April 1, 1950; hatched April 13, 1950.

LARVAE, THIRD AND FOURTH INSTARS: Light chalky green, with four dark green stripes.

FIFTH INSTAR: Ground color chalky white; stripes dark green after molting, changing to reddish brown; dorsal stripe pale, geminate, rather narrow, bounded laterally by wider dark stripes running the length of the body; spiracular stripe wide, prominent, running the length of the body, extending well dorsad of spiracles, darkest along line of spiracles.

There was some difficulty in getting the larvae to pupate. Only one larva formed a cocoon, from particles of dirt stuck on one side of a vertical twig about one-quarter of an inch above the soil. The other larvae crawled around for several days and failed to construct cocoons, pupating on the surface of the soil, while others died.

FOOD PLANTS: *Gilia lutea* (Bentham) and *Gilia brevicula* Gray. Oviposition occurs on the floral bracts (Evans, 1949). In the first two instars the larvae hid inside the partially opened buds or inside the calyxes, and fed on the flowers only. In the remaining three instars, blossoms, buds, and bases of the floral bracts were eaten, but the leaves were never consumed.

TYPES: Holotype, male, Mint Canyon, Los Angeles County, California, March 24, 1947 (W. H. Evans); allotype, female, same data and collector, March 16, 1947. Paratypes, eight males and 10 females: same data as holotype, 14 specimens, March 11–24, 1947, April 9, 1948, March 31, 1950 (W. H. Evans, C. I. Smith); upper Mint Canyon, Los Angeles County, California, March 16–25, 1947, elevation 2600 feet (C. Henne), two specimens; north fork of Chilao Creek, Los Angeles County, California, May 2–5, 1949, elevation 5715 feet (W. H. Evans), two specimens.

Holotype and allotype deposited in the American Museum of Natural History. Paratypes to be distributed as follows: California Insect Survey collection, Division of Entomology and Parasitology, University of California, Berkeley; California Academy of Sciences, United States National Museum, and collections of C. Henne, Pasadena, and W. H. Evans of Sun Valley, California.

RANGE: Southern California. On the wing in March, April, and early May.

REMARKS: In maculation this species is very similar to *spila*. However, the structure and color of the fronts are quite distinctive. In *evansi* the front is usually black, while in *spila* it is brown. A much broader area is raised in *evansi* than in *spila*, as almost the entire structure is involved here; it is suboval, with a strong transverse ridge across the top.

The easiest character in the maculation to use to separate *evansi* from *spila* is found on the lower surface of the forewings. In this species the median cross line is completely absent, although sometimes it may be weakly indicated by a few black scales near the costal and inner margins, while *spila* has a dot in place of the median cross line.

The male genitalia of *evansi* are, in some respects, intermediate between those of *superba* and of *spila*. The median protuberance of the apex of the valves is smaller than in *spila*, but it still occupies more than one-half of the apex, the outer spine-like arm is more like that of *superba* than of *spila*, and the inner shoulder is less strongly developed than in *superba*. The juxta appears to be more like that of *superba*, as the basal "arm" of the Y-shaped organ is longer than that of *spila*.

The female genitalia differ from those of the preceding two species in that the central portion of the ductus bursae rather than the area near the ostium is constricted. Otherwise the genitalic characteristics are very similar.

The junior author noticed that this species preferred to rest in clumps of *Eriogonum fasciculatum* Bentham and captured it feeding on the flowers of *Baeria chrysostoma gracilis* (De Candolle) Hall. This species has been captured by W. H. Evans, flying around willow blossoms in Chilao Creek, together with specimens of *hennei* and *ida*.

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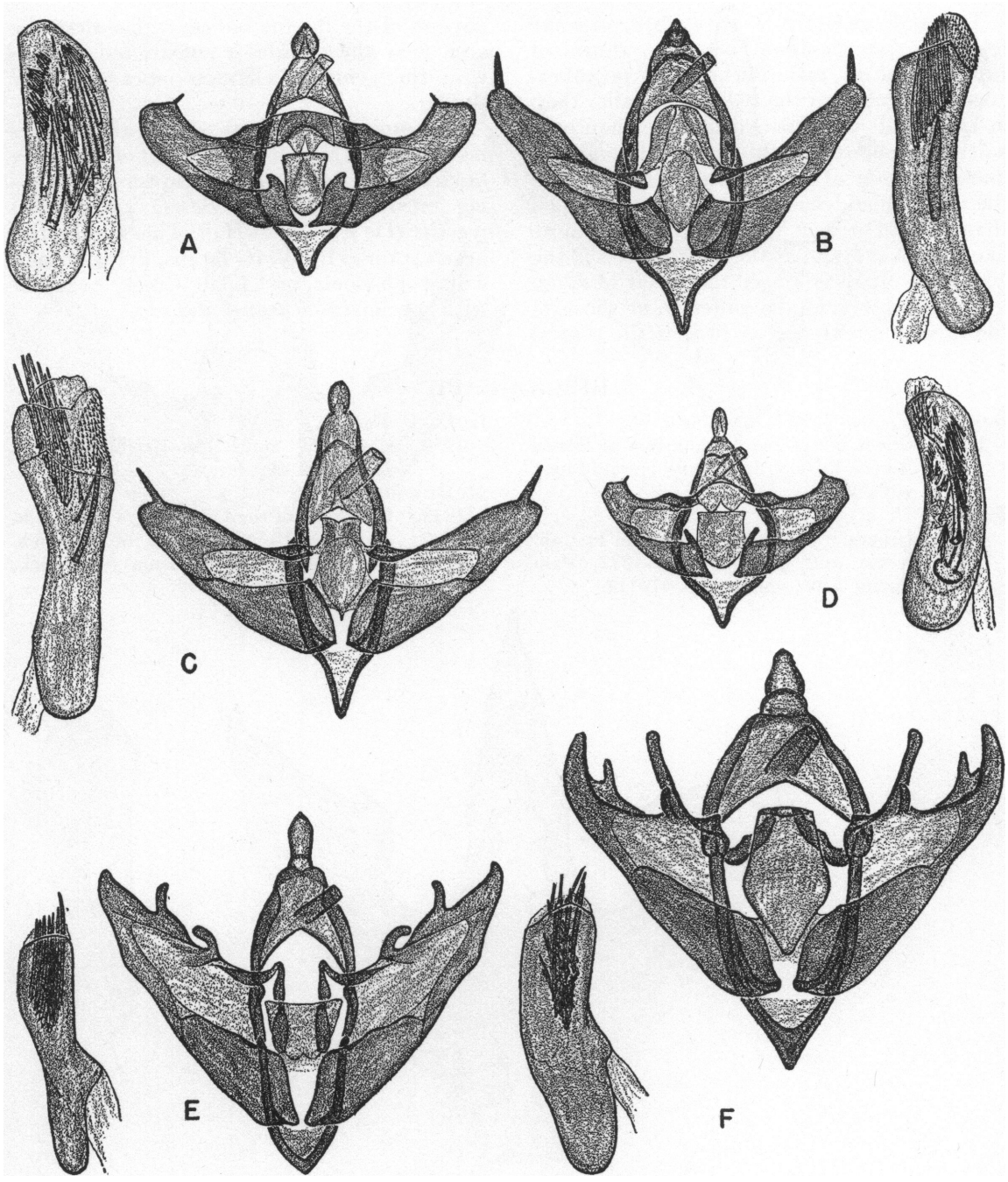


FIG. 1. Male genitalia of *Annaphila*. A. *A. danistica* Grote, Virginia City, Nevada, April (Henry Edwards). B. *A. mera mera* Harvey, Anderson Springs, Lake County, California, April 1, 1950 (W. R. Bauer). C. *A. pustulata* Henry Edwards, White Mountains, Arizona, September 1–5, 1925. D. *A. hennei* Rindge and Smith, Bob's Gap, Los Angeles County, California, April 1, 1948, paratype. E. *A. abdita* Rindge and Smith, Pinnacles, San Benito County, California, March 21, 1948 (C. H. Dickenson), holotype. F. *A. arvalis* Henry Edwards, Ryan Creek, Mendocino County, California, March 26, 1949 (P. D. Hurd).

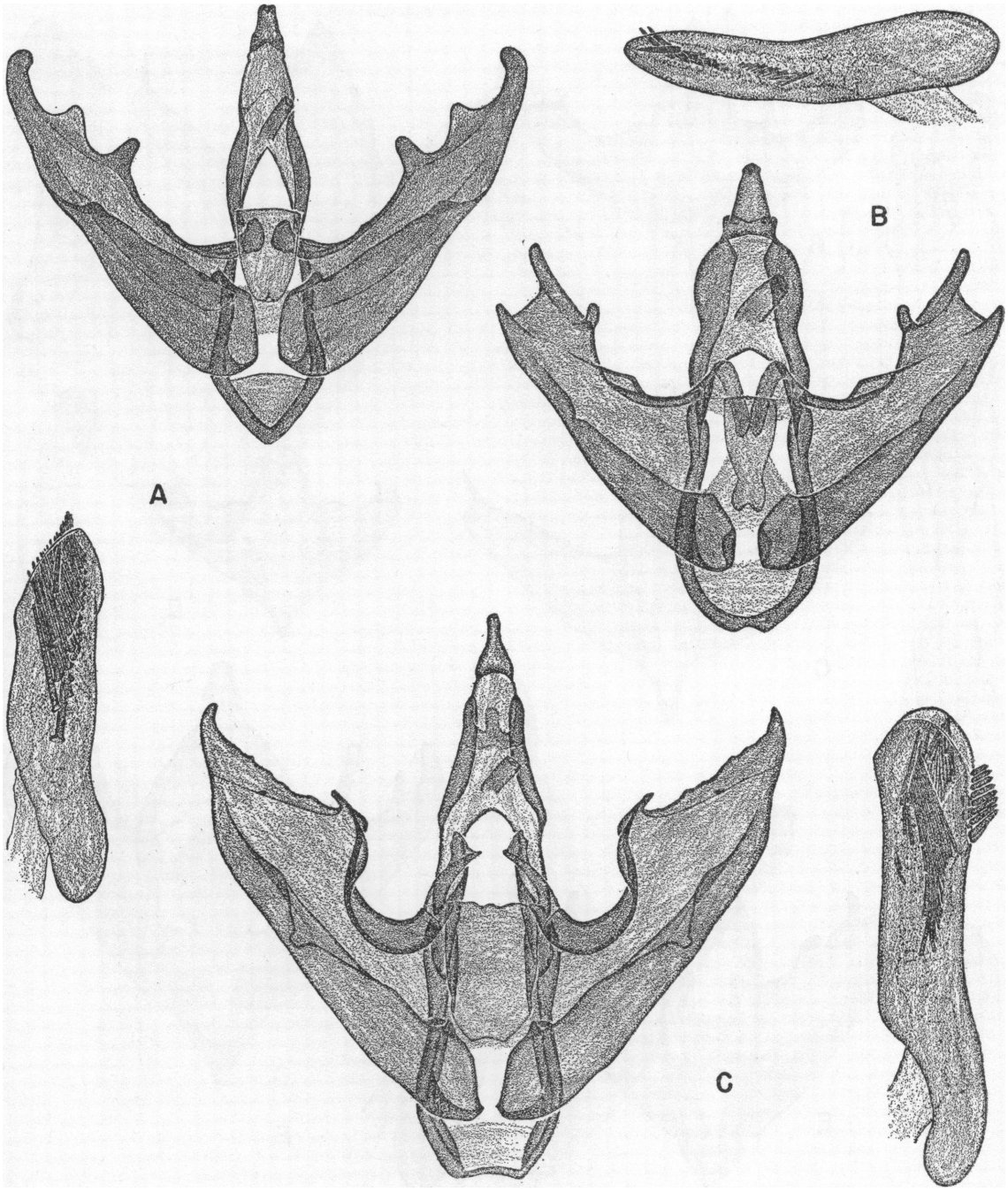


FIG. 2. Male genitalia of *Annaphila*. A. *A. baueri* Rindge and Smith, Anderson Springs, Lake County, California, February 26, 1948 (W. R. Bauer), paratype. B. *A. ida* Rindge and Smith, Newcomb's Ranch, San Gabriel Mountains, Los Angeles County, California, May 1, 1948 (C. I. Smith), holotype. C. *A. astrologa* Barnes and McDunnough, Bob's Gap, southeast of Llano, Los Angeles County, California, March 31, 1948 (W. H. Evans).

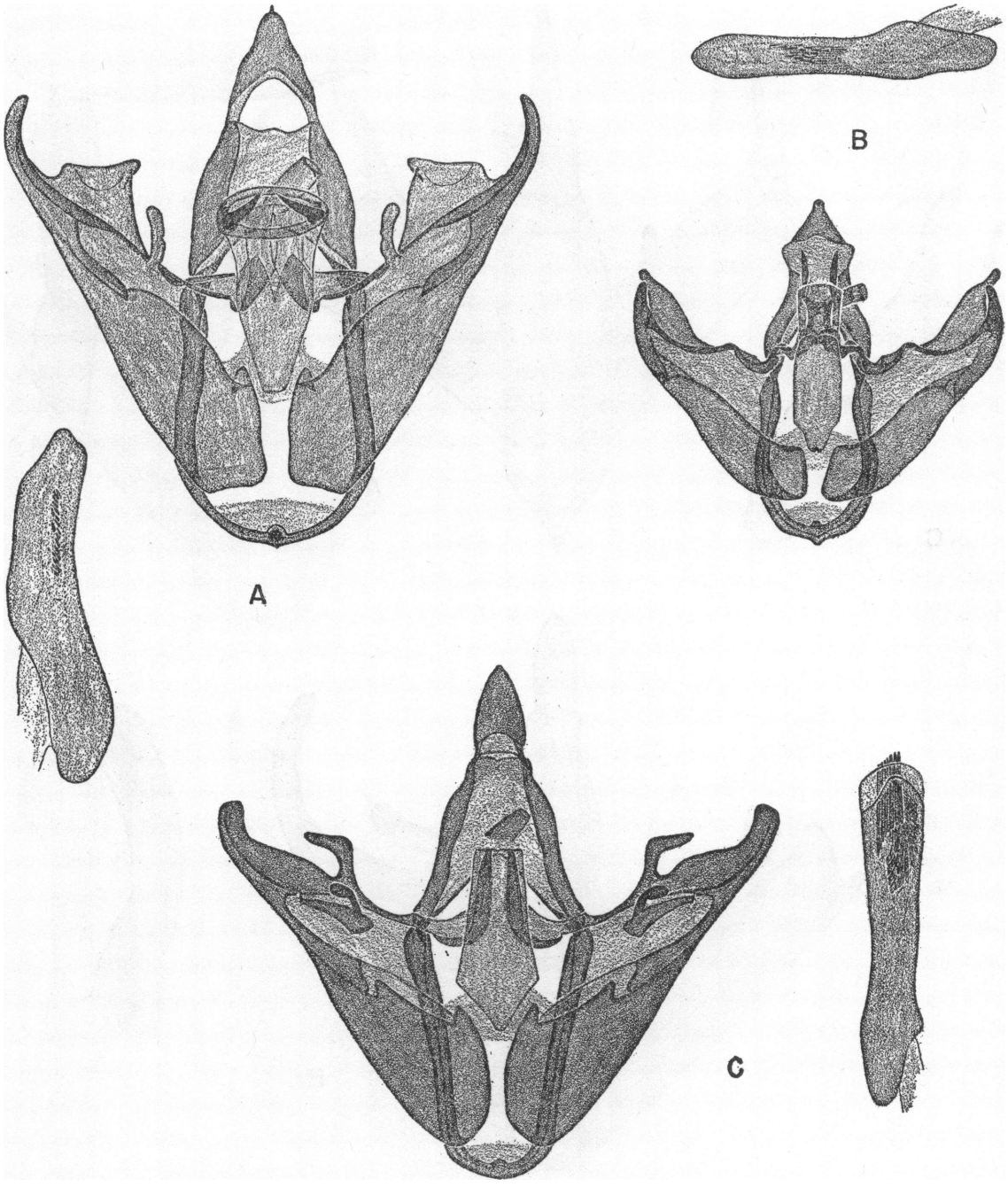


FIG. 3. Male genitalia of *Annaphila*. A. *A. lithosina* Henry Edwards, Havilah, California. B. *A. divinula* Grote, Gavilan Hills, Riverside County, California, March 10, 1946. C. *A. decia* Grote, Egan Ranch, Napa County, California, April 10, 1933.

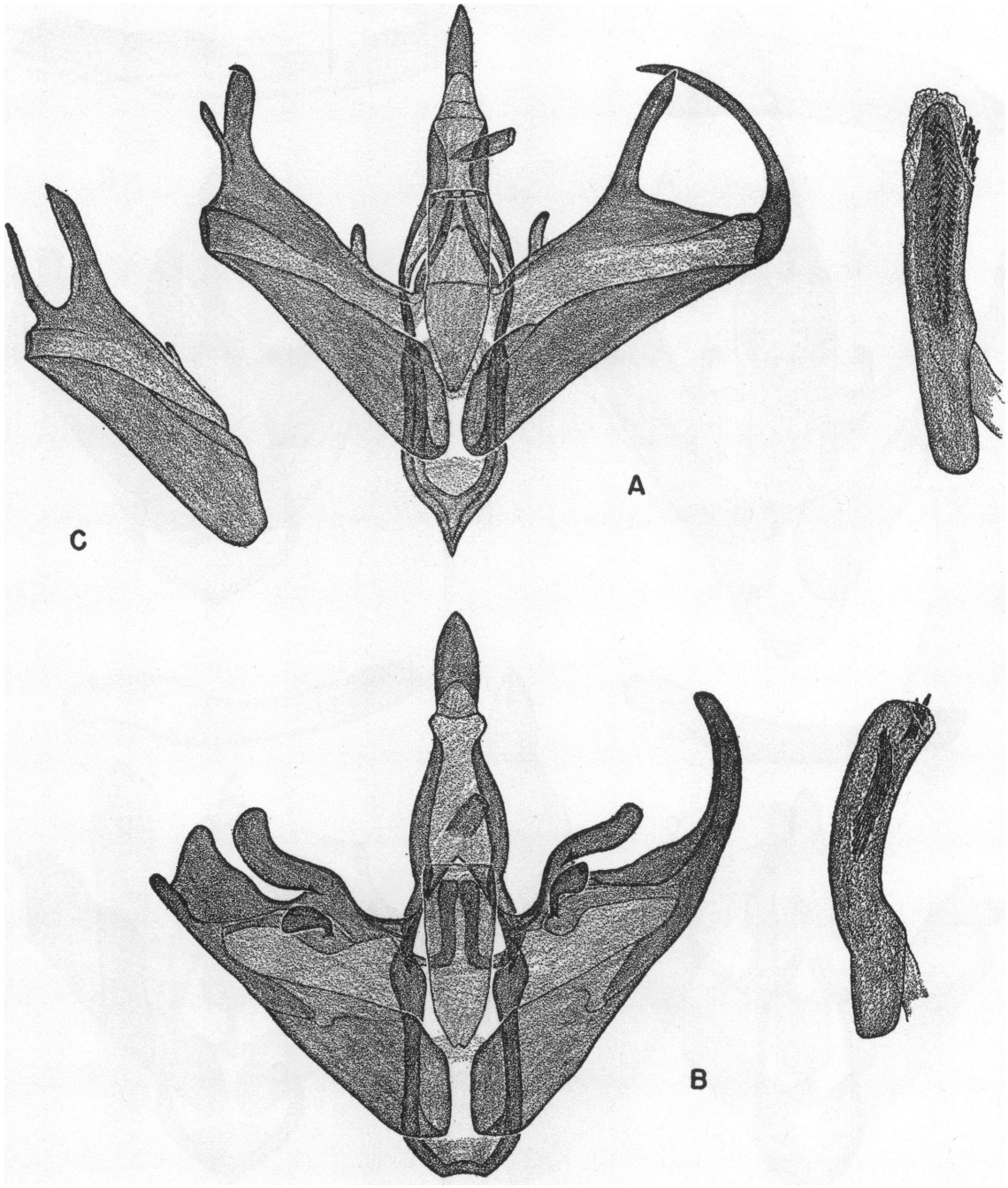


FIG. 4. Male genitalia of *Annaphila*. A. *A. depicta depicta* Grote, San Mateo County, California, April (Henry Edwards). B. *A. diva* Grote, Guerneville, Sonoma County, California. C. *A. depicta morula* Rindge and Smith, La Tuna Canyon, Los Angeles County, California, March 7, 1947 (W. H. Evans), holotype, left valve.

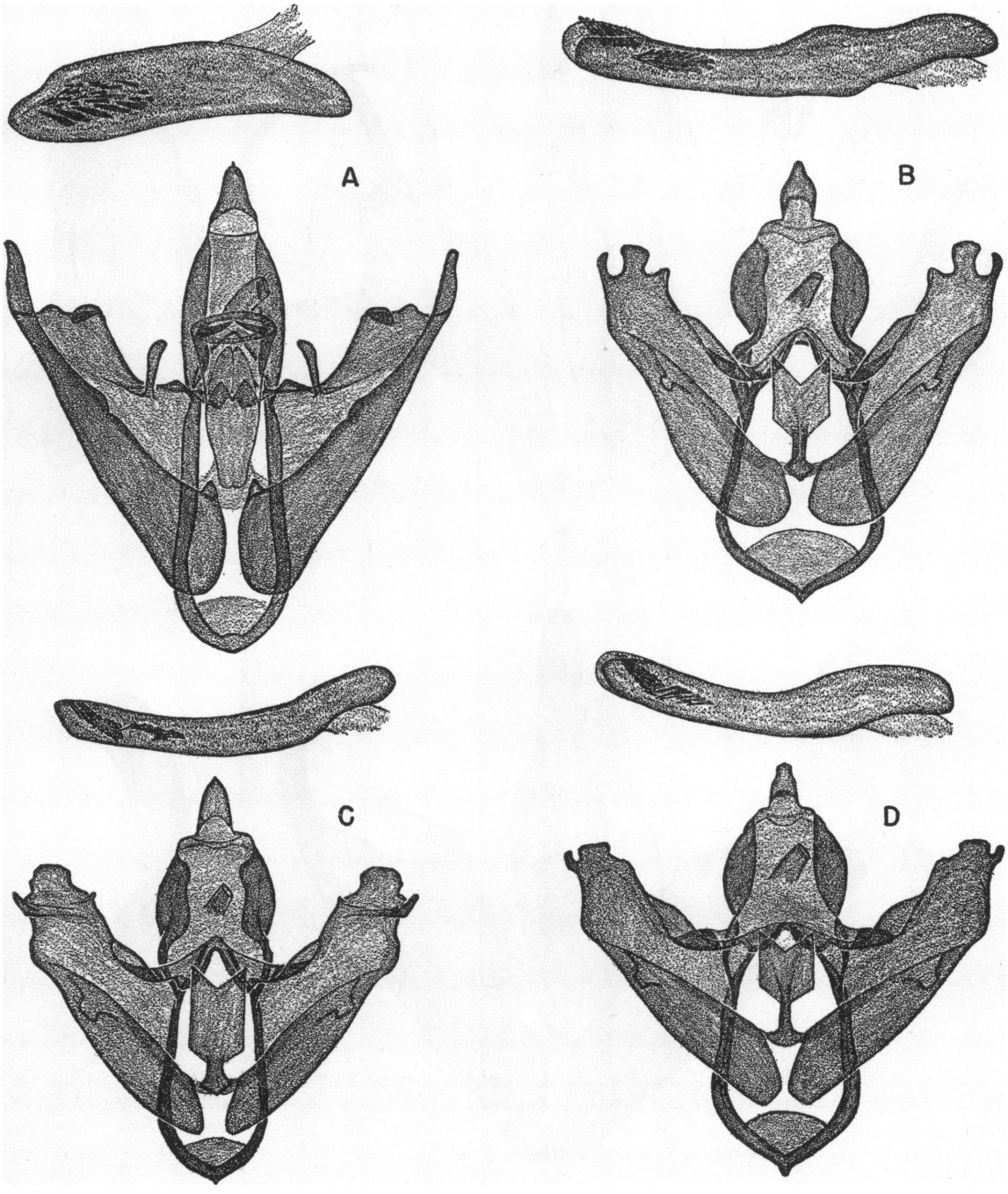


FIG. 5. Male genitalia of *Annaphila*. A. *A. miona* J. B. Smith, Mohawk, Plumas County, California, June 15, 1946 (W. R. Bauer). B. *A. superba* Henry Edwards, Kenwood, California, March 26, 1938 (E. C. Johnston). C. *A. spila* Rindge and Smith, Sonoma County, California, allotype. D. *A. evansi* Rindge and Smith, Mint Canyon, Los Angeles County, California, March 24, 1947 (W. H. Evans), holotype.

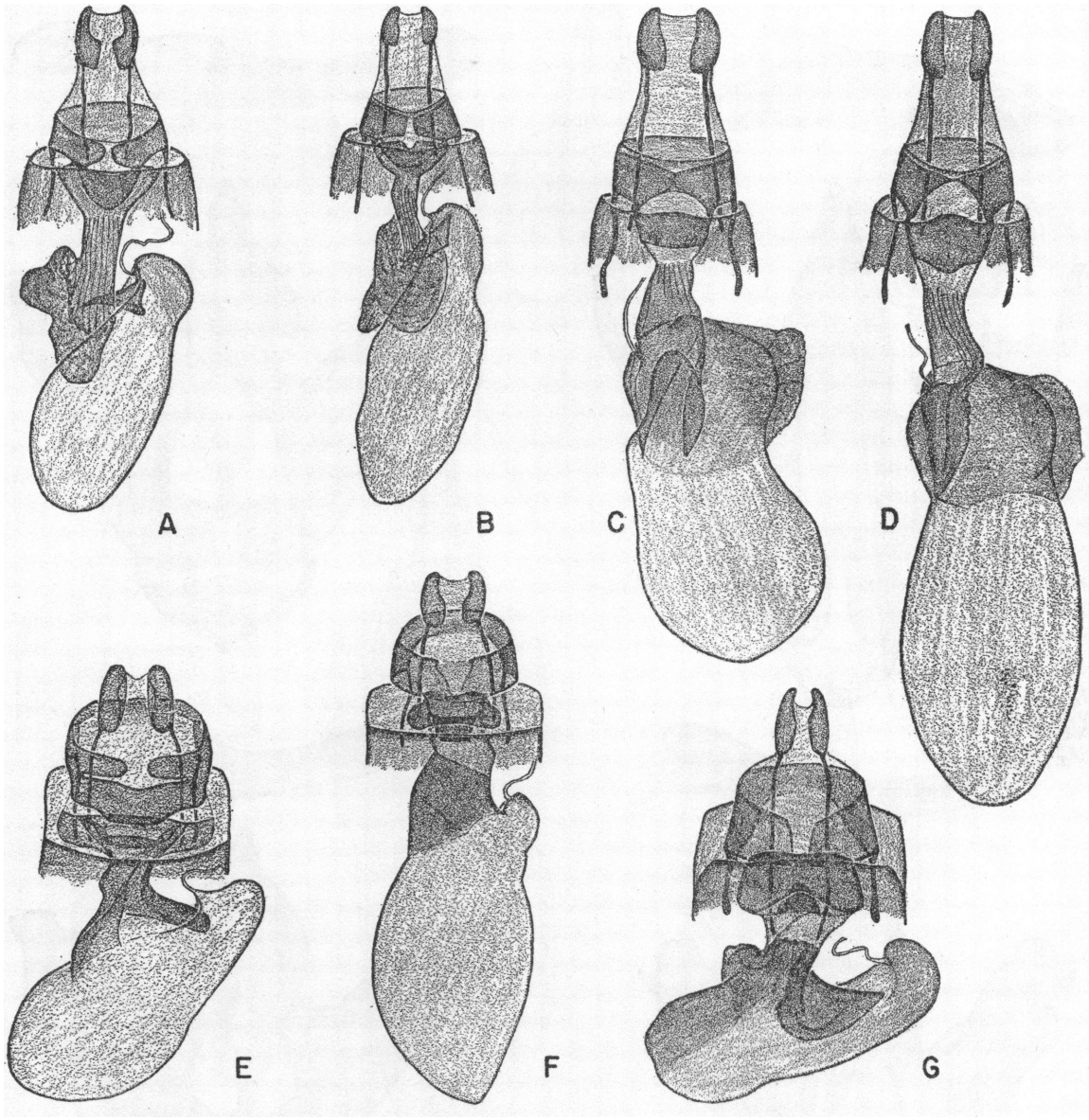


FIG. 6. Female genitalia of *Annaphila*. A. *A. danistica* Grote, Summit, Placer County, California, June, 1903. B. *A. hennei* Rindge and Smith, Bob's Gap, Los Angeles County, California, April 1, 1948, allotype. C. *A. mera mera* Harvey, San Mateo County, California, May, type of *domina* Henry Edwards. D. *A. pustulata* Henry Edwards, Prescott, Arizona, type. E. *A. arvalis* Henry Edwards, Oregon (Walsingham). F. *A. abdita* Rindge and Smith, San Benito County, California, March 9, 1928, allotype. G. *A. baueri* Rindge and Smith, Anderson Springs, Lake County, California, March 20, 1949 (W. R. Bauer), paratype.

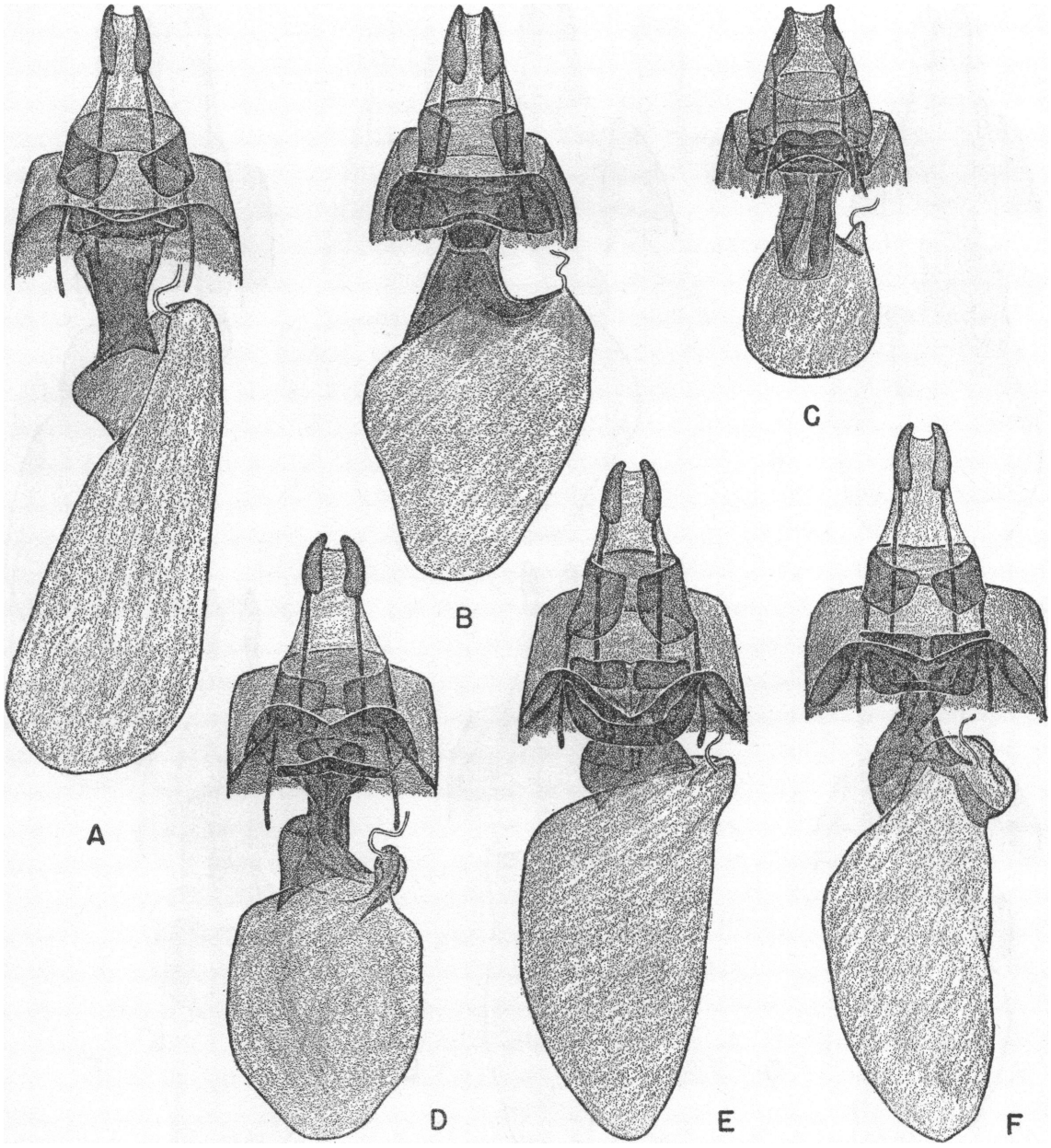


FIG. 7. Female genitalia of *Annaphila*. A. *A. astrologa* Barnes and McDunnough, south California (Henry Edwards). B. *A. ida* Rindge and Smith, north fork Chilao Creek, Los Angeles County, California, May 5, 1949 (W. H. Evans), allotype. C. *A. divinula* Grote, Azusa, Los Angeles County, California, March 14, 1939 (W. D. Dyer). D. *A. lithosina* Henry Edwards, San Jose, California, April 2, 1948 (P. H. Arnaud). E. *A. casta* Henry Edwards, Sonoma County, California, May. F. *A. miona* J. B. Smith, Johnsville, Plumas County, California, July 10, 1946 (W. R. Bauer).

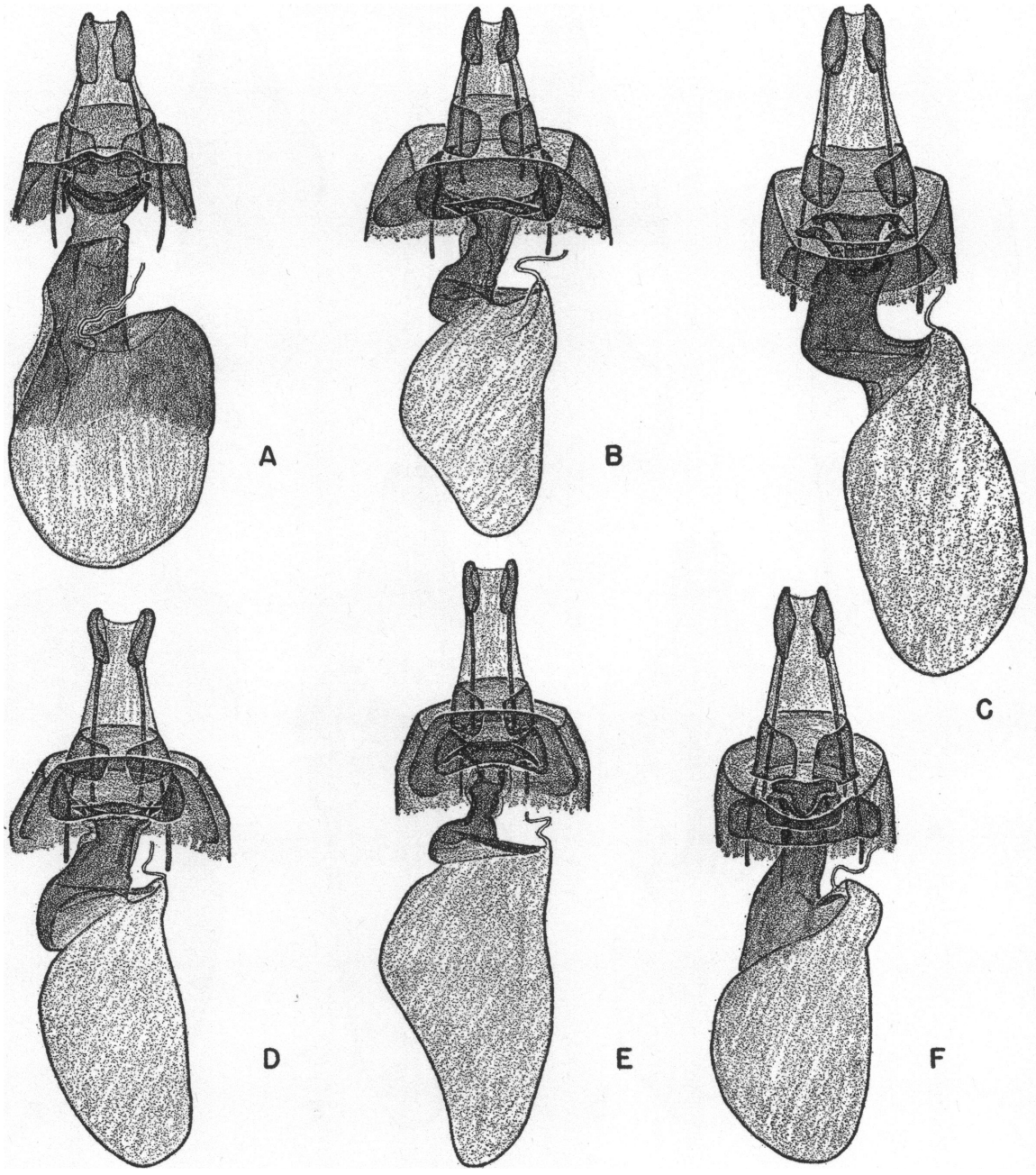


FIG. 8. Female genitalia of *Annaphila*. A. *A. depicta depicta* Grote, Alpine Creek Road, San Mateo County, California, April 4, 1939 (F. H. and S. H. Rindge). B. *A. superba* Henry Edwards, San Rafael, California, March, type. C. *A. diva* Grote, Napa, Napa County, California, March 17, 1930. D. *A. spila* Rindge and Smith, Bridgeman, Madeira County, California, April 17, 1917, holotype. E. *A. evansi* Rindge and Smith, Mint Canyon, Los Angeles County, California, March 16, 1947 (W. H. Evans), allotype. F. *A. decia* Grote, Guerneville, Sonoma County, California.