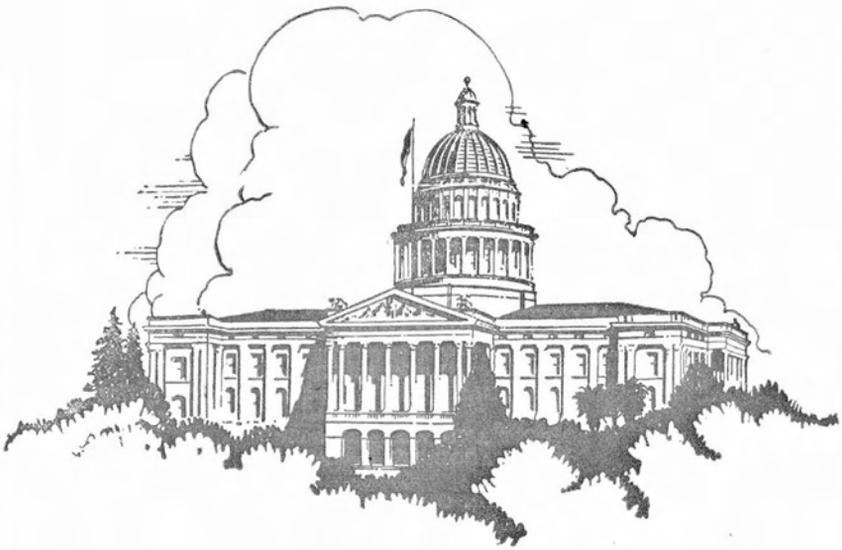


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**CALIFORNIA MICROLEPIDOPTERA VII**

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**T**HE LAST installment of this series was issued in the MONTHLY BULLETIN of the California State Department of Agriculture, Volume No. 22, p. 351, Nos. 7-11, July-November, 1933. Advance copies were mailed to correspondents, to the *Entomological News*, and to the *Zoological Record* on December 29, 1933. The bulletin was officially mailed out January 3, 1934.

The type specimens of installment Number Six bear the following numbers: *Clepsia busckana*, type Number 50144 U. S. N. M., allotype California Academy of Sciences Number 3760; *Aristotelia urbaurea*, type C. A. S. Number 3761, allotype 3762; *Aristotelia rhamnina* type 3763, allotype 3764; *Aristotelia adenostomae* type 3765, allotype 3766; *Recurvaria stanfordia* type 3767, allotype 3768; *Xenolechia querciphaga* type 3769, allotype 3770; *Xenolechia ontariensis* type 3771, allotype 3772; *Gelechia acrina* type 3773; allotype (Soda Creek, Napa County, larva collected from *Quercus agrifolia* Nee May 3, 1931, adult emerged June 11, 1931) 3774; *Gnorimoschema ericameriae* type 3775, allotype 3776; *Anacampsis sacramento* type 3777, allotype 3778.

Since the publication of this installment, *Clepsia busckana* has twice been taken destroying cyclamen in San Francisco greenhouses, J. B. Steinweden collector.

The setal designations used on the larvae herein figured are mainly those which have appeared in many publications by Mr. Carl Heinrich. Mr. S. E. Crumb has recently made some additions (Ent. Am. 14 n. s. p. 133, Nov. 1934). After examining the anal proleg setae of a wide range of Micro larvae it is apparent that there are some important group characteristics to be found in the arrangement and number of these setae, especially in the Gelechioidea. Since I have studied and shall continue to study mainly Gelechiidae, it becomes necessary to indicate peculiarities of these anal proleg setae. According to Mr. Crumb, most of these setae fall into the seventh series, and therefore, this series designation will be tentatively used in this article for all the setae below the suranal plate.

The setae on the anal proleg fall into an upper series, the "a" series, and a lower, or "b" series. All Micro-frenate larvae with well-developed prolegs that were seen, have five setae in the "a" series, and four in the "b" series. Those on the posterior side of the proleg may not belong to the seventh series so are simply designated VIIac and VIIbc. (Seta VIIac is Crumb's "sas." Seta VIIbc in Fracker's monograph is homologized with VIII.) The remainder of the setae are designated from back to front, VIIa<sub>1</sub> to VIIa<sub>4</sub>, and VIIb<sub>1</sub> to VIIb<sub>3</sub>.

Part of the families or genera in the Gelechioidea apparently have an accessory seta as a regular feature on the prolateral side of the anal proleg between setae VIIb<sub>1</sub> and VIIb<sub>2</sub>. This seta is here designated VIIbg and is not considered accessory in the descriptions in this article. In addition, part of the genera of the Gelechiidae, *Agonopteryx*, and

the species here placed under "*Borkhausenia*," have several accessory setae in this "b" series that are here designated as VIIbx (on *Anarsia*). Larvae of *Setiostoma xanthobasis* Zeller, *Cystioecetes nimbosus* Braun and *Stagmatophora* (?) sp. lack accessory setae on the anal proleg, including VIIbg.

There are two sensory punctures associated with the "a" series setae. The one designated VIIpa is located on the anterior side of the leg and between setae VIIa<sub>3</sub> and VIIa<sub>4</sub>. Puncture VIIpl is between setae VIIa<sub>1</sub> and VIIa<sub>2</sub> on the lateral plate of the proleg.

The two basal abdominal segments of the adult moths are more or less fused, especially on the ventral side where there is a friction area over the hind coxae. The large ventral sclerite, of which this friction area consists, is here termed the "anterior sternal plate." This plate is usually supported by small ribs, or *costulae*, which are typically three in number on each side: the longitudinal costula; the mesad costula along the inner anterior margin, which usually connects with the opposite mesad costula; the laterad costula along the lateral front margin. These costulae converge at the front margin of each plate near the lateral side and produce the anterior process which we can here term the *antephysis*. This antephysis is occasionally lacking because the costulae project forward separately before converging.\* The various modifications of these costulae and the antephysis indicate group relationships to some extent. In groups which have chordotonal organs in this sternal plate the structures are especially striking. Utilization of this plate and associated formations will to some slight extent serve to connect the sexes of a species since they are not sexually modified as a general rule. There appear to be some good characters in the dorsal connecting rods, which are here considered to include Forbes' tergo-pleural groove, but they have not been particularly studied so far.

With the exception of the last two species, all moths considered herein are *Gelechiids*.

#### *Anarsia lineatella* Zell.

(See Plate I)

To one who has studied the larval and adult morphology of native California *Gelechiids*, the structures on this moth (the Peach Twig Borer) are most interesting and distinct. Important adult features are: the dimorphic palpi (male without third joint) and the large brush on the second palpal segment; asymmetrical male and female genitalia; tufted setae on harpes; short ovipositor; shape of signum; lack of setae on sternal plate of first two abdominal segments; together with a very short antephysis. The wing venation is as figured.

\* From an examination of adults treated by caustic it is apparent that the "anterior sternal plate" is the sternum of part of the second abdominal segment and includes very little if any of the first segment. The "antephyses" are the anterior processes or projections from near the lateral corners of this plate, are distally free-floating, and would appear to serve in part as guides to the articulation of the abdomen on the thorax, especially for the verticle movements. The shorter antephyses are probably more for support and muscle attachment than for articulation. (The "antephyses" can hardly be called apodemes according to the definition of that term.) Thus, while the dorsal part of the abdomen is securely fastened to the metathorax by the dorsal connecting rods, the ventral part is only attached by flexible tissues and un sclerotized epidermis. In breaking off the abdomen of dry specimens for genitalic examination, the dorsal rods are often broken, but the ventral plate and its appendages always come off intact for the above reasons.

The pupa, as would be suspected, is not particularly different from other *Gelechiids*; the whole surface is pilose, and three abdominal segments are flexible. There is no cremaster. This pupa is a good example of the similarity between the positions of the primary setae on the pupal abdomen with those on the larval abdomen. The eighth abdominal spiracles are closed but indicated. In the adult these spiracles are absent, while in the larva they are the largest back of the thorax.

The *Anarsia* larva is noteworthy in several respects: seven mandibular teeth; a line through the bases of head setae  $A_3$  and  $O_2$  passes just behind ocellus I; head seta  $L_1$  is only slightly nearer  $A_3$  than  $A_3$  is to  $A_2$ ;  $SO_2$  is below the line of ocelli V and VI; the prothoracic spiracle is included in the prespiracular tubercle; seta 1a and 1b on meso- and metathorax on separate tubercles; seta III on A8 almost in front of spiracle; tubercle VII on A8 bisetose; seta VI missing from A9; A10 with accessory setae on the suranal plate and in the "b" series of the proleg; seta VIIac and VIIbc on the posterior side of the leg, somewhat approximated; anal comb with five or six long prongs (Tortricoid in form); anterior proleg crochets in biordinal circle broken inwardly; anal proleg crochets in biordinal series discontinuous centrally.

The Peach Twig Borer larva is about 11 mm. long when full grown. Head, shield, thoracic legs and caudal prolegs black. Tubercles small to moderate in size, blackish. Body brownish-red, intersegmental areas whitish for most of body length, giving the larva a red-ringed appearance. Anterior proleg crochets about 23, broken inwardly, posterior 27, discontinuous centrally.

*Gelechia vanduzeei* Keifer, new species

Plate II, Figs. 1A, 1B, 1C, 1D)

*Gelechia occidentella* Keifer (not Chambers) Pan-Pac. Ent. Vol. 3, p. 138, 1927.

*Gelechia occidentella* Keifer (not Chambers) Mo. Bul. Cal. Dept. Agr. Vol. 22, p. 360, 1933.

This species was determined for me by Miss Braun in 1926 as *occidentella* Chambers. A few months ago it was included with a shipment of other specimens to the U. S. National Museum. Mr. Busck, when examining this shipment, found that this species is not the same as his authentic material of *occidentella* Chambers. Since it is a common moth in certain parts of California, and since I have published on it as above indicated, I therefore name it as a new species. It seems particularly fitting to dedicate this insect to Mr. E. P. Van Duzee, to whom I owe much encouragement and help in my work on Microlepidoptera. This moth was one of the first I caught when visiting Mr. Van Duzee's Mill Valley cabin in 1925. The adults vary from a deep brownish-black to a dark brown mottled ochreous. The type selected comes about halfway between the extremes.

Alar expanse 18-19½ mm. Palpi, basal joint blackish; second ochreous except for the black brush and outer side, tip ochreous; terminal joint blackish, ochreous scales at base, centrally and at tip. Head rather ochreous white, somewhat irrorated fuscous, sides of face blackish. Antennae blackish, some alternate lighter annuli basally. Thorax rather light ochreous, scales tipped light brown, black irroration, apex black; patagia brownish-ochreous. Forewing brownish-

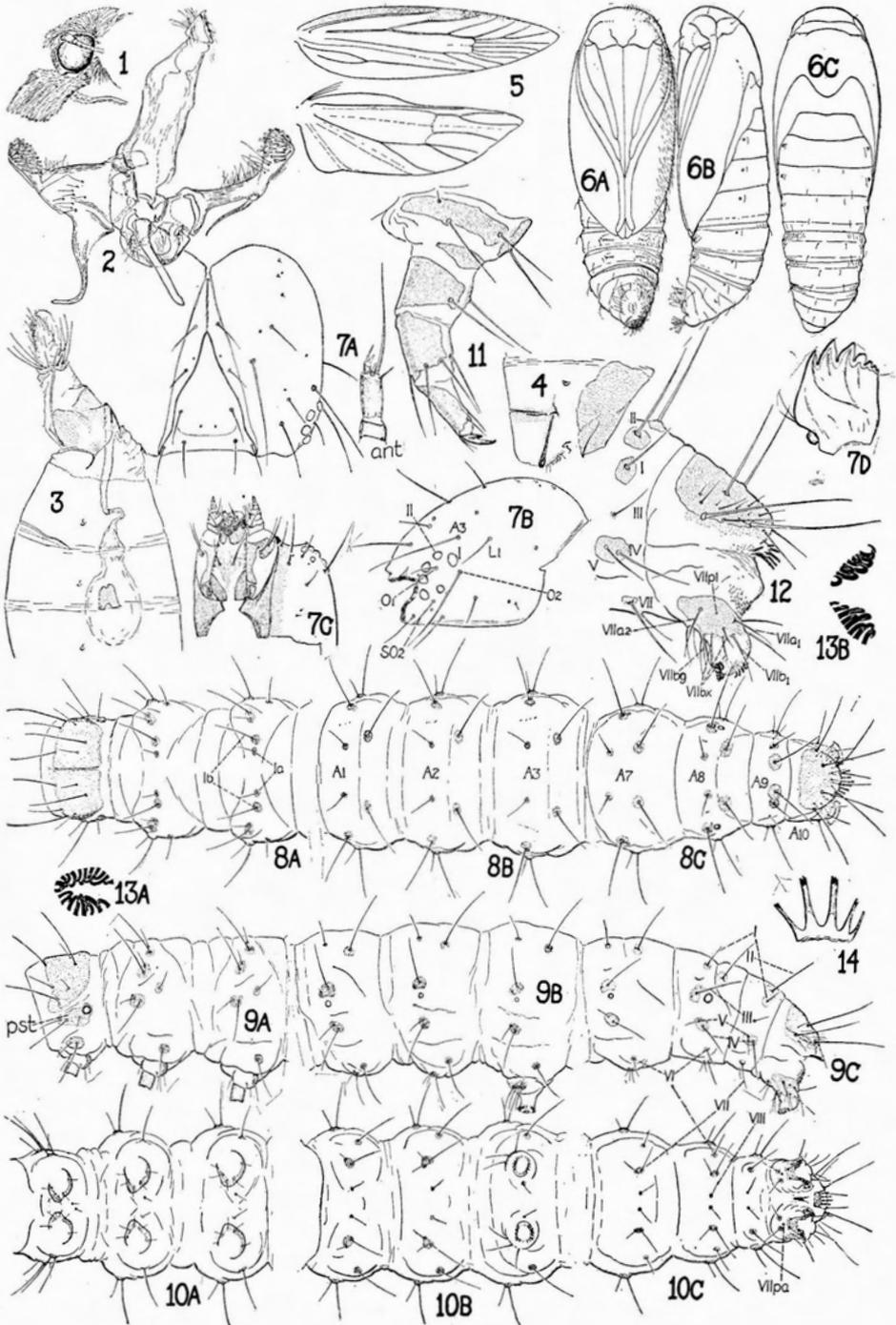


PLATE I

## PLATE I

*Anarsia lineatella* Zeller

1. Male head, left side.
2. Male genitalia.
3. Female abdomen, posterior half.
4. Female abdomen, first two abdominal segments with anterior sternal plate to right.
5. Wings.
- 6A, 6B, 6C. Pupa; ventral, lateral, and dorsal views respectively.
- 7A. Larval head, anterior view; ant.—antennae.
- 7B. Larval head, lateral view; I—first ocellus; II—second ocellus; A<sub>3</sub>—third anterior seta; L<sub>1</sub>—lateral seta; O<sub>1</sub> and O<sub>2</sub>—ocellar setae; SO<sub>2</sub>—subocellar seta.
- 7C. Larval head, ventral view.
- 7D. Ental view of larval mandible.
- 8A. Larval thorax, dorsal view; Ia, Ib—subdorsal setae.
- 8B. Larval abdomen, dorsal view of first three segments, A1, A2, A3, respectively.
- 8C. Larval abdomen, dorsal view of last four segments, A7, A8, A9, A10, respectively.
- 9A. Larval thorax, left side; pst—prespiracular tubercle.
- 9B. Larval abdomen, lateral view of first three segments.
- 9C. Larval abdomen, lateral view of last four segments; setae as follows—I, II, III, IV, V, VI, VII.
- 10A. Larval thorax, ventral view, legs not included beyond coxae.
- 10B. Larval abdomen, first three segments, ventral view.
- 10C. Larval abdomen, last four segments, ventral view; setae thus—VII, VIII; VIIap—anterior puncture of the anal proleg.
11. Larval metathoracic leg or metapod, posterior view of left leg.
12. Larval abdomen, lateral view of last two segments to show accessory setae on suranal plate and anal proleg; setal designations for ninth abdominal as in 9c; VIIa<sub>1</sub> and VIIa<sub>2</sub>—first and second setae of upper proleg series; VIIb<sub>1</sub>—first seta of lower series; VIIbg—accessory Gelechioid seta; VIIbx—additional accessory setae; VIIpl—lateral puncture of the anal proleg.
- 13A. Proleg crochets from anterior leg; outside to left.
- 13B. Anal proleg crochets.
14. Anal fork.

ochreous, more or less overlaid or mottled blackish or blackish-brown. On dark examples only the ochreous stigmata scales and a few others show. The type: Dorsum below fold fuscous blackish, longitudinal blackish streak within costa at base; oblique blackish area from costal one-fifth to fold, sharply defined inwardly, irregularly extending outwardly beyond one-half; stigmata black, light ochreous associated scales, plical before inner discal; antapical fascia wide, outwardly angulated in middle, ground color; some light ochreous and black spots around apex, cilia ochreous black mottled. Hindwings of all specimens rather light fuscous, slightly ochreous tinged. Abdomen above grayish-white, tip slightly ochreous. Body beneath whitish and ochreous, irrorated dark fuscous, the legs blackened on tibiae and tarsi. Uncus of male genitalia broadly hood-shaped; harpes medium length, slender, symmetrical; aedoeagus long, slender; see figures of male and female genitalia.

Type, male, the larva collected from *Quercus agrifolia* Nee, in San Francisco, August 5, 1927, adult emerged September 19, 1927. Allotype, female, the larva from the same host and locality, emergence on September 26, 1926. Fourteen designated paratypes are all from the same location and host, emergence dates from September 7 to 26. For further information on larval coloration, food plants, and on distribution, see the above references.

*Gelechia marinensis* Keifer, new species

Plate II, Figs. 2A, 2B, 2C, 2D)

This species may be synonymous with *ceanothiella* Busek (British Columbia, 1904), but no mention of an antapical fascia is made in that description. If synonymous, this description will at least serve to indicate this fascia, to extend the known distribution, make known the genitalia, the larva, and also additional food plants.

Alar expanse 16-20 mm. Palpi light luteus; first joint fuscous; second joint fuscous outwardly; terminal joint fuscous sprinkled except anterior edge. Head brownish fuscous, face dull luteus; antennae fuscous, alternate lighter scales below. Thorax brownish fuscous. Forewings brownish fuscous or deep brown; stigmata black with conspicuous associated dull ochreous scales; dull ochreous antapical fascia distinct though often little lighter than wing area, outwardly angulate centrally; some dull ochreous scales in spots around apical margins; cilia somewhat lighter than wing color, with indistinct darker transverse lines. Hindwing light fuscous. Abdomen fuscous, lighter basally. Legs fuscous. Uncus of male genitalia broadly hood-shaped; harpes symmetrical but much reduced; aedoeagus rather slender, long anterior projection. See figures of male and female genitalia.

Type, male, collected from *Ceanothus thyrsiflorus* as larva at Mill Valley, Marin County, April 16, 1927, adult emergence May 13, 1927. Allotype, female, collected from *Ceanothus sorediatus* as larva at Phoenix Lake, Marin County, California, April 4, 1927, the adult dated May 18, 1927. Fifteen paratypes are designated from Mill Valley and Phoenix Lake, Marin County; Chico, Pentz, and Big Bend Mountain, *Butte County*. *Adult emergence dates vary from April 16 to June 11. Adults are on hand from Placerville, taken April 17 from Ceanothus*

*integerrimus*, H & A, the food plant of this species in the Sierra. Only the soft-leaved species of *Ceanothus* are attacked.

The larva is a leafroller and is identical in color pattern with *Gelechia vanduzeei*. It is more gray, purplish and black than *vanduzeei*, occurs at a different time of year, and is slightly larger, otherwise the following description fits both insects. Larva: length of specimens examined 13-14 mm. Head black. Prothoracic shield and suranal plate black. Tubercles usually small but black. Legs black. Thorax dark, almost purplish-brown with white intersegmental areas. Abdomen distinct in coloration from thorax, gray-white; dorsal one-half with six longitudinal purplish-brown stripes. Caudal fork present. Crochets: circles 44, anal series 32.

*Gelechia occidentella* Chambers

(Plate IV, Fig. 6)

On Mr. Busck's suggestion, I now transfer my conception of *occidentella* to a comparatively large "pepper and salt" species. The individuals are about 18 to 19 mm. in wing expanse. The forewings are generally grayish with numerous ochreous whitish areas, with the stigmata quite dark (though often obscured by the general wing coloration), and the antapical fascia, which is ochreous whitish, outwardly angulate centrally.

Larva: length about 15 mm. when grown. Head black, sometimes brownish above. Thoracic shield black with lighter spots anteriorly. Suranal plate black. Body tubercles moderate in size, blackish. Body grayish-white, rather dark gray above; dorsal half with six longitudinal irregular fuscous lines: the addorsal narrow, the subdorsal broad and conspicuous; the spiracular line narrow. Anal fork present. Crochets in unbroken unevenly biordinal series, the central abdominal rings with 50 hooks, the caudal prolegs with 34 hooks.

The hosts so far observed are *Quercus agrifolia* Nee, *Quercus lobata* Nee, *Quercus kelloggii* Newb. The species ranges along the coast just behind the fog belt. I have never taken it in San Francisco, but adults can be taken commonly behind Mt. Tamalpais in Mill Valley. Other localities represented are Alma, Santa Cruz County; Phoenix Lake and Novato, Marin County; Sebastopol. *Gelechia acrina* seems to replace this in the inner coast range and has a larva very similarly marked, perhaps inseparable. *Gelechia trichostola*, as mentioned before, is also very similar. A fourth species with larva of this type is described below as *chrysopyla*.

*Gelechia chrysopyla* Keifer, new species

(Plate II, Figs. 3A, 3B, 3C, 3D)

This small "pepper and salt" species might be mistaken for a diminutive *occidentella*, but is, of course, differentiated by genitalia, larval coloration and distribution. Miss Braun, several years ago, indicated that she believed this species to be new. Mr. Busck finds the genitalia to differ from any previously described species. This insect is a member of a considerable group of species now referred to *Gelechia*.

This group includes such as *nigrimaculella* Busck (to which *chrysopyla* is nearly related), *negundella* Heinr., and *gilvomaculella* Chamb.

Alar expanse 11–13 mm. Palpi: basal joint rather fuscous, second joint whitish, ochreous outwardly and in brush, speckled black outwardly and in brush except tip, brush longest basally; terminal joint blackish on white, whitish basally, some white scales, tip slightly ochreous. Head a mixture of whitish and ochreous scales tipped blackish; antennae blackish, narrowly ringed lighter. Thorax ochreous white, unevenly irrorated blackish, apex rather blackish. Forewings whitish and whitish ochreous, unevenly irrorated and overlaid blackish. A light area from costa near base pointing obliquely toward plical stigma which is indistinctly blackish at  $\frac{1}{3}$ ; black oblique band from about costal  $\frac{1}{4}$ , beyond light area, to first discal stigma which is moderately large and black; second discal black, large, irregular at  $\frac{2}{3}$ ; beyond this the wing area is darker; whitish narrow zig-zag fascia from costa to tornus; indications of lighter spots around apical margins; cilia light ochreous white, irrorated black on basal  $\frac{2}{3}$ . Hindwings light gray basally, darker apically, cilia very light gray. Abdomen above rather ochreous white, slightly grayish. Body below ochreous white, the legs barred and ringed blackish on tibiae and tarsi. Male genitalia with hood-shaped uncus and slightly asymmetrical harpes, aedoeagus as figured. Female genitalia as figured.

Type, male, collected from *Quercus agrifolia* Nee as larva at San Francisco, California, May 19, 1927, the adult emergence June 17, 1927. Allotype, female, same data, larva collected May 7, 1927, adult June 12. Seventeen designated paratypes from same host and locality, the adults all emerging during June except one on May 19.

The distribution of *chrysopyla*, as indicated by specimens on hand, includes a somewhat wider ecological range than is usually encountered in oak Gelechiids in California. In San Francisco, this is the common spring Gelechiid skeletonizer of Coast Live Oak. In Marin County back of Mount Tamalpais it is not as common, but is found on Coast Live Oak and on the Valley White Oak (*Quercus lobata* Nee) that is able to approach the coast back of the high ridges. It occurs on Coast Live Oak throughout the range of that tree in Sonoma and Napa counties. I have (April 9) taken larvae at Fair Oaks, Sacramento County, on *Quercus wislizenii*, the Interior Live Oak, where I originally confused this larva with light examples of *Gelechia trichostola*. Specimens were taken at light at Alma, Santa Clara County, August, 1933. The greatest development of the species would appear to occur in Southern California on the south exposure of the coast. I observed large numbers of adults flying from Coast Live Oak in a ravine near Dume Point, Los Angeles County, July 8, 1933. I have not seen such numbers in Northern California. The Oak trees in this southern situation had suffered accordingly. The only other Gelechiid Oak feeder which occurs both in Mill Valley and in Golden Gate Park is *Gelechia vanduzeei*. All others abruptly stop on or before reaching the fog belt.

The larva of *chrysopyla* in color pattern fits in with *occidentella*, *acrina*, and *trichostola*. It is lighter than any of these although very similar to but more ochreous than light *trichostolas*. Larva: full grown at about 12½ mm. Head ochreous brown, blackened slightly on sides. Prothoracic shield same as head, with some dark spots. Tubercles

fuscous, inconspicuous. Body yellowish more or less overlaid brown; six rather broken longitudinal pinkish brown stripes on dorsal  $\frac{1}{2}$ , the subdorsal the most conspicuous. Caudal fork present. Crochets: anterior four pairs in complete biordinal circle 26-30; caudal series unbroken, 25-28.

*Gelechia scabrella* Busek.

Busek—Jr. Ent. Zool. Pomona, V., p. 98, 1913.

Barnes and McDunnough—Check list Lep. Bor. Am. 6281, 1917.

Meyrick—Gen. Insectorum F. 184, p. 84, 1925.

Keifer—Pan-Pac. Ent. VII, p. 32, 1930.

Keifer—Mo. Bul. Cal. Dept. Agr. XXII, p. 361, 1933.

A single example of this species appeared in a series of *Gelechia manzanitae* Keifer, which had been reared from larvae taken on manzanita leaves (*Arctostaphylos* sp.) in the Chiles Valley district of Napa County. These larvae were collected April 27, 1934, and the *scabrella* adult emerged June 13. In view of the fact that I had not distinguished any difference in the larvae when roughly sorting them it is to be supposed that the *scabrella* larva is very similar to the larva of *manzanitae*. The male genitalic evidence would bear out that hypothesis. This rearing proves *scabrella* to be of the same foodplant group as well as the same morphological group as *Gelechia manzanitae* and *Gelechia arbutina* Keifer. At Alma, California, individuals of *scabrella* were collected in company with *arbutina* in a Madrone (*Arbutus*) association which lacked manzanita. This may indicate that *scabrella* also feeds on Madrone.

*Aristotelia adceanotha* Keifer, new species

Plate II, Figs. 4A, 4B, 4C, 4D, 4E)

This neat little species belonging to the *roseosuffusella* group has genitalia very similar to *rhoisella* Busek (Bul. So. Cal. Acad. Sci. 33, p. 74, 1934) but there are apparent differences according to the drawings in Mr. Busek's article. So far as I know, *adceanotha* feeds only on the hard-leaved *cuneatus* of our open dry Sierra foothills. It is not very common and can only be successfully collected in the larval stage by beating. The forewings are dark fuscous brown on the costal side, and bright brown on the dorsal side, the two colors sharply defined. There are three whitish transverse fasciae more or less obscured dorsally.

Alar expanse 11-12 mm. Palpi: basal joint fuscous; median joint light ochreous white, slightly roseate inwardly, a fuscous band at  $\frac{1}{3}$  and another just below tip; terminal joint blackish, lined longitudinally white anteriorly, some scales and tip also white. Head rather light gray infused orange-brown above; antennae blackish-brown, anterior edge including basal joint lined white for a short distance, then alternating white and black. Thorax rather orange-brown. Forewings with basal area dark fuscous brown or blackish-brown on costal side of fold and bright brown on dorsal side, the extreme base orange-roseate; first fascia a white band obliquely outward from costal  $\frac{1}{5}$  with dark edging

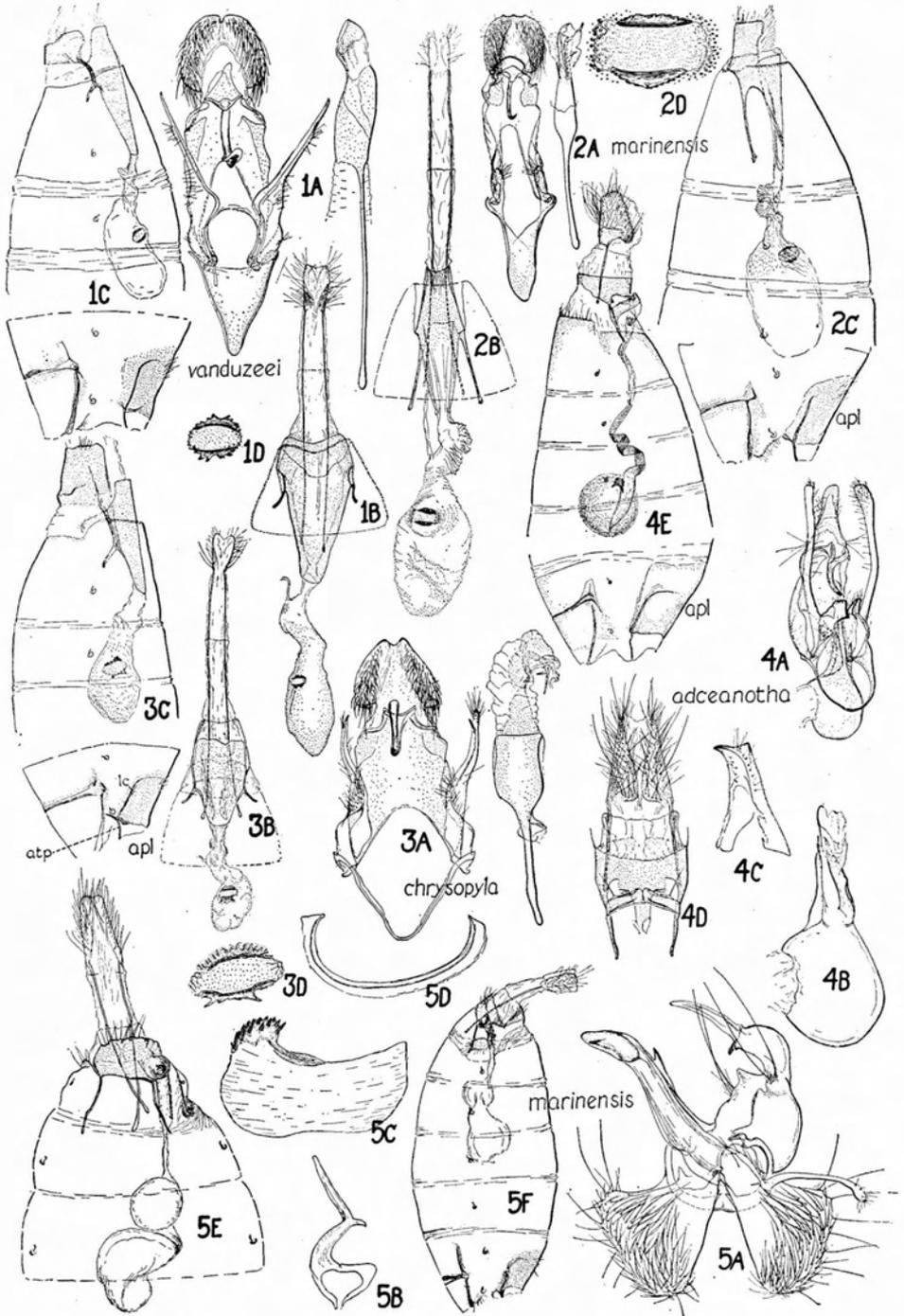


PLATE II

## PLATE II

- 1A. *Gelechia vanduzeei*—male genitalia with aedoeagus separated to right.
- 1B. Female terminalia, ventral view.
- 1C. Female abdomen, left side, ovipositor and third, fourth, and fifth segments omitted.
- 1D. Female signum.
- 2A. *Gelechia marinensis*—male genitalia, aedoeagus to right.
- 2B. Female terminalia, ventral view.
- 2C. Left side of female abdomen, ovipositor and third, fourth, and fifth segments omitted; apl—anterior sternal plate.
- 2D. Female signum.
- 3A. *Gelechia chrysopyla*, aedoeagus to right.
- 3B. Female terminalia, ventral view.
- 3C. Female abdomen, same as 1C and 2C; atp—antephrasis; lc—longitudinal costula.
- 3D. Female signum.
- 4A. *Aristotelia adceanotha*—male genitalia.
- 4B. Aedoeagus.
- 4C. Diagonal view of uncus.
- 4D. Female terminalia, ventral view.
- 4E. Female abdomen, left side, second and third segments omitted; apl—anterior sternal plate.
- 5A. "*Borkhausenia*" *marinensis*—male genitalia.
- 5B. Dorsal view of "uncus."
- 5C. Plate above male genitalia.
- 5D. Curved sclerite below male genitalia.
- 5E. Female terminalia, dorsal view.
- 5F. Female abdomen, left side.

on inner side, this fascia orange-roseate and somewhat obscure on dorsum reaching dorsal edge at  $\frac{1}{4}$ ; area beyond, same as basal area, except dorsum somewhat orange-roseate; central fascia widest, whitish costally with slight fuscous infusion, fading to orange-roseate on dorsal side of fold and with sharp wedge of dark color projecting nearly across center of this fascia; dark costal coloring from this fascia on, limited to a line from center of wing  $\frac{4}{5}$  meets a bright orange-roseate tornal spot on the midline where they are more or less interrupted by a black spot; apex and some spots on outer margin orange-roseate, cilia with dark fuscous basal band, a lighter area beyond that, and cilia tips whitish; tornal cilia light fuscous. Hindwings whitish, somewhat infuscated; cilia gray. Abdomen dull yellow-gray basally, gray apically, whitish margins on segments, apex ochreous. Body below and legs whitish irrorated and banded fuscous. Tarsi of forelegs with three white annuli. Male and female genitalia as figured.

Type, male, collected as larva from *Ceanothus cuneatus* Hook. near Folsom, California, June 9, 1933, adult emerged July 2, 1933. Allotype, female, collected as larva from same host at Jackson, California, June 16, 1933; adult, July 6, 1933. Seven paratypes are designated from the above host and localities.

Larval length about 8 mm. when grown. Head whitish but lined and blotched with dark purple-fuscous. Body dark fuscous-brown, slightly purplish; each segment irrorated white across dorsal center, this white tending to entirely cover thorax and last abdominal segments. Hairs white. Caudal fork present.

*Aristotelia elegantella* Chamb.

This insect comes to light traps occasionally during the summer along the Sierra foothills. Localities represented are Oroville, Fair Oaks, Sacramento, and Salida.

*Aristotelia argentifera* Busek

(Plate III)

Busek, Proc. U. S. N. M. Vol. 25, p. 800, 1903.

Dyar, List Am. Lep., No. 5583, 1903.

Barnes & McDunnough, Checklist Lep. Bor. Am. No. 6050, 1917.

Meyrick, Gen. Insectorum, F. 184, p. 47, 1925.

Keifer, Pan-Pac. Ent. Vol. 3, p. 162, 1927.

In the last reference, I published a short account of the larva of this moth, taken at Phoenix Lake which is situated out of the coastal fog belt on the northeast side of Mt. Tamalpais. Since that time, I have observed numbers of the larvae in the type locality, San Francisco, which is in the fog belt. In San Francisco, the host is primarily *Ericameria ericoides* Less., but occasionally the prostrate open coast form of *Baccharis pilularis* D. C. At Phoenix Lake (about 12 miles due north of the San Francisco dunes), the tall inland form of *Baccharis* is the food plant. Both plants are Aster Composites. The adults from both places have been examined for differences in color pattern, and by dissection, but no morphological or color differences of consequence have been detected. On the other hand, the larvae from the

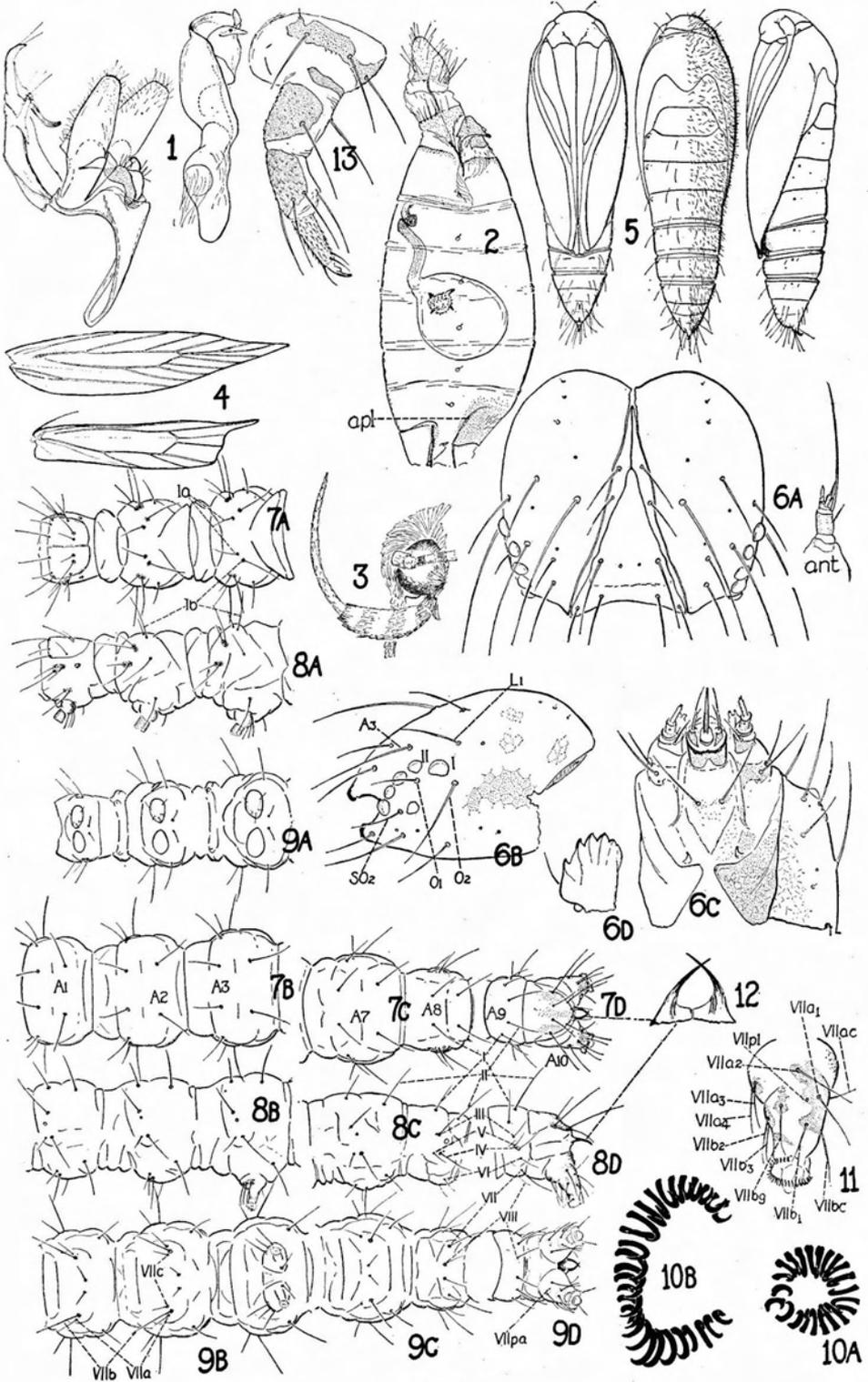
two places, while exhibiting the peculiar and typical *Aristotelia* form, would not be referred to the same section of the genus on color pattern. The Phoenix Lake larva (described in the above reference) is light green and could be confused with the oak-feeding *urbaurea* Keifer. The type locality larva (which is the one figured) is very heavily lined with dark brown. There are apparently a number of generations throughout the year in San Francisco, as adults and larvae in all stages may be collected at any time during the summer and fall. I found light green larvae on upright *Baccharis* at Riverside in July, 1933, demonstrating a closer biological affinity to Phoenix Lake than Phoenix Lake has to San Francisco. Thus two colors of larvae which are distinct geographically, produce adults which are identical in every way so far studied. Here is a case where morphological studies will apparently not solve the question, and to settle the status of these larval forms we shall have to have recourse to the breeding and other activities of each kind.

Various adult structures of *Aristotelia* have been figured before. The only thing which is added is the structure of the anterior sternal abdominal plate. This plate is notably setiferous centrally, has a long slender antepheysis, and lacks the lateral costula. In Vol. 13 (n. s.) of the Ent. Am. Feb. 1934, Busck describes and figures *Aristotelia eupatoriella* which has genital structures somewhat similar to *argentifera*. The underside of the hindwing of *argentifera*, especially in the male, is fuscous on the anterior half and light ochreous posteriorly.

The pupa of this species is typical for the family, is pilose, with three flexible segments and a cremaster.

The larva is typical in form of all *Aristotelia* larvae I have seen. These larvae have an appearance all their own, and a number of striking features indicate considerable specialization. The body is narrow-elongate, tapering toward both ends from the middle. The head is noteworthy in several respects: mandible with first tooth drawn away from the second; apparent lack of the adfrontal puncture; seta  $L_1$  farther from  $A_3$  than  $A_3$  is from  $A_2$ ; a line from the base of  $O_2$  to  $A_3$  passes through ocellus I very obliquely; seta  $SO_2$  has moved up between ocelli V and VI; suboral palpi and spinnerette elongate. Body tubercles very small and no accessory setae (except VIIbg); seta 1a and 1b separate on last two thoracic segments;  $A_8$  with III anterodorsal to spiracle, VII unisetose; all usual setae on  $A_9$ ; anal proleg with setae VIIac and VIIbc on separate tubercles; anal fork with two distally crossed prongs; prolegs narrow-elongate; anterior proleg crochets in complete uniordinal circle; anal crochets in uninterrupted uniordinal series.

The following is the color description of a San Francisco larva: length of approximately full grown larva 10 mm. Head whitish-ochreous mottled faintly light brown. Shield usually reddish-brown, 3 longitudinal whitish stripes. Body dull light yellowish, slightly green, more or less reticulate red-brown; venter often lighter; 3 longitudinal purplish-brown stripes on dorsal half, the subdorsal stripes wide and very conspicuous; whitish stripe along under spiracles. Tubercles minute, blackish. Caudal fork present. Anterior proleg crochets in complete circle 20-24; caudal crochets in unbroken series 26-29.



## PLATE III

*Aristotelia argentifera* Busck

1. Male genitalia, aedoeagus to right.
2. Female abdomen, left side; apl—anterior sternal plate.
3. Head, left view.
4. Wings.
5. Pupa, venter, dorsum, and left side, respectively.
- 6A. Larval head, front view; ant—antenna.
- 6B. Larval head, left side; I, II—ocelli; A<sub>3</sub>, L<sub>1</sub>, O<sub>1</sub>, O<sub>2</sub>, SO<sub>2</sub>—head setae.
- 6C. Larval head from below, showing suboral structures.
- 6D. Larval mandible.
- 7A. Larval thorax, dorsum; 1a, 1b—setae.
- 7B. Larval abdomen, dorsum: A1, A2, A3—abdominal segments shown.
- 7C. Larval abdomen, dorsum; A7, A8, segments.
- 7D. Larval abdomen, dorsum; A9, A10—segments shown; I, II—setae.
- 8A, 8B, 8C, 8D—Larval thorax and abdomen (as in 7), side view; I, II, III, IV, V, VI, VII, VIII—setae.
- 9A, 9B, 9C, 9D—Larval thorax and abdomen (as in 7), venter; VIIa, VIIb, VIIc—setae of the seventh series when multiple; VIIpa—anterior puncture of the anal proleg; VII, VIII—setae.
- 10A. Crochets of anterior prolegs, the outside to the left.
- 10B. Crochets of anal proleg.
11. Left anal proleg, lateral view: VIIac—upper posterior seta; VIIa<sub>1</sub> to VIIa<sub>4</sub>—setae of upper series; VIIbc—lower posterior seta; VIIb<sub>1</sub> to VIIb<sub>3</sub>—lower series setae; VIIbg—accessory seta; VIIpl—lateral puncture.
12. Larval anal fork.
13. Larval metapod, rear view.

*Duvita pasadenae* Keifer, new species

(Plate IV, Figs. 7A, 7B, 7C, 7D)

This species is in most features like *Duvita vittella* Busck. Its main points of difference structurally are in the expanded second joint of the palpi, in the weaker gnathos, differently shaped harpes, and the structure of the aedoeagus. This latter organ is somewhat similar to the type of *Aproaerema*. *Battaristis ichnota* Meyr. differs somewhat from *Duvita vittella*, mainly in hindwing venation and the rudimentary gnathos. However, the male genitalia of the type of *Anacamptis*, and of the type of *Aproaerema* are very similar to all of those mentioned above. It is worthy of note in this new species that the anterior sternal abdominal plate is setiferous centrally, and the antephyes are absent. No females of the species were taken. I am indebted to Mr. Busck for the privilege of studying the types of *Duvita* and *Battaristis*.

Alar expanse 11–12 mm. Labial palpi fuscous; 2nd joint slightly whitish inwardly and at tip, with a loose brush below and slightly expanded toward apex above; terminal joint whitish at base, at tip and somewhat inwardly; this joint slightly thickened with rough scales anteriorly. Head and thorax fuscous, the scales tipped whitish and the face lighter. Antennae fuscous, scape without pecten; flagellum alternate fuscous and ochreous. Forewings fuscous, the scales obscurely white-tipped; basal  $\frac{3}{4}$  nearly unicolorous but the stigmata more or less indicated by faint dark dots. Plical stigma at  $\frac{1}{3}$ ; first discal obliquely beyond plical and a short white dash opposite on costa; second discal stigma at about  $\frac{2}{3}$ , with some white scaling. Sharply outwardly angulated narrow white fascia leaving costa just beyond  $\frac{2}{3}$ , running to tornus, the upper part longer and both parts concave. Wing beyond fascia somewhat more white irrorated than basal part of wing (fascia blending into this on some wings). Base of cilia beyond fascia with alternate whitish and fuscous spots, the fuscous spots somewhat ochreous inwardly; remainder of cilia (which are broad scales in this case, except at tornus) with about 3 white lines representing scale tips. Hindwings and cilia light fuscous, the outer cilia noticeably white-tipped, cubital pecten moderately long and strong. Abdomen fuscous, somewhat overlaid whitish above. Legs darker fuscous with hind tibiae whitish. Male genitalia with tuft of hair on uncus; gnathos weak; harpes broad; aedoeagus as figured; no large ventral plates on eighth segment.

Type, male, collected at Pasadena, California, September 21, 1934. Sixteen designated paratypes bear same data.

*Leucogonia distincta* Keifer, new species

(Plate IV, Figs. 8A, 8B, 8C)

The venation and general appearance of this moth are much like *Leucogonia subsimella* Clem., but the genitalia differ in the rudimentary gnathos, the broad, heavy harpes, and the long slender aedoeagus, as well as other details. The male genitalia of *Leucogonia* do not indicate affinity with *Anacamptis*-like forms although the female genitalia may show some points of similarity. When discovered, the

larvae and pupae of these species may throw light on the subject. The *Duvita* described above has a very similar anterior abdominal sternal plate, as both it and this *Leucogonia* lack the antephytes (*Leucogonia californica* is also similar). Cubital pecten on the hindwings of these *Leucogonia* spp. can only be made out with considerable difficulty and are practically worthless for determination purposes. All species have ventral plates below the male genitalia. I am indebted to Mr. Busck for being able to examine a slide of the male genitalia, of what he considers to be a typical *subsimella* Clem., from Mesilla Park, New Mexico.

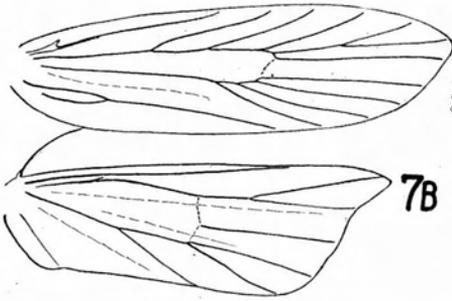
Alar expanse  $7\frac{1}{2}$ -9 mm. Palpi: median joint gray, lighter inwardly and tip white; terminal joint whitish-gray, tip and longitudinal anterior line black. Head shining light gray; antennae blackish, distinctly darker than head. Thorax rather dull dark gray. Forewings rather shining gray tending to blackish apically, especially beyond fascia. Plical stigma faintly darker at  $\frac{1}{3}$ ; short white outward dash on costa at  $\frac{1}{2}$ , preceded and followed by blackish; antapical white fascia from costa to tornus more or less bent outwardly in center but not angulate; some white spots around apical margins including one on apex at cilia base; cilia light gray, the apical cilia basally black bordered by a white line of scale-tips around apex; extreme tips of cilia white. Hindwings lighter gray than forewings. Wings below lighter than body. Abdomen dull gray. Body below and legs dull gray. Male genitalia with broad pointed uncus; gnathos rudimentary; harpes broad, surpassing uncus, emarginate below near tip; aedoeagus bulbous basally, long and very slender, tapering. See figures of male and female genitalia.

Type, male, collected at Sacramento, July 12, 1931. Allotype, female, collected at Sacramento, August 12, 1933. Twenty-four paratypes are indicated, all from Sacramento, and collected during July and August. This exceedingly common little moth is also known from Oroville to Fresno.

#### Synopsis of species of *Leucogonia* Meyr.

- Antapical fascia of forewing angulate outward centrally; a black subapical dot usually present; male genitalia with gnathos present, harpes slender, sacculus short and broad and set with heavy spines, aedoeagus tubular, not tapering ----- *californica* Keifer  
(Pl. IV, Fig. 9)
- The same as *californica* except the sacculus long as costa and with heavy spines apically ----- *subsimella* Clem.
- Antapical fascia of forewing usually bent but not angulate, entire apical area blackish; male genitalia with rudimentary gnathos, harpes heavy and broadly notched below tip, sacculus much reduced and with few setae, aedoeagus bulbous basally and tapering ----- *distincta*, new species

The next two new species belong to a group which has been referred heretofore to the genus *Borkhausenia* Hubn. of the *Oecophoridae*. Heinrich has shown in the Jr. Agr. Res. Vol. 20, p. 815, Mar. 1921, that the male terminalia of the type of *Borkhausenia* are not at all like the species of this group, which have terminalia much like the male terminalia of *Triclonella* Busck. More recently Busck, in the Proc. Ent. Soc. Wash. Vol. 34, p. 17, Feb. 1932, has shown that the male terminalia of *Triclonella* are very similar to the genotype of *Cosmop-*



7B

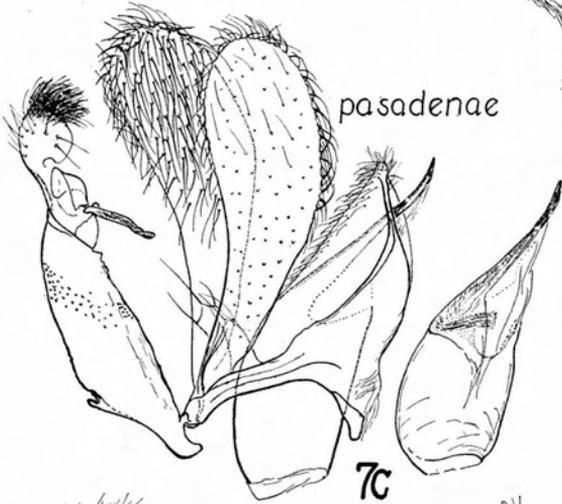


7A



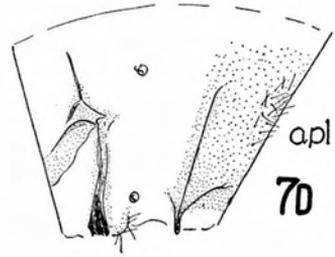
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occidentella



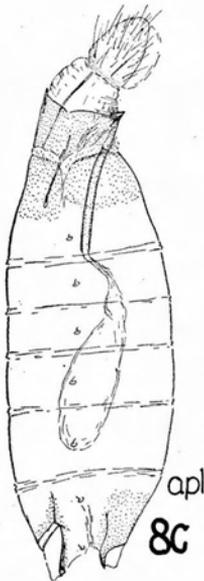
pasadenae

7C



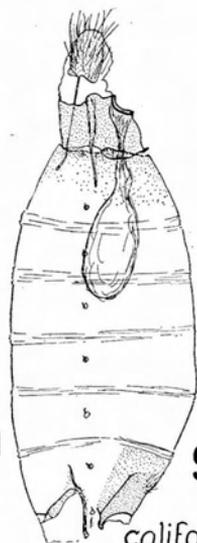
apl

7D



8C

apl



9

californica



8A

distincta



8B

## PLATE IV

6. *Gelechia occidentella*, male genitalia.
- 7A. *Duvita pasadenae*—right side of head and palpus.
- 7B. Wings.
- 7C. Male genitalia, aedoeagus to right.
- 7D. First two abdominal segments; apl—anterior sternal plate.
- 8A. *Leucogonia distincta*, male genitalia.
- 8B. Female terminalia, ventral view.
- 8C. Female abdomen, left side; apl—anterior sternal plate.
9. *Leucogonia californica*, left side of female abdomen.

*teryx* Hubn., and therefore referable to the Cosmopterygidae. For want of a designated genus in this case I am using "*Borkhausenia*" as the vehicle under which to describe these species, although genitalic evidence clearly shows these forms to be linked with the *Cosmopterygidae*.

Heinrich, 1921, described *diveni* of this complex, and recorded the larva as a leafminer in *Lantana horrida* in Texas. The two additional larval habits here recorded show the group to extend to the mint family, Labiatae, also as leafminers. The larva of *diveni* is predominantly white with dark coloring (wine-red) only on the thorax and first abdominal segment. The larvae of the new species are in contrast almost entirely dark reddish-brown with white only on intersegmental thoracic areas.

"*Borkhausenia*" *sphacelina* Keifer, new species

(See Plate V)

Expanse 17-19 mm. color white, scales banded gray just below tip; general effect light to medium gray. Second joint of palpi dark, lighter on inner side and white at tip; terminal joint white just above base and at tip. Antennae somewhat darker than head, which is rather light gray. Color of forewings generally even. Ill-defined whiter longitudinal area in disc; dorsal base area also somewhat lighter than general color. Stigmata dark but not very conspicuous; plical hardly evident, obliquely before first discal; first discal a well-defined gray dot at just before  $\frac{1}{2}$ ; second discal a larger gray spot above a smaller gray spot at  $\frac{2}{3}$ . Cilia light gray. Hindwings whitish, somewhat infuscated, and with yellowish tinge; long scales projecting out onto base of whitish apical and dorsal cilia; veins 3 and 4 short stalked. Abdomen dirty white. Fore and midlegs gray, hindlegs yellowish-white with some gray. Male genitalia as figured; asymmetrical; aedeagus with one large spine and tapering to a long slender point. Female genitalia as figured; ovipositor of moderate length; genital opening ventral and to the left of the midline.

Type, male, collected as larva about three miles west of Shingle Springs, El Dorado County, California, April 17, 1934, feeding on leaves of *Sphacele calycina* Benthham, the adult emerging April 28, 1934. Allotype with same data except collection was on May 7, 1934, and emergence May 18. Twenty designated paratypes have same data, the larvae (or pupae) collected from April 17 to May 19, and the adults appearing the latter part of April and through May.

The dark brown larvae of this moth form a very conspicuous and characteristic globular chamber amongst bunched leaves, and then mine into these leaves. Pupation takes place within this chamber.

The pupa is about 6 mm. long, widest at first abdominal segment, glabrous, dark brown. Wings and antennae extending over onto sixth segment. No movable segments. Genital opening in a groove in center of an elevated area; cremaster absent, hooked hairs present.

The larva has several notable morphological features of taxonomic importance. The head is flattened and partly retracted with the typical foraminal and epicranial structures that usually result from a leaf-mining habit;  $A_1$ ,  $A_2$ ,  $A_3$ , in nearly a straight line with  $L_1$  nearer to  $A_3$ ;

a line through  $A_3$  and  $O_2$  passes just behind the first ocellus; ocelli V and VI reduced. Body tubercles rather small and accessory setae in the seventh series on abdominal segments  $A_1$ ,  $A_2$ ,  $A_3$ ,  $A_4$ ,  $A_5$ ,  $A_6$ ,  $A_{10}$ ; setae 1a and 1b on meso- and metathorax separate;  $A_8$  with III dorsad to spiracle and VII unisetose;  $A_9$  with VI absent; accessory setae on anal proleg in "b" series in addition to VIIbg, VIIac and VIIbc approximated; no anal comb; anterior proleg crochets in unevenly biordinal circle, broken outwardly; anal proleg crochets in uninterrupted series.

Larval length about 12 mm. Head ochreous, black on margins and sides. Prothoracic shield ochreous, black on lateral and posterior  $\frac{2}{3}$ . Suranal plate black. Tubercles small. Body very dark reddish-brown, intersegmental areas of thorax white; flattened dorso-ventrally. About 20-28 biordinal crochets on anterior prolegs, broken outwardly; posterior prolegs with sixteen crochets.

"*Borkhausenia*" *marinensis* Keifer, new species

(Plate II, Figs. 5A, 5B, 5C, 5D, 5E)

In describing this species I am running the risk of synonymy with *episcia* Walsingham. The veins 3 and 4 of the hindwings are stalked as in *episcia*, but Walsingham's color description does not seem to fit, though it is freely admitted that color descriptions are next to useless in separating these species. However, in view of the fact that there is a large complex of closely related species of this group in the general area, the chance of synonymy is minimized. In comparing *marinensis* with *sphacelina*, to which it is closely related, the first difference of note is that *marinensis* is more nearly a true leafminer, forming an elongate blotch mine along the midrib of *Sphacela* leaves, in which it spends its larval life (changing leaves occasionally). In addition it does not bunch leaves. Examination of the male genitalia shows several differences, as figured, especially in the structures provisionally considered as the uncus, and in the recurved aedoeagus. These differences are given biological significance by the larval habits but even more striking mechanical significance by the female terminalia. The genital opening, or ostium, in the female *sphacelina* is left ventral, flanked anteriorly to the left by a sclerotized depression. In *marinensis* this ostium has taken up a left dorsal position with the sclerotized depression on the left margin. Thus we have striking specific differences in the larval habits and the mechanics of the genitalia. This species is slightly smaller and darker than *sphacelina*. The structures in the anterior sternal plate are worthy of note: the antephysis is short and thick, the mesad costula is obsolete, and the laterad costula is recurved forward. Incidentally, these structures on *Borkhausenia pseudospretella* Stainton, which by male genitalia is a good *Borkhausenia*, are noticeably different from the two new species herein described. The description of the adult is as follows:

Expanse 13-17 mm. Color white, scales gray-banded just below tip giving a gray effect. Second joint of the palpi dark gray, lighter inwardly and white tip; terminal joint with white annulus just above base, and white tip. Head light gray, antennae dark gray. Thorax slightly darker than head. Forewings rather even gray except for some

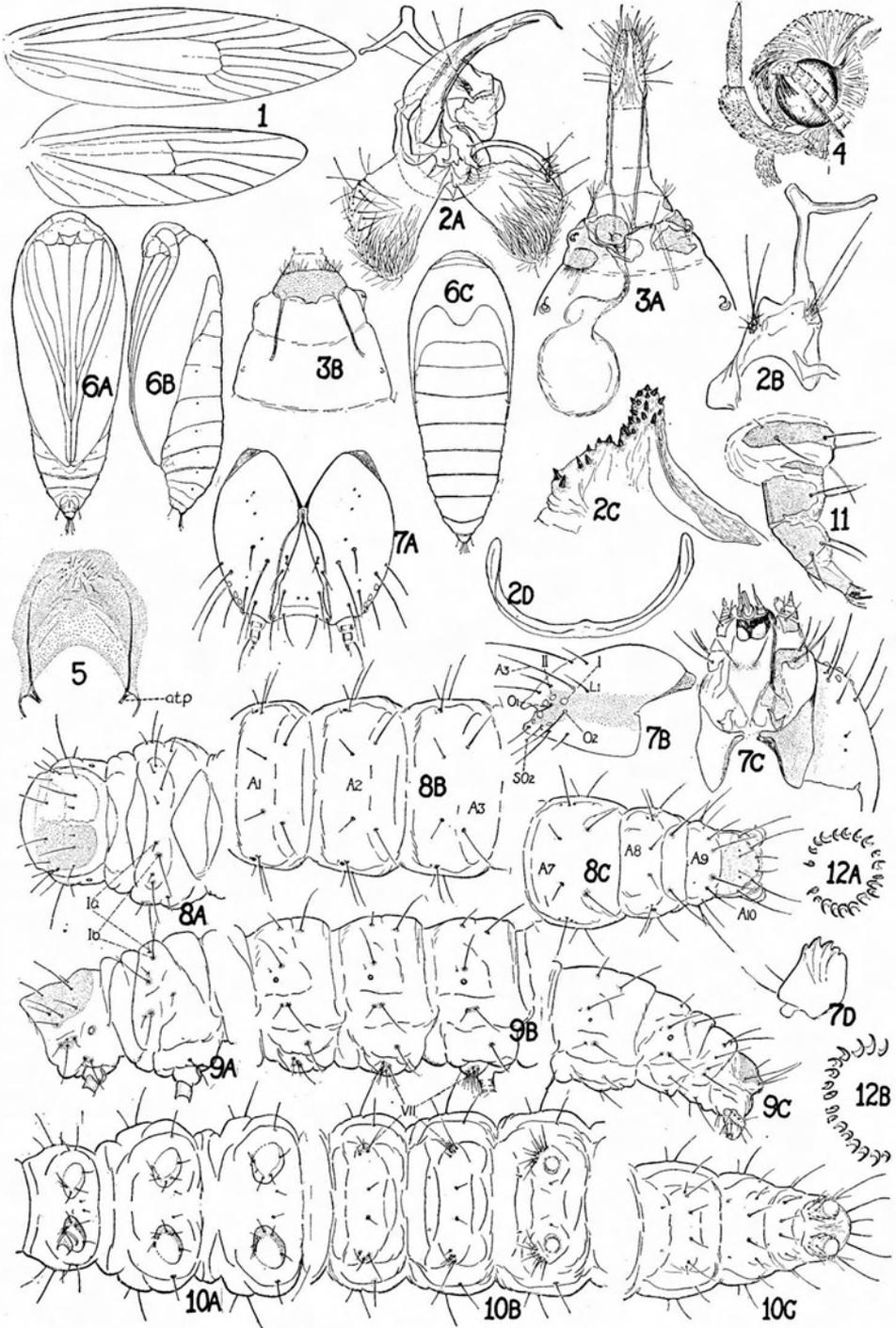


PLATE V

## PLATE V

*"Borkhausenia" sphacelina*

1. Wings.
- 2A. Male genitalia.
- 2B. Ventral view of "uncus."
- 2C. Structures above male genitalia.
- 2D. Curved sclerite below male genitalia.
- 3A. Female terminalia, ventral view.
- 3B. Female abdomen, dorsal view of sixth, seventh, and eighth segments.
4. Adult head, left side.
5. Adult, anterior sternal plate from below; atp—antephrasis.
- 6A, 6B, 6C. Pupa; ventral, lateral, and dorsal views respectively.
- 7A. Larval head from in front.
- 7B. Larval head, left side; I, II—ocelli; A<sub>3</sub>, L<sub>1</sub>, O<sub>1</sub>, O<sub>2</sub>, SO<sub>2</sub>—setae.
- 7C. Larval head, suboral structures.
- 7D. Larval mandible.
- 8A, 8B, 8C. Larval dorsum: first two thoracic segments, and abdominal segments as shown by A<sub>1</sub>, A<sub>2</sub>, etc; Ia, Ib—thoracic setae.
- 9A, 9B, 9C. Same as 8 except lateral view.
- 10A, 10B, 10C. Same as 8, venter, all of thorax included.
11. Left metapod, rear view.
- 12A. Crochets of anterior prolegs, outer side to left.
- 12B. Anal proleg crochets.

poorly defined markings. More or less distinct oblique whitish streak, edged gray, especially outwardly, crosses fold from dorsal direction at  $\frac{1}{5}$  and connects with longitudinal whitish discal area. Central portion of fold lined gray. First discal stigma a dark gray ill-defined spot at just before  $\frac{1}{2}$ , often connected with an outwardly oblique gray dash from direction of costa. Second discal stigma a gray spot at  $\frac{2}{3}$  below a whitish splotch. Veins sometimes lined gray outwardly. Cilia light gray. Hindwings evenly infuscated but lighter than forewings; slightly yellowish; cilia light gray with long scales at base; veins 3 and 4 stalked. Male genitalia and terminalia as figured; asymmetrical; aedeagus rather bluntly rounded at tip. Female terminalia as figured, ovipositor moderate length; ostium on dorsal left.

Type, male, taken as larva mining leaves of *Sphacele calycina* Benth, at Phoenix Lake, Marin County, California, May 12, 1934, the adult emerging June 17, 1934. Allotype, female, with same host and locality data, the adult emerging on June 28, 1927. Sixteen designated paratypes from same host and locality, the larvae collected during April and May, and the adults emerging as late as July 4.

The larva of this species is much like the one described above. It is a miner in *Sphacele* leaves. The mine apparently originates near the base of the leaf on the underside by the midrib, but soon appears above as a brown area, its shape somewhat determined by the angle of the lateral ribs when the larva is young. The frass is spun against the lower epidermis. The larva may mine in several leaves during its lifetime. The cocoon is oval and rather loosely woven.

All material herein treated was collected and reared by the writer.

All types and allotypes are deposited in the collection of the California Academy of Sciences.\* Paratypes are distributed to Miss Annette F. Braun, the United States National Museum, and J. F. Gates Clarke.

\* The new species described in this article are listed in the Museum of the California Academy of Sciences under the following type numbers: *Gelechia vanduzeei*, type 4012, allotype 4013; *Gelechia marinensis*, type 4014, allotype 4015; *Gelechia chrysopyla*, type 4016, allotype 4017; *Aristotelia adceanotha*, type 4018, allotype 4019; *Duvita pasadenae*, type 4020; *Leucogonia distincta*, type 4021, allotype 4022; "*Borkhausenia*" *sphacelina*, type 4023, allotype 4024; "*Borkhausenia*" *marinensis*, type 4025, allotype 4026.