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A REVISION OF THE GEOMETRID GENUS *SERICOSEMA* (LEPIDOPTERA)

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The genus *Sericosema* Warren forms a small homogeneous group in the subfamily Ennominae. There has been little trouble in the past in properly associating the moths with this genus; the difficulties have arisen in the correct application of the specific and subspecific names. This has been due to the great similarity in external structural details of the adults, and in the remarkable uniformity in all species of the color and pattern of both the superior and inferior surfaces of the wings. The problem is quite a difficult one until the genitalic structures are studied; both sexes offer good characters for differentiation of the species, although the male is the better of the two. However, much work still remains to be done with this genus, on both the specific and subspecific levels. There is a particular need for life history work and a careful comparison of the eggs, caterpillars, and pupae to ascertain what differences occur between and within the species of this genus.

MATERIALS STUDIED: Over 850 specimens have been studied, including all the types. This material has been made available to the author through the kindness of the authorities in some of the major eastern and western museums, and the cooperation of several private collectors; these are referred to specifically in the following paragraph. A large number of genitalic slides have been prepared by the author, mainly from specimens in the collection of the American Museum of Natural History and in his personal collection, and additional slides have been examined at the United

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States National Museum and Museum of Comparative Zoölogy, Harvard University; these have served as the basis for the genitalic descriptions and drawings.

ACKNOWLEDGMENTS: The author wishes to acknowledge with thanks the cooperation and aid of the following men who have allowed him to study the types and specimens in their charge: Mr. John G. Franclemont of the United States National Museum; Dr. J. Bequaert of the Museum of Comparative Zoölogy, Harvard University; Dr. T. N. Freeman of the Canadian Division of Entomology, Science Service; Dr. Edward S. Ross of the California Academy of Sciences; and Mr. Lloyd M. Martin of the Los Angeles County Museum. A similar word of thanks goes to Mr. John L. Sperry of Riverside, California, Mr. William R. Bauer of Petaluma, California, and to Mr. James H. Baker of Baker, Oregon, for the privilege of studying specimens from their private collections. The author is grateful for the help of Miss Alice Gray of the American Museum of Natural History who prepared the distribution maps and arranged the genitalic drawings in preparation for publication.

GENUS **SERICOSEMA** WARREN

Sericosema WARREN, 1895, Novitates Zool., vol. 2, p. 131. BARNES AND MCDUNNOUGH, 1917, Check list, p. 115. CASSINO AND SWETT, 1922, Lepidopterist, vol. 3, p. 151.

Euemera HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 340.

Head, front slightly protuberant, rounded, long scaled ventrally; eyes large, round; antennae of male bipectinate, plumose, pectinations arising in central region of segments, terminating before apex, of female simple; tongue present; labial palpi strongly developed, heavily scaled, middle segment extending beyond front, terminal segment subequal to length of eyes. Thorax without tufts; legs without hair pencils, fore tibia with moderate process, hind tibia not dilated, with two pairs of spurs. Abdomen without tufts, tending to be laterally compressed. Forewings broad, apex somewhat produced, 12 veins, no areoles; R_1 from top of cell; R_2 to R_5 stalked, from top near upper angle, R_5 from stalk before R_2; M_1 from upper angle; M_2 from just above middle of DC; Cu_2 from well before outer angle; fovea absent. Hind wings broad; frenulum strong in both sexes; outer margin slightly concave between veins; Sc approximate to R near base for one-fourth length of cell; R and M_1 approximate, from cell, the latter from upper

angle; DC oblique; M_3 from angle, approximate with Cu_1 at base; Cu_2 from well before outer angle. Forewings and hind wings concolorous light gray brown to tawny; primaries above with t. a. line absent, rarely vaguely indicated on costa, median line absent, t. p. line often prominent, subterminal area sometimes broadly suffused, discal dots absent; secondaries without cross lines, sometimes maculation of under side showing through, discal dots usually absent, rarely faintly indicated. Beneath similar to upper surfaces, usually more strongly marked, discal dots present on all wings, secondaries usually with extra-discal line.

MALE GENITALIA: Uncus long, simple, strongly curved dorsally, bent towards left side medially, recurved apically, sparsely haired, apex with small spine; socius fairly strong, with from 10 to 30 hairs; gnathos rudimentary, represented by rudimentary ring below the socii; valves sclerotized basally, costal region with sclerotized arm at or near base, symmetrical or asymmetrical, terminating in smaller sclerotized arm, valve distal to this second arm not heavily sclerotized; transtilla strongly developed, continued posteroventrally as hood-shaped apparatus; cristae present; juxta broadest anteriorly, elongate, in form of calcar; furca absent; saccus projecting short distance beyond base of valves, bluntly pointed or rounded, subequal to length of uncus; aedeagus elongate, longer than combined length of tegumen and saccus, slender, tapering to point posteriorly on ventral surface, vesica armed with group of elongate longitudinal spines two-fifths to three-fourths length of aedeagus, with one group of short transverse spines medially, another group of short longitudinal spines terminally, these latter two groups sometimes contiguous or absent. Ventral surface of eighth abdominal segment without plate.

FEMALE GENITALIA: Ostium simple; operculum absent; ductus bursae membranous or sclerotized, subequal in length to length of apophyses of ovipositor; ductus seminalis from sclerotized swelling or protruding lip on ventral portion of ductus bursae near ostium; bursa copulatrix membranous, shorter than ductus bursae, with large discoid stellate signum. Segment VII of female abdomen ranging in length from subequal to twice length of segment VI; apophyses of segment VIII correspondingly ranging in length from one-half to equal that of segment VII; segment VII posteriorly and segment VIII ventrally often with elongate scales; ovipositor lobes pointed, convex.

EARLY STAGES: Described by Dyar for *juturnaria*, the only species of which the early stages are known. He reports that the eggs are laid loose, supposedly being scattered over the ground by the moths, and that this species overwinters in this stage. Some eggs are preserved on cards in the National Museum collection; also, one empty pupal case is there. These, plus Dyar's descriptions for the eggs, have been used in the following descriptions. When fresh material becomes available it may be necessary to amend the following and to add more details.

EGGS: Elliptical, micropylar end roundly truncate, the other abruptly rounded; upper surface with single, rather deep median groove, lower surface with two grooves; surface with numerous longitudinal ridges and diffuse transverse ridges, forming squares. Color green, turning dull pink.

LARVAE: No material available.

PUPAE: Shiny brown, in slight cocoon, underground. Head, antennae extending caudad of other appendages, slightly longer than wing cases; labial palpi small, triangular; maxillae slightly shorter than wing cases. Thorax, mesothoracic wings extending to posterior portion of fourth abdominal segment; metathoracic wings narrowly exposed to posterior half of fourth abdominal segment; prothoracic legs approximately three-fourths length of maxillae, femora exposed for relatively long distance; mesothoracic legs subequal in length to maxillae; metathoracic legs not exposed. Abdomen, spiracles without furrows; constriction present between segments IV and V, the surface of segments posterior to this somewhat more pitted than anterior ones; dorsum with distinct furrow between segments IX and X, scalloped on posterior margin; furrow present on lateral surface of segment X; cremaster apparently of six recurved spines, the terminal two much thickened and united basally, much longer than remaining four.

GENOTYPE: *Selidosema juturnaria* Guenée, for both *Sericosema* and *Euemera;* both by original designation.

This genus is apparently most closely related to *Syrrhodia* Hübner (*Catopyrrha* Hübner). These two groups are easily separable by maculation, as the species of *Sericosema* have the wings above and below a unicolorous and somewhat drab light gray brown or tawny with at most a single extra-discal cross line. On the other hand, the wings of the species of *Syrrhodia* vary from bright yellow through olivaceous to green and brown, often being

brightly marked with reddish below, and with several cross lines. Structurally, the two genera are easily separated by the nature of the branching of veins R_2 and R_5 of the forewings: in *Syrrhodia*, R_2 branches from the stalk before R_5, while in *Sericosema*, R_5 comes from the stalk before R_2. The genitalia show a fairly close relationship. In the male, both genera have the uncus strongly developed, a rudimentary gnathos, the valves with strongly developed costal arms, a well-developed transtilla, and an elongate aedeagus. The two genera can be easily distinguished from each other by the armature of the aedeagus, *Sericosema* having the vesica armed with a number of spines, whereas in *Syrrhodia* the vesica is either unarmed or has a scobinate patch. The female genitalia may be immediately separated by the presence of a stellate signum in *Sericosema*, which is absent in *Syrrhodia*.

The genus *Sericosema* is found in western North America, ranging from the northern boundary of Mexico to British Columbia and perhaps Alaska, and from the Rocky Mountain states to the Pacific Ocean.

Key to Adults

1. Under surface of hind wings bisected by dark brown line with prominent outwardly projecting tooth in middle, basad of this light gray, distad dark brown, shading into gray near outer margin..... *simularia*
— Under surface of hind wings without above characters.....2
2. Upper surface of forewings with transverse posterior line complete, prominent, subterminal area broadly suffused with dark scales; under surface of hind wings usually broadly suffused with pink, transverse line complete, prominent; expanse, 29 to 41 mm..... *juturnaria*
— Upper surface of forewings with transverse posterior line complete to obsolescent, subterminal area not suffused or only lightly so; under surface of hind wings light gray, tan, or gray brown, transverse line complete or incomplete; expanse, 25 to 37 mm.....3
3. Under surface of hind wings light gray with scattered dark brown scales, transverse line complete to obsolescent; upper surface of forewings with transverse posterior line faint to obsolescent..... *immaculata*
— Under surface of hind wings tan, gray brown, or dark gray, transverse line complete or with central third obsolescent; upper surface of forewings with transverse posterior line prominent.....4
4. Under surface of hind wings light tan to cream colored, transverse line indistinct to obsolescent; when present, usually not broken near middle; Arizona..... *wilsonensis meadowsaria*
— Under surface of hind wings light gray, dark gray to gray brown, sometimes shaded with pink or tan scales; transverse line prominent but with central one-third usually obsolescent.....5
5. Under surface of hind wings light gray brown, with numerous small, dark

brown strigations; transverse line rarely shaded with dark scales distally; southern California ..... *wilsonensis wilsonensis*

— Under side of hind wings light gray, gray brown, or red brown, heavily marked with dark brown strigations; transverse line often shaded with dark scales distally; central California to British Columbia ..... *wilsonensis macdunnoughi*

KEY TO MALE GENITALIA

1. Aedeagus with vesica armed with elongate longitudinal and short transverse and terminal spines 2
— Aedeagus with vesica armed with elongate longitudinal spines only ..... *simularia*
2(1). Costal region of both valves with two sclerotized arms 3
— Costal region of left valve with three sclerotized arms, the right valve with two arms ..... *wilsonensis*
3(2). Basal costal arm as wide as or wider than width of aedeagus, with small, tooth-like projections at distal end ..... *juturnaria*
— Basal costal arm narrower than aedeagus, without terminal tooth-like projections ..... *immaculata*

KEY TO FEMALE GENITALIA

1. Apophyses of ovipositor shorter than or subequal to length of dorsum of segment VII 2
— Apophyses of ovipositor longer than length of dorsum of segment VII 3
2(1). Ductus bursae increasing in width anteriorly, smoothly sclerotized for entire length ..... *juturnaria*
— Ductus bursae of equal width for entire length, largely sclerotized but membranous and convoluted near posterior end ..... *simularia*
3(1). Ductus bursae membranous; bursa copulatrix attenuate ..... *wilsonensis*
— Ductus bursae partially sclerotized; bursa copulatrix ovoid ..... *immaculata*

Sericosema juturnaria (Guenée)

Figures 5A, 7A

Selidosema juturnaria GUENÉE, 1857, Histoire naturelle des insectes, vol. 10, p. 147; 1858, *op. cit.*, atlas, phalénites, pl. 15, fig. 9. WALKER, 1862, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 24, p. 1029. PACKARD, 1871, Proc. Boston Soc. Nat. Hist., vol. 13, p. 394; 1874, *ibid.*, vol. 16, pl. 1, fig. 19; 1876, A monograph of the geometrid moths. . .of the United States, p. 241, pl. 2, fig. 16 (venation), pl. 9, fig. 53. BUTLER, 1881, Papilio, vol. 1, p. 222. DYAR, 1894, Ent. News, vol. 5, p. 63 (description of larva, pupa). OBERTHÜR, 1923, Études de lépidoptérologie comparée, vol. 20, p. 267.

Selidosema inturnaria, GUMPPENBERG, 1892, Nova Acta Deutschen Akad. Naturf., Halle, vol. 58, p. 359.

Enemera (sic!) juturnaria, DYAR, 1902, Bull. U. S. Natl. Mus., vol. 52, p. 318; 1903, Proc. U. S. Natl. Mus., vol. 25, p. 392 (description of egg); 1904, *ibid.*, vol. 27, p. 908. HOLLAND, 1903, Moth book, p. 342, pl. 43, fig. 55.

Sericosema juturnaria, BARNES AND MCDUNNOUGH, 1917, Check list, p. 115. CASSINO AND SWETT, 1922, Lepidopterist, vol. 3, p. 151. MCDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 246; 1938, Check list, p. 157.

Selidosema californiaria PACKARD, 1871, Proc. Boston Soc. Nat. Hist., vol. 13, p. 394; 1876, A monograph of the geometrid moths. . .of the United States, p. 241. (New synonymy.)

Selidosema juturnaria californaria, BUTLER, 1881, Papilio, vol. 1, p. 222 (misspelling).

Selidosema inturnaria californiaria, GUMPPENBERG, 1892, Nova Acta Deutschen Akad. Naturf., Halle, vol. 58, p. 359.

Enemera (sic!) juturnaria californiaria, DYAR, 1902, Bull. U. S. Natl. Mus., vol. 52, p. 318.

Sericosema juturnaria californiaria, BARNES AND MCDUNNOUGH, 1917, Check list, p. 115.

MALE: Head, vertex and front pale gray to gray brown, with scattered light brown scales; palpi reddish brown laterally, shading into light gray terminally, dorsal surface pale gray. Thorax above light reddish brown to cream color, with admixed gray scales, ventrally and legs lighter cream brown with dark brown scales. Abdomen cream brown, with scattered dark brown scales.

UPPER SURFACE OF WINGS: Forewings, ground color pale gray brown with darker brown, reddish brown, and pink scales, usually rather heavily strigate and suffused with these latter along costal margin and distad of t. p. line; costa with numerous small, dark brown patches of scales, continuing towards radial vein as fine, lighter brown strigations, often becoming fewer in number and more indistinct posterior to this; basal area of wing to t. p. line unicolorous, unmarked except as above noted; t. p. line dark smoky brown, prominent, broad, diffuse, rarely obsolescent, arising on costa three-fifths to two-thirds distance from base at right angle, swinging outward in broad curve below radial veins to vein M_3, recurving and running subparallel with outer margin, gradually decreasing in width, with slight outward bulge just above vein 2A, meeting inner margin with strong basal bend about three-fourths distance from base; broad, diffuse, dark smoky brown subterminal shading present in varying degrees, usually present below apex, nearly always present opposite outward curve in t. p. line, often completely filling area between line and fringes; fringes concolorous or with pinkish tinge, unmarked or with faint venular spots of dark brown. Hind wings concolorous with forewings; t. p. line usually absent, rarely indicated by few brown scales, or showing through from under surface; subterminal area usually

with broad, diffuse, dark smoky brown shading, most prominent near outer angle, fading out posteriorly; fringes as on primaries.

UNDER SURFACE OF WINGS: Ground color pale gray brown, heavily overlain with darker brown, reddish brown, and pink scales except along inner margin of forewings, darker than above. Primaries, maculation similar to above, with dark discal spot, central area sometimes broadly suffused with smoky brown, subterminal area not so heavily marked. Secondaries, often heavily suffused with pinkish, appearing darker than forewings; discal dot dark, round; t. p. line usually prominent, complete, rarely partially obsolescent, dark brown, rather sharply delimited on inner side, broadly shaded on outer side, gradually shading into ground color, arising on costal margin three-fourths distance from base, gently curving to inner margin one-half to two-thirds distance from base, often most prominent at costa; subterminal area concolorous with basal area; fringes of both wings as above, without spots. Expanse: 29 to 41 mm.

FEMALE: Like the male. Subterminal area of forewings above tending to be more suffused with dark smoky brown in some examples, while in others it is very lightly marked. Under surface of wings, especially secondaries, tending to be more suffused with pinkish. Expanse: 30 to 41 mm.

MALE GENITALIA: Uncus tapering, slightly bent towards left side medially; socius with from 16 to 30 hairs; valves, costal region symmetrical, with broad truncate arm near base, almost as long as length of tegumen, as wide as or wider than aedeagus, truncate end with several tooth-like projections, the most prominent tooth always being at outer distal margin, the two arms being asymmetrical in this respect; costal region with second smaller sclerotized arm two-thirds distance from base projecting from valve less than width of aedeagus; sacculus heavily haired basad of basal costal arm, naked at base; juxta subrectangular anteriorly; aedeagus, vesica with from three to eight longitudinal spines approximately two-fifths length of aedeagus, groups of short transverse and longitudinal spines usually contiguous, rarely separate, ranging in total number from 10 to 30, usually 16 to 19.

FEMALE GENITALIA: Ductus bursae sclerotized, gradually increasing in width towards bursa copulatrix, somewhat bent towards left side and dorsally; ductus seminalis from protruding ventral lip one-sixth to one-fourth distance from ostium to bursa copulatrix, lateral margins of this lip extending laterad to sides of

ductus bursae; bursa copulatrix ovoid, broadly attached to ductus bursae, usually with faint rings encircling large, slightly elliptical ventral signum, diameter of the latter being approximately one and one-half to two times diameter of ostium. Dorsum of segment VII approximately one and one-half times as long as dorsum of segment VI; apophyses of segment VIII approximately one-half length of dorsum of segment VII; apophyses of ovipositor subequal to length of dorsum of segment VII.

EARLY STAGES: Described by Dyar.

TYPES: *Juturnaria*, in United States National Museum. Described from four males, at least three of these being in the collection at Washington. The lectotype is hereby designated as the specimen with the label "Selidosema Juturnaria Guenée Sp. G. X no. 1164 Boite no. 257." *Californiaria*, Museum of Comparative Zoölogy, Harvard University, type no. 14619; described from a single female.

TYPE LOCALITIES: "Californie" (*juturnaria*); "Cal." (*californiaria*).

RANGE: Western United States, from California to British Columbia, south in Rocky Mountain states to Utah and Colorado. Packard (1876) records it from Alaska. Two specimens labeled "Volga, S. Dakota '94" in the Museum of Comparative Zoölogy collection, if correctly labeled, extend the distribution considerably to the east; however, this locality needs to be verified. (See fig. 1.) On the wing from May through September.

FOOD PLANT: *Rhamnus* (Dyar, 1894).

REMARKS: Four hundred and six specimens examined. This species is the largest in size and has the greatest range of any of the species in the genus. It is usually easy to determine by means of the ground color of the wings above which is the lightest in hue of any of the species, by the fact that the upper side of the forewings usually has the t. p. line very prominent and complete, and the subterminal area is often broadly suffused with dark scales. On the under surface of the wings there is considerable variation in color, but most examples, especially the females, are broadly suffused with pink; the cross line is rather variable in amount and intensity, but it is usually complete and prominent, gently curving across the wing. There is a fair amount of variation within the species in the characters just mentioned; *californiaria* is a pale and lightly marked female, with hardly a trace of the cross line on the hind wings beneath. A complete series of intergradations can

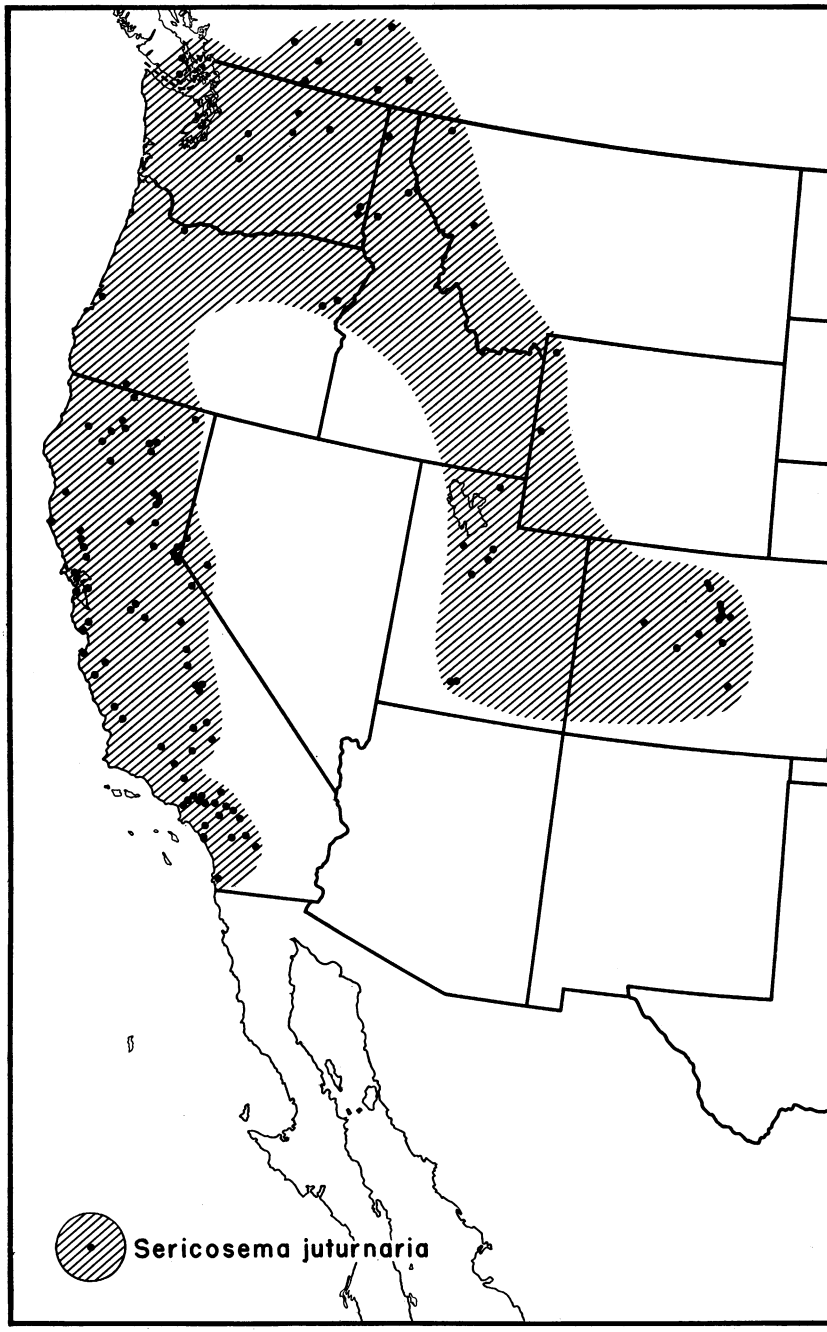

FIG. 1. Distribution of *Sericosema juturnaria* (Guenée).

be found from this lightly marked form to those specimens heavily suffused with dark scales above and below which form the other extreme.

The male genitalia are very distinct, not only in being the largest in size within the genus, but in the symmetrical nature of the valves with the very broad, toothed, truncate costal arm near the base. The closest relationship appears to be with *immaculata*.

The female genitalia are also quite distinct, being recognizable by the short apophyses, the smoothly sclerotized ductus bursae increasing in width anteriorly, the ductus seminalis arising from a prominent lip, and by the relatively large signum.

Sericosema immaculata immaculata (Barnes and McDunnough)

FIGURES 5B, 7B

Euemera immaculata BARNES AND MCDUNNOUGH, 1913, Contributions to the natural history of the Lepidoptera of North America, vol. 2, p. 129, pl. 8, fig. 2.

Sericosema juturnaria immaculata, BARNES AND MCDUNNOUGH, 1917, Check list, p. 115. MCDUNNOUGH, 1938, Check list, p. 157.

MALE: Head, vertex and front whitish gray, with scattered brown scales; palpi reddish brown laterally, terminal joint light gray, especially near apex, dorsal surface concolorous with front. Thorax light gray with light brown and reddish brown cast, legs brown with gray scales. Abdomen light gray with reddish brown scales.

UPPER SURFACE OF WINGS: Forewings, ground color light tawny, with reddish brown and smoky brown scales, usually strigate and suffused with these latter along costal margin and distad of t. p. line; costa with numerous small brownish patches of scales, continuing towards radial vein as indistinct strigations, becoming obsolescent posterior to this; basal area of wing to t. p. line unicolorous, unmarked except as above noted; t. p. line smoky brown, rather narrow, gradually decreasing in width, fading out before reaching inner margin, rather faint to obsolescent, arising on costa two-thirds distance from base at right angle, swinging outward in broad curve below radial veins to vein M_3, recurving and running parallel to outer margin, with outward bulge above vein 2A; subterminal area lightly suffused with smoky brown and reddish brown scales; fringes concolorous to gray, sometimes marked at vein endings. Hind wings concolorous or slightly paler than forewings, without markings, veins slightly

darkened; subterminal area lightly suffused with reddish brown; fringes as on primaries.

UNDER SURFACE OF WINGS: Forewings smoky brown, costal margin and apex suffused with light gray with numerous dark brown scales, inner margin lighter; costal margin with brown scales forming small strigations; t. p. line represented by rectangular block to vein M_1, posterior to this only very faintly indicated; discal dot very faint; fringes gray, sometimes marked at vein endings. Hind wings even light gray with dark brown scales; discal dot dark brown, prominent; t. p. line complete, incomplete, or sometimes absent, dark brown, diffuse, arising on costa two-thirds distance from base, subparallel with outer margin, curving to inner margin three-fifths distance from base; fringes as on primaries. Expanse: 25 to 36 mm.

FEMALE: Like the male. Forewings above with t. p. line tending to be slightly more prominent, fringes tending to be more checkered. Expanse: 27 to 37 mm.

MALE GENITALIA: Uncus tapering, rather strongly bent towards left side medially; socius with from 10 to 18 hairs; valves, costal region with elongate, slightly asymmetrical arms arising medially in sclerotized area, being approximately three-fourths length of tegumen and approximately one-half width of aedeagus in size, arm on right side slightly longer than left arm, terminally both arms bluntly pointed or rounded; costal region with second smaller sclerotized arm three-fifths distance from base projecting only slightly from valve; sacculus heavily haired basad of basal costal arm, naked at base; juxta subrectangular to triangular anteriorly; aedeagus, vesica with from three to eight longitudinal spines of varying lengths, the shortest being about one and one-half times width of aedeagus and the longest being approximately three-quarters length of aedeagus, groups of short transverse and longitudinal spines usually well separated, the former ranging in number from 18 to 35, the latter from three to 10.

FEMALE GENITALIA: Ductus bursae sclerotized, sometimes rather weakly so anterior to point of attachment of ductus seminalis, subequal to width of ostium throughout except near junction with bursa where diameter increases slightly, somewhat bent towards left side and dorsally; ductus seminalis from sclerotized swelling one-sixth to one-eighth distance from ostium to bursa copulatrix; bursa copulatrix ovoid, attached to ductus bursae rather broadly on right posterior side with slight ridge de-

marking same, usually with faint rings encircling slightly elliptical ventral signum, diameter of the latter being subequal to diameter of ostium. Dorsum of segment VII twice as long as dorsum of segment VI; apophyses of segment VIII slightly shorter than dorsum of segment VII; apophyses of ovipositor slightly longer than, to one and one-half times length of, dorsum of segment VII.

EARLY STAGES: Unknown.

TYPE: In United States National Museum; described from a single male; illustrated with original description.

TYPE LOCALITY: Loma Linda, San Bernardino County, California.

RANGE: California, normally occurring in mountainous regions, often at higher elevations. (See fig. 2.) On the wing from May through August.

FOOD PLANT: Unknown.

REMARKS: Two hundred and twenty-one specimens examined. This is the most lightly marked species of the genus, on both the superior and inferior surfaces of the wings. That, plus the even light gray of the under side of the secondaries, usually distinguish it. However, within this species there is considerable variation in the amount of maculation, ranging from complete absence of the cross lines above and below to fairly prominent cross lines. The type from southern California is the more immaculate form; specimens from the Sierra Nevada Mountains match this quite well. More commonly the wings show a narrow cross line on the primaries above and on the secondaries below; the extreme of this is found in a series from Modoc County, California, where the maculation is quite distinct and the band on the secondaries below is about 1 mm. in width. In a single specimen from Mohawk, Plumas County, California, both the upper and lower surfaces of the wings are evenly suffused with gray black scales; this is the only known example of a melanistic tendency in the genus.

The male genitalia appear to be most like those of *juturnaria*, but are easily distinguished therefrom by the much more slender and slightly asymmetrical costal arms of the valves, in the aedeagus by the greater length of the elongate spines in the vesica, and by the larger number of the short transverse and longitudinal spines, the groups of which are farther apart. The genitalia of the type have the costal arms long, narrow, and pointed, more so than in most examples. This, however, is not a constant feature in southern California specimens; in fact, it appears in but

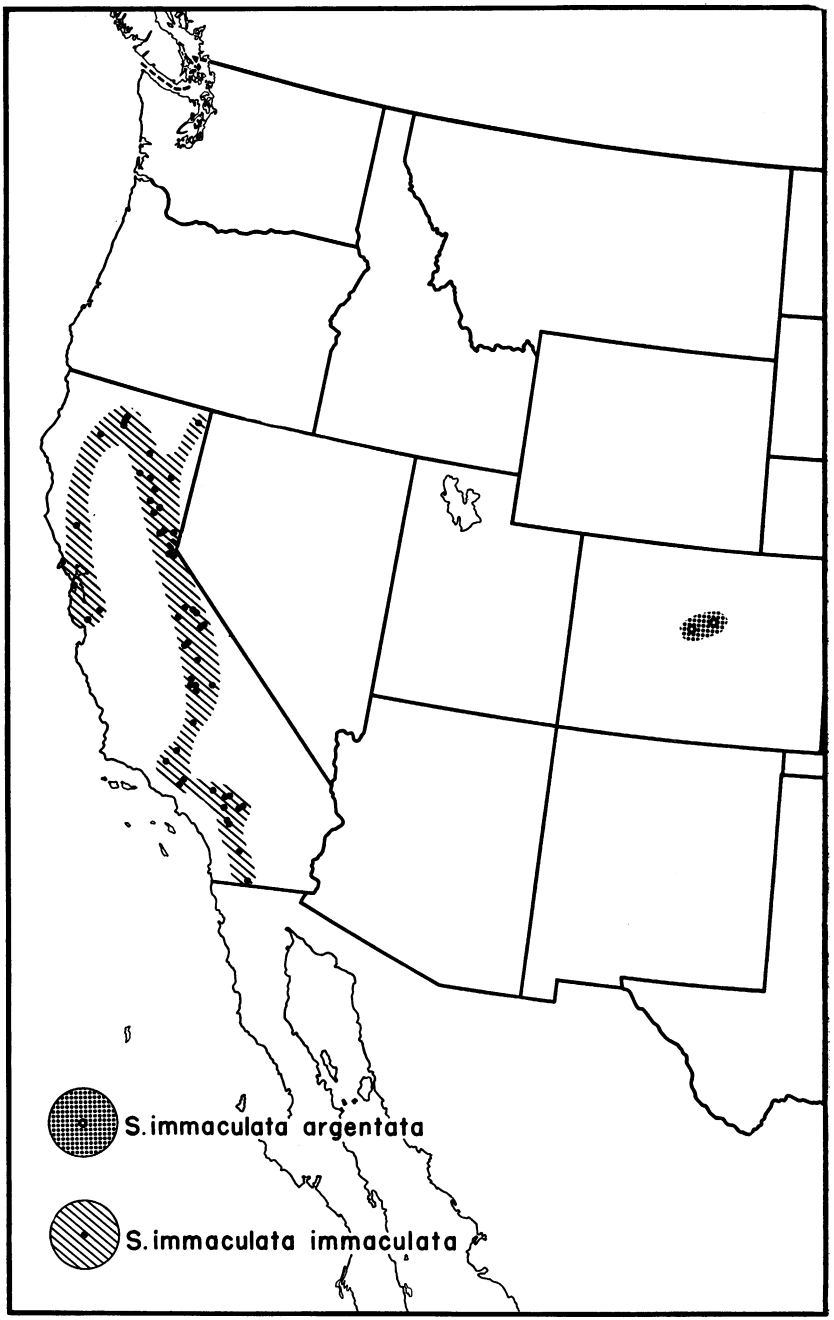

FIG. 2. Distribution of *Sericosema immaculata* Cassino and Swett.

very few of them. Yet, as one goes north, the costal arms tend to become slightly thicker and more truncate, with the entire genitalia becoming slightly larger.

The female genitalia can be recognized by the elongate nature of the apophyses and by the sclerotized nature of the ductus bursae.

Sericosema immaculata argentata Cassino and Swett, new status

Sericosema argentata CASSINO AND SWETT, 1922, Lepidopterist, vol. 3, pp. 153, 190. MCDUNNOUGH, 1938, Check list, p. 157.

This name is being retained for specimens occurring in Colorado. At present, only two examples, both males, are known to the author. Obviously this subspecies, if it is one, cannot be adequately characterized from two specimens. However, it can be stated that these examples are quite similar to those occurring in the Sierra Nevada Mountains of California. The type is relatively heavily marked, while the second specimen (labeled "Como, Park Co., Col. July. Oslar") is lightly marked. The original description matches the type quite well, except for the color used; above it is much paler than "reddish brown," while the under side of the secondaries might be more accurately described as a light gray rather than a "silvery white."

A slide was made of the genitalia of the type by Cassino. As far as can be told from the crushed condition of this slide, the genitalia seem to agree very well with those of California examples.

TYPE: Museum of Comparative Zoölogy, Harvard University, type no. 16834; described from a single male.

TYPE LOCALITY: Platte Canyon, Colorado.

RANGE: Colorado. (See fig. 2.)

Sericosema wilsonensis wilsonensis Cassino and Swett

Sericosema wilsonensis CASSINO AND SWETT, 1922, Lepidopterist, vol. 3, p. 151. MCDUNNOUGH, 1938, Check list, p. 157.

MALE: Head, vertex and front cream to gray brown; palpi cream brown laterally, with scattered brown scales, occasionally light gray dorsally. Thorax gray brown above, ventrally and legs lighter gray, with dark brown scales. Abdomen gray, with scattered dark brown scales.

UPPER SURFACE OF WINGS: Forewings, ground color cream gray to light tawny, with dark brown, smoky brown, and yellow brown scales, usually strigate and suffused with these latter along costal

margin and distad of t. p. line; costa with numerous small dark brown patches of scales, continuing towards radial vein as fine dark brown strigations, becoming indistinct or absent posterior to this; basal area of wing to t. p. line unicolorous ground color, sometimes with scattered darker scales; t. p. line dark smoky brown, prominent, sometimes diffuse distally, arising on costa two-thirds distance from base at right angle, swinging outward in broad curve below radial veins, becoming progressively narrower posteriorly, recurving to vein Cu_2, going straight or with slight outward bulge above vein 2A to inner margin with slight basal bend at four-fifths distance from base; subterminal area somewhat darker than inner portion of wing, broadly suffused with dark brown or smoky brown scales, occasionally these heaviest near apex and more often opposite or just below outward bulge in t. p. line; fringes concolorous or light gray in terminal half, sometimes checkered. Hind wings concolorous with forewings; t. p. line absent, rarely showing through from under surface; subterminal area more or less suffused with dark brown or smoky brown scales, most prominent near outer angle of t. p. line, fading out posteriorly; fringes as on primaries.

UNDER SURFACE OF WINGS: Forewings cream brown to smoky brown, darker than above; costal margin and apex light gray to yellow brown, with numerous dark brown strigations; discal dot faint; t. p. line usually present on costa and extending to end of cell, absent or obsolescent posterior to this; fringes gray or concolorous with wing, checkered or plain. Hind wings light gray brown with numerous dark brown or reddish brown scales; discal dot dark brown, small, rather diffuse; t. p. line dark smoky brown, narrow, somewhat diffuse, arising on costa two-thirds to three-fourths distance from base, extending to vein M_1, absent in center of wing, then reappearing as diffuse patch between veins Cu_1 and 2A; subterminal area concolorous with basal area, rarely with darker area distad of t. p. line near costa; fringes as on forewings. Expanse: 26 to 32 mm.

FEMALE: Like the male, but forewings above often tending to be slightly suffused with smoky brown scales, especially in subterminal area; fringe usually with ends of veins darkened. Under surface of both wings often somewhat more contrastingly marked, with ground color being lighter than in male, rarely shaded with pink or red brown, t. p. line more heavily represented, sometimes shaded distally with dark brown scales, on secondaries the line as

thick as 1 to 2 mm. near costa; hind wings rarely with subterminal area darker than basal portion of wing. Expanse: 26 to 32 mm.

MALE GENITALIA: Uncus not tapering or only very slightly so, slightly bent towards left side medially; socius with from 16 to 24 hairs; valves, costal region asymmetrical, right valve with two arms, left valve with three arms; right valve with elongate arm arising medially in sclerotized area, being approximately three-fourths length of tegumen and one-half to two-thirds width of aedeagus in size, terminally rounded or bluntly pointed, second smaller sclerotized arm three-fifths distance from base projecting a distance subequal to width of basal costal arm; left valve with elongate arm arising medially in sclerotized area, approximately same size as arm on right side but tending to be more pointed and narrower, second smaller sclerotized arm located between basal and terminal arms, smaller than, and one-half the length of, basal arm, terminally truncate or pointed, third sclerotized arm three-fourths distance from base similar to corresponding arm on right valve, shorter than second arm on left valve but similar in outline; valvula with from eight to 12 hairs arising from small tubercles basad of basal costal arm, sacculus lightly haired basad of this, naked at base; juxta subrectangular to triangular anteriorly; aedeagus, apex with short heavy spine, vesica with from five to 10 longitudinal spines of varying length, the shortest being about one and one-half times width of aedeagus and the longest being one-half length of aedeagus, groups of short transverse and longitudinal spines usually separate, sometimes contiguous, the former ranging in number from 24 to 34, the latter from seven to 14.

FEMALE GENITALIA: Ductus bursae membranous, sclerotized between ostium and point of attachment of ductus seminalis, subequal in width to ostium; ductus seminalis from sclerotized swelling one-sixth to one-eighth distance from ostium to bursa copulatrix; bursa copulatrix elongate, broadly attached to ductus bursae with crenulate ridge demarking same, with or without faint rings encircling more or less circular dorsal signum, diameter of the latter being subequal to or slightly larger than diameter of ostium. Dorsum of segment VII one and one-half times to twice as long as dorsum of segment VI; apophyses of segment VIII two-thirds to four-fifths length of dorsum of segment VII; apophyses of ovipositor one and one-quarter times length of dorsum of segment VII.

The male genitalia can be easily separated from those of *juturnaria* and *immaculata* by the asymmetrical number and position of costal arms of the valves, and by the short heavy spine on the apex of the aedeagus. In these respects the genitalia are similar to those of *simularia*, but can be distinguished therefrom by the more elongate costal arms and by the presence of short transverse and longitudinal spines in the vesica of the aedeagus. The female genitalia can be recognized by the elongate nature of the ovipositor apophyses, together with the membranous ductus bursae and elongate bursa copulatrix.

Within the species there is not much difference in genitalia in either males or females. There is some variability in the length, width, and shape of the basal costal arms, but this is, to a large extent, an individual character; the genitalia of the holotype and a paratopotype show considerable variability here, for example. There is a similar amount of variation in the spining of the vesica, especially in the size and number of the short transverse and longitudinal groups. The female genitalia do not show much variability.

EARLY STAGES: Unknown.

TYPE: Museum of Comparative Zoölogy, Harvard University, type no. 16835.

TYPE LOCALITY: Mount Wilson, Los Angeles County, California.

RANGE: Southern California. (See fig. 3.) On the wing during June, July, and August.

FOOD PLANT: Unknown.

REMARKS: Thirty-four specimens examined. Examples of this species are most likely to be confused with small specimens of *juturnaria*. Specimens of the latter usually average about 5 mm. greater in wing expanse than in this species; *juturnaria* also tends to have the superior surfaces of the wings with a slightly lighter ground color. Both species have the upper surface of the forewings marked with a prominent and complete t. p. line and with the subterminal area more or less suffused with dark scales. However, the t. p. line in *wilsonensis* is usually more strongly bent outward, and it meets the inner margin of the wing somewhat farther out than in *juturnaria*. On the average the subterminal area of *wilsonensis* is somewhat less heavily suffused than in *juturnaria*, although this character is variable in both species. The former species tends to have the suffusion most prominent opposite the

outward bulge of the t. p. line, whereas in *juturnaria* it is usually more widespread. The under side of the secondaries offers the

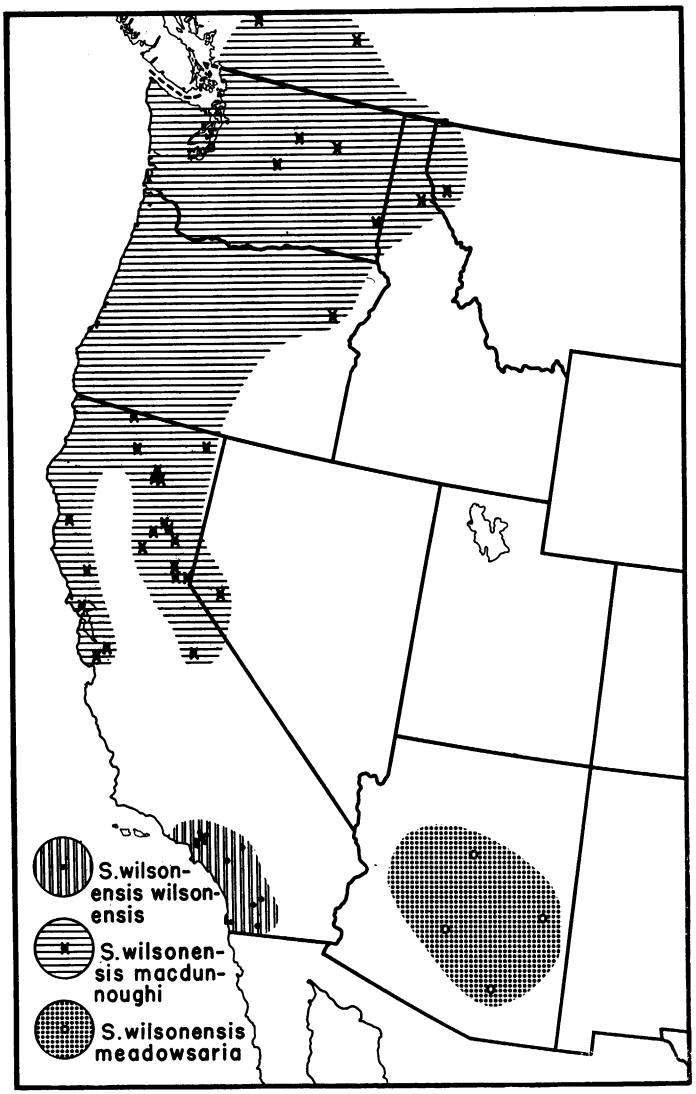

FIG. 3. Distribution of *Sericosema wilsonensis* Cassino and Swett.

best diagnostic characters. In *wilsonensis* the color tends to a dark brown or gray brown, more or less heavily dotted with

darker scales, with the cross line often contrastingly marked and lacking or reduced in the middle third of the wing. In *juturnaria* the color tends to be a more uniform pink, with a smoother appearance, and the cross line is nearly always complete and less contrastingly marked. In some specimens of *wilsonensis* the discal dots of the under side of the wings are quite prominent, more so than in *juturnaria;* however, this character is a rather variable one.

Sericosema wilsonensis can be divided into three subspecies. Typical *wilsonensis,* from southern California, is somewhat intermediate in color and maculation between the Arizona subspecies *meadowsaria* and the subspecies that ranges from central California northward. The best diagnostic characters to separate these three are found on the under side of the secondaries. Nominate *wilsonensis* can usually be distinguished by the fact that the color here is a light gray brown, sometimes shaded with a red brown tone, with numerous, rather small, dark brown strigations; that the t. p. line usually is rather sharply contrasted in color against the ground color of the wing; that it is absent in the center of the wing; and that it is only rarely shaded with dark scales distally.

Sericosema wilsonensis meadowsaria Sperry, new status

Sericosema meadowsaria SPERRY, 1948, Bull. Brooklyn Ent. Soc., vol. 43, p. 89.

MALE: Forewings above tending to be slightly more tawny in color than in the nominate subspecies, only lightly suffused with darker scales; t. p. line tending to be less prominent. Under surface of wings light tan; forewings with t. p. line tending to be indistinct or obsolescent; hind wings with t. p. line indistinct, obsolescent, or absent, subterminal area concolorous with basal area, very rarely darkened distad of t. p. line. Expanse: 28 to 32 mm.

FEMALE: Like the male, but forewings above tending to be more cream colored, only very sparsely suffused with smoky brown scales; subterminal area almost concolorous with basal area; occasionally with pinkish cast to costal margin and fringe. Under surface of both wings also cream colored, very lightly marked with darker scales, slightly shaded with pink or red brown; cross line lightly indicated, not nearly so contrastingly marked as in the nominate subspecies, very rarely thickened with distal shading; hind wings with subterminal area almost never darker than basal portion. Expanse: 28 to 34 mm.

MALE GENITALIA: Valves, costal region of both valves with basal arms somewhat shorter and thicker than in the nominate subspecies, basal arm on right side tending to be truncate apically, occasionally with a tooth at each outer margin, basal arm of left side subequal to one-half the width of corresponding arm on right side; aedeagus, vesica with elongate longitudinal spines sometimes one-half length of aedeagus, groups of short transverse and longitudinal spines often contiguous, sometimes separate.

FEMALE GENITALIA: As in the nominate subspecies.

EARLY STAGES: Unknown.

TYPE: In collection of John L. Sperry, Riverside, California.

TYPE LOCALITY: Todd's Lodge, Oak Creek Canyon, Arizona.

RANGE: Arizona. (See fig. 3.) On the wing during June, July, and August.

FOOD PLANT: Unknown.

REMARKS: Twenty-five specimens examined. This subspecies is the palest in color and the most lightly marked, both above and below, of any of the races. The under side of the secondaries varies from light cream to tan, sometimes lightly shaded with pink or red brown, and less heavily marked with dark strigations; the t. p. line is indistinct, obsolescent, or absent; when present, it is not nearly so contrastingly marked as in the nominate subspecies.

Sericosema wilsonensis macdunnoughi, new subspecies

Figures 6A, 7C

Sericosema wilsonensis MCDUNNOUGH (not Cassino and Swett), 1927, Canadian Ent., vol. 59, p. 266.

MALE: Upper surface of forewings suffused with very pale pinkish brown scales and numerous fine smoky brown strigations, especially along costal margin and in area distad of t. p. line; costa narrowly light gray in outer half of wing; subterminal area contrasting with basal area owing to heavier concentration of dark brown strigations, with apex and area opposite to and just below outward bulge in t. p. line darkest; fringes light gray in terminal half, contrasting owing to light color, checkered; hind wings concolorous with primaries, rather heavily suffused with dark scales in outer portion of wing. Under surface of wings light gray, heavily overlain with dark brown and smoky brown strigations; forewings with costa and apex showing lighter than remainder of

wing; fringes as above. Hind wings beneath very heavily and evenly strigate with dark scales; discal dot and t. p. line not appearing prominently but as thickening of strigations, t. p. line absent in center of wing; subterminal area almost concolorous with basal area, being very slightly darker distad of t. p. line; fringes lighter than wing. Expanse of holotype: 33 mm.

FEMALE: Like the male, but forewings above more cream colored and less heavily marked with dark scales, especially in area basad of t. p. line; t. p. line slightly more prominent and with slightly less outcurve than in male; subterminal area contrasting with basal area owing to even suffusion of orange brown and dark brown scales, the latter concentrated only opposite outward bend in t. p. line; secondaries with maculation of under side showing through faintly. Under surface of wings light gray, only lightly strigate with dark brown scales; forewings only darkened distad of t. p. line, especially in posterior half or two-thirds of wing; secondaries with discal dot and t. p. line showing strongly, the latter obsolescent in middle of wing; subterminal area and fringes concolorous with basal area. Expanse of allotype: 30 mm.

MALE GENITALIA: Valves, costal region of both valves with basal arms tending to be slightly longer and thinner than in the nominate subspecies, basal arm on right side either truncate or bluntly pointed apically, basal arm on left side slightly narrower than width of corresponding arm on right side; aedeagus, groups of short transverse and longitudinal spines in vesica sometimes tending to be reduced in size and number.

FEMALE GENITALIA: As in the nominate subspecies.

TYPES: Holotype, male, Seton Lake, Lillooet, British Columbia, July 8–10, 1926 (J. McDunnough); allotype, female, Seton Lake, British Columbia, July 21, 1933 (J. McDunnough); both in Canadian National Collection, Ottawa. Paratypes, seven males and two females: Seton Lake, British Columbia, July 8–10, 1926, and July 22, 1933 (J. McDunnough); Wallace, Idaho, July 30, 1934, and August 27, 1933; Trout Valley, Montana, August 5, 1941 (G. H. and J. L. Sperry); Pateros, Washington, May 26, 1933; Black Canyon, Washington, June 18, 1933. Paratypes to be distributed as follows: California Academy of Sciences, United States National Museum, Canadian National Collection, the American Museum of Natural History, and collection of John L. Sperry of Riverside, California.

RANGE: British Columbia, Washington, Idaho, and Montana south to central California and adjacent regions of Nevada. (See fig. 3.) On the wing from May through September.

FOOD PLANT: Unknown.

REMARKS: Eighty-three specimens examined. As in the other subspecies, there is a fair amount of variability in the color and maculation, especially on the under side of the hind wings. The superior surfaces of the wings tend to be more shaded with pinkish brown scales and with more numerous fine smoky brown strigations, especially in the males; this gives the wings a somewhat darker appearance than in the other subspecies. The upper surface of the wings in the female, on the other hand, tends to be less heavily marked with dark scales than in the male, and there is usually more of a contrast in color between the basal and distal parts of the wings. The under surface of the secondaries varies from a light gray to gray brown and red brown, all heavily overlain with numerous dark strigations in the male, less heavily so in the female. The t. p. line is rather variable, ranging from being obsolescent to completely present. In the males, it is complete in about one-half the specimens examined, obsolescent between veins M_1 and Cu_1 in one-quarter, and altogether absent in this area in the remaining one-quarter; in the females, the t. p. line is absent in the center of the wing in a little over three-sevenths of the specimens, obsolescent medially in a little less than three-sevenths, and complete in only one-seventh of the specimens examined. The subterminal area is rather variable also, ranging from being concolorous with the basal portion of the wing, to having a slight dark shading distad of the t. p. line, to having part or all of the subterminal area suffused with reddish brown or dark smoky brown scales. Expanse: males, 26 to 33 mm.; females, 28 to 35 mm.

This subspecies can be distinguished from the other races by the slightly darker color of the wings above, by the darker under side of the secondaries and usually with more and heavier dark strigations, by the tendency of the t. p. line to be complete, and the fact that the subterminal area is often darker than the basal area of the wing.

This subspecies is named in honor of my friend and colleague, Dr. J. H. McDunnough, who captured the types and recorded them in the literature. This name is purposely misspelled as an aid in pronunciation.

Sericosema simularia (Taylor)

Figure 6B, 7D

Enemera (sic!) simularia TAYLOR, 1906, Ent. News, vol. 16, p. 190. BARNES AND MCDUNNOUGH, 1912, Canadian Ent., vol. 44, p. 275.

Sericosema simularia, BARNES AND MCDUNNOUGH, 1917, Check list, p. 115. CASSINO AND SWETT, 1922, Lepidopterist, vol. 3, p. 152. MCDUNNOUGH, 1938, Check list, p. 157.

MALE: Head, vertex and front light gray to gray brown palpi light reddish brown laterally, dorsal surface concolorous with front. Thorax light gray to gray brown above, ventrally and legs light gray with scattered brown scales. Abdomen light gray with brown scales.

UPPER SURFACE OF WINGS: Forewings, ground color light tan, with orange brown, reddish brown, dark brown, or smoky brown scales, usually strigate and suffused with these latter along costal margin and distad of t. p. line; costal region with pinkish to yellow brown cast, with numerous small brownish patches of scales continuing towards radial vein as fine strigations, becoming obsolescent posterior to this, often with fairly prominent mark at one-third distance from base; basal area of wing to t. p. line unicolorous, unmarked except as above noted; t. p. line smoky brown, prominent to obsolescent, rather narrow except at origin on costa one-half to three-fifths distance from base, going at outward oblique angle to vein M_2, turning sharply posteriorly, often fading out before reaching inner margin, going almost in straight line with slight outward bulge above vein 2A and with slight basal bend to inner margin at three-fourths distance from base; subterminal area often heavily suffused with smoky brown below apex and between veins M_3 and Cu, fading out posteriorly; fringes concolorous, lighter gray in terminal half, sometimes marked at end of veins. Hind wings concolorous with forewings; t. p. line usually absent, rarely indicated by few brown scales, or showing through from under surface; subterminal area often suffused with smoky brown scales, most prominent near outer angle, fading out posteriorly; fringes as on primaries.

UNDER SURFACE OF WINGS: Forewings brown to smoky brown, darker than above; costal margin and apex light gray to reddish brown, with numerous dark brown strigations; discal dot faint; t. p. line from prominent brown patch on costa, otherwise indistinct or obsolescent, course as above; subterminal area suffused with smoky brown as above; fringes as above. Hind wings light

gray, with numerous dark brown scales in basal region; discal dot faint; t. p. line prominent, dark smoky brown, broadly diffuse outwardly, arising on costa about one-half distance from base at right angle, going to inner margin three-fifths distance from base, sharply bent outwardly between veins R and Cu_1 with smaller outward bend at vein 2A; terminal half of wing broadly shaded with smoky gray from t. p. line, gradually becoming light gray near outer margin; fringes as on primaries. Expanse: 25 to 32 mm.

FEMALE: Like the male; forewings above tending to be less suffused with dark scales; t. p. line usually present, distinct, although sometimes obsolescent; fringes tending to be marked at ends of veins. Under surface of forewings tending to be more shaded with reddish brown; t. p. line present, fading out just before reaching inner margin; fringes as above. Expanse: 28 to 35 mm.

MALE GENITALIA: Uncus tapering, apex swollen, especially on right side, rather strongly bent towards left side medially; socius with from 12 to 20 hairs; valves, costal region asymmetrical, right valve with costal arms separated by width of aedeagus, left valve with medial swelling and with costal arms approximated terminally; right valve with prominent arm arising two-thirds length of costa from base, being approximately one-half length of tegumen and wider than width of aedeagus in size, terminally rounded, second smaller sclerotized arm two-thirds distance from base projecting from valve less than width of aedeagus; left valve with broad triangular medial swelling, first costal arm located between median swelling and terminal arm, three-quarters distance of valve from base, height less than width of aedeagus, broadly rounded apically; second costal arm five-sixths distance from base similar to corresponding arm on right valve, subequal in size to first costal arm; valvula and sacculus lightly haired medially; juxta subtriangular anteriorly, sometimes scarcely differentiated; aedeagus, apex with short spine, vesica armed with from four to seven longitudinal spines ranging from one-third to one-half length of aedeagus, short transverse and longitudinal spines absent.

FEMALE GENITALIA: Ductus bursae sclerotized, membranous for approximately twice diameter of ostium anterior to point of attachment of ductus seminalis, membranous area and adjacent anteriorly sclerotized area convoluted, anterior half of ductus smoothly sclerotized and of equal width; ductus seminalis from

sclerotized swelling one-eighth distance from ostium to bursa copulatrix; bursa copulatrix ovoid, broadly attached to ductus

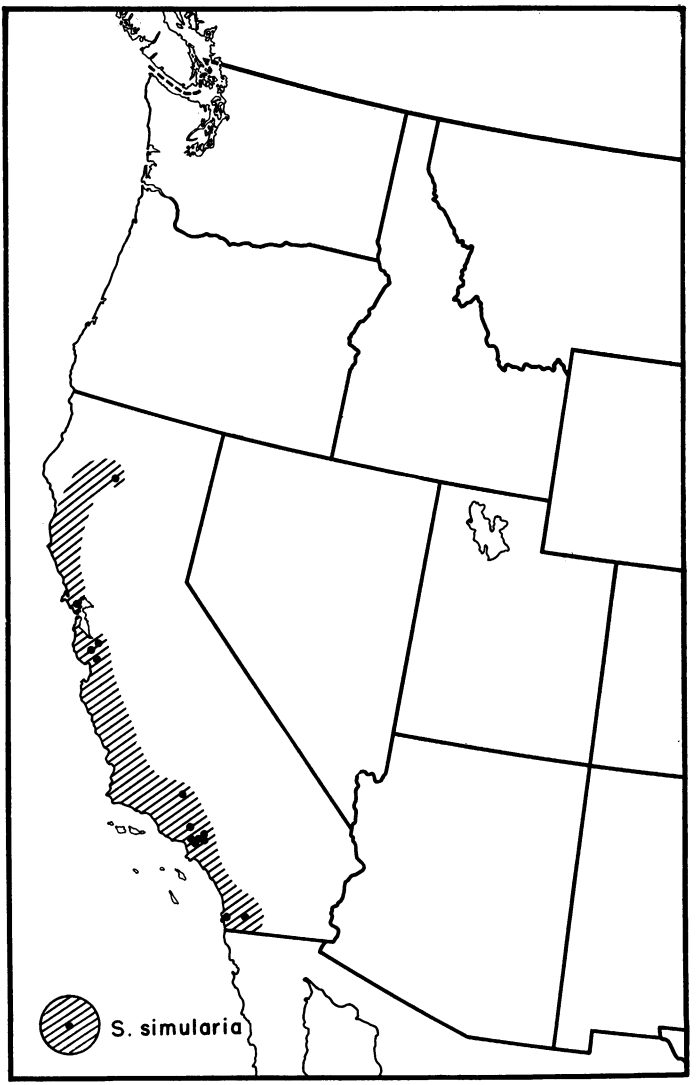

FIG. 4. Distribution of *Sericosema simularia* (Taylor).

bursae, with or without faint rings encircling more or less circular dorsolateral signum, diameter of the latter slightly larger than

diameter of ostium. Dorsum of segment VII one and one-third times as long as dorsum of segment VI; apophyses of segment VIII one-half length of dorsum of segment VII; apophyses of ovipositor subequal in length to dorsum of segment VII.

EARLY STAGES: Unknown.

TYPE: In United States National Museum. Described from two worn specimens; the lectotype, hereby designated, is the specimen labeled by Taylor as "Type 1." This specimen is a female, with genitalia on slide HWC 1802.

TYPE LOCALITY: Pasadena, California.

RANGE: California, extending from San Diego County up the coastal mountain ranges as far north as Shasta County. (See fig. 4.) On the wing from May through August.

FOOD PLANT: Unknown.

REMARKS: Eighty-three specimens examined. This species is the one least likely to be misidentified. The under side of the secondaries is very distinct, having the light gray basal half sharply delimited from the gray brown terminal portion by the outwardly toothed dark brown cross line. On the upper surface of the wings, the ground color is slightly darker than in the other species, and the more strongly angled t. p. line of the forewings is also characteristic.

The male genitalia are similar to those of *wilsonensis* in that the costal region of the valves is asymmetrical, but in this species the arms are much shorter and broader. The aedeagus is unique in completely lacking any short transverse and longitudinal spines in the vesica.

The female genitalia are distinguished by the short apophyses, and by the membranous and convoluted nature of the ductus bursae near the point of attachment of the ductus seminalis.

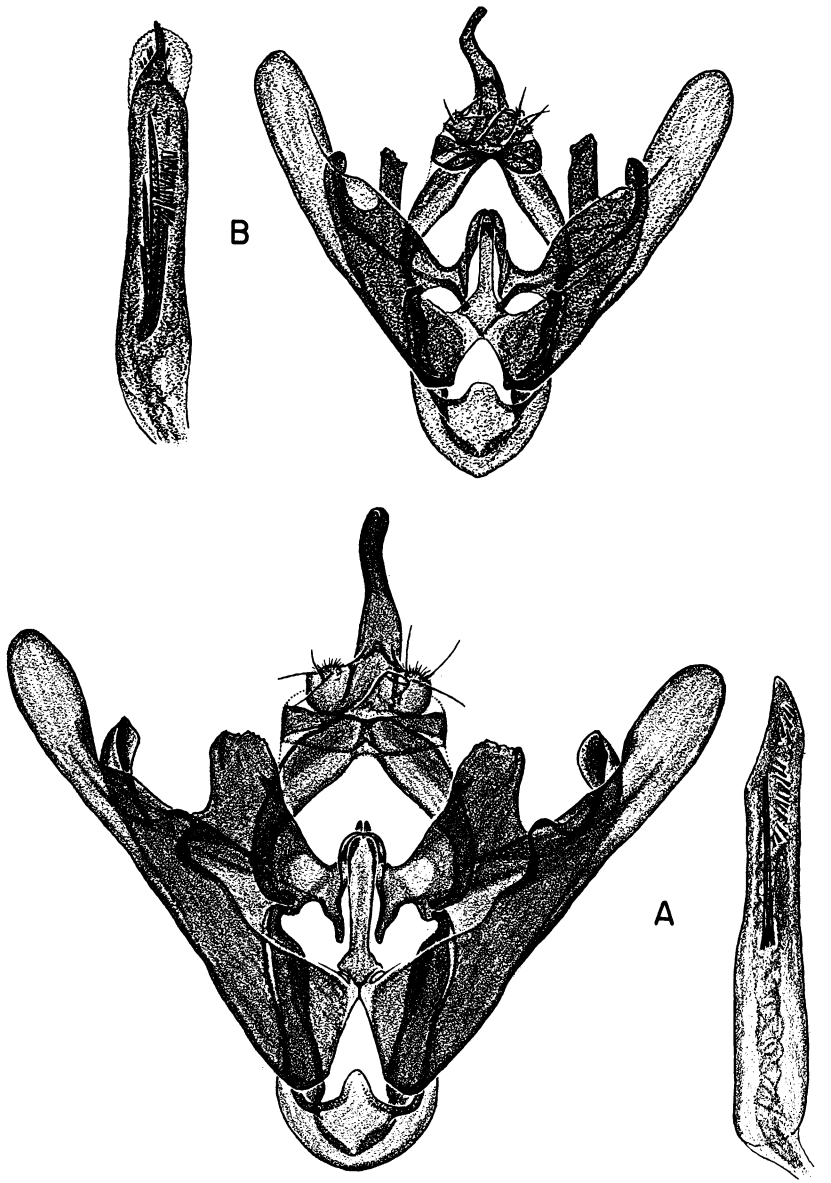

FIG. 5. Male genitalia of *Sericosema*. A. *S. juturnaria* (Guenée), Keddie, Plumas County, California, June 17, 1941 (F. H. Rindge). B. *S. immaculata immaculata* (Barnes and McDunnough), Plumas County, California, July, 1905.

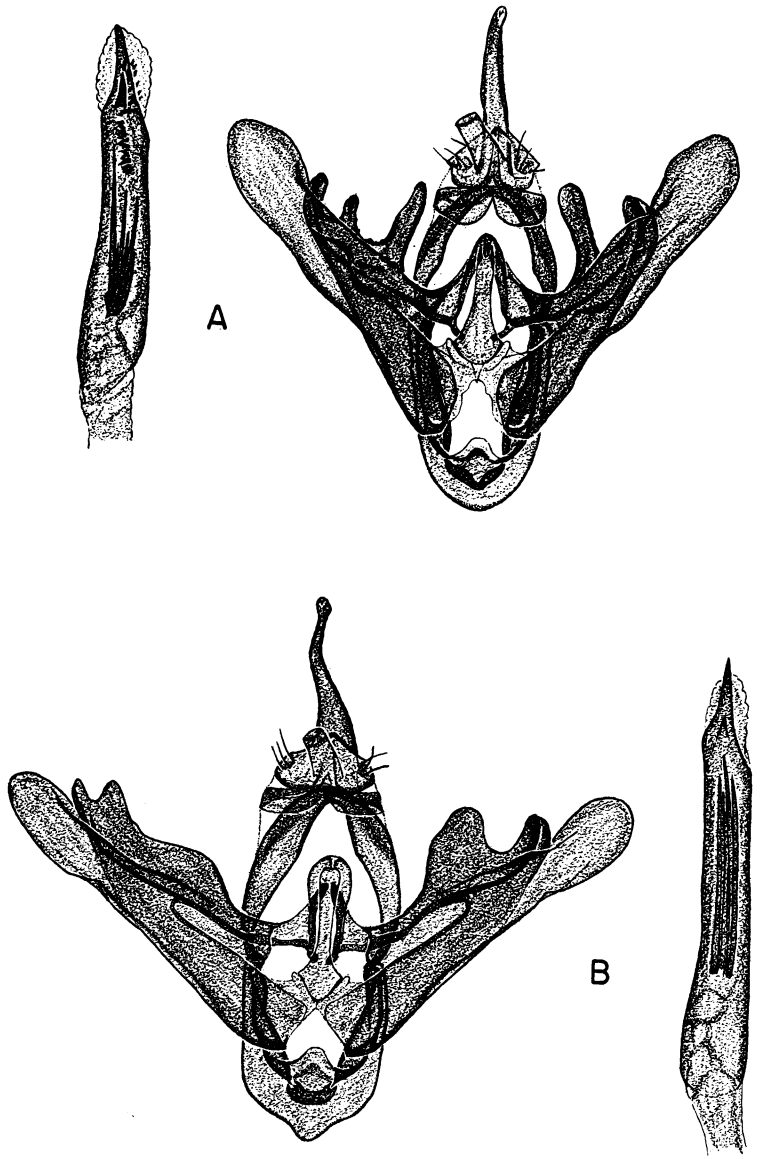

FIG. 6. Male genitalia of *Sericosema*. A. *S. wilsonensis macdunnoughi* Rindge, San Antonio Ranger Station, Santa Clara County, California, July 21, 1948 (R. van den Bosch). B. *S. simularia* (Taylor), San Diego, California, June 5, 1910 (George H. Field).

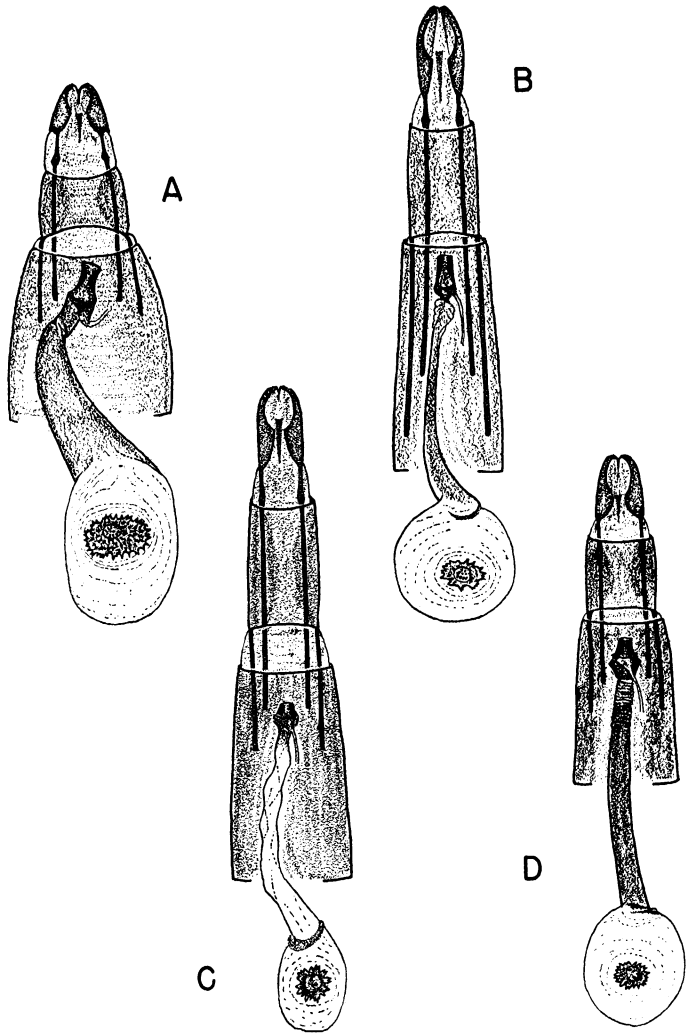

FIG. 7. Female genitalia of *Sericosema*. A. *S. juturnaria* (Guenée), Placer County, Sierra Nevadas, California, *ex* collection Henry Edwards. B. *S. immaculata immaculata* (Barnes and McDunnough), Sierra Nevadas, California, *ex* collection Henry Edwards. C. *S. wilsonensis macdunnoughi* Rindge, Keddie, Plumas County, California, July 13, 1941 (F. H. Rindge). D. *S. simularia* (Taylor), San Antonio Ranger Station, Santa Clara County, California, July 17, 1948 (R. van den Bosch).