

NORTH AMERICAN CRAMBUS

I. THE SILVERY-STRIPED SPECIES OF CALIFORNIA (PYRALIDIDAE)

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For a number of years the author has been preparing a revision of the North American *Crambus*, which is now well on the way to completion. Circumstances unfortunately make it necessary to publish in a number of short papers, of which this is the first, instead of in one large one.

During the course of this study, material has been loaned to the author by nearly every museum in North America, the entire collections of most of which have been studied. The authorities of the British Museum very kindly sent their collection of North American *Crambus*, exclusive of types, as well as some exotic material. Mr. G. A. Bisset of the British Museum has been very generous with his time, making comparisons with the Zeller, Walker and Grote types and preparing numerous genitalia dissections. Mr. Carl Heinrich of the U. S. National Museum has also been especially kind, particularly in turning over to the author much work done on the genus by himself and the late Geo. G. Ainslie.

Many private collectors have coöperated most wholeheartedly. Although acknowledgments will be made in the appropriate places, special mention must be made of the generosity of Mr. and Mrs. John L. Sperry of Riverside, California.

Probably 90 percent of the North American *Crambus* material in the collections of the world has been studied. On the basis of the material studied, therefore, this revision may be considered as sufficiently thorough.

KEY TO SPECIES BY PATTERN OF FORE-WING

In practically all cases there are recognizable color and pattern characters for the differentiation of *Crambus* species; but in many instances these are relatively very slight and are difficult to use for one who is not well acquainted with the species. The following key should therefore be used with caution; and whenever possible determinations should be made by means of the genitalia. In both sexes these organs offer clear-cut and unmistakable characters.

FORE-WING WITH A SHARPLY DEFINED, PEARLY- OR SILVERY-WHITE
STRIPE RUNNING FROM BASE WELL TOWARD OUTER MARGIN.

1. A white patch basad of the subterminal line and distad and dorsad of the tip of the silvery-white stripe; dorsal margin lighter than ground-color, diffusely shaded with whitish; costo-apical markings brownish-yellow, not fuscous; inter-venular lines noticeably darker than ground-color, with semi-metallic, leaden scaling *pascuellus* (L.)
1. No distinct white patch distad and dorsad of tip of stripe; if there is a light shade here, then this is continued on to the outer margin; costo-apical markings dark brown or fuscous .. 2
2. Ground-color brownish-yellow with inter-venular lines darker; stripe very sharply pointed; no small, pointed, pearly-white dash below R_5 between costo-distal angle of stripe and costa; no triangular, white tooth from dorsal margin of stripe; submarginal line very close to outer margin, especially beyond end of stripe *braunellus* n. sp.
2. Ground-color darker or, if light, not yellow; a small, pointed, pearly-white dash usually present below R_5 between costo-distal angle of stripe and costa, sometimes joined to stripe; triangular white tooth from dorsal edge of stripe often present; submarginal line further basad from outer margin .. 3
3. A distinct white or yellowish-white shade connecting end of stripe with outer margin of wing, fusing with white, marginal subapical mark; this shade often obliterating submarginal line; area below this shade, between submarginal line and outer margin, distinctly light grey; black marks between ends of veins in this area sometimes obliterated, when present forming slender lines; small, pointed, pearly-white dash below R_5 between costo-dorsal angle of stripe and costa of wing, rarely present; stripe with at most a rudimentary dorsal tooth, usually with none; ground-color bright golden-brown *sperryellus* n. sp.
3. Whitish shade beyond end of stripe poorly defined, if present at all; fuscous, triangular apical mark proportionately larger, so that white mark below this is proportionately smaller; black marks between ends of veins forming elongated dots rather than slender lines; small, pointed, pearly-white line below R_5 , between costo-dorsal angle of stripe and costa, usually present; dorsal tooth of stripe often present, sometimes very strong; ground color dark or light, but not usually bright golden-brown 4
4. Ground-color dark grey-brown; all dark markings heavy; stripe with strong dorsal tooth; stripe heavily outlined with dark shading, especially dorsally in the angle between the tooth and the distal part of the stripe; subterminal line strongly curved distad at costa, heavy and dark there; stripe not infrequently more or less filled in with grey-brown scaling, or considerably narrowed *occidentalis* Grote
4. Ground-color usually lighter, less greyish-brown; dorsal tooth never very strong, nor heavily accentuated with dark scaling below it; subterminal line not bent strongly distad at costa; dark markings all less extensive
..... *leachellus* (Zincken) subspecies, 5

5. Size large, length of fore-wing 14-17 mm.; ground-color lighter brown, often very pale; stripe usually broad, somewhat blunt at tip; dorsal tooth of stripe usually more prominent than in following form *leachellus cypridalis* Hulst
5. Size smaller, length of fore-wing 11-13.5 mm.; ground color darker brown; stripe narrower than in *cypridalis*, with dorsal tooth very small or absent; stripe usually more sharply pointed than in other *leachellus* forms; stripe more widely separated from costa by dark brown scaling *leachellus rickseckerellus* n. subsp.

KEY TO SPECIES BY MALE GENITALIA

1. Uncus a single structure, often bearing short spines but never long tufts of spines or hairs 2
1. Uncus a pair of rounded pads which bear long, pointed hair-pencils (Fig. 6) *pascuellus* (L.)
2. Costa of harpé with a long, heavily chitinized spine; sacculus of harpé with a short, slender spine; oedeagus extending considerably basad of attachment of ductus seminalis 4
2. Costa with no long, free spine; sacculus large, with long, free arm or spine; oedeagus extending but little basad of attachment of ductus seminalis 3
3. Uncus short, stout, flattened, with a mid-dorsal keel, truncate; sacculus not heavily toothed; saccus extending far cephalad, bilobed; gnathos short (Fig. 4) *braunellus* n. sp.
3. Uncus long, slender, simple; gnathos long and slender; sacculus with a number of strong teeth along its dorsal margin, and many smaller teeth along its ventral margin; saccus not extending far cephalad, only slightly bilobed (Fig. 5) *sperryellus* n. sp.
4. Portion of oedeagus cephalad of attachment of ductus seminalis very long, curled in a flat spiral of at least one complete turn; free arm of costa of harpé not extending far dorsad of dorsal edge and apex of cucullus (Fig. 1-2) *leachellus* (Zincken) subspecies
4. Portion of oedeagus cephalad of attachment of ductus seminalis shorter, not completing a full turn of a spiral; free arm of costa lying further dorsad of dorsal edge and apex of cucullus (Fig. 3) *occidentalis* Grote

KEY TO SPECIES BY FEMALE GENITALIA

1. Ostium protruding caudad far beyond genital plate (Fig. 11) *braunellus* Klotz
1. Ostium protruding caudad little if any beyond genital plate 2
2. Ductus bursae extremely long, flatly coiled a number of times (Fig. 8) *leachellus* forms and *occidentalis*; see text
2. Ductus bursae sometimes bent or twisted, but not coiled a number of times 3

3. Ostium a simple, transverse plate; caudal half of ductus bursae very thick and heavily chitinized (Fig. 10) .. *sperryellus* Klots
3. Ostium more complex, consisting of a number of rounded plates; ductus bursae thin, lightly chitinized (Fig. 7) .. *pascuellus* (L.)

CHECK LIST OF SPECIES

1. *pascuellus* (L.)
floridus Zeller
hastiferellus Walker (*partim*—♀♀)
2. *leachellus* (Zincken)*
pulchellus Zeller
lativittellus Zeller
hastiferellus Walker (*partim*—♂♂)
 (a) *cypridalis* Hulst
 (b) *rickseckerellus* Klots
3. *occidentalis* Grote
agricolellus Dyar
4. *sperryellus* Klots
5. *braunellus* Klots

DESCRIPTIONS, DISCUSSION, ETC.

1. CRAMBUS PASCUELLUS (Linnaeus) (Figs. 6 and 7)

Tinea pascuellus Linnaeus, 1758, *Systema natura*, Editio decima, Holmiae [Stockholm], p. 535.

Crambus hastiferellus Walker, 1863, *Catalogue of the Lepidoptera Heterocera in the British Museum [in] List of the Specimens of Lepidopterous Insects in the Collection of the British Museum . . . London, 1854-1866, vol. 27, p. 155-156.*

Crambus floridus Zeller, 1872, *Beitrage zur Kenntniss der nord-amerikanischen Nachtfalter . . . Verh. der K.-K., Zool.-Bot. Ges. im Wien*, 22:537.

Crambus pascuellus Fernald, 1896, *The Crambidae of North America*, Amherst, Mass., p. 27-28, pl. I, fig. 3.

Crambus floridus = *pascuellus* (L.) Fernald, 1896, loc. cit.

Crambus floridus Forbes, 1920, *The Lepidoptera of New York and Neighboring States . . . Ithaca, N. Y.*, p. 600.

* I have no record of the occurrence of the nymotypical subspecies, *C. leachellus leachellus* in California.

Pascuellus is an extremely widely distributed species, occurring throughout the northern parts of both the Palaearctic and the Nearctic regions. It does not appear to have evolved any subspecies or races despite this wide range, in which it stands almost alone in its genus. A great many of the North American *Crambus* are closely related to Palaearctic species; in some cases the differences are only racial, although in most cases they seem to have progressed to the point of being specific. However, in comparing specimens of *pascuellus* from England, France and Germany with a large series from North America, I have been unable to find any constant difference that might serve to validate Zeller's name *floridus* as a race.

Pascuellus is a common species in the northern parts of both Palaearctic and Nearctic regions. It appears to be characteristic of the Canadian Life Zone in North America, although occasional specimens may occur south of the true limits of this zone. In the Rocky Mountains I have found it locally very common in grassy meadows and swamps, but not in acid bogs.

Hastiferellus Walker is a name that has caused a great deal of trouble to students of North American *Crambus*. Mr. G. A. Bisset of the British Museum has very kindly compared specimens and genitalia dissections, which I sent to him, with Walker's type specimens, so that we are now able to clear up the trouble. Walker's three female cotypes are specimens of *pascuellus*. The five males are referable to *leachellus* (Zincken), see following.

Mr. Bisset has also kindly compared specimens sent by me with the single type of *floridus* that remains in the British Museum. I am thus sure of the authenticity of my determination of this name. This specimen is a female; in the absence of knowledge as to the fate of the male specimen mentioned in the original description it seems best to fix it hereby as the lectotype.

DISTRIBUTION, GENERAL—Northern Europe, Asia and North America, extending southward in mountainous regions. New York to California, not occurring in dry, hot plains areas.

DISTRIBUTION, CALIFORNIA — Seneca, Plumas County, 16 June, 18 July; Sisson, July; Eureka, 4-6 June; Truckee, 1-7 July; Siskiyou County.

TYPE LOCALITIES—Sweden (?) (*pascuellus*); Beverly, Mass. (*floridus*); Nova Scotia (*hastiferellus*).

LOCATION OF TYPES—unknown (*pascuellus*); 1 ♀ in British Museum; 3 ♀ ♀ in British Museum (*hastiferellus*).

FIXATION OF TYPES—*floridus*: the ♀ in the British Museum is hereby chosen as lectotype; *hastiferellus*: see below under *leachellus* Zincken.

2. CRAMBUS L. LEACHELLUS (Zincken)
(Figs. 2 and 9)

- Chilo leachellus* Zincken, 1818, Magazin der Entomologie, Halle, 3:114.
- Crambus pulchellus* Zeller, 1863, Chilodinarum et Crambidarum genera et species, Berlin, p. 18, no. 13.
- Crambus lativittellus* Zeller, 1863, loc. cit., p. 18, no. 13.
- Crambus leachellus* Zeller, 1863, loc. cit., p. 18-19, no. 14.
- Crambus involutellus* Zeller, 1863, loc. cit., p. 18, no. 14, (nec *Crambus involutellus* Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 12:203, = *C. praefectellus* (Zincken).)
- Crambus hastiferellus* Walker, 1863, Cat. Lep. Heteroc. Brit. Mus. . . ., 27:155-156 (*partim*, ♂ ♂).
- Crambus leachellus* Fernald, 1888, Entomologica Americana, 4:44.
- Crambus leachellus* Felt, 1894, Bull. 64, Cornell University Agr. Exp. Sta., p. 71-73, pl. II, VII, XII, XIII (genitalia, pattern, biology, etc.).
- Crambus leachellus* Fernald, 1896, The Crambidae of North America, Mass. Agr. College, Amherst, Mass., p. 29-30, pl. I, fig. 2.

As far as I know the nymotypical subspecies does not occur south of Vancouver, B. C., being replaced southward by the subspecies *cypridalis* Hulst and *rickseckerellus* Klots (see ff.). It is possible, however, that *l. leachellus* may be found in some of the mountainous regions in the northern part of California.

L. leachellus is treated here at some length because of the great amount of misunderstanding that has prevailed regarding the synonymy and application of this name.

Zeller's determination of *leachellus* Zincken may be taken as probably accurate, since he states (loc. cit., p. 19) that he saw Zincken's specimen ("ego in ipsius specimine . . . vidi . . ."). As far as I have been able to determine, the Zincken collection was broken up and sold at auction in Vienna in 1857. Probably all authentic material of *leachellus* has long been lost.

Pulchellus Zeller applies to this name as a synonym, probably a minor variant. Mr. Bisset kindly compared specimens for me with the type, a male, in the British Museum. Likewise into the synonymy must go the hitherto unrecognized name of *lativittellus* which Zeller validated in discussing a female specimen of Kollar's. Possibly this specimen is in the Vienna Museum.

The male specimens of Walker's *hastiferellus* belong here, as is evidenced by comparisons with them made for me by Mr. Bisset. There are five of these in the British Museum, of which one has been chosen lectotype.

Zeller was incorrect in placing Clemens' *involutellus* as a synonym of *leachellus*. I have studied the type of *involutellus*, which is in the Academy of Natural Sciences of Philadelphia; the name is a synonym of *praefectellus* (Zincken), an Eastern species which does not occur west of the Great Plains.

DISTRIBUTION, GENERAL—North America, from British Columbia to Texas and Florida, exclusive of the West Coast States and the Great Basin.

DISTRIBUTION, CALIFORNIA—Probably does not occur in the state, being replaced by *l. cypridalis* and *l. rickseckerellus*.

TYPE LOCALITIES—Unknown (*leachellus*); Illinois (*pulchellus*); unknown (*lativittellus*); Nova Scotia (*hastiferellus*).

LOCATION OF TYPES—Lost? (*leachellus*); 1 ♂ in British Museum (*pulchellus*); unknown, possibly Vienna (*lativittellus*); ♂ lectotype and 4 ♂ cotypes in British Museum (*hastiferellus*).

2a. CRAMBUS LEACHELLUS CYPRIDALIS Hulst

(Fig. 1)

Crambus cypridalis Hulst, 1886, Trans. Amer. Ent. Soc., 13:165.

Crambus cypridalis Fernald, 1896, The Crambidae of North America, Mass. Agr. College, Amherst, Mass., p. 26, pl. 3, fig. 1.

Cypridalis is a distinct subspecies of *leachellus*, and may even have differentiated far enough, in the opinion of some workers, to be regarded as a distinct species. It averages considerably larger in size than *l. leachellus*, with a much paler ground-color of the fore-wing on which darker streaking between the veins stands out quite distinctly. In the male genitalia the free arm of the costa of the harpé is much longer than in *l. leachellus*, often or even exceeding the apex of the cucullus. I am not able to say what the characters of the female genitalia are, for although I have studied a considerable number of specimens, they are all males.

In both *l. leachellus* and *l. cypridalis* there is a certain amount of variation in the length and coiling of the basal part of the oedeagus. I have seen one specimen of *l. leachellus* from Florida and one from Kansas in which this does not make a complete coil, which is a normal characteristic of *occidentalis*. In the great majority of specimens, however, this seems to be a reliable character for differentiating *leachellus* and *occidentalis*, as noted in the key.

There appears to be very little overlapping of the ranges of *l. leachellus* and *l. cypridalis*. The former is common at Vancouver; but I have seen one specimen from there that on the basis of color and size would be referable to *cypridalis*.

DISTRIBUTION, GENERAL—Great Basin States and West Coast States south at least to the San Bernardino Mountains, Calif.

DISTRIBUTION, CALIFORNIA—Lower Klamath Lake; Plumas County; Mendocino; Santa Barbara; Sheep Creek, San Bernardino Mountains, October 26.

TYPE LOCALITY—Utah.

LOCATION OF TYPE—Rutgers University (1 ♂).

2b. CRAMBUS LEACHELLUS RICKSECKERELLUS, new subspecies.
(Fig. 8)

Length of fore-wing, 11.5-13.5 mm. Head and palpi, dull, light brown. Dorsum of thorax more shining brown.

FORE-WING—Ground-color brown, somewhat lustrous, darker around silvery-white stripe, especially between it and costa. Silvery-white stripe narrow, straight, with only a rudimentary dorsal tooth, tapering gradually to a sharp point well basad of submarginal line. A number of slender, intervenular lines of dull, metallic scaling run from stripe toward submarginal line; these all tend to be rudimentary except the one below R_5 (costad of stripe) which often forms a spindle-shaped white dash. A pale, whitish shade running from end of stripe to outer margin. Submarginal line of dull, semi-metallic shading, margined inwardly with darker brown scales. Basad of this on costa is a short, broad, white stripe. Apical area white, with a narrow, fuscous, triangular patch that is connected basally with a dark line running to costa distad of submarginal line. Area between submarginal line and outer margin and below subapical white shade whitish, flecked with dark brown scales. Intervenuar dots in this area blackish, elongated. Fringes somewhat lustrous, light brownish, lighter subapically.

HIND-WING—Very pale brown, slightly darker apically and terminally, fringes somewhat paler.

COMPARISON WITH *L. LEACHELLUS*:

1. Pattern of fore-wing—The silvery-white stripe is narrower and more acutely pointed, being thus separated from the costal margin by a wider area of dark brown scaling.

2. Male Genitalia—The free arm or spine of the costa is longer than in *l. leachellus*, being sufficiently long if straightened out to reach or exceed the apex of the cucullus; the cucullus seems to be slightly narrower toward its apex than in *l. leachellus*.

3. Female Genitalia—The dorsal edge of the ostium does not protrude further than the ventral edge; while in *l. leachellus* the dorsal edge seems to protrude further quite consistently. The ostium narrows to the ductus bursae less abruptly than in *l. leachellus*, and appears to be proportionately somewhat greater in diameter. A short distance above the bursa copulatrix the ductus bursae makes an abrupt bend cephalad, becoming more

lightly chitinized, and then runs almost directly to the bursa. At this point there is, in *l. leachellus*, a distinct swelling; in *l. rickseckerellus* this swelling appears to be absent.

From *l. cypridalis* it is easy to differentiate *rickseckerellus* at a glance by the characters of size, color and pattern given in the key and diagnosis. No consistent difference in the male genitalia has been noted between these two subspecies. Owing to the lack of females of *cypridalis* nothing can be said about the characters of the female genitalia.

It is possible that *rickseckerellus* may eventually be proven to be a species distinct from *leachellus*. On the other hand it may be merely a distinct variety (although I doubt this) or a habitat subspecies. There is needed a good deal of collecting and life-history work on these forms. However there seems little room for doubt that *rickseckerellus* is a distinct entity of some sort, worthy of a name.

Holotype male, allotype female, 4 male and 2 female paratypes, all San Diego, Calif., November (Ricksecker coll.). One male paratype, Santiago (sic!) Cal., (W. S. Wright, coll.).

LOCATION OF TYPES—Holotype, allotype, 2 male and 1 female paratypes in the American Museum of Natural History; 1 male paratype in the U. S. National Museum; 1 male paratype in the Los Angeles Museum; 1 female paratype in the British Museum; 1 male paratype in the author's collection.

3. CRAMBUS OCCIDENTALIS Grote (Fig. 3)

Crambus occidentalis Grote, 1880, Canadian Entomologist, 12:16.

Crambus occidentalis Grote, 1881, Canadian Entomologist, 13:66-67.

Crambus occidentalis Fernald, 1896, The Crambidae of North America, Mass. Agr. College, Amherst, Mass., p. 23, pl. 2, fig. 3.

Crambus agricolellus Dyar, 1923, Insecutor Inscitiae Menstruus, 11:28.

On the basis of the characters set forth in the keys, and of its wide distribution in California, *occidentalis* must be regarded as a separate species, although one closely related to *leachellus*.

Mr. G. A. Bisset very kindly compared specimens, which I sent to him, with the type of *occidentalis* in the British Museum. I have compared the same specimens with the type series of *agricolellus* Dyar in the U. S. National Museum. There is no doubt that the latter is conspecific with the former.

There is, however, a faint possibility that *agricolellus* may be a valid, although extremely close, race of *occidentalis*. I have been able to study far too few specimens from the northern part

of the range of the species, so cannot be sure one way or the other. The northern specimens average a trifle larger and lighter in color than those from San Diego. The latter show striking uniformity except that in an occasional specimen the silvery white stripe is more or less filled in with brown scaling. Some of the northern specimens, however, are just as small and dark as nearly any of the southern.

Available for study have been 10 specimens from the general vicinity of San Francisco, 3 others known only as from "California" and 117 from San Diego. All of these 130 specimens are males, which is a most curious phenomenon.

DISTRIBUTION, GENERAL—California.

DISTRIBUTION, CALIFORNIA — San Francisco; Berkeley, 14 October; Petaluma, 15 October; Sauzalito (sic!) 8-21 October; San Diego, November.

TYPE LOCALITIES — Sauzalito (sic!) (*occidentalis*); San Diego (*agricolellus*).

LOCATION OF TYPES—British Museum (δ lectotype, *occidentalis* + 2 cotypes); U. S. National Museum (*agricolellus*).

4. CRAMBUS SPERRYELLUS new species.

(Figs. 5 and 10)

Length of fore-wing 11-14 mm. Head and palpi light brown. Dorsum of thorax light, shining, golden brown.

FORE-WING — Ground color bright golden-brown, darker along costal margin and (sometimes) along dorsal edge of silvery-white stripe. Silvery-white stripe broad, very narrowly separated from costal margin along basal half. A rudimentary dorsal tooth from slightly beyond middle of stripe. Submarginal line semi-metallic leaden, oblique in its first third from costa, then forming a rounded angle of approximately 90° and running almost straight to dorsal margin. Submarginal line narrowly margined inwardly with darker brown, this bordered basally toward costa with a white line. Apex white, with a narrow, fuscous triangle in the white area. Short, thin, semi-metallic, whitish lines run, distad from silvery-white stripe between veins R_5 and M_1 , M_3 and Cu_1 , Cu_1 and Cu_2 , and Cu_2 and $2dA$, the last of these the longest. A distinct whitish or very light brownish shade connecting end of silvery-white stripe with white, marginal, subapical area. Area below this shade and between submarginal line and outer margin heavily flecked with light brown and very light grey scales. In this area is a series of thin, blackish, intervenular lines. A very thin, dark brown terminal line, much darker below apex. Fringes pale brown, lighter below apex.

HIND-WING—Very pale brownish-white, darker apically and terminally. Fringes almost white.

In general color and pattern *sperryellus* somewhat resembles *leachellus* (Zincken), as which it has usually been identified. In fact, however, *sperryellus* has no close relatives among the *Crambus* of western North America. The characters listed in the keys and diagnoses above will serve to differentiate *sperryellus* from *leachellus* and *occidentalis*.

The range of *sperryellus* probably does not touch that of *l. leachellus*, but overlaps very largely those of *l. cypridalis* and *l. rickseckerellus*. From the former of these it can be distinguished at a glance by size, color and pattern. It resembles *l. rickseckerellus* more closely, and worn specimens are not always easy to differentiate by color and pattern. The genitalic characteristics are, however, absolutely distinctive, and can usually be seen by blowing or scraping away some of the loose hair-scales at the tip of the abdomen.

Both pattern and male genitalia of *sperryellus* seem to show a relationship to *Crambus quinquareatus* Zeller, a species characteristic of the eastern United States that ranges as far west as Texas; so that it is closer to this species than to any other. It may be distinguished from *quinquareatus* as follows:

1. Fore - wing: *Quinquareatus* — silvery-white stripe approaching subterminal line more closely than in *sperryellus*, often touching it; area below whitish subapical shade and beyond subterminal line brownish, not contrasting with general tone of wing.

Sperryellus—silvery-white stripe ending more basad of subterminal line; area below whitish subapical shade and beyond subterminal line distinctly grey, contrasting with general tone of wing.

2. Male genitalia: *Quinquareatus* — costa little produced dorsad or curled mesad; cucullus rather square-ended; dorsal margin of sacculus a rather smooth ridge, without prominent teeth; terminal margin of sacculus rather square-ended, with a number (2-5, usually 2) of teeth; ventral margin of sacculus smooth, without a number of fine teeth; oedeagus with a dorsad-projecting spine at tip and with a slender, not strongly curved cornutus.

Sperryellus—costa considerably produced dorsad and curled mesad; cucullus rounded terminally; dorsal margin of sacculus strongly toothed; sacculus terminating in a long, mesad-curved spine; ventral margin of sacculus finely toothed; oedeagus bent ventrad at tip, with a rather heavy, strongly curved cornutus.

3. Female genitalia: *Quinquareatus*—ostium projecting free far caudad; ductus bursae with at least three rather irregular twists or coils, one of which occurs almost immediately in from the ostium.

Sperryellus—ostium not projecting free caudad; ductus bursae running cephalad for at least half its length, thick, strongly

chitinized, only slightly curved; then narrowing abruptly and bent sharply twice only but not twisted or coiled.

Sperryellus is apparently the commonest and most widely distributed *Crambus* in California. It has consistently been determined as "*leachellus* (Zincken)" and occasionally as "*trichusalis* Hulst" and "*occidentalis* Grote," to none of which species is it at all closely related. I understand from Mr. Richard M. Bohart of the University of California at Los Angeles that it is of some economic importance. Mr. Bohart, who is working on the life-history of this as well as of other California *Crambus*, has very kindly sent me interesting material of the species.

Holotype male, San Diego, Calif., 15 September (Ricksecker); allotype female, San Diego, Calif., November (Ricksecker); 128 paratypes as follows:

CALIFORNIA:

Siskiyou County: Dunsmuir, 23 May, 1936 (Sperry) 1 ♀.

Sacramento County: Sacramento, 17 June, 1930 (Browne) 1 ♂.

Santa Cruz County: Santa Cruz, 14 April, 1928, 1 ♀.

Inyo County: Burchim Canyon, 16 May, 1937 (Walton) 1 ♀.

Tulare County: Exeter, 15 April, 1928, 1 ♀.

Kern County: Havilah, 1 ♀; Bakersfield, 27 September, 1939, ex blue grass (Morley), 2 ♂♂, 1 ♀.

Los Angeles County: Saugus, 1 September, 1938, ex lawn grass (Bohart), 1 ♂; Los Angeles, 2 April to 30 September (Coolidge, Pence), 6 ♂♂, 4 ♀♀; Glendale, 2 to 25 August, 1921, 2 ♂♂, 1 ♀; Pasadena (labeled "Pas."), 1 ♂; Alhambra, 22 to 31 July, 1919 (Campbell), 2 ♂♂, 1 ♀; State Insectary, Monrovia (Philipson), 1 ♂; Claremont (Metz, Baker), 4 ♂♂; Westwood Hills, August, 9 September to 26 October (Bohart), 3 ♂♂, 7 ♀♀.

San Bernardino County: Big Bear Lake, San Bernardino Mountains, 6,000 ft. alt., 4 July, 1931 (Dammers), 1 ♀; Devils Canyon, San Bernardino Mountains, 7 June, 1931 (Dammers), 1 ♀; Colton, 21 August (Pilate), 1 ♀; Loma Linda, 13 April to 8-15 September (Pilate), 4 ♂♂, 2 ♀♀; Needles, 1-6 April, 1918 (Bradley), 1 ♀.

Riverside County: Riverside, 4 April to 24 July (Buckwalter, Dammers, Sperry), 6 ♂♂, 5 ♀♀; Palm Springs, 23-25 May, 1918 (Bradley), 1 ♂, 5 ♀♀; Coachella, 2 May, 1918 (Bradley), 1 ♀.

San Diego County: San Diego, April to November (Ricksecker, Field, Piazza, Wright), 33 ♂♂, 10 ♀♀.

——? County: Pine Lake, So. Calif. (Johnson), 1 ♂ ;
Three Rivers, 800 ft., 6-7 August, 1927 (Bradley), 1 ♂ ;
"Western U. S. A., 89-93," collection British Museum
(probably Lower Klamath Lake), 6 ♂ ♂ , 4 ♀ ♀ .

ARIZONA:

Tempe, 28 June to 28 August, 1921 (Walter & Martinez),
1 ♂ , 2 ♀ ♀ .

It is with great pleasure that I name this species for Mr. and Mrs. John L. Sperry of Riverside, Calif., in appreciation of their generosity in sending me a great deal of valuable *Crambus* material including a number of new species.

DISTRIBUTION, GENERAL—California and adjacent Arizona.

DISTRIBUTION, CALIFORNIA—see list of type material.

TYPE LOCALITY—San Diego, Calif.

LOCATION OF TYPES—Holotype, allotype and a series of paratypes in the American Museum of Natural History; paratypes in the British Museum, Canadian National Collection, U. S. National Museum, Museum of Comparative Zoology, Cornell University; Academy of Natural Sciences of Philadelphia, Carnegie Museum, Los Angeles County Museum, and the collections of Mr. and Mrs. John L. Sperry, Miss Annette Braun, Mr. R. M. Bohart and the author.

5. *CRAMBUS BRAUNELLUS*, new species.
(Figs. 4 and 11)

Length of fore-wing, 12-13 mm. Head and palpi very pale brownish. Dorsum of thorax slightly darker and more lustrous.

FORE-WING—Ground-color light brownish-yellow, darker between silvery-white stripe and costa, and dorsad of stripe. Silvery-white stripe narrow, with at most only a bare indication of a dorsal tooth, tapering gradually to a very sharp point well before submarginal line. Running from the stripe to the submarginal line are 7 slender, intervenular lines of semi-metallic, leaden scales, in the spaces between veins from below R_5 to below $2d$ A. These lines are somewhat margined with darker brown scales. Area over vein M_2 between silvery-white stripe and submarginal line, but dorsad of tip of stripe, whitish, but not forming a clearly-marked white patch. Submarginal line leaving costa at an acute angle, bending opposite end of stripe, then running to dorsal margin quite close to outer margin. Submarginal line of semi-metallic, leaden scales, margined basally with brown. This basal margining is very dark toward costa; basad of it is a white stripe which runs far basad along costa. Apical area white, largely filled by triangular, fuscous mark. Area below apical area and between submarginal line and outer margin whitish.

speckled with dark scales. A series of fuscous, rounded dots on outer margin between tips of veins from M_2 to 2d A. A fine, dark brown marginal line, strongest below apex. Fringes whitish basally, darker terminally.

HIND-WING—Very pale brownish-white, slightly darker apically and terminally. Fringes almost white.

Although I have only three specimens of this species, and the data on one of these are dubious, I have no hesitation in naming it. The characters given in the diagnosis and keys will serve to differentiate it, not only from the other California *Crambus*, but also from all other North American species.

Braunellus must be either extremely rare or else extremely local. I suspect the latter, for a number of other species of *Crambus*, hitherto very rare in collections, have proven in recent years to be common when sought in exactly the right environment at the right time. Acid bogs, an environment seldom collected for moths, seem to harbor many such species.

Two of the three specimens of the type series are in the collection of the Museum of Comparative Zoology and bear labels "Colton, Calif., Pilate" and small, square date labels that are undecipherable. They are from the collection of Frederick Allen Eddy. I have no doubt of the authenticity of the locality on these specimens. From the Eddy Collection material I have studied material of other characteristically Californian *Crambus* (i.e., *sperryellus* and *gausapalis*) bearing similar labels. Some of the latter, be it noted, are specimens collected by Pilate at Loma Linda, a locality at which he resided and did much collecting.

The paratype is from the Holland Collection in the Carnegie Museum. It bears a printed label "Opelousas, La., Pilate" and the date "May 30-96." Inasmuch as Dr. Holland is known to have been at times quite careless with the data on specimens, I think it probable that this, too, is a California specimen and probably came from Colton.

Holotype male and allotype female, Colton, Calif. (G. R. Pilate), ex-coll. Frederick Allen Eddy. Paratype female labeled "Opelousas, La., Pilate," May 30-96, ex Holland Collection (true locality probably California, possibly Colton).

DISTRIBUTION, GENERAL—California.

DISTRIBUTION, CALIFORNIA—Colton.

TYPE LOCALITY—Colton, California.

LOCATION OF TYPES—Holotype and allotype in Museum of Comparative Zoology, Cambridge, Mass. Paratype in Carnegie Museum, Pittsburg, Pa.

OTHER SILVER-STRIPED CRAMBUS OF POTENTIAL OCCURRENCE
IN CALIFORNIA

Four other species of silver-striped *Crambus* may very well occur in California, although I have seen no specimens of them from there. The following notes will suffice for identification of these:

1. *Unistriatellus* Packard—An easily identified species in which the silvery-white stripe continues without interruption and almost without narrowing to the outer margin. It is of wide distribution in the northern states and Canada, being essentially a Canadian Life Zone species. West Coast records are: BRITISH COLUMBIA—various localities, July. WASHINGTON—Grayland, Long Beach, Ilivado and Chehalis, July-September. OREGON—Houser, July.

2. *Latiradiellus* Walker (*myellus* auct. nec Huebner)—Characterized by the fact that the white stripe, which nearly reaches the outer margin(is cut twice by heavy, dark, median and post-median bands. Be it noted that the North American species, for which *latiradiellus* is the oldest name, is not conspecific with the European *myellus* (Huebner) or with at least two other Palaearctic species that are extremely similar in color and pattern. *Latiradiellus* is characteristically a species of Canadian Life Zone; but I have taken it in Transition Zone in Connecticut. West Coast records are: BRITISH COLUMBIA—various localities, July-August; WASHINGTON—Puyallup, August.

3. *Tutillus* McDunnough—In the key this species would run out to *pascuellus* (L.); from this species it may be distinguished by the very much narrower silvery-white stripe and by the very dark brown ground color. *Tutillus* is another essentially northern species, which may occur in northern California. West Coast records are: BRITISH COLUMBIA—Victoria, common, generally about the middle of May. WASHINGTON—Toledo, Tumwater, June. OREGON—Salem, Portland.

4. *Bidens* Zeller—In the key this species would run out to *braunellus*. From this species it may be separated at a glance by the shape of the silvery-white stripe which is narrow at the base of the wing and broadens greatly to the very strong dorsal tooth which is located at about two-thirds from the base of the stripe. From *pascuellus*, with which some authors have confused *bidens*, it can be distinguished by the fact that *bidens* has no white patch basad of the subterminal line. Like the three preceding, *bidens* is a northern species. It is extremely local, being apparently a bog species. West Coast records are: BRITISH COLUMBIA—various localities, July-August. OREGON — Waldport, July.

EXPLANATION OF FIGURES

The drawings were made with a camera lucida, but subsequently changed and corrected. They do not, therefore, represent actual, single specimens. They are intended to illustrate the characters upon which the conclusions of the author have been based.

Since mere size, within the limits of variation of the species, has little taxonomic significance, no exactly consistent scale of enlargement was used.

In the figures of the male genitalia the uncus, gnathos, anal tube and tegumen have been drawn above the saccus and harpé, and the oedeagus beneath, unless otherwise indicated below.

PLATE 6

- Figure 1 —Left lateral aspect, male genitalia, *Crambus leachellus cypridalis* Hulst.
Figure 2 —Left lateral aspect, male genitalia, *Crambus leachellus leachellus* (Zincken).
Figure 3 —Left lateral aspect, male genitalia, *Crambus occidentalis* Grote.
Figure 4 —Left lateral aspect, male genitalia, *Crambus braunellus* new species.
Figure 4A—Dorsal aspect, saccus and harpés, *Crambus braunellus* new species.
Figure 5 —Left lateral aspect, male genitalia, *Crambus sperryellus* new species.
Figure 5A—Dorsal aspect, saccus and harpés, *Crambus sperryellus* new species.
Figure 6 —Left lateral aspect, male genitalia, *Crambus pascuellus* (L.).

PLATE 7

- Figure 7 —Left lateral aspect, female genitalia, *Crambus pascuellus* (L.).
Figure 8 —Ventral aspect, female genitalia, *Crambus leachellus rick-seckerellus* new subspecies.
Figure 9A—Ventral aspect, ostium, *Crambus leachellus leachellus* (Zincken).
Figure 9B—Ventral aspect, final bend of ductus bursae, *Crambus l. leachellus* (Zincken).
Figure 10 —Ventral aspect, female genitalia, *Crambus sperryellus*, new species.
Figure 11 —Left lateral aspect, female genitalia, *Crambus braunellus* new species.
Figure 11A—Ventral aspect, protruding portion of ostium, *Crambus braunellus* new species.

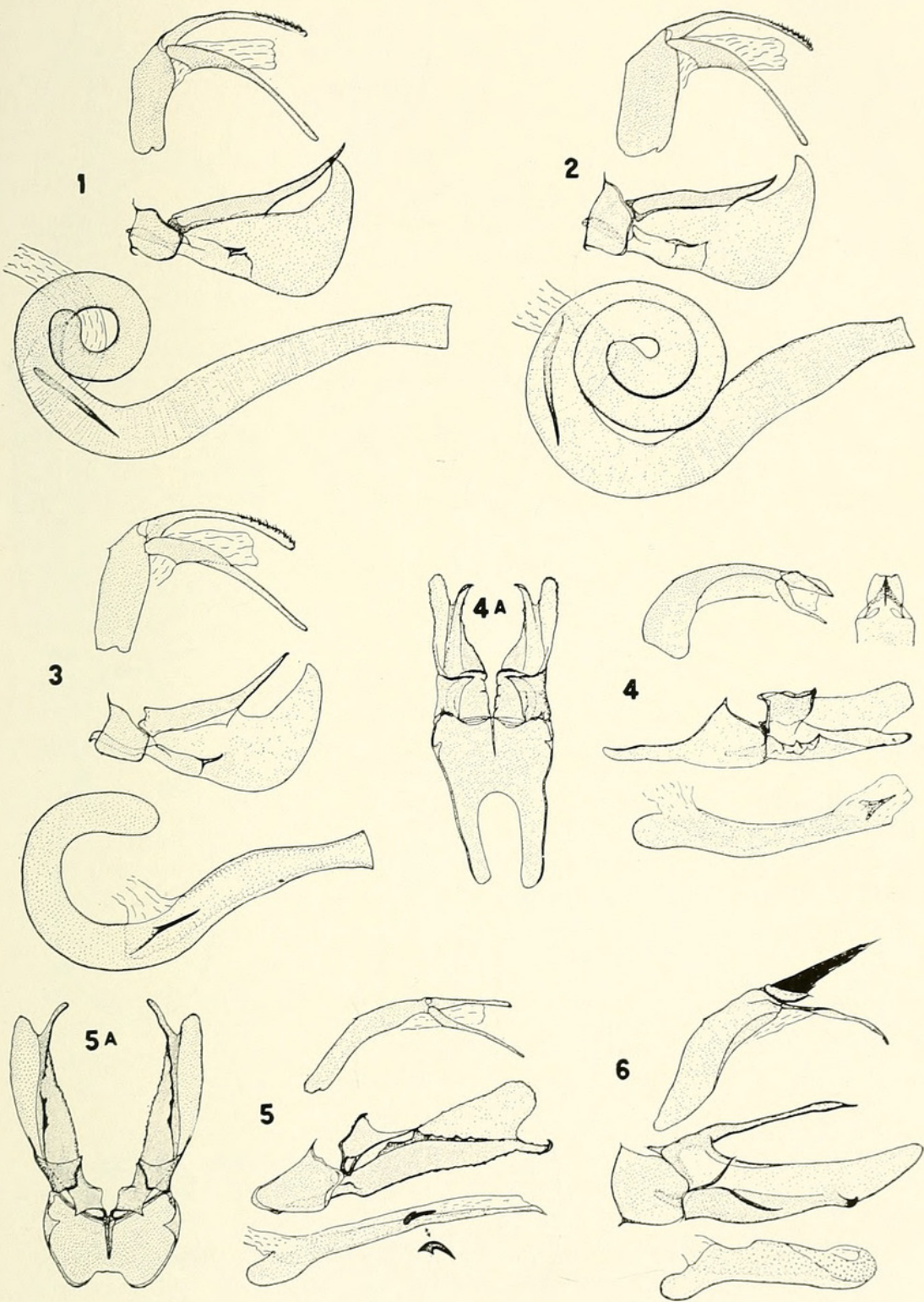


PLATE 6

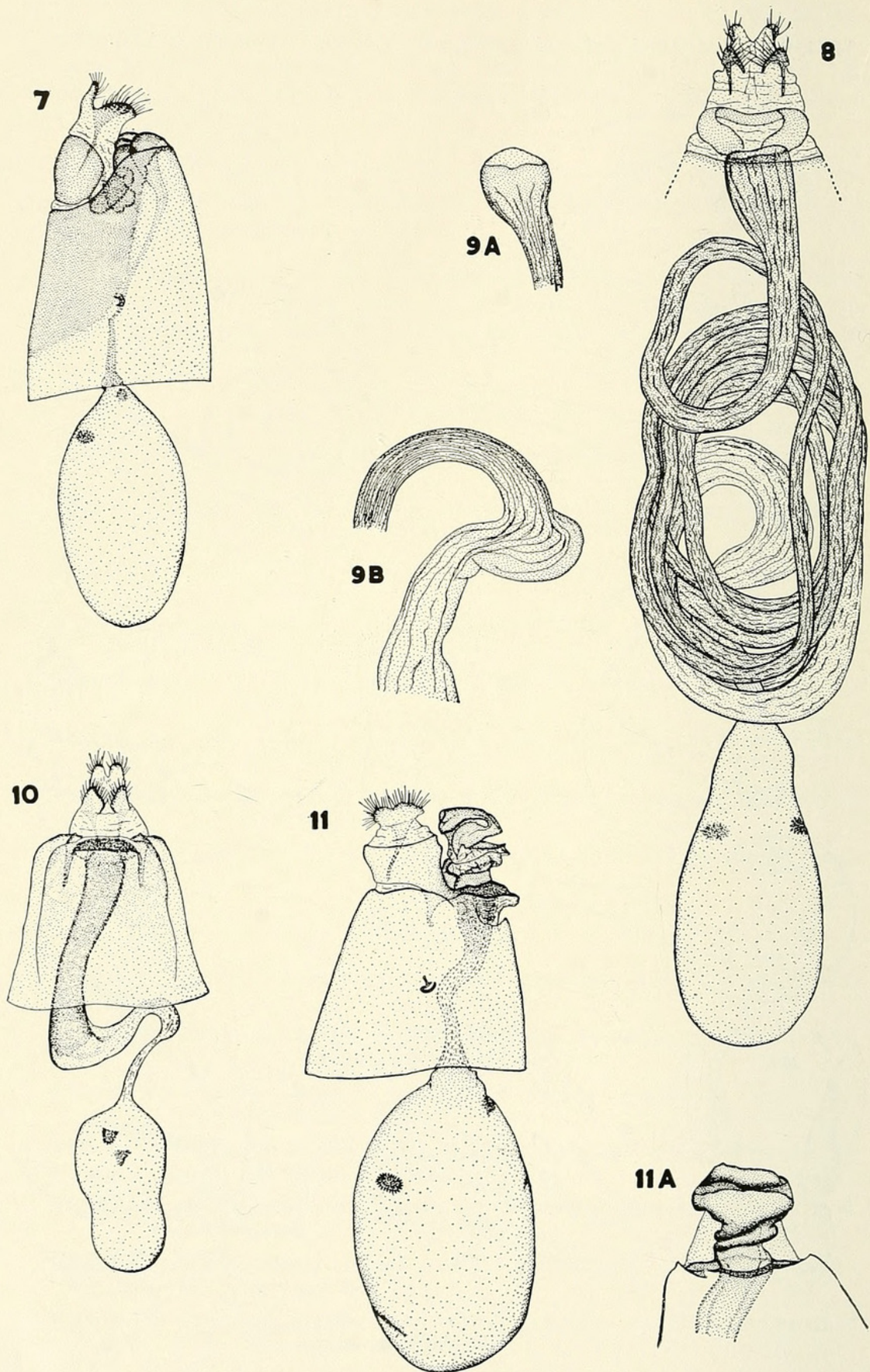


PLATE 7



1940. "North American Crambus. I. The silvery-striped species of California (Pyralididae)." *Bulletin of the Southern California Academy of Sciences* 39, 53–70.

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