

THE CALIFORNIAN SALVIAS

A REVIEW OF SALVIA, SECTION AUDIBERTIA

CARL EPLING

Associate Professor of Botany, University of California, Los Angeles

FOREWORD

The *Salvias* which are confined largely to the Californian area are of interest because of the association with them of most of the students of the California flora. Few of the older California botanists but were the discoverers in the field or describers in the herbarium of one or more of these interesting plants. Earliest and foremost were George Bentham, David Douglas, and Asa Gray, and it is largely to these that the section owes its present content. More recently Professor Munz has contributed an authoritative revision, which, save for extensions in range due to recent explorations and the discovery of numerous natural hybrids, would render this work superfluous. Where not otherwise apparent I have sought to indicate by subsectional names the principal students of the group.

The historical aspect of the group is not its sole source of interest, however, fascinating as that backward vista may be. Two other phases present themselves and offer an ever-widening avenue of investigation into the future: the rôle which the group plays in plant economy, and the method of speciation which has prevailed within it. But scant reference may be made to either of these subjects in this paper since both are but little explored.

Confined as they are to arid portions of the Southwest, the *Audibertias* are components primarily of two shrub formations—the *Larrea-Franseria* formation of the Colorado Desert, and the related *Artemisia californica-Salvia* formation of the coastal plain. Seven species are conspicuous localized elements in the former; five species are important or dominant elements in the latter. The remaining six species are either ubiquitous

Issued December 27, 1937.

or are associated with a formation contiguous to those mentioned. Ignoring the ubiquitous *S. Columbariae*, two species enter into the desert woodland (*Pinus-Juniperus*) in association with *Artemisia tridentata*, and one enters into the valley woodland (*Quercus-Pinus*), often in association with *Artemisia californica*. Two enter into the drier aspects of the chaparral (chamisal). But the greatest impress is made in the coastal sage formation (*Artemisia californica*), ranging along the coastal plain and in the foothills of the coastal ranges from the Bay region in central California to Rosario in Lower California. Here one species or another may be the dominant and sometimes seemingly sole species for thousands of acres. Because of its low elevation and relatively gentle slope as well as the peculiarities of its climate, this formation has been the one chiefly occupied by man. It is accordingly the one most modified. In southern California the citrus industry is closely correlated with the coastal sage formation. Perhaps this disturbance of the original formation has resulted in more species coming together and consequently more frequent crossing.

There is, then, an abundant body of facts relating to the distribution of these plants, even though their significance may not be understood; one may only surmise the course of speciation and the factors involved. When one considers the remarkable uniformity of flower structure which is seen in the large section Calospace (470 species or more) the *Audibertias* appear heterogeneous. In habit there is a tremendous range between *S. carduacea* and *S. apiana* or between *S. Columbariae* and *S. spathacea*. In flower structure the seemingly fundamental and significant structure of the stamens presents an even wider range when one compares those of *S. carduacea* (anthers sessile, the connective divaricate, both thecae fertile) with those of *S. apiana* (half the anthers suppressed, the filament well developed). Here would appear to be ample justification for generic segregation, as was suggested by Greene (the genus *Ramona*). Yet one may proceed step by step from one extreme to the other. What is more significant, the species suggest interchanges of blocks of characters. *S. Munzii* has roughly the foliage of *S. Clevelandii*, the flowers of *S. mellifera*.

S. Brandegei has the flowers and inflorescence similar to *S. mellifera*, the foliage of *S. eremostachya*. *S. Vaseyi* suggests an intermediate condition between *S. apiana* and *S. eremostachya*. And so throughout the whole group blocks of characters reappear in different combinations. The only possible explanation of these facts which occurs to me is that these species have all arisen through hybridization. Such an explanation is given substance by reason of the frequency with which natural hybrids occur: usually when any two species grow together, particularly of the groups Munzia and Jepsonia. Such hybrids are described in the body of the paper. In no sense whatever do the species suggest origin from a single differentiating stock.

It is equally undesirable to hazard a guess as to the origin of the group. Within *Salvia* it appears to be most nearly related to Calosphace, both morphologically and geographically. Within that intricate complex of nearly 500 known species only two species suggest to me a possible connection with Audibertia: *S. axillaris* and *S. clinopodioides*. The corolla and stamens of the former (but not the calyx nor yet the general habit) stand apart from the rest of the section and are suggestive of those of *Salvia spathacea*. The habit of *S. clinopodioides* and particularly the calyx set it off from most of the section Calosphace and are suggestive again of the habit and calyces of *S. spathacea*. Whether these resemblances are genetic or the result of independent and parallel developments it is difficult to say.

To explore adequately these avenues as well as that of the pollination mechanisms will require prolonged studies. Meanwhile the present paper may be considered an introduction. It is based upon an examination of practically all of the extant collections both in this country and abroad and upon a field knowledge extending over a decade or more in which most of the species have been visited throughout their total area of distribution. None but has been studied in the field and most species in the garden as well.

As always, the author is under great obligations to the keepers of the various herbaria here and abroad who so gen-

erously lend valuable material for study. He is particularly under obligations to Dr. Philip A. Munz, Mr. Frank Gander, Mr. French Gilman, and Mr. Joseph Ewan for helpful suggestions and data as to occurrence. He is greatly indebted to Dr. Elbert Ahlstrom for assistance in reading manuscript and proof and checking of bibliographical references. He is under especial obligations to the artist, Mr. Alexander Chudom, whose illustrations require no commendation to be appreciated. These have been prepared by him from living material with the exception of *S. californica* and *S. Brandegei*. Drawings of the flowers were made by the author from living plants and copied in wash by the artist. The calyces are shown without pubescence. The outline maps show the approximate limits of each species in so far as known. The author is further indebted to Mr. William Stewart for pollen smears of several species and hybrids. His obligations should also be recorded to Mr. J. E. Harding for his courtesy at El Arco no less than to Mr. N. R. Vail for his hospitality on Santa Rosa Island.

The chief prior treatments are as follows:

Bentham, G., Lab. Gen. et Sp. 312. 1833, and in DC. Prodr. 12: 358. 1848.

Gray, A., Syn. Fl. N. Am. 2: 372. 1878.

Jepson, W. L., Manual Calif. 867. 1925.

Munz, P. A., in Bull. S. Calif. Acad. Sci. 26: 17. 1927, and in Bot. S. Calif. 443. 1935.

Sect. AUDIBERTIA

Audibertia Benth. in Bot. Reg. 17: 1469. 1831, based upon *A. incana* (not Benth., op. cit. 15: 1282. 1829).

Ramona Greene in Pittonia 2: 235, 301. 1892, based upon *Audibertia polystachya* Benth., Lab. Gen. et Sp. 314. 1833.

Audibertiella Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon *Audibertia* Benth., loc. cit.

Annual herbs or shrubs clothed with either simple or branched hairs and usually sprinkled with sessile glistening droplets, less often with stalked glands; leaves quite variable

in size and form, often deltoid-oblong, even hastate, often oblong-elliptical or obovate, rarely rotund or spatulate, rarely pinnatifid, prevailingly bullate-rugose, their margins crenulate or entire, commonly whitened or ashy, seldom entirely glabrous; flowers usually numerous in compact glomerules which are disposed in moniliform spikes, these simple or branched, or frequently solitary and capitate, few-flowered and forming an elongated showy thyrsis in one species or even a thyrsoid spike, subtended by numerous bracts which are usually involucrate, less often few in the axils of the upper leaves and subtended by small bractlets; calyx tubular or turbinate, rarely subequally dentate, the posterior three teeth usually united into a gibbous upper lip which is entire, trimucronate, or even aristate at the tip, the two lower teeth small, free, or more or less united with the upper lip, usually acuminate, even aristate, completely united with the upper in one species, the orifice thus truncate and oblique; corolla-tube cylindrical, flaring somewhat toward the throat, sometimes vertically compressed, thus closing the throat, entirely glabrous within or variously pilose-annulate or pubescent, the upper lip ascending, plane, by no means galeate, usually incised and the segments somewhat divaricate, sometimes retuse, less often entire, almost suppressed in one species, the lower lip usually declined, the laterals more or less spreading, the middle either entire or lacinate or erose, sometimes strongly cupped, sometimes plane, sometimes strongly convex or all, depending upon the degree of anthesis; stamens seated in the throat, even toward the middle of the tube, or upon the base of the lower lip, sometimes ascending under the upper lip, sometimes thrust out from the tube or even declined along the lower lip; filament very short, almost wanting in one species, or about equal to the connective, articulated with it, the lower portion and one anther being completely suppressed; style glabrous, its branches either subequal or the posterior shorter; nutlets gelatinous when wetted.¹

¹ Jepson (Manual) has sought to differentiate between *Echinosphace* and *Pycnosphace*, on the one hand, and the remaining species, on the other, by the presence or absence of the gelatinous coat. If mature nutlets are used, all species will be found to afford it in some degree, although *S. funerea* and *S. spathacea* do so but little.

KEY TO THE SUBSECTIONS

- Both branches of the connective manifest, bearing perfect anthers; leaves pinnatifid or sinuate-spinose and iliciform (frequently entire in *S. funerea* but spinose at the tip).
- Calyx teeth free; long arm of the connective ascending from the base of the lower lip, the shorter projected into the tube, or sometimes (*S. funerea*) both more or less contained within the tube; arachnoid herbs or spinose shrubs ECHINOSPHERE
- Posterior calyx teeth joined into a gibbous lip; long arm of the connective ascending under the upper lip, the lower deflexed; annual hispidulous herbs PYCNOSPHERE
- Lower arm of the connective usually wholly suppressed, rarely (*S. spathacea*) manifest, and even bearing a minute anther; leaves crenulate or entire.
- Stamens ascending under the upper lip and but little surpassing it or not at all, even entirely concealed within the tube (*S. Brandegei*).
- Stout perennial viscid herbs with hastate or deltoid-oblong leaves 8–20 cm. long; corolla-tubes 25–35 mm. long GREENEOSTACHYS
- Shrubs with oblong-elliptical, obovate or even linear leaves; corolla-tubes 5.5–9.5 mm. long PARISHIELLA
- Stamens thrust forth from the tube or even declined, patently longer than the upper lip JEPSONIA

Subsect. ECHINOSPHERE

Sect. *Echinospere* Benth., Lab. Gen. et Sp. 302. 1833,
based upon *S. carduacea*.

Singular annual herbs with arachnoid pubescence and basal pinnatifid leaves, or shrubs with small leaves usually spinose-toothed and iliciform, sometimes entire but spine-tipped, clothed with branching hairs, rarely glandular; flowers of the annual species borne in dense echinate heads concealed in cottony hairs, subtended by reflexed spinose bracts, of the perennial species disposed in the axils of the upper leaves, subtended by small bractlets; calyx teeth 5, deltoid, subequal and obtuse or acute, or unequal, the lateral pair partly adnate to the upper, all spinose; corolla-tubes of the annual species strongly pilose-annulate near the middle, those of the shrubs glabrous or sparsely pubescent, lobes of the upper lip partly free, the middle lobe lacinate, either concave or convex; stamens seated either in the throat or on the base of the lower lip, each bearing two perfect anthers of unequal size, the longer arm of the connective ascending from the base of the lower lip, the shorter thrust into the tube, or sometimes the longer anther contained

wholly within the tube, the filaments short or nearly wanting; style branches equal or nearly so.

A thistle-like annual herb with basal pinnatifid leaves spinosely dentate, arachnoid.....1. *S. carduacea*

Shrubs with leaves mostly iliciform, sometimes entire but spine-tipped.

Calyx teeth deltoid, acute or obtuse, subequal.

Corolla-tubes 5–7 mm. long; connectives 4–6 mm. long.....2. *S. californica*

Corolla-tubes 9–11 mm. long; connectives 1.5 mm. long.....3. *S. funerea*

Calyx teeth lanceolate-spinose; corolla-tubes 9–11 mm. long; connectives 2.5

mm. long.....4. *S. Greateae*

DOUGLASIANA

Singular arachnoid annual herbs with pinnatifid leaves; flowers in compact echinate glomerules, the calyces hidden in cottony wool, subtended by spinose reflexed bracts, disposed in stout moniliform spikes; calyx teeth partly joined, spinose; corolla-tubes strongly pilose-annulate near the middle, the middle lobe of the lower lip large and showy, laciniate, convex.

1. *S. carduacea* Benth., Lab. Gen. et Sp. 302. 1833, based upon a specimen collected by Douglas in California; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Plate 12.

S. gossypina Benth., Pl. Hartweg. 330. 1839, based upon a specimen collected by Hartweg in the Sacramento Valley; the type is in the herbarium of the Royal Botanic Gardens at Kew.

A striking and handsome herb suggesting *Carduus*, arachnoid-woolly throughout, 10–15 cm. tall in forms dwarfed by aridity, as much as a meter tall when luxuriant, its flowering stems one or more; leaves entirely basal, mostly 8–15 cm. long, oblong-elliptical in outline, subsessile, pinnatifid, their lobes deltoid, spinose-toothed, crisped; flowers numerous in globose glomerules subtended by several oblong-iliciform reflexed bracts, solitary or several, disposed at the tips of the usually strict sometimes ternate stems, remote; flowering calyces prevailing 15–17 mm. long, white with very long soft-cottony hairs in the mat of which they lie buried, teeth of the lower lip about 5 mm. long, the upper three joined to the middle, twice as long, all spinose; corolla a lovely violet, mostly 15–17 mm. long,

strongly and obliquely pilose-annulate near the middle, the lobes of the upper lip subequal to the tube, narrowed near the middle, erose at the tips, the middle lobe of the lower subequal,



Fig. 1. Showing distribution of *S. carduacea*, *S. californica*, *S. funerea*, and *S. Greatae*.

broadly spreading, laciniate, the laciniae white at the tips; stamens seated on the base of the lower lip, the filament practically wanting, the connectives 12–14 mm. long; style branches subequal.

The species ranges from interior Contra Costa, San Joaquin, and Stanislaus counties southeastward through the Great Valley and interior valleys of the coast ranges to Kern County and thence through the western Mojave Desert from Inyokern and Searles Station southward along the western margin of the Colorado Desert to northern Lower California, as far south, at least, as San Quintin and as far east as Barstow. Throughout this range it is associated with a variety of plants and is found usually in sandy, often disturbed soil. Its occurrence is chiefly in two formations: the coastal sage formation (*Artemisia californica-Salvia* spp.-*Eriogonum fasciculatum*) and the Sonoran formation (*Larrea mexicana-Franseria dumosa-Yucca brevifolia*). While it is most frequently seen in the former, it seems usually to occupy disturbed ground there, as though an interloper, although I have observed it as far south as San Quintin in the *Artemisia* association growing under natural conditions. It appears to be natural to the western part of the Mojave Desert (*Larrea-Franseria*), occurring there chiefly in sandy or gravelly soil of the valleys and in a good year frequent and abundant. It enters only into the western margin of the Colorado Desert, however. At the same time it occurs widely and sometimes in great abundance on the alluvial cones of the Great Valley. It seldom ranges above 4,000 feet. The corolla is exquisite in form and coloring, the tips of the fringe being white, the anthers lacquer-red. The odor of the foliage is pungent, suggestive of *Citronella* in which respect it is like *S. Greatae*. It belongs to that class of plants sometimes known as "winter annuals," flowering after the winter rains mostly in April, May, and June, and soon disappearing. Following are localities where the species has been found:

CALIFORNIA: CONTRA COSTA: Antioch; ALAMEDA: Corral Hollow; SAN JOAQUIN: Tracy, Calaveras R.; STANISLAUS: Knight's Ferry, Adobe Valley, Crows Landing; MADERA: Berenda; FRESNO: Coalinga; TULARE: Porterville, Visalia, Grapevine Spring, Delano, Earlimart; SAN BENITO: Panoche, San Benito; MONTEREY: Arroyo Seco, Palomar Cr., Lockwood; SAN LUIS OBISPO: Cholame, Nipomo, Pala Prieta of Bitterwater Valley; KERN: Rosamond, Bakersfield, Wasco, Lebec, Caliente, Pama Sta., Jewette, Searles, Mojave; SANTA BARBARA: Orcutt, Betteravia; LOS ANGELES: Peace Valley, Tejon Rancho, Gorman's, Lancaster, Palmdale, Pomona, Acton, Claremont; SAN BERNARDINO: Helendale, Barstow, Crofton, Hesperia;

ORANGE: Orange, Vale Verde near Galivan; RIVERSIDE: Banning, Riverside, Temecula, Colton, Winchester, Perris, Elsinore, San Jacinto Valley; SAN DIEGO: San Diego, San Felipe, Jacumba, Mason Valley; BAJA CALIFORNIA: San Quintin.

MUNZIA

Singular rounded herbs with leaves usually iliciform, sessile, sometimes entire but spine-tipped; flowers few in the axils of the upper leaves, subtended by small bractlets; calyx teeth either deltoid and subequal, obtuse or acute, or else unequal and spinose; corolla-tubes either glabrous within or sparsely pilose, not at all annulate, the middle lobe erose or laciniate, concave or plane; filaments short, both anthers perfect, the lower usually smaller (larger and included within the tube of *S. funerea*).

The habit of these shrubs is very similar to the species of *Atriplex* with which they are commonly associated. All three occur in areas where volcanic rock is present, although not usually on such rock but upon sedimentary rock associated with it. *S. funerea* and *S. Grevatae* occur in gravelly washes of narrow canyons or on the sides of the canyons above such washes from about 1000 feet to 3000 feet. *S. californica* occurs in open broad gravelly washes. All are found in the *Larrea-Franseria* formation and are associated with species of *Atriplex* and *Encelia*, and two, *S. californica* and *S. Grevatae*, occur in company with *Hyptis Emoryi*.

2. ***S. californica*** Brandege in Proc. Calif. Acad., II, 2: 197. 1889, based upon a specimen collected by Brandege in Baja California at "Cardon Grande" near Calmalli; the type is in the herbarium of the University of California (Berkeley).

Plate 13.

A shrub 1–2.5 m. tall, its branchlets whitened with floccose branching hairs and sprinkled with golden glands; leaf-blades .5–4 cm. long, sessile, crowded, oblong-iliciform, the teeth usually 6–9, deltoid, shortly spinose, both surfaces floccose and whitened with branched hairs; flowers 3–6 in the axils of diminished iliciform leaves, the glomerules .5–3 cm. distant; flowering calyces 4.5 mm. long, whitened with floccose branching hairs, their teeth deltoid, subequal, the three posterior

somewhat united; corolla-tubes (? white or pallid) 5–7 mm. long, the upper lip 2 mm. tall, the lower twice as long, very sparsely pilose above, the middle lobe nearly plane; stamens adnate to the base of the lower lip, the filament scarcely 1 mm. long, the connective 4–6 mm. long; style branches equal.

Found in Baja California in sandy gravelly washes with species of *Atriplex*, *Hyptis Emoryi*, *Hymenoclea Salsola*, *Viguiera reticulata*, and *Encelia farinosa*. It is known to occur at San Pablo, Cardon Grande near Calmalli, Lagoon Head (? Scamman's Lagoon), 10 mi. w. of Calmalli, San Gertrudis, 18 mi. w. of Punta Prieta, and Los Angeles Bay. It is known locally at Calmalli and San Gertrudis as "Salvia China." I was unable to learn the significance of the term.

3. *S. funerea* Jones, Contrib. West. Bot. 12: 71. 1908, based upon a specimen collected in Inyo Co., Calif., in the Funeral (Amargosa) Range; the type is in the herbarium of Pomona College. Plate 14.

S. funerea var. *fornacis* Jeps., Man. Calif. 868. 1925, based upon a collection made by Parish (no. 10032) in Furnace Creek, Death Valley; the type is in Jepson's herbarium.

A white shrub as much as a meter and a half tall, its branchlets densely lanate with branched hairs; leaf-blades 1.5–2 cm. long, elliptical or ovate, acuminate-spinose at the apex, frequently rounded below the middle, more commonly narrowed to petioles 2–5 mm. long, mostly entire, some usually iliciform with one or two pairs of stout spinose teeth, both surfaces ashy or white with branching hairs; flowers prevailingly 3 in the axils of usually iliciform leaves, crowded into foliose spikes 3–8 cm. long; flowering calyces very densely white-lanate with branching hairs, 4.5–6 mm. long, their teeth subequal, deltoid, the three posterior lightly joined at the base; corolla violet, its tube 9–11 mm. long, pilose within above the middle and in the palate, the upper lip 2–2.5 mm. tall, the lower twice as long; stamens seated between the middle of the tube and the throat; filaments 1.5–2.5 mm. long, the connective 1.5 mm. long; style branches equal and somewhat dilated.

General throughout narrow canyons on the western slopes

of the Amargosa Range (Granite, Funeral, and Black Mountains), ranging at least from Hole-in-the-Rock Spring to Furnace Creek, Travertine Canyon, and Ryan. It occurs in the Grapevine Mountains in Titus Canyon and in the northern part of the Panamint Mountains in Grotto and Mosaic Canyons and possibly further south. It is found from about 1000 to about 3000 feet, in the narrow canyons, both in the washes and in small gullies entering them or on narrow benches above the washes. It is an associate of the *Larrea-Franseria* formation and is most often found with *Atriplex hymenelytra*, *Viguiera reticulata*, *Encelia farinosa* or *E. Actoni*, and *Eucnide urens*.

4. S. Greatae Brandege in Zoe 5: 229. 1906, based upon a specimen collected in Riverside Co., Calif., in Canyon Springs Wash near Dos Palmas by Hall and Greata (no. 5848); the type is in the herbarium of the University of California (Berkeley).

Plate 15.

A fragrant shrub rounded and dense, as much as a meter tall, its branchlets whitened with branching hairs, less often glandular with small spreading hairs and sprinkled with longer spreading stout ones; leaf-blades generally 2-3 cm. long, sessile, iliciform or the lowest nearly entire and elliptical, prevailing ashly with branched hairs, sometimes more or less glandular, especially the lower becoming glabrate; flowers numerous in the axils of iliciform leaves, the glomerules mostly 3-6 cm. distant; flowering calyces 11-12 mm. long, generally incanous with branching hairs, sometimes entirely glandular, arcuate-gibbous, the lower lip 3-3.5 mm. long, the three upper teeth partly united, the posterior one twice as long as the lateral ones, all spinose; corolla rose, its tube 9-11 mm. long, the upper lip 2-2.5 mm. tall, the lower almost twice as long, very sparingly pilose on the upper surface, the middle lobe lightly cupped; stamens seated nearly in the throat, the filament 1 mm. long, the connective 2.5 mm. long; style branches equal.

This species is known only from the Orocopia Mountains where it occurs in a canyon near Dos Palmas (east of Mecca, California), Salt Creek Wash, and in the narrow canyons behind Hidden Spring, ranging from about 500 feet elevation. In the canyon bottom it occurs in loose gravel and rocks in the

Larrea-Franseria formation with *Hyptis Emoryi*, *Bebbia juncea*, *Cercidium Torreyanum*, *Peucephyllum Schottii*, *Acacia Greggii*, and *Encelia farinosa*; on the sides of the canyon above the wash its principal associate is *Encelia farinosa*. Like *S. Vaseyi* the corolla-tube is vertically compressed in the throat. It is not improbable that the species will be found in other canyons in the Orocopia Mountains.

Subsect. PYCNOSPHERE

Pycnospace Benth., Lab. Gen. et Sp. 302. 1833, as section, based upon *S. Columbariae*; Rydb., Fl. Rocky Mts. 747. 1917, as genus.

Singular annual herbs with pinnatifid hispidulous leaves; flowers many in compact usually capitate sometimes remotely moniliform glomerules, subtended by spine-tipped rotund bracts; upper calyx teeth completely joined, provided with two or sometimes three spines at the tip, the lower free, spinose; corolla-tube glabrous; stamens seated toward the throat, the long arm of the connective ascending under the upper lip, somewhat surpassing it, the shorter deflexed, both anthers perfect, the lower smaller.

One species.....5. *S. Columbariae*

5. *S. Columbariae* Benth., Lab. Gen. et Sp. 302. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Plate 16.

Pycnospace Columbariae Rydb., Fl. Rocky Mts. 747. 1917.

A singular annual herb 3–4 cm. tall in drouth forms, or 30–50 cm. tall in robust forms, their flowering stems one or more, mostly retrorse-hispidulous, frequently sprinkled with longer thick hairs; leaves mostly basal, with usually one or two cauline pairs, pinnatifid, oblong-ovate in outline, their lobes crenate or again rounded-lobed, both surfaces more or less hispidulous, the upper bullulate, the lowermost borne on subequal petioles, the upper sessile or nearly so; flowers many in glomerules either solitary or sometimes 2–3, these subtended by

overlapping rotund colored bracts, glabrous or hispidulous, ciliate, notched, provided with a spine in the notch; flowering calyces mostly 8–10 mm. long, hispidulous, more or less glandular, arcuate-gibbous, bearded on the hump with long thickened



Fig. 2. Showing distribution of *S. Columbariae*.

hairs, the teeth of the lower lip 2.5–3 mm. long, all spinose, the teeth of the upper lip wholly joined save for the spines, the middle one of which is usually suppressed; corolla clear blue, its tube mostly 7–8 mm. long, glabrous within, the upper lip

2.5–3 mm. tall, the lower about twice as long, entire; stamens seated in the throat, the filament about 1.5 mm. long, the connective about 2.5 mm. long; posterior style branch mostly half as long as the anterior, or less.

An ubiquitous vernal plant in southern California, most variable in stature, occupying dry, often disturbed soil, in association with the chaparral, the coastal sage, the Great Basin microphyll or Sonoran Desert formations. Found usually below 4000 feet, but may occur at least as high as 7000 feet. Ranges from Glenn and Butte counties southward through the coast ranges into Baja California as far south as Cedros Island, southeastward from Tuolumne and Stanislaus counties throughout southern California, through Nevada (Washoe, Mineral, Nye, Lincoln and Clark counties) to Washington County, Utah, through western and southern Arizona (Mohave, Maricopa, Pima, Gila, and Cochise counties) into northern Sonora. It is known to occur on Santa Catalina and San Clemente Islands and perhaps upon the other coastal islands as well. Throughout this range the species is remarkably constant, save for variability in stature due to water supply during growth.

Subsect. GREENEOSTACHYS

Stout viscid perennial herbs with creeping rootstocks, the flowering stems ascending; leaves ample, deltoid-oblong or hastate, borne on marginate or winged petioles; flowers many in large viscid glomerules disposed in stout moniliform spikes, subtended by colored appressed bracts; upper calyx teeth wholly joined to a gibbous lip, the two lower small, free; corolla-tube glabrous; stamens ascending under the upper lip and exceeding it, the lower part of the connective half as long as the upper or less, the lower anther usually suppressed, rarely vestigial.

One species.....6. *S. spathacea*

6. *S. spathacea* Greene in Pittonia 2: 236. 1892, based upon *Audibertia grandiflora* Benth., loc. cit. (not *S. grandiflora* Etling).
Plate 17.

Audibertia decurrens Nutt. ex Benth. in DC. Prodr. 12: 359. 1848 (an herbarium name cited in synonymy).

Audibertia grandiflora Benth., Lab. Gen. et Sp. 312. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella grandiflora Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon *Audibertia grandiflora* Benth., loc. cit.

Ramona grandiflora Briq., loc. cit., 440. 1894, based upon *Audibertia grandiflora* Benth., loc. cit.

A perennial herb with creeping rhizomes, frequently forming mat-like clumps, its annual stem usually solitary, stout, ascending usually 0.5–1 m., viscid-pilose throughout with spreading hairs; leaves approximate toward the base, the blades prevalently oblong-hastate, 8–20 cm. long, obtuse, truncate-subhastate at the base, irregularly crenate, rarely somewhat lobed, the upper surfaces bullulate, sparingly viscid-pilose, the lower ashy-tomentose or glabrate, borne on petioles mostly 3–8 cm. long, these margined or winged and clasping at the base; flowers numerous in glomerules 3–6 cm. distant, disposed in coarse viscid interrupted spikes 20–30 cm. long or more, subtended by numerous ovate or elliptical viscid appressed acuminate bracts, usually purplish; flowering calyces 22–30 mm. long, viscid-pilose, hispidulous within, the teeth of the lower lip 2–4 mm. long, weakly spinose, cut between them to a depth of 8–12 mm., the teeth of the upper lip wholly connate, rarely trimucronate at the tip; corolla crimson, its tube glabrous within, 25–35 mm. long, narrowed below the middle, the upper lip 7–8 mm. tall, the lower somewhat longer; stamens seated between the middle of the tube and the throat, ascending under the upper lip, their filaments equal to the tube, the connective 10–15 mm. long, the lower anther sometimes somewhat polliniferous; posterior style branch shorter, of varying length.

Ranges from Solano County near Vacaville southward in the coastal counties to Orange County, although apparently never collected in Alameda County. It is infrequent although

locally abundant, associated chiefly with the valley woodland formation (*Quercus agrifolia*, *Q. Douglasii*, *Q. lobata*, *Q. Wislizeni*), occurring on open slopes though usually in partial shade of other species, especially *Quercus agrifolia*. It may

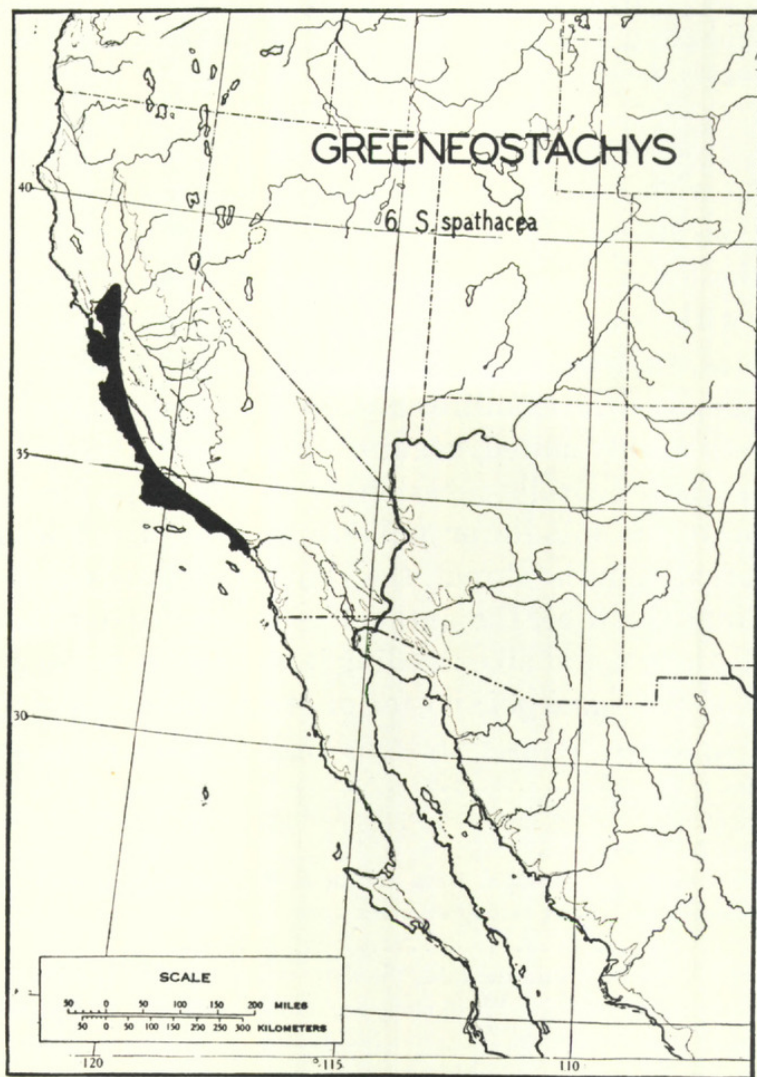


Fig. 3. Showing distribution of *S. spathacea*.

grow near *Salvia mellifera*, *apiana*, *leucophylla*, and *Columbariae*, but I have never seen it growing actually with any of these species, nor have I seen any suggestion of a hybrid form. Following are localities where it is known to occur:

CALIFORNIA: SOLANO: Vacaville; CONTRA COSTA: Pine Canyon, foot of Mt. Diablo; SAN MATEO: San Bruno Hills, Colma; MONTEREY: Tassajara Hot Springs, Morro Cr., Santa Lucia Mts.; SAN LUIS OBISPO: Paso Robles, Atascadero, Cambria, San Luis, Morro; SANTA BARBARA: Surf, Santa Maria, Mission Canyon near Santa Barbara, Cuyama Canyon, Montecito, San Isidro Ranch, Zaca Lake Forest Reserve, Carpinteria, Gaviota Pass; VENTURA: Foster Park, Ojai Cr.; LOS ANGELES: Los Alisos, Los Flores, Mandeville and Topanga Canyons of Santa Monica Mts., Pasadena, Calabasas, Pacific Palisades, Mint Canyon, Mulholland Highway in Bel Air; ORANGE: Laguna, Santa Ana Canyon (Aliso Canyon).

Subsect. PARISHIELLA

Shrubs with bullate-rugose leaves, oblong-elliptical or obovate, even linear, the upper surfaces glabrous or hirtellous, green, the lower ashy or whitened with appressed hairs, one species with branched hairs; flowers numerous in compact glomerules subtended by appressed often weakly spinose bracts, disposed in moniliform spikes, often branched; upper calyx teeth wholly united, usually trimucronate, the lower free, shortly spinose; corolla-tubes either narrowly pilose-annulate within near the middle or pubescent above the middle; the stamens seated in the throat, the filaments scarcely if at all exerted from the tube, the anthers ascending under the upper lip, but little or not at all exceeding it, entirely concealed within the tube of *S. Brandegei*; posterior style branch shorter.

Leaves linear, revolute, whitened below with branched hairs; stamens wholly included in the tube.....9. *S. Brandegei*

Leaves oblong-elliptical or obovate, appressed pubescent beneath; stamens exerted from the tube.

Connectives somewhat exerted from the tube, the anthers somewhat exceeding the upper lip; leaves oblong-elliptical, prevailing 3-6 cm. long.....7. *S. mellifera*

Connectives included within the tube, the anthers shorter than the upper lip; leaf-blades prevailing 12-15 mm. long, rarely as much as 4 cm., mostly obovate or oblanceolate.....8. *S. Munzii*

7. *S. mellifera* Greene in Pittonia 2: 236. 1892, based upon *Audibertia stachyoides* Benth., loc. cit. (not *S. stachyoides* Kunth). Plate 18.

Audibertia stachyoides Benth., Lab. Gen. et Sp. 313. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

S. mellifera var. *typica* Munz in Bull. S. Calif. Acad. Sci. 26: 24. 1927, based upon the same.

Audibertia spinulosa Nutt. ex Benth. in DC., Prodr. 12: 359. 1848 (an herbarium name cited in synonymy).

Audibertiella stachyoides Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon the preceding.

Ramona stachyoides Briq., loc. cit., 440. 1894, based upon the same.

A shrub 1–2 m. tall, its branchlets pubescent with usually retrorse hairs, sometimes villous, more or less glandular; leaf-blades prevailingly 3–6 cm. long, oblong-elliptical, obtuse at the apex, narrowed below the middle to more or less margined petioles 3–12 mm. long, the upper surfaces bullate, green, glabrate or hirtellous, the lower ashy, less often whitened by appressed hairs, areolate, the margins crenulate, flowers many in compact glomerules prevailingly 2–4 cm. in diameter including the flowers, subtended by ovate bracts, reflexed at maturity, hirtellous or villous, more or less glandular, either acuminate or shortly spinose, disposed in moniliform spikes, usually paniced, mostly 2–6 cm. distant; flowering calyces 5.5–7 mm. long, villous and more or less glandular, hispidulous within, the lower teeth free, 1.5–2 mm. long, ovate, acuminate-spinose, those of the upper lip joined to the apex, muticate or (usually) trimucronate, rarely shortly tridentate; corolla pale blue or tinged with rose, or whitish, its tube 5.5–9 mm. long, mostly about 9 mm., narrowly and transversely annulate near the middle, the upper lip 2.5–3 mm. tall, retuse, the lower twice as long, its middle lip cupped; stamens ascending under the upper lip, seated within the throat, exserted from the corolla-tube 3–4 mm., the connective and filament subequal.

This species is one of the principal shrubs of the coastal sage formation (*Artemisia californica*, *S. mellifera*, *S. apiana*, *S. leucophylla*, *Rhus laurina*, *Rhus integrifolia*), ranging from the Bay region to a point somewhat south of Tijuana. Southward from San Diego County its place in the formation is assumed by *S. Munzii*. As far as I know, the two species do not grow together, but both occur frequently with *S. apiana*. *S. mellifera*

occurs also with *S. leucophylla*, *S. Columbariae* and, infrequently, *S. Clevelandii* and *S. carduacea*. Hybrids are common with *S. apiana* and *S. leucophylla*, occasional with *S. Co-*



Fig. 4. Showing distribution of *S. mellifera*, *S. Munzii*, and *S. Brandegei*.

lumbariae and not recorded for *S. carduacea* or *S. Clevelandii*. The inflorescence of the coastal forms tends to be more branched and elongate than those of the interior, the flowers bluer, and the plant less compact. The last flowers of the sea-

son may simulate the flowers of *Salvia Munzii* in the reduced and included stamens.

The species ranges more or less continuously from Contra Costa, Alameda, western Stanislaus, and Santa Clara counties southward along the coast, extending into the interior coastal valleys, but apparently not into the Great Valley, to southern California. Here it is one of the most abundant species of the coast ranges and the lower parts of the Sierra, extending inland as far as Cajon Pass and the San Jacinto Mountains and southward through San Diego County west of the divide, into northern Lower California where it is soon replaced by *S. Munzii*. It occurs also on Santa Cruz and Catalina Islands. During the severe winter of 1936-37 occasional plants in the Santa Monica Mountains were frozen back. The species regenerates after fire chiefly by seedlings. It reaches its greatest development on low foothills, as in the Santa Monica Mountains. As the name suggests, it is an important bee plant.

8. *S. Munzii* Epl. in Madroño **3**: 169. 1935, based upon a specimen collected by Epling and Robison in a small arroyo south of the Hamilton Ranch, Lower California; the type is in the herbarium of the University of California (Los Angeles).

Plate 19.

S. mellifera var. *Jonesii* Munz in Bull. S. Calif. Acad. Sci.

26: 24. 1927, based upon a specimen collected in Lower California near Ensenada, by Jones (10. IV. 1882); the type is in the herbarium of Pomona College.

A rounded handsome shrub as much as 2.5 m. tall with branchlets appressed-hispidulous; leaf-blades primarily obovate-oblong, prevailing 12-40 mm. long, rounded at the apex, narrowed below the middle to petioles 1-3 mm. long, frequently sessile, the upper surface bullulate, hirtellous, the lower clothed with minute appressed hairs, both ashy, their margins crenulate; flowers few in glomerules 10-15 mm. in diameter, subtended by usually oblong-elliptical appressed bracts about equal to the calyces, acute or shortly aristate, ciliolate and for the rest nearly glabrous, disposed in slender unbranched or sometimes ternate moniliform spikes; flowering calyces 4.5-6

mm. long, hirtellous, more or less glandular, the lower teeth free, 1.5–2 cm. long, subaristate, the upper completely joined and usually obscurely trimucronate; corolla clear blue, its tube 7–9.5 mm. long, puberulent within above the middle but hardly annulate, the upper lip 2–2.5 mm. tall, retuse, the lower twice as long; stamens seated about midway between the middle of the tube and the throat, shorter than the upper lip, the connective and filament subequal.

Ranges from San Miguel Mountain in San Diego County, at least as far south as Rosario, Baja California, and about 25 miles inland from that point, apparently falling within the range of *Rhus laurina*. It ranges from sea-level to perhaps 4000 feet, entering the *Idria* belt in Lower California. North of Ensenada, at least along the coast, it is spasmodic in occurrence. Southward it becomes more abundant, and in the vicinity of San Antonio Canyon is, with *Artemisia californica*, a co-dominant of the coastal sage formation. Its most constant associate throughout its range is *Artemisia californica*. In odor it more nearly resembles *S. Clevelandii* which it also resembles in foliage. It may be readily distinguished from *S. mellifera* by its more compact rounded habit, the usually unbranched inflorescence, the more obovate leaves, and particularly by the conformation of the corolla and stamens which are sometimes scarcely exerted from the corolla-tube. Its corollas are uniformly a darker blue than those of *S. mellifera*, rarely approaching it in color. Its flowering period is notably earlier than that of *S. mellifera*, it being in full flower throughout its range in the first part of February, 1935. While *S. mellifera* ranges south of Tijuana, I have not yet found the two growing together. I believe that *S. Munzii* in the northern part of its range occurs at higher elevations than *S. mellifera*. The species occurs near or perhaps with *S. Clevelandii* on San Antonio Mesa, Baja California, but no hybrids have thus far been observed. It occurs frequently with *S. apiana*.

Following are specific localities where the species is known to occur:

CALIFORNIA: SAN DIEGO: San Miguel Mt., 2½ mi. s. e. of Sunnyside.

BAJA CALIFORNIA: 18 mi. n. of Ensenada, Salitre near Johnson Ranch, San An-

tonio Mesa and Canyon, La Grulla Gun Club, Arroyo Seco between San Rafael and San Antonio Mesa, San Telmo Abajo, San Rafael Valley, Rosario, 25 mi. e. of Rosario, Hamilton Ranch, Santa Clara Canyon, San Quintin, San Vicente Canyon, Ensenada, Las Salinas (? near S. Quintin), Cariso Cr., Las Animas Canyon between Ensenada and Santo Tomas.

9. S. Brandegei Munz in Bull. S. Calif. Acad. Sci. **31**: 69. 1932, based upon *Audibertia stachyoides* var. *revoluta* Brandege, loc. cit. Plate 20.

Audibertia stachyoides var. *revoluta* Brandege in Proc. Calif. Acad. II, **1**: 216. 1888, based upon a specimen collected on Santa Rosa Island, Calif., by Brandege; the type is in the herbarium of the University of California (Berkeley).

S. mellifera var. *revoluta* Munz in Bull. S. Calif. Acad. Sci. **26**: 23. 1927, based upon the same.

A shrub 1 m. tall or more, its branchlets pubescent with branching hairs; leaf-blades linear, prevailingly 2–4 cm. long, 2–5 mm. wide, obtuse, subsessile, their margins crenulate, revolute, the upper surfaces bullate, glabrous, green, the lower white-tomentose with branched and simple hairs; flowers few in glomerules 1.5–2 cm. in diameter, disposed in moniliform spikes, 1–3 cm. distant, subtended by ovate bracts shorter than the calyces, villous with branching hairs; flowering calyces 7–8 mm. long, villous with branching hairs, the teeth of the lower lip free, 1.5 mm. long, shortly spinose, the three posterior wholly joined except for the apex where trimucronate, 3.5–4 mm. tall; corolla lavender, almost rose-color, its tube 7–8 mm. long, pubescent within above the middle, hardly annulate, the lobes of the upper lip 3–3.5 mm. tall, joined almost to the apex, the middle lobe of the lower lip 3–4 mm. long, obcordate; stamens singular, the connective and filament together subequal to the anther, seated between the middle of the tube and the throat and wholly included within the tube; style shortly exerted.

This species occurs only on Santa Rosa Island, apparently playing the same rôle there in the coastal sage formation that *S. mellifera* and *S. Munzii* do on the mainland. While its principal associates there are *Artemisia californica* and *Rhus in-*

tegrifolia, its normal range is difficult to determine because of the profound modification of the original vegetation of the island through grazing and its replacement by introduced grasses. At present *S. Brandegei* occurs on the walls of a few of the steeper canyons, apparently on both sides of the island, ranging from sea-level to approximately 800 feet, entering (with *Artemisia californica*) into the chaparral belt (quercetal-chamisal). While *Artemisia californica* occurs elsewhere in small patches, due to the protection of *Opuntia*, it is not apparently accompanied by the *Salvia*.

Subsect. JEPSONIA

Shrubs of varied habit or (*S. sonomensis*) suffrutescent prostrate herbs, of interest to the botanist not only by reason of the morphology of leaf and flower but because of their part in plant economy; leaves varied, now deltoid now oblong-elliptical or obovate, rarely (*S. leucophylla*) clothed with branched hairs; posterior calyx teeth wholly joined unless trimucronate or even aristate at the apex, the two inferior free, mostly acute, rarely spinose, even aristate (those of *S. leucophylla* wholly joined to the upper lip, the orifice accordingly oblique and truncate); corolla-tube more commonly pilose-annulate near the middle, less often pubescent usually above the middle; stamens seated either in the tube near the throat or on the base of the lower lip, thrust out from the tube or even declined on the lower lip, the connective and filament subequal, the whole clearly much longer than the upper lip, the lower arm of the former wholly suppressed, the articulation oblique and inconspicuous; style usually declined, the posterior branch shorter.

Perennial suffrutescent prostrate herbs.....16. *S. sonomensis*

Erect shrubs.

Hairs branched; calyx teeth wholly united, the orifice therefore entire, oblique

.....11. *S. leucophylla*

Hairs simple; lower calyx teeth free.

Leaf-blades entire, obovate, oblanceolate or spatulate, similarly clothed on both sides with minute appressed hairs.

Corolla-tubes pubescent above the middle, scarcely annulate, 5-10 mm.

long; calyces 5-7 mm. long.....14. *S. carnosa*

- Corolla-tubes more or less pubescent above the middle, strongly pilose-annulate below, 15–22 mm. long; calyces 8–13 mm. long.....13. *S. pachyphylla*
- Leaf-blades crenulate, sometimes obovate, mostly deltoid-oblong or oblong-elliptical, similarly clothed on both surfaces with minute hairs in two species but these leaves not obovate.
- Leaves similarly clothed on both surfaces with minute appressed hairs, very white, the upper surface not bullate-rugose.
- Leaves truncate or abruptly cuneate at the base; corolla-tubes 11–14 mm. long.....17 *S. Vaseyi*
- Leaves narrowed at the base; corolla tubes 5–7 mm. long.....18. *S. apiana*
- Leaves bullate-rugose on the upper surfaces, green, the lower surfaces hispidulous or ashy with appressed hairs.
- Leaves narrowed below the middle, elliptical-oblong or obovate, the lower surfaces ashy with appressed hairs; lower lip of corolla shorter than the upper.....10. *S. Clevelandii*
- Leaves tending to be deltoid, the lower surfaces hispidulous, green; lower lip of corolla longer than the upper.
- Middle lobe of the lower lip entire, about 3–4 mm. long.....12. *S. mohavensis*
- Middle lobe of the lower lip erose, furcate, about 5–6 mm. long.....15. *S. eremostachya*

10. *S. Clevelandii* Greene in Pittonia 2: 236, 1892, based upon *Audibertia Clevelandii* Gray, loc. cit. Plate 21.

Audibertia Clevelandii Gray in Proc. Am. Acad. 10: 76. 1874, based upon a specimen collected near Potrero, San Diego Co., by Cleveland; the type is in the Gray Herbarium.

Audibertiella Clevelandii Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon the same.

Ramona Clevelandii Briq., loc. cit., 440. 1894, based upon the same.

A fragrant pretty shrub as much as a meter tall, its branchlets pubescent with retrorse hairs, ashy; leaf-blades 1.5–2.5 cm. long, usually elliptical, frequently obovate, obtuse at the apex, narrowed at the base to petioles 3–6 mm. long, their margins crenulate, the upper surfaces bullulate, hirtellous, the lower ashy or, especially when young, whitened with minute appressed hairs, areolate with prominent veins; flowers many in compact glomerules which are solitary, or two or three in remotely interrupted spikes, these even branched, subtended by firm ovate bracts shorter than the calyces, glandular-hispidu-

lous or the outer hirtellous; flowering calyces 8–10 mm. long, glandular-hispidulous, the teeth of the lower lip free, 1–1.5 mm. long, shortly spinose, the upper wholly joined unless trimucronate at the apex, 3.5–4 mm. tall; corolla dark violet-blue, its



Fig. 5. Showing distribution of *S. Clevelandii*.

tube 12–18 mm. long, arcuate, transversely pilose-annulate below the middle, the lobes of the upper lip almost wholly united, 6–8 mm. tall, the middle lobe of the lower lip mostly oblong, 3–4 mm. long, plane, retuse, otherwise entire; stamens seated toward the throat, the connective and filament subequal.

This species is a component of the chaparral of western San Diego County, extending from the vicinity of Lake Henshaw southward to San Antonio Mesa, Baja California, from sea-level to about 3000 feet. It occurs most commonly with the chamise, *Adenostoma fasciculatum*, and *Ceanothus* spp., but frequently is found with species of the coastal sage formation: *Salvia mellifera*, *S. apiana*, *Rhamnus crocea*, *Cneoridium dumosum*. Hybrids are known with *S. apiana* (*S. Palmeri*). The foliage is fragrant with a sweetish sage-like odor, noticeable en masse in the open or when dry in the herbarium, persisting for long periods. Occasional albino heads occur.

Following are specific localities where the plant is known to grow:

CALIFORNIA: SAN DIEGO: Flinn Springs, Mt. Woodson, Otay Mt., Alpine, Palomar Mt., Henshaw Dam, between Ramona and Ballena, Tecate R., Del Mar, Moreno Grade, Japatul Valley, Torrey Pines Park, Descanso, Cottonwood Grade near Potrero, Palomar Mt., Laguna Mts., Valley Center, Soledad R., 2½ mi. south of Tenaja Guard Station on road to Santa Margarita.

BAJA CALIFORNIA: Tecate R., 30 mi. south of Tijuana, San Antonio Mesa at head of San Antonio Canyon. (This latter point marks the southern limit of the chamisal, as far as I have been able to observe.)

11. *S. leucophylla* Greene in Pittonia 2: 236. 1892, based upon *Audibertia nivea* Benth., loc. cit. (not *S. nivea* Thunb.).

Plate 22.

Audibertia nivea Benth., Lab. Gen. et Sp. 313. 1833, based upon a specimen collected by Douglas in California; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella nivea Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon the preceding.

Ramona nivea Briq., loc. cit., 440. 1894, based upon the same.

A handsome whitened shrub as much as 1.5 m. tall or more, its branchlets incanous with very minute branched hairs; leaf-blades deltoid-oblong, prevailingly 3–6 cm. long, rounded at the apex, usually truncate at the base, or narrowed in the smaller ones, borne on more or less margined petioles 3–8 mm. long, their margins crenulate, the upper surfaces bullulate, both surfaces, especially the lower, ashy or whitened with very

small branched hairs; flowers many in compact glomerules subtended by whitened ovate-elliptical appressed bracts equal to the calyces, arranged in stout moniliform spikes, 3-6 cm. distant; flowering calyces mostly 8-11 mm. long, whitened with

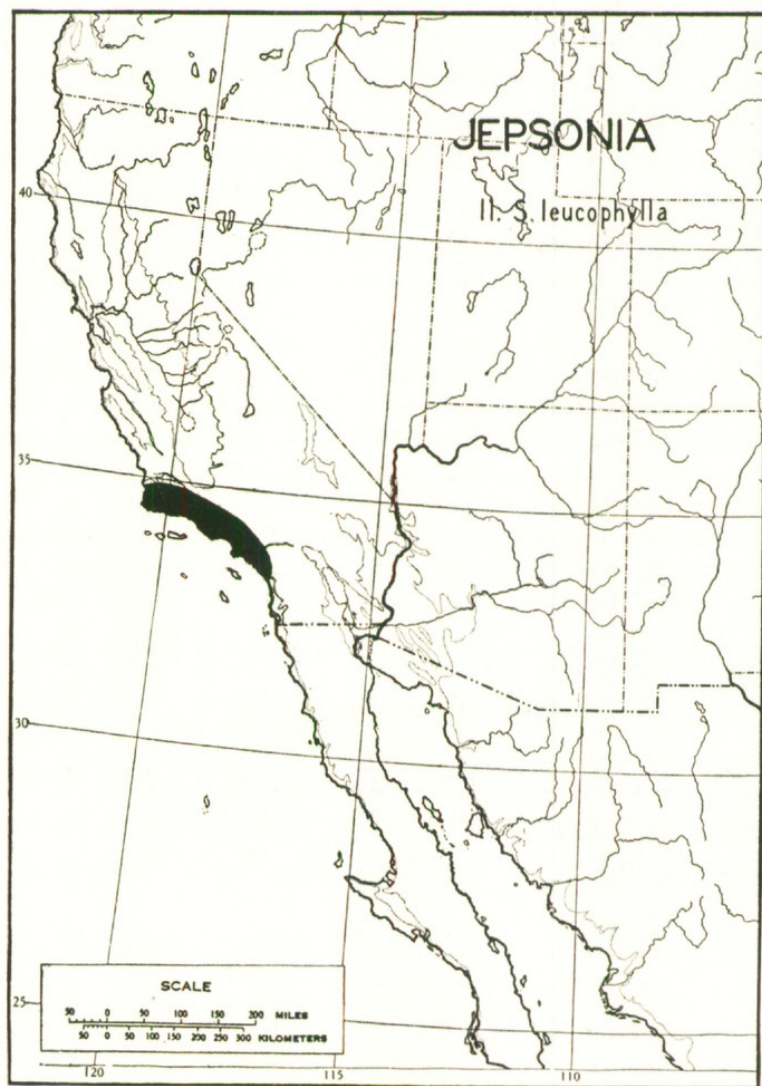


Fig. 6. Showing distribution of *S. leucophylla*.

minute branched hairs, the teeth wholly united into a single cucullate lip, the lower part sometimes barely evident, the orifice strongly oblique; corolla rose-color, rarely tending to bluish, its tube 10-13 mm. long, strongly pilose-annulate above the middle, the upper lip 6-8 mm. tall, oblong, its lobes free in the

upper part, the middle lobe of the lower lip oblong, plane, 4–5 mm. long; stamens seated in the throat, the connective shorter than the filament.

This species is a component of and an important member of the sage formation within its range. It occurs with *S. mellifera* and frequently with *S. apiana*, but often in pure and even dense stands, forming a close-cropped gray mantle of velvety texture over the rounded coastal hills. It is unique in the section by reason of the branched pubescence, the truncate calyx, and the conformation of the corolla. It is a noteworthy bee plant.

Following are localities where it is known to occur:

CALIFORNIA: SAN LUIS OBISPO: Pismo Beach, San Luis Obispo; SANTA BARBARA: Santa Inez Mts., between Zaca Lake and Los Olivos, Mission Ridge (Santa Barbara), Lompoc (Salsipuedes Canyon), Montecito, Cuyama Cañon; KERN: Lebec; VENTURA: Fillmore, Santa Paula, below Mutau Flat, Piru Cr., Sulfur Mt. near Ojai, Sespe Cr.; LOS ANGELES: Los Alisos Canyon near Santa Monica, Girard, Malibu Hills, Calabasas, Bouquet Canyon, San Francisquito Canyon, Pico Canyon near Newhall, Castaic, Topanga Canyon (intermixed with both *S. mellifera* and *S. apiana*), Pt. Dume, Puente Hills; SAN BERNARDINO: Chino Hills; ORANGE: Santa Ana Canyon, Black Star Canyon, Santiago Canyon.

12. *S. mohavensis* Greene in Pittonia 2: 235. 1892, based upon *Audibertia capitata* Gray, loc. cit. (not *S. capitata* Schlecht.). Plate 23.

Audibertia capitata Gray in Proc. Am. Acad. 7: 387. 1868, based upon a specimen collected in San Bernardino Co., Calif., in the Providence Mts., by Cooper; the type is in the Gray Herbarium.

Audibertiella capitata Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon *Audibertia capitata* Gray, loc. cit.

Ramona capitata Briq., loc. cit. 440. 1894, based upon *Audibertia capitata* Gray, loc. cit.

A low rounded shrub as much as a meter or more tall, but commonly less, its branchlets hispidulous; leaf-blades prevailingly 1.5–2 cm. long, for the most part deltoid, sometimes narrowly so or oblong-elliptical, obtuse, truncate at the base or narrowed to petioles 5–8 mm. long, their margins crenulate, the upper surfaces bullulate, the lower reticulately veined, both more or less hispidulous and sprinkled with sessile glands; flowers few in a loose subglobose head, subtended by submem-

braneous bracts, the outer ovate, the inner linear, all usually whitish; flowering calyces 7–12 mm. long, hirtellous, ciliate, more or less glandular, the teeth of the lower lip nearly free, usually ovate, acuminate, 1–2 mm. long, those of the upper com-

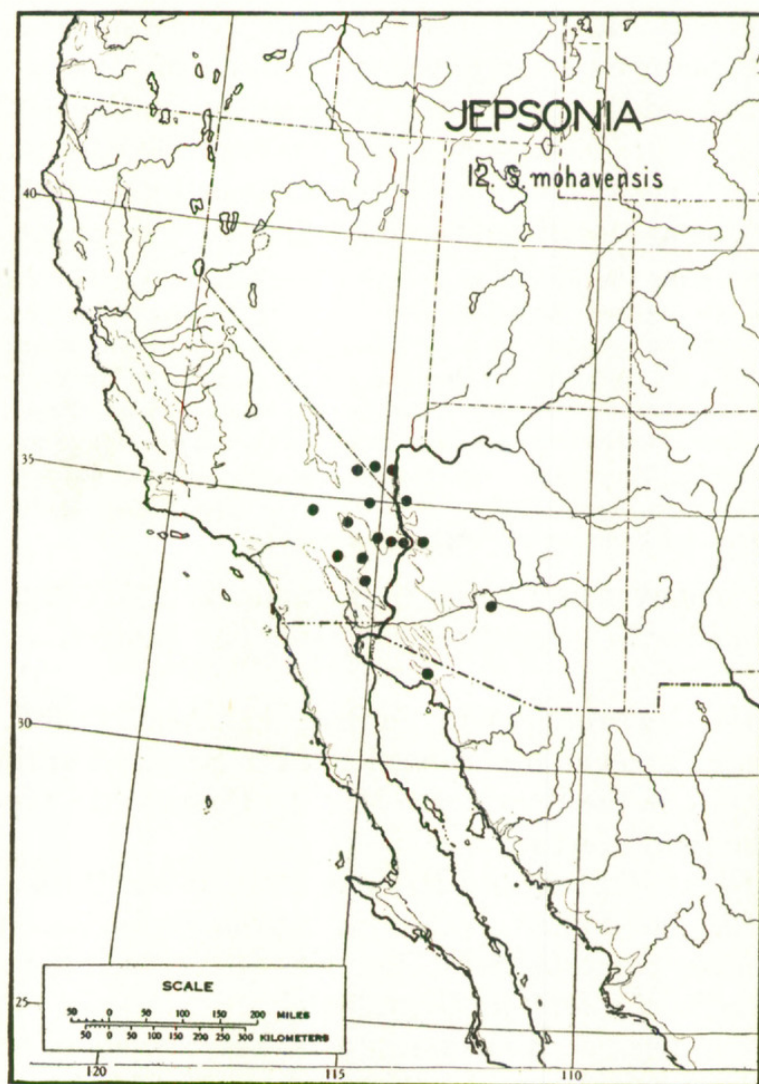


Fig. 7. Showing distribution of *S. mohavensis*.

pletely joined unless weakly trimucronate at the apex, 2.5–3.5 mm. tall; corolla pale blue or lavender, its tube slender, flaring near the throat, pubescent within above the middle, the lobes of the upper lip joined to the middle, 3.5 mm. tall, the

middle lobe of the lower subequal, nearly plane, entire; stamens seated in the throat, the connective somewhat shorter than the filament, the joint obvious; upper style branch shorter.

This species ranges from the Little San Bernardino Mountains near Lost Horse Well and Keyes Lookout through eastern San Bernardino and Riverside counties to Pinacate Mt., Sonora. In California it is known from the Little San Bernardino, Sheep Hole, Providence, Old Woman, Whipple, Old Dad, Eagle, Ord, Turtle, Clark, and Newberry Mountains. In Nevada it is known from Clark County: Good Springs, Meca Spring, and Eldorado Canyon near Nelson. In Arizona it is known from the Black Ute Mts. (Battleship Rock), the Chimehuevis Mts., and the Sierra Estrella. In Sonora it is known only from Pinacate Mt. It occurs in the upper part of the *Larrea-Franseria* formation, verging toward the piñon-juniper belt. It is found especially in rocky places and on steep rocky canyon walls.

13. *S. pachyphylla* Epl. ex Munz, Man. So. Calif. Bot. 445. 1935, based upon *Audibertia incana* var. *pachystachya* Gray, loc. cit. (not *S. pachystachya* Trautv.). Plate 24.

Audibertia incana var. *pachystachya* Gray, Syn. Fl. N. Am., ed. 2, 2, pt. 1: 461. 1886, based upon a specimen collected in California in Bear Valley in the San Bernardino Mts., by the Parish brothers (no. 330); the type is in the Gray Herbarium.

Audibertia pachystachya Parish in Erythea 6: 91. 1898, based upon the above.

Ramona pachystachya Heller in Muhlenbergia 1: 4. 1900, based upon the same.

S. carnosa var. *compacta* Hall in Univ. Calif. Publ. Bot. 1: 111. 1902, based upon *Audibertia incana* var. *pachystachya* Gray, loc. cit.

S. compacta Munz in Bull. S. Calif. Acad. Sci. 26: 22. 1927, based upon *S. carnosa* var. *compacta* Hall, loc. cit. (not *S. compacta* Kuntze).

A low compact rounded shrub, woody at the base, 30–50 cm. tall, as much as a meter in diameter, its branches sprawling or

ascending, its branchlets scurfy-puberulent, whitened; leaf-blades prevailingly 2–3 cm. long, obovate, rounded at the apex, narrowed at the base to petioles 5–15 mm. long, their margins entire, both surfaces whitened with minute appressed hairs

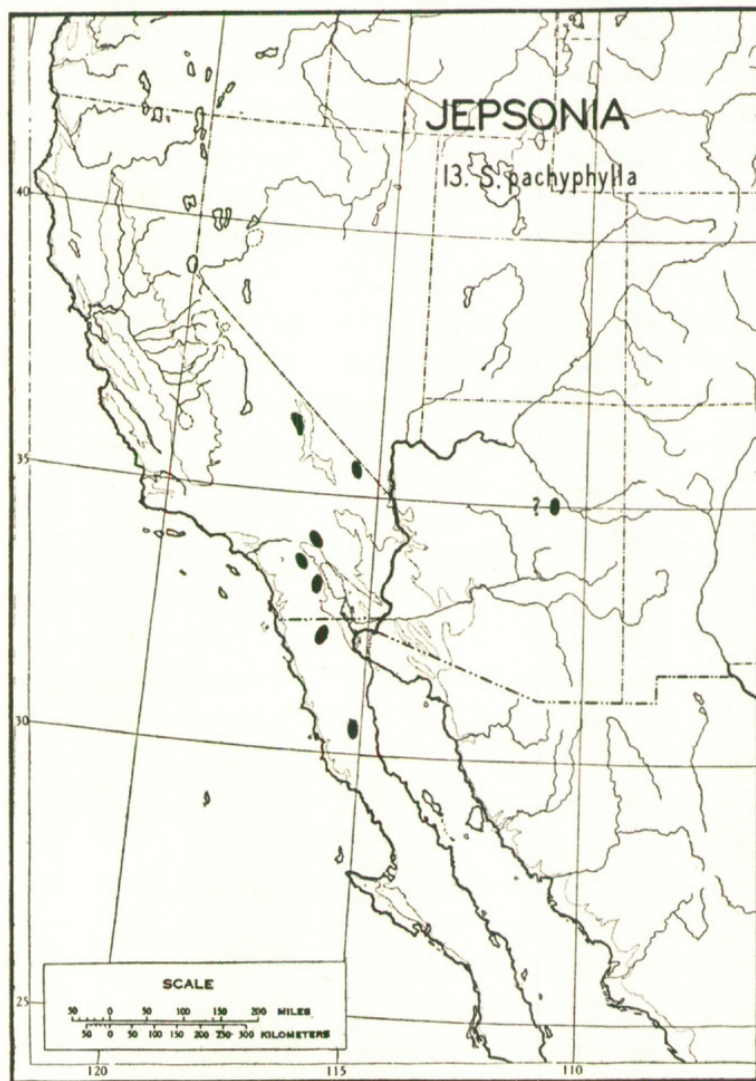


Fig. 8. Showing distribution of *S. pachyphylla*.

especially in youth; flowers several in sufficiently dense glomerules disposed usually in a compact spike 5–10 cm. long, 4–5 cm. broad, less often interrupted, 2–5 cm. distant, subtended by showy usually purple bracts mostly 1–2 cm. long, as much as 3 cm., obovate or oblong, usually rounded-truncate at the apex,

more or less ciliate on the margins, for the rest either glabrous and somewhat shining or hirtellous, hardly pilose; flowering calyces nearly cylindrical, 8–13 mm. long, pubescent, hispidulous within, the teeth of the lower lip 1–3 mm. long, mostly deltoid, acute, sometimes weakly spinose, nearly free, those of the upper lip entirely joined, 3–6 mm. tall, the lip truncate, rarely somewhat retuse; corolla dark violet-blue, rarely rose-color, its tube 15–22 mm. long, cylindrical, pubescent within above the middle, densely and transversely pilose-annulate below, the lobes of the upper lip 4–6 mm. tall, joined to the middle, the middle lobe of the lower erose, emarginate; stamens seated in the throat, the connective equalling the filament, the joint sufficiently obvious; posterior style branch shorter.

This species ranges widely but is localized. In the Panamint Mts. it occurs frequently and even abundantly in the *Juniperus utahensis*-*Pinus monophylla* formation or even below this, ranging from about 5000 feet in Emigrant Canyon to 10,000 feet or more at the saddle near Eagle Spring on Telescope Peak. Here it enters the zone occupied by *Pinus aristata* and *P. flexilis*. It is known from Towne Pass, Upper Wild Rose Canyon, Upper Hanaupah Canyon, and Telescope Peak. In the San Bernardino, San Jacinto, and Santa Rosa Mountains it lies chiefly in the more arid yellow pine belt, ranging into the juniper and piñon belt. In the San Bernardino Mountains it is known from Seven Oaks, Upper Santa Ana Canyon, top of Cushenberry Grade, Holcomb Valley, 2 mi. e. of Fawnskin, Upper Fish Cr., Cactus Flat, Quail Springs, Black Rock Canyon near Warren's Well, north slope of Sugar Loaf Mt., Bear Valley, Johnson Grade below Baldwin Lake, Big Meadows, Brown's Flats. In the San Jacinto Mountains it is known from the vicinity of Tauquitz Valley and Hidden Lake, and from the north side of San Jacinto Peak. In the Santa Rosa Mountains it is known from the vicinity of Santa Rosa and near Vandeventer Flat. It has recently been found by Wolf at Pachalka Spring and on the north side of the main peak of Clark Mt. In Lower California it occurs with yellow pine, as far as recorded, between Ojos Negros and Neji Rancho, and in the San Pedro Martir at La Grulla, La Encantada, and Vallecitos. I have ob-

served the species growing with *S. carnosa* in Wild Rose Canyon and on Cactus Flat, but due presumably to the difference in flowering period, no hybrids are formed. It evidently occurs with *Salvia apiana* in the Santa Rosa Mountains. *Artemisia tridentata* is an associate in the Panamint, San Bernardino, and San Jacinto Mts. A specimen collected by Marcus Jones in 1929 is said to have been obtained at the crater near Winslow, Arizona. This extension of range should be verified.

14. *S. carnosa* Dougl. ex Benth. in Bot. Reg. **17**: t. 1469. 1831, based upon a specimen collected by Douglas "on clayey banks of the Columbia and plains from Walla Walla to Spokane and on the south to the Sources of the Missouri"; the type is in the herbarium of the Royal Botanic Gardens at Kew.

A small erect shrub 30–70 cm. tall, its branchlets scurfy-puberulent, often whitened, sometimes pilose with spreading hairs in the inflorescence; leaf-blades prevailingly 1–2 cm. long, rarely 3–4 cm., oblanceolate or even linear or rotund, mostly obovate, rounded or retuse at the apex, narrowed at the base to petioles mostly 5–8 mm. long, entire, both surfaces silvery with a minute close puberulence especially when young; flowers many in sufficiently dense glomerules, disposed in short interrupted spikes, usually moniliform, less often congested, subtended by ovate-rotund usually colored bracts, these ciliate, puberulent or nearly glabrous, sometimes pilose, sometimes entirely glabrous, venulose and somewhat shining; flowering calyces turbinate, thin, hirtellous or pilose, usually ciliate, hispidulous within, the teeth of the lower lip nearly free, ovate, obtuse or weakly mucronate, those of the upper either wholly joined, the lip 1.5–2 mm. tall, rotund-truncate, or even retuse, or free nearly to the middle, either obtuse or weakly mucronate, about 1 mm. long; corolla blue, its tube cylindrical, 5–10 mm. long, pubescent within above the middle, but scarcely annulate, the upper lip 2–3 mm. tall, its lobes joined about to the middle, the middle lobe of the lower erose, often furcate; stamens seated in the throat, the connective somewhat shorter than the filament, the connection obvious; posterior style branch shorter.

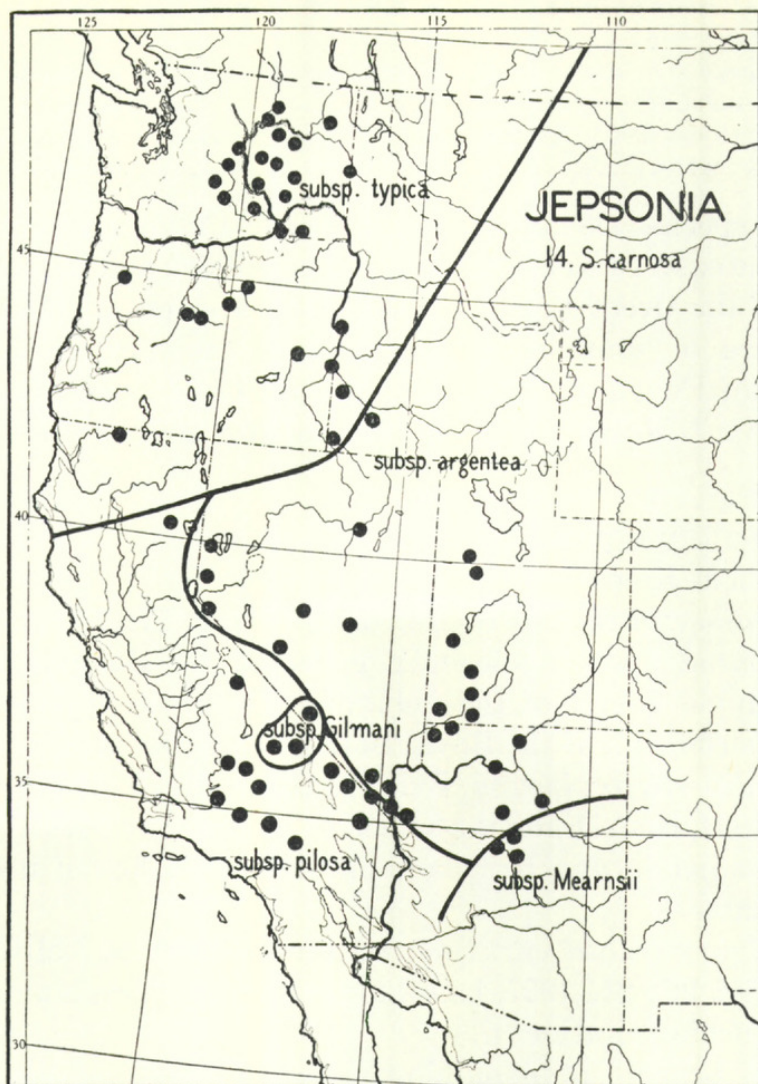


Fig. 9. Showing distribution of *S. carnosa* and its subspecies.

KEY TO THE SUBSPECIES

- Leaves oblanceolate or linear, 2–4 mm. broad (see also subsp. *typica*).....
subsp. (b) *Mearnsii*
- Leaves obovate or spatulate, rarely oblanceolate, for the most part more than
 4 mm. broad.
- Leaf-blades usually oval or elliptical, rarely obovate, prevailing 1.5–3,
 rarely 4 cm. long.....subsp. (a) *typica*
- Leaf-blades usually rotund or spatulate, abruptly narrowed to the petioles,
 mostly 4–15 mm., rarely 20 mm. broad.
- Bracts pilose on the outer surfaces; glomerules mostly 3–4, moniliform
 but usually approximate.....subsp. (e) *pilosa*

Bracts usually glabrate except for the ciliate margins; glomerules mostly 2-3.

Glomerules mostly about 1.5 cm. in diameter, usually 0.5-1.5 cm. distant on slender peduncles.....subsp. (d) *Gilmani*

Glomerules mostly 1.5-2.5 cm. in diameter, generally crowded.....subsp. (c) *argentea*

This species ranges from the upper Columbia southward along the eastern base of the coastal cordillera and in the mountains of the Great Basin to the northern slopes of the coastal cordillera of southern California and eastward in Arizona almost to Flagstaff. It occurs primarily in association with *Artemisia tridentata*, verging toward the juniper-pine association.

14a. subsp. *typica* Epl. nom. nov., based upon the Douglas specimen at Kew.

Audibertia incana Benth. in Bot. Reg. 17: t. 1469. 1831, based upon a specimen collected by Douglas on the upper course of the Columbia River; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella incana Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon the same.

Ramona incana Briq., op. cit. 440. 1894, based upon the same.

Salvia carnosa var. *typica* Munz in Bull. S. Calif. Acad. Sci. 26: 21. 1927, based upon the same (excluding Californian citations).

Upper branchlets hispidulous between the glomerules; leaf-blades mostly oval or elliptic, sometimes obovate, sometimes oblanceolate, 1.5-3, rarely 4 cm. long, gradually narrowed to the petioles and usually twice their length or more; mature glomerules usually 2-2.5 cm. in diameter, usually 3-4 in an interrupted spike, for the most part less than 1 cm. distant, subtended by opaque usually greenish hispidulous-ciliate bracts, their veins scarcely prominent.

This subspecies is known to me only from herbarium material save for a casual acquaintance years ago near Spokane. It is apparently a component of the *Artemisia tridentata* formation ranging into the juniper belt, occurring mostly between 2000 and 3000 feet.

Following are localities from which the subspecies has been gathered:

WASHINGTON: OKANOGAN: Omak, Soap Lake, Brewster; STEVENS: Loon Lake; CHELAN: Wenatchee; DOUGLAS: Egbert Springs; LINCOLN: Almira, Odessa; SPOKANE: Spokane Falls, Spokane; KITTITAS: Ellensburg; GRANT: Wilson Cr., Soap Lake, Vantage, between Ephrata and Coulee City; YAKIMA: Donald, Snipes Mt. near Yakima, Yakima R.; BENTON: Rattlesnake Mts.; FRANKLIN: Kahlotus; WALLA WALLA: near Wallula, Walla Walla.

IDAHO: WASHINGTON: Weiser; OWYHEE: Reynolds Cr.

OREGON: WHEELER: Mitchell; GRANT: Mt. Kimberly; CROOK: Maurey's Mts. near Prineville; MALHEUR: near Adrian.

CALIFORNIA: rocky slopes along the Klamath R. near the Pacific Highway in the juniper belt.

14b. subsp. **Mearnsii** Epl. comb. nov., based upon *Audibertia Mearnsii* Britt., loc. cit.

Audibertia Mearnsii Britt. in Trans. N. Y. Acad. Sci. **8**: 71. 1889, and in the Bull. Torr. Bot. Club **16**: 202. 1889, based upon a specimen collected by Mearns in Arizona near Fort Verde; the type is in the herbarium of the N. Y. Bot. Garden.

Branchlets more or less hispidulous between the glomerules; leaf-blades oblanceolate or linear, 1–2 cm. long, 2–4 mm. broad, gradually narrowed to obscure petioles, mature glomerules usually 2–2.5 cm. in diameter, for the most part 2, about 1 cm. distant in an interrupted spike, or solitary, subtended by glabrous purple shining venulose bracts.

This subspecies is known to me only from very inadequate herbarium material. It is known to occur at three places only: 10 miles east of Jerome Junction (now Copper Station, 1 mi. east of Chino Valley P. O.), at Schuerman's near Sedona, and on the sides of small canyons in limestone near Fort Verde, all in Arizona. It may be highly localized (for I was unable to find it in this region when searching for it) and presumably occurs in association with mesquite.

14c. subsp. **argentea** Epl. comb. nov., based upon *Audibertiella argentea* Rydb., loc. cit.

Audibertiella argentea Rydb. in Bull. Torr. Bot. Club **36**: 683. 1909, based upon a specimen collected in Arizona at Mokiak Pass by Palmer (no. 395); the type is in the herbarium of the N. Y. Bot. Garden.

Branchlets usually hispidulous between the glomerules; leaf-blades usually 8–15 mm., even 20 mm. in diameter, obovate or rotund, abruptly narrowed to petioles somewhat shorter; glomerules usually 2–3, usually congested, sometimes into a compact spike, rarely 1 cm. distant, subtended by usually glabrous, venulose, shining purple or blue bracts.

This subspecies is known to me from herbarium material only. The following are localities from which it is recorded; it ranges higher than the other subspecies and probably occurs in the *Artemisia* and the piñon associations:

IDAHO: OWYHEE: Bruneau.

UTAH: TOOELE: Granite Mts., 5000 ft.; JUAB: Dugway Range, near Detroit, 21 mi. west of Sulphur Springs; BEAVER: Wa Wa; IRON: Cedar Canyon, 6800 ft.; WASHINGTON: Valley of the Virgin near St. George, Santa Clara Valley, 5000 ft., Beaverdam Mts., Zion Canyon, Springdale.

NEVADA: WASHOE: Virginia City, hills n. e. of Reno, 6000 ft., Truckee Desert, 4500 ft., Pyramid Lake; DOUGLAS: near Minden; MINERAL: Candelaria; NYE: Currant, Monitor Valley, 5500 ft.; EUREKA: Palisade; CLARK: Los Vegas Mts., Indian Spring of Charleston Mts., 4000 ft., Lee Canyon of Charleston Mts., 8700 ft.

ARIZONA: MOHAVE: House Rock, Mokiak Pass, Union Pass, Pagumpa at head of Grand Wash; COCONINO: Bright Angel and Hermit Trails of Grand Canyon, Willow Spring, near Flagstaff; 50 miles south of Lee's Ferry.

CALIFORNIA: MONO: Topaz; INYO: Nelson Range near Lee's Pump; (?) RIVERSIDE: near Daggett.

14d. subsp. **Gilmani** Epl. subsp. nov., based upon a collection made by Epling and Gilman in the Panamint Mts. (Piñon Mesa, Wild Rose Canyon); the type is in the herbarium of the University of California (Los Angeles).

Branchlets hispidulous or sometimes pilose between the glomerules; leaf-blades prevailingly 4–7 mm. in diameter, rotund or spatulate, abruptly narrowed to petioles 2.5 mm. long; mature glomerules usually about 1.5 cm. in diameter, sometimes solitary, mostly 2–3 in interrupted spikes, .5–1.5 cm. distant, borne on slender peduncles, subtended by rather opaque, rarely shining bracts which are glabrous or hispidulous, rarely pilose, and usually rose-colored.

It is a pleasure to associate with this plant of the Death Valley Region the name of Mr. French Gilman, curator of the botanic garden in Death Valley and long-time student of the flora and fauna of the Sonoran desert. I am indebted to Mr. Gilman

for notes regarding the distribution of Death Valley and Panamint Labiatae.

This subspecies occurs just at the lower margin of the juniper-piñon association ranging chiefly in the *Artemisia* association from about 3000–7000 feet. It intermixes occasionally with *S. pachyphylla* (Wild Rose Canyon) but, perhaps due to the differences in flowering time, apparently does not hybridize with it.

It is known from the following localities:

CALIFORNIA: INYO: Panamint Mts. (Ubehebe, Panamint Canyon, Wild Rose Canyon, Hanaupah Canyon, Surprise Canyon), Argus Mts. (Shepherds Canyon).

NEVADA: CLARK: Valley of Fire; ESMERALDA: Goldfield.

The specimens cited from Nevada may rather be subsp. *argentea* but seem to be this clearly, especially the Goldfield specimen. Specimens from the Providence and New York Mountains, as well as near Chloride, are more or less intermediate.

14e. subsp. ***pilosa*** Epl. comb. nov., based upon *Audibertia incana* var. *pilosa* Gray, loc. cit. Plate 25.

Audibertia Dorrii Kellogg in Proc. Calif. Acad. **2**: 190. fig. 57. 1863, based upon a specimen collected by C. H. Dorr, presumably near Virginia City, Nevada; the type, formerly in the California Academy of Sciences, is lost.

Audibertia incana var. *pilosa* Gray, Syn. Fl. N. Am. ed. 2, **2**: pt. 1: 461. 1886, based upon a specimen collected by the Parish brothers in the San Bernardino Mts. of California; the type is in the Gray Herbarium.

Salvia pilosa Merriam in N. Am. Fauna **7**, pt. 2: 322. 1893, based upon the same.

Audibertiella Dorrii Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia Dorrii* Kellogg, loc. cit.

Ramona Dorrii Briq. in Engler u. Prantl, Nat. Pflanzenf. IV. IIIA. 287. 1897, based upon the same.

Ramona pilosa Abrams in Bull. N. Y. Bot. Gard. **6**: 443. 1910, based upon *Audibertia incana* var. *pilosa* Gray, loc. cit.

Salvia carnosa var. *pilosa* Jeps., Man. Calif. 870. 1925, based upon the same.

Branchlets hispidulous and frequently pilose between the glomerules; leaf-blades usually rotund, frequently spatulate, usually 7–10 (rarely 15) mm. in diameter, narrowed abruptly to petioles mostly 5–7 mm. long; mature glomerules 1.5–2.5 cm. in diameter, prevailingly 4–5 in interrupted spikes, usually less than 1 cm. distant and often crowded, subtended by purplish or greenish bracts which are strongly ciliate and pilose on the backs with hairs of the same order; at the same time they are hardly opaque but somewhat shining and venulose.

The range in flower size is about the same in all the subspecies except perhaps subsp. *pilosa*. The smallest flowers are found here, particularly in a form with very compact glomerules, such as that collected by Jones near Bishop and by Munz near Deep Creek (no. 11913).

This subspecies occurs in association with *Artemisia tridentata* at the lower margin of the juniper-piñon association often with *Yucca brevifolia*, from about 3500–6000 feet.

Following are localities where it is known to occur:

CALIFORNIA: LASSEN: Hot Springs Peak; MONO: Rock Creek Canyon, 6000 ft.; INYO: near Bishop; KERN: Johannesburg, Antelope Valley, Walker Pass, Onyx, Mt. Pinos; LOS ANGELES: Palmdale, Little Rock Cr. of San Gabriel Mts., Hungry Valley, Vincent, Acton, Lancaster; SAN BERNARDINO: Victorville, Hesperia, San Bernardino Mts. (Cushenbury Grade, Deep Cr.), Providence Mts., 4000 ft., Kelso, Cajon, Ventrigger Spring, 11 mi. s. of Barstow, Hackberry Mt., New York Mts. near Ivanpah, Cima, Kingston Mts.; RIVERSIDE: Little San Bernardino Mts. (Covington Flats, Key's Ranch).

NEVADA: ESMERALDA: Amargosa Desert; CLARK: Goodsprings, Las Vegas, Eldorado Canyon at Nelson, 3000 feet.

15. *S. eremostachya* Jeps., Man. Calif. 870. 1925, based upon a specimen collected by him in Coyote Canyon, Indian Valley, Riverside Co., Calif.; the type is in Jepson's herbarium.

Plate 26.

An intricately branched shrub about a meter tall or less, its branchlets ashy with spreading glandular hairs, frequently pilose; leaf-blades deltoid-oblong, even linear, mostly 1.5–3.5 cm. long, 4–10 mm. wide, obtuse at the apex, truncate at the base or narrowed to more or less marginate petioles 3–8 mm. long, their margins crenulate, nearly straight, frequently revo-

lute, the upper surface bullate, the lower areolate with raised veins, both hispidulous; flowers few in sufficiently dense glomerules, disposed in interrupted spikes formed of 2-3 glomerules 1-2 cm. distant, subtended by thin rotund-ovate bracts,

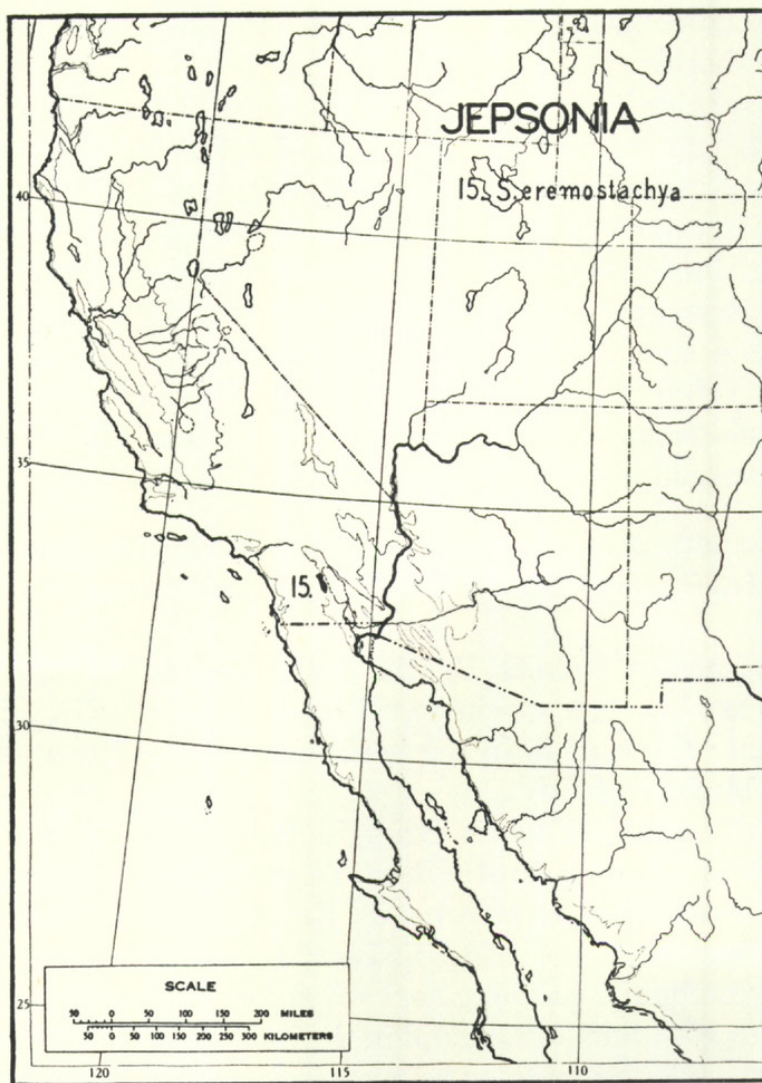


Fig. 10. Showing distribution of *S. eremostachya*.

short-acuminate, glandular, sparingly pilose; flowering calyces glandular-pilose, about 11 mm. long, the lobes of the lower lip free, 3-3.5 mm. long, weakly spinose, those of the upper wholly united unless 2- or 3-spinose at the apex, 4.5-5 mm. tall; corolla

blue or rose color, its tube cylindrical, arcuate, somewhat narrowed near the throat, pubescent within above the middle, 14–17 mm. long, the lobes of the upper lip 4–6 mm. tall, frequently erose, joined in the middle, the middle lobe of the lower lip forked and strongly eroded, rotund; stamens seated in the throat, the connective and filament subequal; posterior style branch shorter.

This species is a component of the *Larrea-Franseria* formation, ranging from 1200 ft. to about 4500 ft. It is known from three localities only: (a) Indian Canyon, Collins Valley, Santa Rosa Mts. near Borego, (b) eastern San Diego Co., Rockhouse Canyon, Santa Rosa Mts., and (c) on the Palms to Pines Highway from just below the piñon belt to the foot of the grade. Its associates are *Larrea mexicana*, *Prunus eriogyna*, *Salvia apiana*, *Salvia Vaseyi*, *Acacia Greggii*, *Encelia farinosa*, *Krameria canescens*, and *Eriogonum fasciculatum*. Hybrids have been observed with the two *Salvia* species mentioned.

16. *S. sonomensis* Greene in Pittonia **2**: 236. 1892, based upon *Audibertia humilis* Benth., loc. cit. (not *S. humilis* Benth.). Plate 27.

Audibertia humilis Benth., Lab. Gen. et Sp. 313. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella humilis Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia humilis* Benth., loc. cit.

Ramona humilis Greene in Erythea **1**: 44. 1893, based upon *Audibertia humilis* Benth., loc. cit.

A low perennial creeping herb often forming mats, its flowering stems 15–30 cm. tall, hispid in the inflorescence with spreading more or less glandular hairs, rarely hispidulous with short glandular hairs, softly retrorse-hirsute below; leaf-blades elliptical-obovate, generally 3–6 cm. long, rounded at the apex, attenuate at the base to subequal petioles, their margins crenulate, the upper surfaces bullulate, cinereous, hirtellous, the lower appressed-tomentose, more or less whitened; flowers

numerous in glomerules 1–5 cm. distant, forming interrupted moniliform spikes 10–25 cm. over all, borne on subequal peduncles, subtended by acute appressed elliptical villous bracts; flowering calyces 6–9 mm. long, the lobes of the lower lip free,



Fig. 11. Showing distribution of *S. sonomensis*.

those of the upper wholly united, trimucronate at the apex; corolla pale violet, its tube 4–8 mm. long, villous-annulate near the middle, the lobes of the upper lip nearly free, 2–3 mm. long, mostly acute, the lower lip thrice as long, its middle lobe rotund,

erose; stamens seated on the base of the lower lip, the filament and connective subequal, their point of connection obscure, entire, the upper staminodia often prominent; style branches very short, the upper somewhat shorter than the lower.

This species occurs generally along the Sierra foothills from Shasta County to Calaveras; along the coast ranges in Lake, Sonoma, and Napa counties; in Monterey County and in San Diego County.

I am familiar with it only in the last where it occurs under thin chamise: *Adenostoma fasciculatum*. In its northern range it apparently occurs with the oak woodland or yellow pine formations or under manzanita within these formations. No hybrids are known, nor does it apparently grow with any other species. The specific localities from which it is known are as follows:

CALIFORNIA: SHASTA: Ydalpom, Kennet, O'Brien Cr., Cow Cr.; SISKIYOU: McCloud, Pit R. Ferry, Mt. Shasta, Sisson, Burney, Bully Hill; BUTTE: Forest Ranch, 2700 ft., Cohasset; NEVADA: Banner Hill, Lake City, Grass Valley; SACRAMENTO: Folsom; CALAVERAS: Mokelumne Hill, Murphy's Camp, Devil's Gulch; LAKE: Lower Lake, Mt. Konocti, 3000 ft.; NAPA: Mt. St. Helena, Calistoga; SONOMA: Sonoma; SAN BENITO: San Juan, Mt. Hood, Fremont's Peak; MONTEREY: Santa Lucia Peak, Tassajara Hot Springs, N. Fork San Antonio R., Arroyo Seco R.; SAN DIEGO: Harper Ranch near Cuyamaca Lake, top of Cuyamaca Peak, Guatay Mt., Descanso Junction.

17. S. Vaseyi Parish in *Muhlenbergia* **3**: 126. 1907, based upon *Audibertia Vaseyi* Porter, loc. cit. Plate 28.

Audibertia Vaseyi Porter in Bot. Gaz. **6**: 207. 1881, based upon a specimen collected in San Diego Co., Calif., at Mountain Springs by Vasey; the type may be in the Porter herbarium at the Academy of Natural Sciences, Philadelphia.

Audibertiella Vaseyi Briq. in Bull. Herb. Boiss. **2**: 73. 1894, based upon *Audibertia Vaseyi* Porter, loc. cit.

Ramona Vaseyi Briq., loc. cit., 440. 1894, based upon the same.

A low rounded snowy shrub as much as a meter tall, its branchlets minutely incano-puberulent; leaf-blades prevailingly deltoid-ovate, 3-5 cm. long, obtuse at the apex, truncate at the base or abruptly cuneate, their margins crenulate, both

surfaces densely whitened with minute appressed hairs, borne on petioles 5–10 mm. long; flowers many in compact glomerules disposed in moniliform long-peduncled spikes 30–60 cm. long, 3–8 cm. distant, subtended by whitened bracts, the outer ovate,

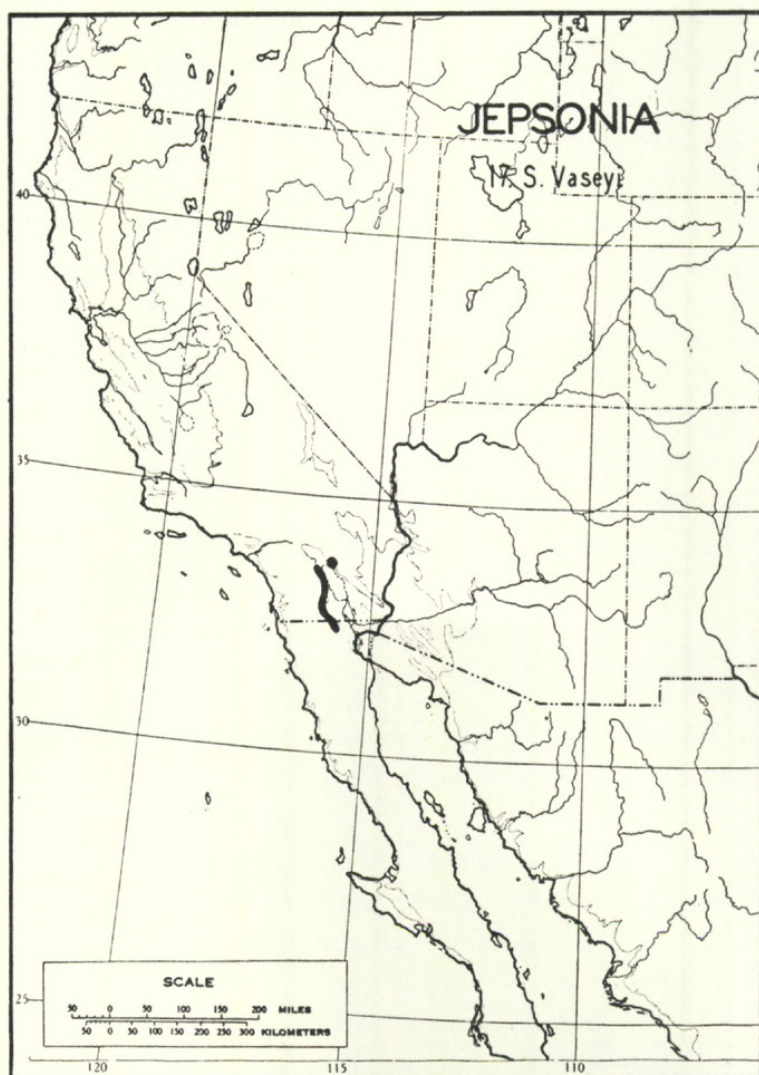


Fig. 12. Showing distribution of *S. Vaseyi*.

the inner lanceolate, all tipped with a stout bristle; flowering calyces whitened with minute hairs, 8–10 mm. long excluding the bristles, the lobes of the lower lip deltoid-ovate, free, drawn into a bristle 3–4 mm. long, as much as 8 mm. long over all,

those of the upper wholly united, the lip drawn into a bristle as long as the body, 5–8 mm. long over all; corolla white, its tube 11–14 mm. long, strongly pilose-annulate within near the middle and vertically compressed, the throat closed, the lobes of the upper lip almost completely joined, the lip rotund, retuse, 3–4 mm. in diameter, the lower lip 7–12 mm. long, the middle lobe obreniform, erose; stamens seated in the throat, the connective somewhat longer than the filament.

This species is a component of the *Larrea-Franseria* formation, its principal associates being *Larrea mexicana*, *Eriogonum fasciculatum polifolium*, *Encelia farinosa*, *Franseria dumosa*, *Fouquieria splendens*, and *Yucca mohavensis*. It occurs chiefly on the western side of the Colorado Desert from Mountain Spring in San Diego County (and doubtless in Baja California) to Palm Canyon in the San Jacinto Mountains. On the eastern side of the valley it occurs in Morongo Valley (Little San Bernardino Mts.). It is abundant on the Palms to Pines Highway. While doubtless abundant throughout this range it is not otherwise recorded save from Martinez Canyon in the Santa Rosa Mountains, Yaqui Well, and Palm Canyon near Borego. It occurs with *Salvia eremstachya* and *S. apiana* and hybridizes with both.

18. *S. apiana* Jeps. in *Muhlenbergia* **3**: 144. 1908, based upon *Audibertia polystachya* Benth., loc. cit. (not *S. polystachya* Ort.). Plates 29 & 30.

Audibertia polystachya Benth., *Lab. Gen. et Sp.* 314. 1833, based upon a specimen collected in California by Douglas; the type is in the herbarium of the Royal Botanic Gardens at Kew.

Audibertiella polystachya Briq. in *Bull. Herb. Boiss.* **2**: 73. 1894, based upon the preceding.

Ramona polystachya Greene in *Pittonia* **2**: 235. 1895, based upon the same.

S. californica Jeps., *Fl. W. Middle Calif.* 460. 1901, based upon the same (not *S. californica* Brandegees).

S. apiana var. *typica* Munz in *Bull. S. Calif. Acad. Sci.* **26**: 25. 1927, based upon *S. apiana* Jeps., loc. cit.

S. apiana var. *compacta* Munz, loc. cit., based upon a specimen collected in Riverside Co., Calif., in the Dry Morongo Wash, by Munz and Johnston (no. 5170); the type is in the herbarium of Pomona College.

A snowy shrub 1-2 or even 3 m. tall, its branchlets whitened with minute appressed hairs; leaf-blades either elliptical or oval, mostly 5-10 cm. long, obtuse at the apex, narrowed at the base to petioles 0.5-2 cm. long, their margins crenulate, frequently subentire, both surfaces whitened with very minute appressed hairs; flowers few in lax glomerules, subtended by ovate-lanceolate frequently subspinose bracts mostly shorter than the calyces, spreading or deflexed, disposed in striking elongated panicles as much as 1.5 m. long, the branchlets either ascending or shortened and appressed to the axis, thus forming a spike-like thyraxis or even an apparent interrupted spike; flowering calyces 5-7.5 mm. long, whitened with very minute appressed hairs, the lower teeth mostly free, ovate, about 1.5 mm. long, obtuse or subspinose, the upper wholly united, the lip obtuse, truncate or retuse, hardly mucronate; corolla whitish, commonly speckled with lavender, its tube 5-7 mm. long, pilose in the throat, commonly annulate, the upper lip entire or retuse, 1.5-2 mm. tall, plane, recurved, the lower 8-20 mm. long, abruptly bent at the base and ascending, thus closing the orifice, the middle lobe rotund, erose, cupped, deflexed, 4.5-12 mm. broad; stamens seated on the base of the lower lip, ascending and divaricate, the connective longer than the filament; style deflexed.

This species is an important and characteristic component of the coastal sage formation, ranging into the western margins of the *Larrea-Franseria* formation from Santa Barbara County to about 30 miles north of Punta Prieta in Lower California. It occurs also in isolated colonies within the chaparral (chamisal), the piñon-juniper, and even reaches to the yellow pine forest. It has the greatest altitudinal range of any species save perhaps *S. Columbariae*. It occurs very commonly with *Eriogonum fasciculatum*. It may occur with *S. mellifera*, *leucophylla*, *Clevelandii*, *eremostachya*, *pachyphylla*, *Vaseyi*,

Munzii, *Columbariae*, and *carduacea*. It forms hybrids with all but the last two. I have seen it also in the vicinity of but not actually with *S. spathacea*, *sonomensis*, *carnosa*, and *mohavensis*. In Lower California it reaches into the *Idria* association.



Fig. 13. Showing distribution of *S. apiana*.

It is obviously the most catholic of all the *Audibertias*. As it occurs along the western margin of the Colorado Desert, it becomes more compact in inflorescence (var. *compacta* Munz) but not otherwise modified. This more compact form is by no

means consistent in its occurrence, however, and is not well defined. Since its range is largely marginal to that of *Salvia Vaseyi*, I have wondered whether these more compact forms might represent slight intermixture with that species, with which clearly defined hybrids do occur.

As the flowers open they tend to have the conformation of the flowers of *S. Vaseyi* or *S. eremostachya*. The elongate lower lip is soon reflexed, however, in most cases. It may not be so reflexed in occasional plants. While usually with a whitish speckled corolla (yellowish in the bud), occasional forms occur with a fairly well-defined bluish tinge.

Following are localities where the species may be found:

CALIFORNIA: SANTA BARBARA: Santa Barbara Mts. (Billiard Flat), Santa Barbara; VENTURA: Topa Topa Mts., Piru Cr.; LOS ANGELES: San Gabriel Mts. (Big Rock Cr.), Claremont, Los Angeles (Elysian Park), Westwood, Santa Monica Mts., Verdugo Hills, Sierra Madre, Monrovia, Acton, Antelope Valley, Newhall, Mt. Lowe; SAN BERNARDINO: San Bernardino, Cajon Pass; RIVERSIDE: Whitewater, Morongo Wash, Corona, Box Springs, Menifee, Sage, San Jacinto, Ramona, San Jacinto Mts. (Snow Cr.), Massacre Canyon; ORANGE: Rincon, Santa Ana Canyon; SAN DIEGO: Otay Mesa, Coronado Isl., Santa Rosa Mts., Flinn Springs, Lake Hodges, Mountain Springs, Jacumba, San Felipe, Vallecitos, Mason Valley, La Jolla, Oak Grove, Palomar Mt., Witch Cr.; SANTA CATALINA ISLAND.

BAJA CALIFORNIA: San Pedro Martir, San Antonio Canyon, Sacaton, Tijuana, 34 mi. n. of Punta Prieta (furthest south observed), Jaraguay, Cataviña, El Marmol, Arroyo Seco between Johnson Ranch and San Antonio Mesa.

HYBRIDS

When two or more species of *Salvia* are found growing with or near each other occasional or sometimes numerous plants may be found which are more or less intermediate between these species. While it is true that, to my knowledge, no hybrids have as yet been produced by hand, it seems hardly other than that these intermediate plants are natural hybrids, particularly since they are seldom, if ever, found apart from the supposed parent species. I consider them to be such. In habit, in foliage, in pubescence, and in floral characteristics they are generally intermediate, although in some cases may resemble one parent or the other very closely, only small clues indicating the compound heritage. They are not markedly more robust than the parents although sometimes with somewhat larger

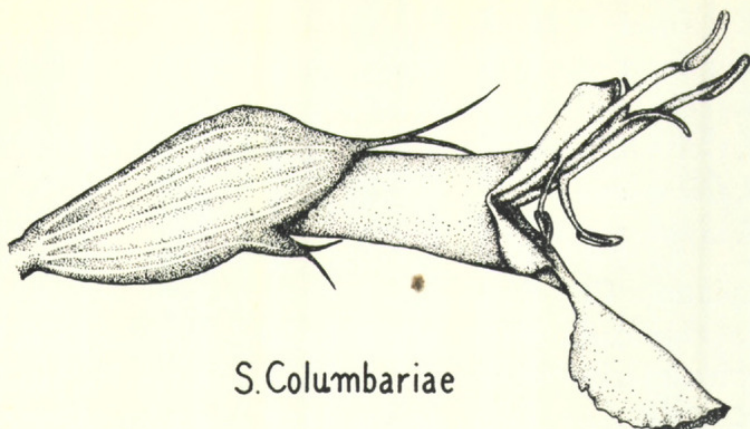
flowers. In fact, the foliage is reduced in size if anything. Whether they are fertile is unknown but by inference from their infrequency and association with the parent species, which are otherwise quite constant, it would appear that they are not. Apart from their intermediate nature I have observed several facts of interest, namely, that the branched pubescence of *S. leucophylla* is dominant, always (in my experience) appearing in the hybrid, although modified and not so luxuriant, and that the lower end of the connective, which in the parents is completely lost, is slightly but definitely developed in occasional hybrids. With one exception, namely *S. apiana* \times *pachyphylla*, the anthers appear normal. There is some slight suggestion that hybridization produces an elongation to the upper calyx lip as in *S. Columbariae* and *S. Vaseyi*.

A drawing has been included (fig. 14) which will indicate to a certain degree the intermediate nature of the average hybrid. It shows flowers from *S. Columbariae* and *S. mellifera* and the intermediate (known as *S. bernardina*). It will be seen that the calyx is about intermediate; the corolla of the hybrid is more nearly that of *S. Columbariae*, the stamens more nearly those of *S. mellifera*. The resemblance of this hybrid flower to the flower of *S. Munzii* is remarkable and, to me, suggestive of the probable course of speciation within the section. I have seen similar hybrids, almost certainly between *S. eremostachya* and *S. apiana*, which strongly suggested *S. Vaseyi* in habit and structure.

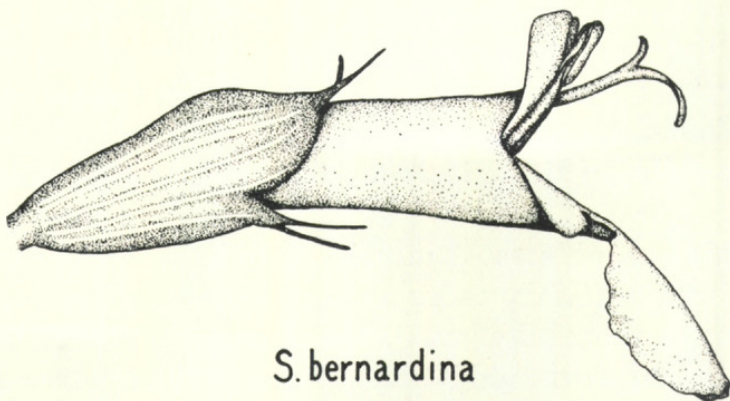
While in so far as observation has permitted, it would appear that the hybrids usually occur anywhere in the range of the parent species, *S. bernardina* (*S. Columbariae* \times *mellifera*) appears to be restricted to the vicinity of San Bernardino, although the parents occur together over wide areas.

The following have been observed:

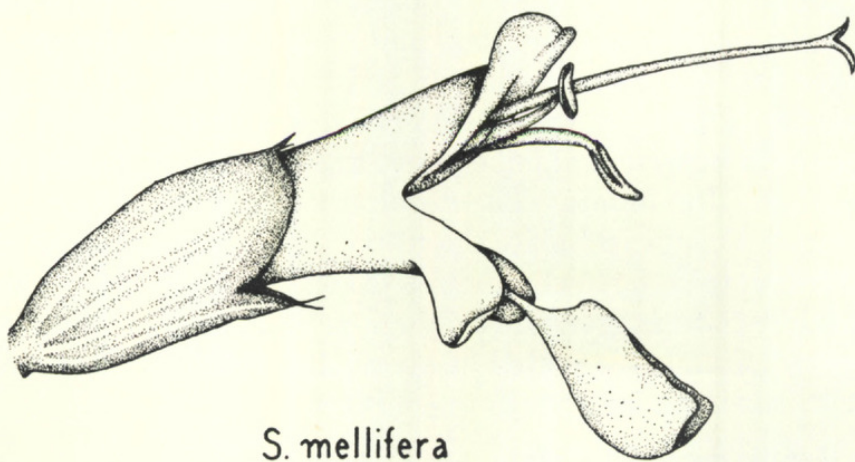
- A. *S. apiana* \times *Clevelandii* (*S. Palmeri*)
- B. *S. apiana* \times *mellifera*
- C. *S. apiana* \times *leucophylla*
- D. *S. apiana* \times *pachyphylla*
- E. *S. apiana* \times *Munzii*



S. Columbariae



S. bernardina



S. mellifera

Fig. 14. Flower of *S. bernardina* compared with those of its parents.

- F. *S. apiana* × *Vaseyi*
- G. *S. apiana* × *eremostachya*
- H. *S. leucophylla* × *mellifera*
- J. *S. Columbariae* × *mellifera* (*S. bernardina*)
- K. *S. Clevelandii* × *leucophylla*
- L. *S. eremostachya* × *Vaseyi*

A. ***S. apiana* × *Clevelandii*** *

Audibertia Palmeri Gray in Bot. Calif. 1: 601. 1876, based upon a specimen collected on Tighes Ranch in San Diego Co., Calif., by Palmer; the type is in the Gray Herbarium.

S. Palmeri Greene in Pittonia 2: 236. 1892, based upon the preceding (not *S. Palmeri* Gray).

Audibertiella Palmeri Briq. in Bull. Herb. Boiss. 2: 73. 1894, based upon the same.

Ramona Palmeri Briq., loc. cit., 440. 1894, based upon the same.

In habit this hybrid is about intermediate between its parent species, having the foliage more nearly that of *S. Clevelandii*, though perhaps more elongated, the flowering stems being more elongated, after the habit of *S. apiana*. The inflorescence is about intermediate, the glomerules being usually smaller and instead of being solitary are numerous, and it is branched. The pubescence of the plant would not at first glance appear different, though whiter in some forms, especially in the younger leaves, these becoming glabrate in age, contrary to *S. apiana*. The petioles are longer than in *S. Clevelandii*. The calyces both in form and pubescence are scarcely different from those of *S. Clevelandii*. The corollas are about midway, suggesting *S. Vaseyi* in habit, the upper lip being nearly entire, about 5 mm. tall, the lower about 9–10 mm. long, lightly cupped, the middle lobe larger in proportion than in *S. Clevelandii*. The pilose annulus is seated at about the middle of the tube, in other words in an intermediate position.

B. ***S. apiana* × *mellifera***

In habit this is a more robust plant than *S. mellifera* with more elongate branches, thus resembling *S. apiana*. The foli-

age is about intermediate in size and texture, being usually more pubescent than *S. mellifera* but not so white as *S. apiana*. The closeness and density of the pubescence is more nearly that of *S. apiana*. The inflorescence is about intermediate, being more branched than is usual with *S. mellifera*, the branchlets tending to be erect as in the thyrsis of *S. apiana*, rather than to spread in an arcuate manner as in *S. mellifera*. The pubescence of the bracts and calyces is finer and more appressed than in *S. mellifera*, thus resembling *S. apiana*. The flowers are intermediate, both in size and form. The stamens project straight from the tube instead of ascending under the upper lip as in *S. mellifera* and are longer. The corolla-tube is pilose-annulate below or near the middle, more broadly and coarsely than in *S. mellifera*.

C. *S. apiana* × *leucophylla*

A stout plant resembling *S. apiana* more in habit, with the stout elongated flowering stalks of that species. The pubescence throughout is that of *S. leucophylla* but the foliage is not so whitened. The leaves are intermediate in texture and more or less truncate at the base, but their margins are more convex than in *S. leucophylla*. The inflorescence is paniced but distinctly glomerulate, the glomerules being more compact and larger than in *S. apiana*. The calyces have the form of those of *S. leucophylla* but bear two small teeth partly adnate to the upper lip which is usually entire. The corollas are about intermediate, having a pilose annulus above the middle of the tube as in *S. leucophylla* and a plane middle lobe which is broader than in *S. leucophylla*. The stamens are declined as in that species.

D. *S. apiana* × *pachyphylla*

Known to me only from a single herbarium specimen: *Munz* 5829, collected in the Santa Rosa Mountains. The peculiar nature of the calyx, almost wholly that of *S. pachyphylla*, the oblong and thin bracts, the intermediate nature of the foliage in texture and form, the intermediate nature of the inflorescence and of the corolla, all suggest most strongly such a hybrid. The corollas vary considerably in size and length of tube,

are pilose below the middle of the tube, the upper lip is entire or notched, the lower lip is variable in size. The peculiar geniculate character of the stamens is unusual as well as the apparently incomplete development of the anthers which in most hybrids are apparently normal. Some seeds, however, were beginning their development.

E. *S. apiana* × *Munzii*

In the region of Sacaton and San Antonio Mesa in northern Lower California *S. apiana* and *S. Munzii* frequently occur together. Two plants of hybrid origin were found, one at the entrance to Cedar Cañon near San Antonio Mesa and one on the second ridge north of San Vicente on the Sacaton road. They are about intermediate and resemble the hybrids of *S. apiana* and *mellifera*.

F. *S. apiana* × *Vaseyi*

An undoubted hybrid between these parents was found growing with abundant *S. Vaseyi* at Palm View on the Palms to Pines Highway and about a mile from abundant *S. apiana compacta*. As might be expected from the general similarity of the parents, it was not readily detected. In habit and in flowers it was about intermediate, the flowers being distinctly glomerulate. One is led to wonder whether *Salvia apiana* var. *compacta* represents, in part at least, an intermixture with *S. Vaseyi*, since the two occur in approximately contiguous range along the western margin of the Colorado Desert. The corollas of *S. apiana* var. *compacta* are often larger than those of the typical species.

G. *S. apiana* × *eremostachya*

These parents were found growing together freely at a point .6 mi. below the Shumway Road, Palms to Pines Highway (from Idylwild to Palm Springs). This point marked the upper limit of *S. eremostachya* and the lower limit of *S. apiana*. About a mile further down the highway occurs the upper limit of *Salvia Vaseyi*. *S. apiana* was mostly of the more compact form although some specimens were scarcely more so than coastal forms. There was some slight suggestion in foliage

habit that the more compact forms might represent intermixtures with *S. Vaseyi*. With the first-named parents several hybrid plants were found. While more or less intermediate in general habit, one was scarcely different from *S. eremostachya* in many ways. In general they suggested a plant with the foliage of *S. leucophylla* and the inflorescence of *S. Vaseyi*. The pubescence of the leaves was like that of *S. apiana* in type but coarser; that of the flowers intermediate and less glandular than of *S. eremostachya*. The corollas were mostly larger than with either parent. Growing with these parents and hybrids was a single plant hard to identify. Generally of the aspect of *S. Vaseyi*, its leaves were corrugated and much greener. The flowers were essentially those of *S. Vaseyi*, but still not typical. It may represent *S. Vaseyi* with a slight intermixture of *S. eremostachya*, but was not at all like the presumed hybrid of this parentage found several miles lower on the highway.

H. *S. leucophylla* × *mellifera*

In habit much like *S. mellifera* but with usually larger leaves more oblong and cuneate at the base but hardly truncate, the texture more nearly that of *S. mellifera*, the pubescence branched but lacking the density of that of *S. leucophylla*. Inflorescence stouter than in *S. mellifera*, but frequently branched after the habit of that species, the glomerules larger, more compact, the pubescence of the bracts and calyces branched. Calyces resembling those of *S. leucophylla*, but the two lower teeth present. Corolla-tube mostly 10–11 mm. long, strongly pilose-annulate just above the middle, the upper lip intermediate, the lower cupped more after the habit of *S. mellifera*. Stamens thrust forward, exserted 5–8 mm.

J. *S. Columbariae* × *mellifera*

S. bernardina Parish in Bull. Calif. Acad. 1: 211. 1885, based upon a specimen collected by Parish near San Bernardino, Calif.

S. Columbariae var. *bernardina* Jeps., Man. Calif. 869. 1925, based upon the same.

A low shrub with rather fleshy branchlets clothed above with spreading hairs, its leaves about intermediate between those

of the parent species, having the approximate outline and texture of *S. mellifera* but pinnately lobed, the pubescence being rougher, less appressed than in *S. mellifera*, and more abundant than in *S. Columbariae*. Glomerules about intermediate, 2-3 in a spike, these occasionally ternate, the bracts more rotund than those of *S. mellifera* but less so than those of *S. Columbariae*, these and the calyces more villous than either of the parents, the latter without the tuft of hairs on the back as in *S. Columbariae* and more similar to those of that species. Corolla intermediate in form, the stamens being those of *S. Columbariae* but less exserted and the secondary anthers somewhat more dwarfed. The corolla-tube is annulate near the middle as in *S. mellifera* but less sharply so. This hybrid is known to me from herbarium specimens only. While the parent species occur together frequently, the hybrid is rare.

K. *S. Clevelandii* × *leucophylla*

A single specimen has been seen at the Rancho Santa Ana Botanic Garden where the two parent species are growing together (the former planted). It is a rounded shrub about intermediate in habit and in foliage, the inflorescence being interrupted-spicate with more remote glomerules than in *S. leucophylla*. The glomerules themselves and the flowers are nearly those of *S. Clevelandii*, the corolla being paler blue, smaller (its tube 11-12 mm. and annulate below the middle), and of a somewhat different conformation. The branched trichomes of *S. leucophylla* appear unchanged on the foliage; those of the calyces are intermediate. The odor is more like that of *S. leucophylla*.

L. *S. eremostachya* × *Vaseyi*

A single plant was found on the Palms to Pines Highway 1.5 mi. above the viaduct at the foot of the grade. It was growing with abundant *S. Vaseyi*. The habit was much like that of *S. eremostachya*, the inflorescence being glomerulate but not elongate. The foliage was intermediate; the flowers were not unlike those of *S. eremostachya* but with less glandular pubescence.

INDEX

New names are printed in **bold-face** type; previously published names in ordinary type; and synonyms in *italics*.

	Page		Page
Audibertia (Section)	98	<i>Pycnosphace</i> Rydberg	107
<i>Audibertia</i> Benth.	98	<i>Columbariae</i> Rydberg	107
<i>capitata</i> Gray	123	<i>Ramona</i> Greene	98
<i>Clevelandii</i> Gray	119	<i>capitata</i> Briquet	123
<i>decurrens</i> Nutt.	110	<i>Clevelandii</i> Briquet	119
<i>Dorrii</i> Kellogg	133	<i>Dorrii</i> Briquet	133
<i>grandiflora</i> Benth.	110	<i>grandiflora</i> Briquet	110
<i>humilis</i> Benth.	136	<i>humilis</i> Greene	136
<i>incana</i> Benth.	130	<i>incana</i> Briquet	130
var. <i>pachystachya</i> Gray	125	<i>nivea</i> Briquet	121
var. <i>pilosa</i> Gray	133	<i>pachystachya</i> Heller	125
<i>Mearnsii</i> Britton	131	<i>Palmeri</i> Briquet	146
<i>nivea</i> Benth.	121	<i>pilosa</i> Abrams	133
<i>pachystachya</i> Parish	125	<i>polystachya</i> Greene	140
<i>Palmeri</i> Gray	146	<i>stachyoides</i> Briquet	113
<i>polystachya</i> Benth.	140	<i>Vaseyi</i> Briquet	138
<i>spinulosa</i> Nutt.	113	Salvia	
<i>stachyoides</i> Benth.	112	<i>apiana</i> Jepson	140
var. <i>revoluta</i> Brandegee	117	var. <i>compacta</i> Munz	141
<i>Vaseyi</i> Porter	138	var. <i>typica</i> Munz	140
<i>Audibertiella</i> Briquet	98	<i>apiana</i> × <i>Clevelandii</i>	146
<i>argentea</i> Rydberg	131	<i>apiana</i> × <i>eremostachya</i>	148
<i>capitata</i> Briquet	123	<i>apiana</i> × <i>leucophylla</i>	147
<i>Clevelandii</i> Briquet	119	<i>apiana</i> × <i>mellifera</i>	146
<i>Dorrii</i> Briquet	133	<i>apiana</i> × <i>Munzii</i>	148
<i>grandiflora</i> Briquet	110	<i>apiana</i> × <i>pachyphylla</i>	147
<i>humilis</i> Briquet	136	<i>apiana</i> × <i>Vaseyi</i>	148
<i>incana</i> Briquet	130	<i>bernardina</i> Parish	145, 149
<i>nivea</i> Briquet	121	<i>Brandegei</i> Munz	117
<i>Palmeri</i> Briquet	146	<i>californica</i> Brandegee	104
<i>polystachya</i> Briquet	140	<i>californica</i> Jepson	140
<i>stachyoides</i> Briquet	113	<i>carduacea</i> Benth.	101
<i>Vaseyi</i> Briquet	138	<i>carnosa</i> Douglas	129
Douglasiana Epling	101	subsp. <i>argentea</i> Epling	131
Echinosphace Epling (Subsect.) ..	100	subsp. Gilmani Epling	132
<i>Echinosphace</i> Benth. (Sect.) ...	100	subsp. Mearnsii Epling	131
Greeneostachys Epling (Subsect.)	109	subsp. <i>pilosa</i> Epling	133
Jepsonia Epling (Subsect.)	118	subsp. typica Epling	130
Munzia Epling	104	<i>carnosa</i> var. <i>compacta</i> Hall	125
Parishiella Epling (Subsect.)	112	var. <i>pilosa</i> Jepson	133
Pycnosphace Epling (Subsect.) ..	107	var. <i>typica</i> Munz	130
<i>Pycnosphace</i> Benth. (Sect.) ...	107	<i>Clevelandii</i> Greene	119

	Page		Page
Clevelandii × leucophylla	150	mellifera Greene	112
Columbariae Benth.	107	var. revoluta Munz.....	117
var. <i>bernardina</i> Jepson	149	var. typica Munz.....	113
Columbariae × mellifera	149	var. <i>Jonesii</i> Munz.....	115
<i>compacta</i> Munz	125	mohavensis Greene	123
eremostachya Jepson	134	Munzii Epling	115
eremostachya × Vaseyi	150	pachyphylla Epling	125
funerea Jones	105	<i>Palmeri</i> Greene	146
var. <i>foenicis</i> Jepson	105	<i>pilosa</i> Merriam	133
<i>gossypina</i> Benth.	101	sonomensis Greene	136
Greatae Brandege	106	spathacea Greene	109
leucophylla Greene	121	Vaseyi Parish	138
leucophylla × mellifera	149		

EXPLANATION OF PLATE

PLATE 12

Salvia carduacea.

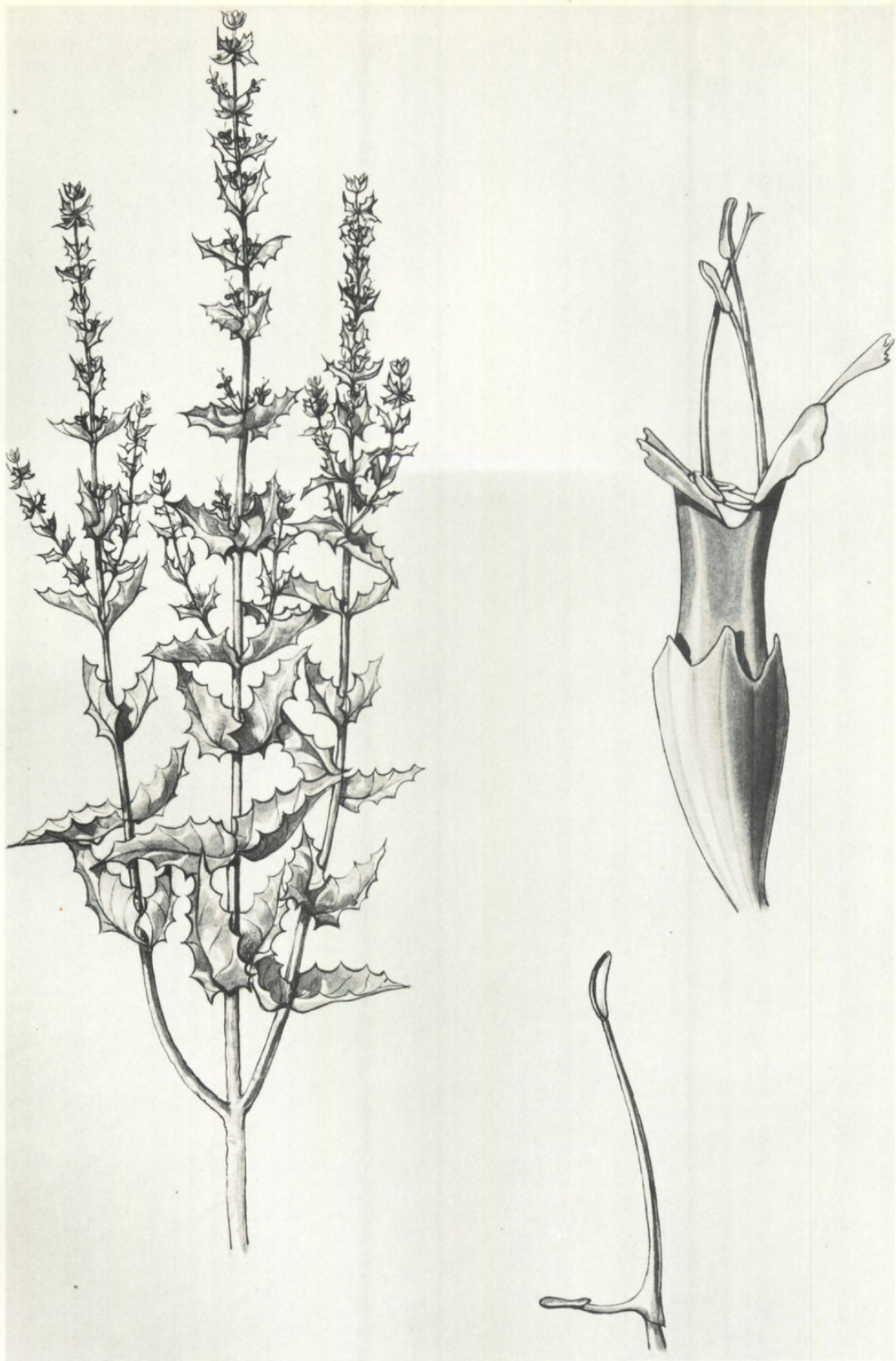


EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 13

Salvia californica.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 14

Salvia funerea.

In the upper right-hand corner is a branchlet in fruit. The dense, branched hairs form a globular, more or less adhesive mass such that the calyces cling to each other and to other objects and are blown by the wind.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 15

Salvia Greatae.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 16

Salvia Columbariae.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 17

Salvia spathacea.

The imperfect anther rarely, if ever, bears pollen.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 18

Salvia mellifera.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 19

Salvia Munzii.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 20

Salvia Brandegei.

The flower in this case was reproduced from a boiled specimen. The author has not seen the living plant in flower, but, judging from the few herbarium specimens which have been collected, the stamens are as indicated.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 21

Salvia Clevelandii.

The lower lip of the corolla is essentially plane and oblong.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 22

Salvia leucophylla.

The lower lip of the corolla is plane and oblong.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 23

Salvia mohavensis.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 24

Salvia pachyphylla.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 25

*Salvia carnos*a subsp. *pilosa*.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 26

Salvia cremostachya.

The throat of the corolla is vertically compressed.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 27

Salvia sonomensis.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 28

Salvia Vaseyi.

The corolla throat is vertically compressed.



EPLING — THE CALIFORNIAN SALVIAS

EXPLANATION OF PLATE

PLATE 29

Salvia apiana.



EPLING — THE CALIFORNIAN SALVIAS



Epling, Carl. 1938. "The California Salvias. A Review of Salvia, Section Audibertia." *Annals of the Missouri Botanical Garden* 25, 95–188.

<https://doi.org/10.2307/2394478>.

View This Item Online: <https://www.biodiversitylibrary.org/item/54437>

DOI: <https://doi.org/10.2307/2394478>

Permalink: <https://www.biodiversitylibrary.org/partpdf/27671>

Holding Institution

Missouri Botanical Garden, Peter H. Raven Library

Sponsored by

Missouri Botanical Garden

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.