

roads old board fences are occasionally seen. Every such bit of fence should be scrutinized and its lichens collected. Apparently our state is gradually becoming dryer; deforestation, the greater demand for water, and the capture of water that once fed springs and brooks, all combine to help make life more difficult for earth lichens. As the rainy season approaches, the collection of lichens becomes easier. Every botanist should make an effort during the coming winter to collect typical examples of all the lichens he sees. If this is not done soon, many of our lichens of greatest interest will exist only in one or two European and in two or three American herbaria.

I have not said anything of the fundamental importance of lichens as soil makers, nor of their being just as valuable as any other plants in the study of ecology. One could give many sound reasons for their collection and study, but at this time I merely urge that all botanists do what they can to get first-class specimens illustrative of some of our most unique plants, for the benefit of posterity.

Stanford University,
September, 1935.

STUDIES IN *PENSTEMON*—II. THE SECTION *HESPEROTHAMNUS*

DAVID D. KECK

The first revisional work in *Penstemon* by the present writer was published in 1932.¹ Many notes and a little manuscript were compiled thereafter in the expectation that these monographic studies in the genus would continue. Unforeseen developments caused my attention to be turned to other taxonomic problems but the opportunity has been sought to resume work in this genus when time permitted. The opportunity came in the winter of 1935 to study material of *Penstemon* in several important herbaria.

This, the second paper of the *Penstemon* series,² treats the shrubby Pacific Coast species of the section *Hesperothamnus*, which is proposed here as new. The results are largely the outcome of herbarium studies, although six of the eight species treated have been studied in the field and five of them have been grown for several years in the gardens of the Carnegie Institution of Washington at Stanford University.

All the material in the following herbaria has been examined:
A—Arnold Arboretum, Harvard University, Jamaica Plain,
Mass.

¹ Studies in *Penstemon*. A systematic treatment of the section *Saccanthera*, Univ. Calif. Publ. Bot. 16: 367–426. 1932.

² A part of the cost of publication of this article is borne by the Carnegie Institution of Washington.—Ed.

C—University of California, Berkeley.

CI—Carnegie Institution of Washington, Stanford University, California.

CAS—California Academy of Sciences, San Francisco.

F—Field Museum, Chicago.

GH—Gray Herbarium, Harvard University.

M—Missouri Botanical Garden, St. Louis.

ND—University of Notre Dame, Notre Dame, Indiana.

NY—New York Botanical Garden.

Ph—Academy of Natural Sciences, Philadelphia.

Po—Pomona College, Claremont, California.

RM—Rocky Mountain Herbarium, University of Wyoming, Laramie.

SU—Dudley Herbarium, Stanford University, California.

US—United States National Herbarium, Washington, D. C.

The helpful cooperation of the curators of these institutions and the aid I have received from others, particularly my colleague Dr. Jens Clausen, during the course of this study is gratefully acknowledged. Space prevents the giving of more than representative citation, but the distributional maps plot many other stations from which material has been seen.

AFFINITIES OF THE SECTION *HESPEROTHAMNUS*

The group of species treated here has never before been given sectional ranking, yet is one of the most natural and distinct entities in this large genus. The eight species composing this section show much evidence of close interrelationship, but they are so clearly marked off from other species of *Penstemon* that it is difficult to suggest their nearest affinities outside the section. A certain floral similarity exists between *P. ternatus* of section *Hesperothamnus* and *P. labrosus* as well as other species of the section *Elmigera*. However, a closer morphological similarity in floral features probably exists between several species of section *Hesperothamnus* and the *P. Palmeri* group of section *Spectabiles*. Characters of pubescence of the corolla-throat and the filaments, the anthers and the staminode, and corolla-shape are the principal ones that are suggestive in this connection. Although a bridge may exist between sections *Hesperothamnus* and *Spectabiles*, the scarlet-flowered species of section *Hesperothamnus* must have had a development independent of any other section with scarlet-flowered species. Which section is the older is not clear at present. The mere fact that in one the species are woody while in the other they are herbaceous does not settle the matter.

Species of section *Hesperothamnus* tend to have parallel variations particularly as regards pubescence. All the species, compared to others of the genus, are of rather wide distribution, the limits, presumably, being those set by climatic factors. Prob-

bly these species have been coexistent for a very long period and perhaps from their earliest differentiation have had many genes in common which played a part in moulding their subsequent variants.

HESPEROTHAMNUS Keck sect. nov.

Fruticosi, as subsection, A. Gray, Syn. Fl. 2¹: 260. 1878.

Erect shrubs; stems very woody at least below, usually producing short branchlets almost throughout; leaves coriaceous; sepals entirely herbaceous or with narrow hyaline margins; *corolla strongly bilabiate*, glandular-pubescent externally, pubescent within at base of throat, the *upper lip subgaleate*, terminating with two very short lobes, the lower lip parted more than half way to base with three *strongly recurved* lobes; stamens exceeding throat, the anthers protected under upper lip, the filaments flattened, dilated usually and *strongly pubescent at base*, the anther-sacs widely divaricate, explanate (except in *P. Rothrockii*), ovate to rotund, glabrous; capsule brown, ovoid; seeds very irregular, the seed-coat usually compressed into narrow wings. Largely chaparral species of Western North America. Type species, *Penstemon cordifolius* Benth.

KEY TO THE SPECIES AND SUBSPECIES

- Corolla fulvous, yellowish or whitish, not distinctly tubular, with prominent guide lines extending from lower lip into throat. Largely pollinated by bees.
- Inflorescence spicate-racemose; pedicels shorter than calyces; flowers solitary or geminate 1. *P. Rothrockii*
- Corolla 10–12 mm. long, glabrate; leaves gray with a short scabrous pubescence 1a. subsp. *typicus*
- Corolla 13–15 mm. long, sparsely villous outside; leaves green, glabrate 1b. subsp. *jacintensis*
- Inflorescence paniculate or thyrsoid; pedicels longer than calyces; flowers usually geminate or several.
- Sterile filament glabrous; corolla white tinged with pink, long-hirsute without 2. *P. breviflorus*
- Calyx glandular-pubescent 2a. subsp. *typicus*
- Calyx glabrous 2b. subsp. *glabrisepalus*
- Sterile filament densely bearded; corolla short-pubescent without.
- Stem glaucous; leaves elliptic, 1–4 cm. long, 5–18 mm. broad, denticulate; corolla *ca.* 4 mm. broad, fulvous with yellowish lower lip 3. *P. Lemmonii*
- Stem not glaucous; leaves linear-oblongate, 0.5–2 cm. long, 2–8 mm. broad, usually entire, corolla *ca.* 10 mm. broad, yellow.
- Twigs glabrate or puberulent, herbage green; sepals ovate, obtuse. Coastal 4. *P. antirrhinoides*
- Twigs cinereous, herbage pallid; sepals $\pm$ long-acuminate. Desert 5. *P. microphyllus*
- Corolla red, distinctly tubular. Largely pollinated by humming-birds.

- Leaves opposite, narrowly elliptic to narrowly cordate; stems not glaucous.
 Sterile filament bearded at tip; leaves mostly subcordate at base; inflorescence a deltoid thyrses of reflexed branches; corolla-limb 15 mm. long; scandent. Southern California 6. *P. cordifolius*
 Sterile filament bearded to base; leaves acute or obtuse at base; inflorescence a few- to many-flowered corymbiform cyme of ascending branches; corolla-limb 12 mm. long; not scandent. Northern California.
 Herbage glabrous 7. *P. corymbosus*
 Herbage puberulent to cinereous 7a. var. *puberulentus*
 Leaves ternate, narrowly elliptic to narrowly cordate; inflorescence an elongated racemose thyrses; stems glaucous 8. *P. ternatus*
 Calyces and pedicels glabrous 8a. subsp. *typicus*
 Calyces and pedicels glandular-pubescent 8b. subsp. *septentrionalis*

1. PENSTEMON ROTHROCKII A. Gray

Penstemon Rothrockii A. Gray, Syn. Fl. 2¹: 260. 1878.

Shrub 3–6 dm. high; herbage grayish to light green, finely puberulent to hispidulous throughout, often slightly glandular within the inflorescence: leaves 5–15 mm. long, 2–7 mm. wide, subsessile, lance-oblong to ovate, entire or remotely undulate-denticulate: inflorescence a strict spiciform raceme, 3–15 or 20 cm. long; flowers usually geminate but frequently alternate toward apex of the inflorescence, subsessile: calyx 4–6 mm. long, glandular-hispidulous; sepals lanceolate to ovate-lanceolate, acuminate: corolla brownish yellow with red-brown or purplish guide lines, 11–16 mm. long, 3–5 mm. broad at summit of throat, subcylindric; upper lip erect, occasionally moderately ampliate, 4–5 mm. long, faintly keeled: sterile filament glabrous at tip, included: anther-sacs dehiscent throughout but not explanate, oblong, 0.8–1.1 mm. long.

Southwestern Nevada and southeastern California.

1a. PENSTEMON ROTHROCKII subsp. **TYPICUS** nom. nov.

Penstemon Shockleyi S. Wats. Proc. Am. Acad. 23: 265. 1888.

Type locality: "On Miller Mountain, Esmeralda County, Nevada, at 8,000 feet altitude (*W. H. Shockley, 1886*)."
 Watson mistook this for a member of the *P. deustus* group and failed to point out its connection with *P. Rothrockii*, which he apparently overlooked. The type of this is a good match for the type of *P. Rothrockii*, differing only in having slightly more glabrate leaves.

Penstemon scabridus Eastw. Bull. Torr. Club 32: 208. 1905.

Type locality: "... near Kern Lakes and on the Hindman's Trail over Coyote Pass, Tulare County, California, July 19, 1903" (Eastwood). This locality is not distant from the type locality

of *P. Rothrockii*, which species this matches in all respects and which Miss Eastwood overlooked.

From the upper Transition Life Zone to timber-line (2,100 to 3,200 meters), Mono County to Tulare County, California, and adjacent southwestern Nevada. Type locality: "S. E. California, on Little Olanche Mountain, toward the sources of Kern River, at 10,400 feet, *Rothrock*." This is *Rothrock* 341 (see *Rothrock*, Rep. U. S. Geogr. Surv. 6: 370. 1878) and not at all *Rothrock* 332 from the same locality and which Gray had before him when writing his description. The latter is *P. Newberryi* Gray and because of the fragmentary nature of the specimen was mistaken by him for the present species.

NEVADA. Esmeralda County: Miller Mt., *Shockley* 539 (GH, type of *P. Shockleyi*; isotypes F, NY, SU, US); Silver Peak Mts., *Goldman* 2581 (US). Clark County: Lee Canyon, Charleston Mts., *Heller* 10994 (A, C, F, GH, M, NY, Ph, SU, US); MacFarlands Spring, Charleston Mts., June 28, 1928, *Jaeger* (CI, GH, SU). CALIFORNIA. Mono County: above Long Valley on Benton road, *Ferris* 6774 (SU); Marble Canyon, White Mts., Aug. 3, 1930, *Duran* (C, CAS, F, M, NY, RM, US). Inyo County: Westgaard Pass, July, 1928, *Jones* (Po); Surprise Canyon (Panamint Mine), Panamint Mts., *Hall & Chandler* 7005 (C); Cottonwood Creek, *Purpus* 1914 (C); between Bishop and Anderson's Camp, 1913, *Brandeggee* (C). Tulare County: Kern Canyon opposite Junction Meadow, *Bacigalupi* 1744 (SU); Little Kern River, *Purpus* 5158 (C, GH, M, US); Soda Springs, Upper Kern River, *Hall & Babcock* 5414 (C, SU); near Kern Lakes, July 19, 1903, *Eastwood* (CAS, type of *P. scabridus*); Little Olanche Mt., *Rothrock* 341 (GH, type; isotypes F, US); Lloyd Mountain Sequoia Grove, *Dudley* 851 (SU).

1b. *PENSTEMON ROTHROCKII* subsp. *JACINTENSIS* (Abrams)
comb. nov.

Penstemon jacintensis Abrams, Bull. Torr. Club 33: 445. 1906.

Penstemon Rothrockii var. *jacintensis* (Abrams) Munz et Johnst. Bull. So. Calif. Acad. Sci. 23: 27. 1924.

San Jacinto Mountains, Riverside County, California, at elevations of 2300 to 2800 meters. Type locality: "San Jacinto Mountain, altitude 9,000 feet, *H. M. Hall* 704."

CALIFORNIA. Riverside County, San Jacinto Mts.: *Parish* 473 (C, F, GH, M, SU, US); Tamarack Valley, *Hall* 704 (US, type); Round Valley, *Munz* 6400 (GH); Tahquitz Peak, Sept. 6, 1929, *Hoffmann* (CAS); Tahquitz Valley, *Hall* 2588 (C, M, NY, SU, US).

Penstemon Rothrockii has two natural geographic subspecies. In a species whose distribution is marked by broad gaps due to its occurrence on isolated mountain ranges, a single instance of

isolation may scarcely be selected as a basis for a subspecies with but a trifling morphological character for substantiation. The unit *jacintensis* must stand on the basis of the 1 to 3 mm. increase in corolla-length of San Jacinto Mountains material. Other criteria that have been proposed for the support of this as a separate species and as a variety, such as differences in flower color and sepal shape, appear to have no foundation. Corollas of subsp. *jacintensis* are 13 to 16 mm. long and are often ampliate at the throat so as gradually to arcuate the upper side and increase the width to 5 mm. Subspecies *typica* has straight corollas 11 to 13 mm. long, which are not noticeably ampliate nor much over 4 mm. in breadth. However, *Baker 4400a* (CI), from Coyote Pass, Tulare County, near the type locality of *P. Rothrockii*, has corollas up to 14 mm. long. The leaves of this specimen are green, a character attributed solely to their variety *jacintensis* by Munz and Johnston. While the corolla is always glandular-pubescent externally (contrary to Gray's description) in both subspecies, material from southern Sierra Nevada differs from all the rest in the less strongly hirsute pubescence on the limb. Leaves are glabrate, being puberulent only toward the base of the blade, except that in most of the Sierran material the leaves are definitely hispidulous.

From this it is apparent that subsp. *jacintensis* may stand on its corolla-size character, admitting some overlapping, but the erratic distribution of minor variations in the amount of pubescence uncorrelated with other characters prevents the confirmation of further subspecies and likewise prevents the re-erection to specific rank of *P. jacintensis*.

2. PENSTEMON BREVIFLORUS Lindl.

Penstemon breviflorus Lindl. Bot. Reg. 23: t. 1946. 1837.

Shrub 5–20 dm. high, the stem and often the leaves glaucous, glabrous up to the ultimate pedicels of the inflorescence: leaves 10–50 or 70 mm. long, 3–12 mm. wide, subsessile, linear-lanceolate to broadly lanceolate or oblanceolate, serrulate to entire: inflorescence a thyrus of many cymules, 5–30 cm. long; peduncles divergent, 0.5–6 cm. long; calyx 5–8 or 10 mm. long, glabrous or glandular-pubescent; sepals broadly lanceolate to ovate, acuminate: corolla white flushed with rose on lobes and within upper lip; with claret guide lines and a band of claret at base of throat, reddish yellow in bud, 15–18 mm. long and more or less strongly hirsute on limb externally; tube shorter than calyx; throat short, moderately expanding; upper lip arched, *ca.* 10 mm. long, strongly keeled: sterile filament glabrous at tip, slightly exserted: anthers less than 1 mm. long.

Sierra Nevada in westernmost Nevada and in California throughout the Sierra Nevada and Coast Range.

2a. *PENSTEMON BREVIFLORUS* subsp. *TYPICUS* nom. nov.

Penstemon carinatus Kellogg, Proc. Calif. Acad. 1: 63. 1855. The type has been lost.

Penstemon canoso-barbatus Kellogg, Proc. Calif. Acad. 2: 15. 1860. Type from Yosemite. The description clearly applies to this species, but as no mention was made of the pubescence of the calyx, and as the type specimen has been lost, it is impossible to assign it to the correct subspecies. The figure in Hutchings Magazine (vol. 5, p. 103, 1860) has not been seen.

Penstemon breviflorus canoso-barbatus (Kell.) Schelle, Handb. Laubh. Benen. 432. 1903.

Penstemon breviflorus carinatus (Kell.) Schelle, l. c.

Southern Washoe County, Nevada; Sierra Nevada, California, from Nevada County to Los Angeles and Ventura counties, thence northerly through the Coast Range to Mount Hamilton. Occasional in dry rocky places of the lower Transition and bordering Upper Sonoran Zone from 450 to 1830 meters altitude. Type locality: California. Lindley described and figured this from a plant raised in the garden of the Horticultural Society from seeds picked off some of Douglas' dried specimens. Douglas' plants probably came from Monterey County (Santa Lucia Mts.). Lindley's figure is accurate and may be taken as the type in lieu of a wild plant from Douglas' collections.

NEVADA. Washoe County: Broncho Creek, *Kennedy* 938 (RM). CALIFORNIA. Nevada County: Emigrant Gap, *Jones* 3276 (CAS, M, Ph, US). Placer County: Forest Hill, *Smith* 1830 (CAS); 2.3 mi. S. E. of Loomis, *Keck* 2432 (CI, Po, SU). Amador County: French Garden, *Hansen* 443 (A, C, M, SU, US). Inyo County: Cottonwood Creek Canyon, *Purpus* 1907 (C). Tulare County: Old Colony Mill, July 26, 1905, *Brandeggee* (C, NY, US); Marble Fork Bridge, Sequoia Nat'l Park, *Abrams* 7749 (A, NY, SU); Middle Tule River, *Purpus* 5575 (C, GH, M, US). Kern County: Greenhorn Mts., *Palmer* 71 (M, NY, US); Walker Basin, *Coville & Funston* 1095 (US); Bisses Station, Tehachapi Mts., *Dudley* 508 (C, NY, SU, US); Fort Tejon, *Xantus* 62 (NY, Ph, GH, US). Los Angeles County: between Oakgrove Canyon and Elizabeth Lake, *Abrams & McGregor* 409 (A, GH, NY, Po, SU, US). Ventura County: Mutau Flat, *Dudley & Lamb* 4765 (DS); Seymour Creek, Mount Pinos, *Peirson* 3237 (Po, RM, SU). Santa Barbara County: Zaca Mt., June 17-22, 1902, *Eastwood* (GH, NY). San Luis Obispo County: Paso Robles Springs, *Palmer* 328 (C, M, NY). Monterey County: Tassajara Hot Springs, *Elmer* 3358 (M, SU, US); between King City and Jolon, June 18, 1908, *Brandeggee* (C); San Carpajo Canyon, June 1912, *Condit* (C). San Benito County: Hernandez, June 28, 1903, *Lathrop* (SU). Santa Clara County: Mount Hamilton, *Smith* 20 (C).

2b. *PENSTEMON BREVIFLORUS* subsp. *GLABRISEPALUS* subsp. nov.

Quoque subsp. typicae aliter omnino similis differt calycibus glabris.

Occasional in Nevada from Ormsby County to Douglas County, and in California from Shasta County to Tulare County and from Mendocino County to Napa County, occurring in dry rocky places in the Upper Sonoran and Transition zones from 180 to 2070 meters elevation.

Type: *Keck & Heusi 283* (Dudley Herbarium of Stanford University, No. 187668; isotypes Berlin, C, CI, GH, Kew, Conservatoire de Botanique, Geneva, M, Ph, Po), collected at Mather, Tuolumne County, California, 1400 meters elevation, July 14, 1927.

NEVADA. Ormsby County: mts. west of Carson City, *Heller 9814* (A, GH, NY, Ph, SU, US); Kings Canyon, *Baker 1257* (A, C, CAS, GH, M, NY, RM, US). Douglas County: Cave Rock, *Hall & Chandler 4595* (C). CALIFORNIA. Shasta County: Oak Run, May 20, 1894, *Baker & Nutting* (C, RM). Tehama County: Red Bluff, June 1917, *Wickes* (CAS). Butte County: Iron Canyon, *Austin 65* (C, M, US); Table Mt., *Heller 10785* (A, C, F, GH, M, NY, Ph, SU, US). Yuba County: Bullards Bar Reservoir, *Keck 984* (C, CAS, CI, Copenhagen, GH, M, Ph, Po, SU). Nevada County: Penn Valley west of Grass Valley, *Heller 13192* (A, CAS, F, GH, M, NY, SU, US). Amador County: Ione, *Braunton 1040* (M). Calaveras County: Copperopolis, *Davy 1350* (C). Mono County: Leevining Canyon, 8500 ft., *Keck & Stockwell 3896* (C, CI, SU). Mariposa County: Yosemite Valley, *Abrams 4524* (A, C, GH, NY, SU, US). Madera County: Raymond, *Eastwood 12561* (A, CAS). Fresno County: Tehipite Valley, *Hall & Chandler 460* (C, M, NY, SU, US). Tulare County: Sequoia Nat'l Park, Aug. 1925, *McCracken* (SU). Mendocino County: Ukiah, *Eastwood 3388* (CAS, US). Lake County: Mount Konocti, June 10, 1926, *Blankinship* (CAS); Allen Springs, June 22, 1882, *Cleveland* (C). Napa County: Pope Creek, *McMinn 207* (SU).

One collection, made between Bartletts and Clear Lake, Lake County, *Abrams 6288* (NY, SU), I take to be a natural hybrid between this subspecies and *P. Lemmonii* Gray judging from aspect, short corolla, light tuft of beard on the staminode, and the lightly pubescent calyx.

The proposal of a new subspecies here recognizes the evident segregation of the species into a southwestern component with strongly glandular-pubescent sepals and a northeastern component with glabrous sepals. In the Coast Range these subspecies do not meet but in the Sierra Nevada they occur together for a considerable distance with consequent hybridizing and dilution of the distinction between them.

3. *PENSTEMON LEMMONII* Gray

Penstemon Lemmonii Gray, Bot. Calif. 1: 557. 1876.

Shrub 5–15 dm. high: herbage bright green, at least the stems glaucous, glabrous up to pedicels of inflorescence: leaves 10–45 or 60 mm. long, 5–20 or 28 mm. wide, ovate-lanceolate to elliptic, serrulate to subentire: inflorescence a narrow elongated panicle of very many cymules, 5–40 cm. long; peduncles divergent, 0.5–2 or 3 cm. long; calyx 4–7 mm. long, glandular-pubescent; sepals lanceolate, attenuate: corolla purplish brown, the lower lip pale yellow within with purple guide lines, 10–14 mm. long, inflated dorsally; tube scarcely equaling calyx; throat abruptly expanding; upper lip erect, *ca.* 5 mm. long: sterile filament densely canary-yellow-bearded for two-thirds its length, somewhat exserted: anther-sacs 0.8 mm. long.

California, in the Coast Ranges from Siskiyou County to Humboldt and Solano counties, and in the Sierra Nevada from Mount Shasta to Lake Tahoe, extending slightly into Washoe County, Nevada; at elevations of 500 to 2100 meters. Type locality: "Long Valley, Mendocino Co. (*Kellogg*, 1869), Plumas Co. (*Lemmon*, 1874)." In spite of the fact that this species was named in honor of Lemmon, I choose the former collection as the type. It was distributed as from Long Valley, Mendocino County, *Kellogg & Harford* 678. The type is at Gray (isotypes, CAS, NY, US). Lemmon's sheets at Gray Herbarium bear the meagre information: Plumas County, *Lemmon* 1128, and Sierra County, 1874, *Lemmon* 154. As neither coincides accurately with Gray's data, neither is as desirable as the Long Valley specimen for the type.

NEVADA. Washoe County: Slide Mt. near Franktown, *Tidestrom* 10500 (Ph); mts. west of Bowers, *Heller* 10662 (A, CAS, CI, F, GH, M, NY, SU, US). CALIFORNIA. Siskiyou County: Clark Mine, Russian Creek, *Butler* 426 (C); W. flank of Mount Shasta, *Keck* 1265 (C, CAS, CI, SU); Cantara, *Eastwood* 1348 (CAS, GH, M, NY, US). Shasta County: Dunsmuir, *Heller* 12493 (A, CAS, F, GH, M, Ph, SU, US); Pitt to Baird, *Eastwood* 1446 (CAS, GH, NY, US). Trinity County: Trinity Alps, *Baker* 183 (SU). Plumas County: Crescent Mills, June 29, 1920, *Clemens* (CAS, NY, Ph); 3 mi. N. of Keddies, *Keck* 1712 (CAS, CI, Po, SU). Nevada County: Truckee, *Sonne* 255 (F, M, Ph, SU, US); Donner Lake, *Heller* 7013 (A, C, GH, M, NY, Ph, RM, SU, US); Soda Springs, *Jones* 2596 (F, M, Ph, SU). Placer County: Deer Park, *Geis* 163 (C, GH, M, RM, US). El Dorado County: Meek's Bay, Lake Tahoe, *Heller* 13332 (A, CAS, F, GH, M, NY, Ph, SU, US). Glenn County: E. of Newville, *Heller* 11519 (A, CAS, F, GH, M, NY, ND, SU, US). Yolo County: Buckeye Creek, *Stinchfield* 351 (NY, SU). Humboldt County: jct. E. of Arcata, *Jones* 28828 (C, M); Klamath River, mouth of Slate Creek, *Tracy* 5352 (C); Trinity River near Willow Creek,

Tracy 3504 (C). Mendocino County: Talmadge, *Howell 6699* (CAS); Ukiah, Aug. 11, 1908, *Condit* (C). Lake County: Elk Mt., *Tracy 2338* (C, US); Adams Springs, *Howell 5456* (CAS, CI). Napa County: Pope Creek Canyon, *Howell 4356* (C, CAS, CI); Howell Mt., *Bacigalupi 1873* (NY, SU). Solano County: Vacaville, June 20, 1892, *Jepson* (C).

4. PENSTEMON ANTIRRHINOIDES Benth.

Penstemon antirrhinoides Benth. in DC. Prodr. 10: 594. 1846.

Lepidostemon penstemonoides Lem. Illustr. Hortic. 9: t. 315. 1862.

Penstemon Lobbii Hort. ex Lem. l. c.

Spreading shrub 6–20 dm. high: herbage bright green, not glaucous, finely puberulent throughout, not noticeably glandular: leaves 5–23 mm. long, 2–8 mm. wide, linear to oblanceolate or rarely elliptic, usually entire; petioles corky at base and floccose in fascicles which occur on older wood: inflorescence a broad leafy panicle, much branched, 5–30 cm. long; peduncles divergent, 1–1.5 cm. long, 1–3-flowered: calyx 3–6 mm. long, microscopically glandular-puberulent; sepals ovate to rotund, obtuse or cuspidate-acute: corolla bright yellow with reddish lines without, brownish red in bud, 16–20 mm. long, *ca.* 8–10 mm. broad at throat; tube shorter than calyx; throat abruptly wide-expanding; upper lip erect to arcuate, 9–12 mm. long, boat-shaped, keeled: sterile filament densely yellow-bearded for two-thirds its length, well exerted: anther-sacs 1.6–1.9 mm. long.

Frequent on dry, chaparral-covered slopes of the Upper Sonoran Zone in the interior coastal drainage region from southwestern San Bernardino County, California, to the San Pedro Martir Mountains, Baja California, Mexico, at elevations of 200 to 1200 meters (to 2500 meters on San Pedro Martir). Type locality: California. The type collected by Coulter, in Herb. Hookerianum, Kew, not seen by me.

CALIFORNIA. San Bernardino County: Mill Creek, *Smith 34* (C); San Bernardino Valley, *Parish 4171* (C, GH, M, NY, US); Slover Mt., *Parish 107* (A, C, F, M, NY, Ph, SU, US). Riverside County: Banning, May 28, 1928, *Van Dyke* (CAS); Idyllwild, July 10, 1928, *Van Dyke* (C, CAS); San Jacinto River, 2500 ft., *Hall 2016* (C, M, Ph, SU, US); Glen Ivy, *Craig 206* (Po, SU). Orange County: Santa Ana Canyon, *Munz et al. 2621* (Po, SU, US). San Diego County: between Fallbrook and San Luis Rey, *Abrams 3347* (A, F, GH, M, NY, Ph, SU, US); Foster, *Hall 3879* (C, F, NY, RM, US); Santa Ysabel, *Henshaw 146* (NY, US); between Campo and Potrero, *Abrams 3712* (GH, NY, SU); Dalzura, *Spencer 118* (C, GH, US). MEXICO. Baja California: Tecate River, near Monument 245, *Schoenfeldt 3736* (SU, US); Ensenada to Ojos Negros, *Goldman 1110* (US); Refugio Ranch (50 mi. S. of Ensenada), *Ballou 24* (C); San Vicente, Apr. 17,

1925, *Jones* (Po, SU, US); San Pedro Martir, 8200 ft., May 19, 1893, *Brandege* (C).

5. *PENSTEMON MICROPHYLLUS* A. Gray

Penstemon microphyllus A. Gray, *Pacif. Rail. Rep.* 4: 119. 1857.

Penstemon Plummerae Abrams, *Bull. Torr. Club* 33: 445. 1906. The type, from Mineral Park, Mohave County, Arizona, June 1884, *Lemmon* (US; isotype C) has been studied and found to be this. Since Abrams makes no reference to *P. microphyllus* Gray, it is probable that he overlooked this species.

Penstemon antirrhinoides var. *microphyllus* (Gray) Munz et Johnst. *Bull. Torr. Club* 49: 43. 1922.

Closely similar to *P. antirrhinoides* Benth. differing in the following characters: herbage yellowish gray-green, canescent throughout, the twigs cinereous: calyx 5.5–8 or 10 mm. long, canescent and viscid; sepals lance-oblong, acuminate: anthersacs 1.2–1.3 mm. long.

In the Upper Sonoran Zone on the desert ranges from central Arizona to Southern California and adjacent Baja California, at elevations of 300 to 1500 meters. Type locality: "On Williams' Fork of the Colorado, New Mexico." (Probably Mohave or Yuma County, Arizona).

ARIZONA. Bill Williams Fork, Feb. 1853–4, *Bigelow* (GH, type; isotype NY). The type specimen is a poor scrap from which all the primary leaves have fallen leaving the young leaves fascicled in the axils, their bases (pulvini) white-pubescent. Gila County: Mescal Mts., May 24, 1890, *Jones* (A, C, M, Ph, Po, US); Christmas, *Peebles et al.* 5188 (Ph, US); Roosevelt Dam, *Eastwood* 6202 (A, CAS). Pinal County: Superior, *Harrison & Kearney* 1481 (US). Yavapai County: Cottonwood Creek near Prescott, *Palmer* 334 (C, F, M, NY, Ph, US); Skull Valley, Apr. 28, 1903, *Jones* (US); Congress Jct., May 4, 1903, *Jones* (Po). Maricopa County: Sierra Estrella, *Peebles et al.* 3280 (US); Harquahala Mts., *Goldman* 3008 (US). Mohave County: Chloride, Apr. 14, 1903, *Jones* (Po); Union Pass, May 30, 1893, *Wilson* (C, ND, RM); Oatman to Kingman, *Harrison & Kearney* 7601 (F, US); Yucca, *Jones* 3941 (A, C, CAS, F, NY, Ph, Po, RM, SU, US). CALIFORNIA. San Bernardino County: Bonanza King Mine, Providence Mts., *Munz et al.* 4059 (C, NY, Po, RM, SU, US); Kelso, May 2, 1906, *Jones* (Po, SU); Old Dad Mts., *Jones* 25577 (M); Old Woman Mts., May 13, 1920, *Jones* (C, CAS, GH); Quail Springs, *Munz & Johnston* 5239 (Po). Riverside County: Palm Springs, *Eastwood* 2985 (CAS, US); Old Nicholas Canyon, Santa Rosa Mts., *Munz* 5930 (Po). San Diego County: Palm Canyon, Borrego Valley, *Munz & Hitchcock* 11347 (GH); Jacumba, *Mearns & Schoenfeldt* 3223 (SU, US). MEXICO. Baja California: 39 mi. W. of Mexicali, *Munz* 9588 (C); N. W. slope, San Pedro Martir Mts., *Goldman* 1203 (Ph, US).

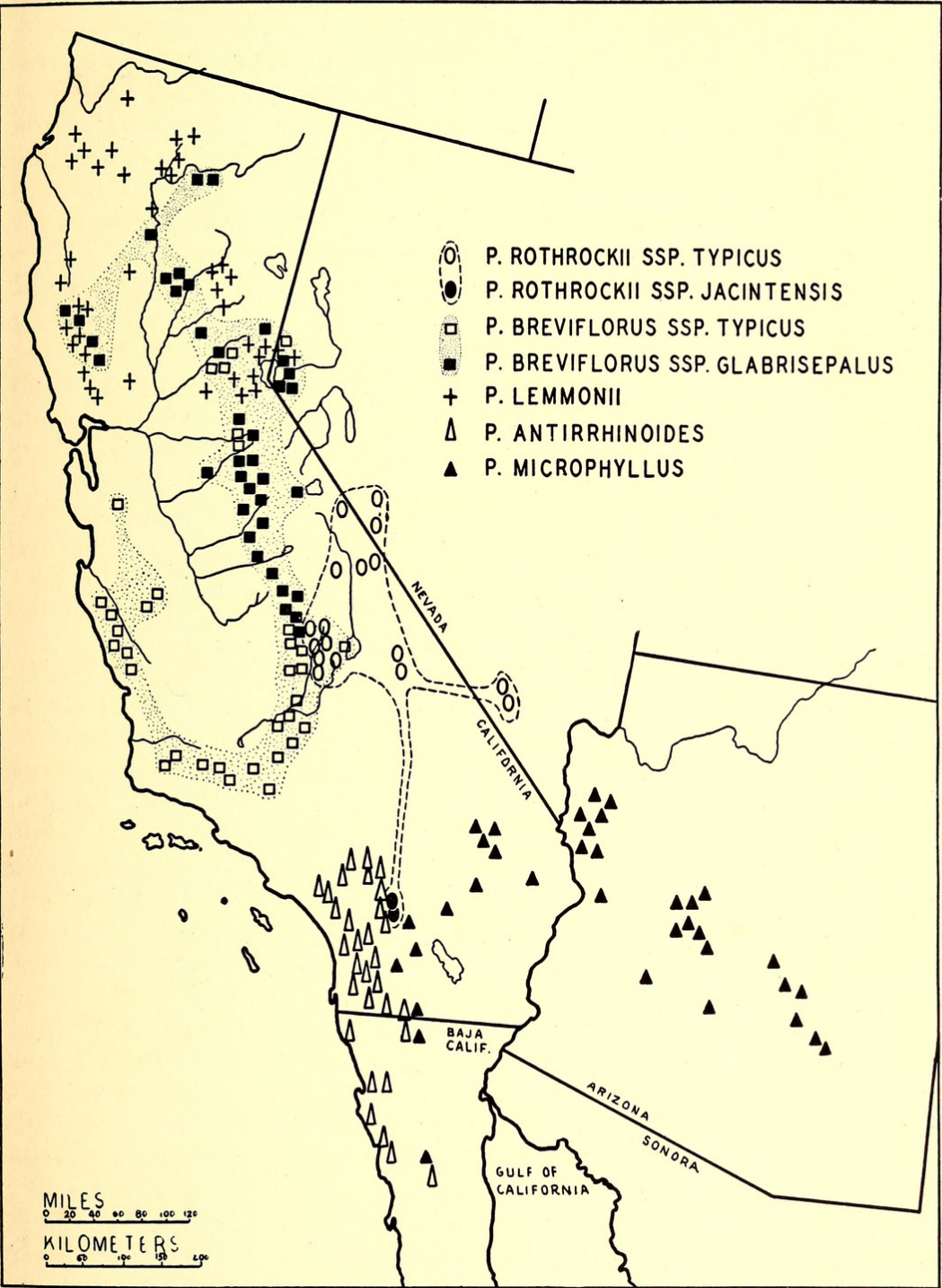


FIG. 1. Distribution of yellowish and whitish flowered species of section *Hesperothamnus*.

There is ample justification for retaining this as a species rather than following the lead of Munz and Johnston in reducing it to a subcategory under *P. antirrhinoides*. While the affinity of *P. microphyllus* and *P. antirrhinoides* is sufficiently obvious to tempt one for phylogenetic clearness to follow the latter course, it is also evident that these behave as distinct ecospecies, occupying quite distinct habitats, and exchanging genes only in the relatively narrow zone where cismontane climate meets desert and where species meets species.

6. *PENSTEMON CORDIFOLIUS* Benth.

Penstemon cordifolius Benth. Scroph. Ind. Introd. 7, 1835.

Penstemon cordatus Walp., Rep. 3: 249. 1844-5. This is Bentham's name miscopied.

Scandent shrub 10-30 dm. high: herbage dark green, glabrous to lightly pubescent or hispidulous, more densely hairy and glandular within the inflorescence: leaves 15-35 mm. long, 10-20 mm. wide, lance-ovate to cordate, serrulate to sharply serrate: inflorescence a drooping compact thyrus composed of many leafy cymules, with strongly divaricate or reflexed branchlets, 5-25 cm. long; peduncles 0.5-2 cm. long, 1-5-flowered: calyx 7-10 mm. long, densely glandular-pubescent; sepals lanceolate, acuminate: corolla dull scarlet, 30-40 mm. long, 5-7 mm. broad at throat, tubular; upper lip erect, 14-18 mm. long, not strongly keeled: sterile filament densely yellow-bearded for two-fifths its length, included: anther-sacs 1.2-1.6 mm. long.

Frequent on chaparral-covered slopes of the Upper Sonoran Zone in the coastal mountains below 1000 meters from San Luis Obispo County, California, southward to northern Baja California. Type locality: "New California," collected by Douglas.

CALIFORNIA. *Douglas* (GH, isotype). San Luis Obispo County: Santa Margarita, July 12, 1911, *Brandege* (C); Arroyo Grande, May 1895, *Sanford* (C). Santa Barbara County: Suey Creek, *Eastwood* 386 (CAS); Gaviota Pass, *Abrams* 6538 (SU); Santa Barbara, *Elmer* 3956 (C, CAS, GH, M, NY, SU, US); Santa Rosa Island, June 1888, *Brandege* (C); Santa Cruz Island, 1886, *Greene* (A, C, F, M, Ph, SU, US). Ventura County: trail to Nordhoff, *Dudley & Lamb* 4813 (SU, US); Topatopa Mts., *Abrams & McGregor* 150 (A, GH, NY, SU, US). Los Angeles County: Sepulveda Canyon, Santa Monica Mts., *Abrams* 2545 (F, GH, M, NY, Ph, SU); Newhall, *Grinnell* 460 (US); Claremont, *Baker* 3441 (C, CAS, F, GH, M, NY, Po, US); Santa Catalina Island, *Heller* 8951 (NY, US); San Clemente Island, *Trask* 291 (A, US). San Bernardino County: Puente Hills, *Howell* 2428 (CAS, CI); San Bernardino, *Parish* 4181 (C, GH, M, NY, US). Riverside County: 12 mi. N. of Idyllwild, June 20, 1926, *Jones* (CAS, GH, Po, SU); Coldwater Canyon, Santa Ana Mts., *Hall* 573 (C). San Diego County: Rincon Grade, May 29, 1926,

Jones (CAS, GH, NY, Po, SU); San Diego, *Brandege* in *Baker 1616* (C, CAS, F, GH, M, NY, Po, RM, US); Jamul Valley, *Palmer 273* (C, F, M, NY). MEXICO. Baja California: Tecate River near Monument 245, *Schoenfeldt 3758* (SU, US).

An interesting hybrid between this species and *P. antirrhinoides* Benth. has been collected by Carl V. Meyer, no. 738 (C), on the Escondido-Moosa Canyon road, San Diego County.

7. *PENSTEMON CORYMBOSUS* Benth.

Penstemon corymbosus Benth. in DC. Prodr. 10: 593. 1846.

Shrub 3–5 (rarely to 10) dm. high: stems very woody, more or less glaucous: herbage deep green, canescent to glabrous: leaves 8–32 mm. long, 5–15 mm. wide, lance-oblong to broadly elliptical, entire to remotely serrate: inflorescence a terminal corymb, densely glandular-pubescent, 4–8 cm. long; peduncles seldom exceeding 1 cm. in length: calyx 6–9 mm. long; sepals linear-lanceolate to lance-ovate, acuminate or attenuate: corolla bright red or brick red, 25–35 mm. long, *ca.* 6 mm. broad at throat, tubular; upper lip erect, 11–13 mm. long, not strongly keeled: sterile filament densely yellow-bearded for its entire length, included: anther-sacs 0.9–1.1 mm. long.

Coast Ranges of California from Del Norte County to Monterey County, on rocky slopes and cliffs at elevations of 150 to 1500 meters. Type locality: California, probably in the Santa Lucia Mts., Monterey County.

The type number is *Coulter 629*. Bentham had no sheet of this in his herbarium but there was one in Herbarium Hookerianum from which, without doubt, his description was drawn. This sheet contains three twigs, the two lateral ones glabrous as to stems and leaves, the central one canescent. This would account for Bentham's statement "glaber vel pubescens" in the original description. A photograph and notes on this specimen taken by H. M. Hall at Kew have been examined. Isotypes of *Coulter 629* (GH, NY) are heavily pubescent on the leaves and stems of the several pieces represented. As it is desirable to distinguish a variety in this species on the presence or absence of pubescence, the type must be set as regards this character. Since Coulter's number includes both forms on the type sheet, we are permitted to choose the two pieces with glabrous leaves, which incidentally much better represent the true species even though Coulter collected predominantly pubescent material. The glabrous form is by far the more common in California. Moreover, Jepson has already given a varietal name to the pubescent form.

CALIFORNIA. Del Norte County: Smith River, *Gale 380* (GH, M. Ph, US). Humboldt County: Jarnigans, July 10, 1888, *Chesnut & Drew* (C, US); Kneeland Prairie, *Tracy 3847* (C, NY, RM, US); Chaparral Mt. at Bug Creek, *Kildale 10357* in part

(SU). Mendocino County: Richardson Grove, Eel River, *Heller 13860* (F, M, NY, SU, US); between Lanes Redwood Flat and Coolidge Memorial Park, *Keck 2680* (C, CI, SU); Blue Rock Station, *Kellogg & Harford 679* (CAS, GH, NY, US). Lake County: Middle Creek, foot of Elk Grade, Aug. 1892, *Jepson* (C). Sonoma County: Austin Creek, *Davy & Blasdale 6009* (C). Marin County: Mount Tamalpais, *Eastwood 1536* (GH, NY, US). Contra Costa County: Mount Diablo, *Elmer 4956* (C, CAS, M, NY, SU, US). Santa Clara County: Loma Prieta, *Elmer 4980* (SU); Mount Hamilton, *Howell 11502* (A, CAS, CI). San Benito County: Hepsedam Peak, June 2, 1899, *Dudley* (SU). Monterey County: Point Sur, July 1888, *Brandege* (F).

7a. *PENSTEMON CORYMBOSUS* var. *PUBERULENTUS* Jepson

Penstemon corymbosus var. *puberulentus* Jepson, Man. Fl. Pl. Calif. 909. 1925.

Penstemon intonsus Heller, Muhlenb. 1: 44. 1904. Type: "No. 6020, collected August 1, 1902, along Eel river near Hullville, Lake County, California" (Heller). This lightly puberulent form is described as new because of the bearded staminode, Bentham having erroneously described the sterile filament of *Coulter 629* as glabrous.

With the species but less frequent; also to Shasta and Butte counties. Type locality: "Butte Co. (Richardson Sprs., Hall 6763, type)."

CALIFORNIA. Shasta County: Cottonwood Canyon (near Shasta), *Brewer 1337* (C, GH, US). Butte County: Richardsons Springs, *Hall 6763* (C, type; isotypes GH, NY, US). Siskiyou County: Klamath River, 4 mi. below Happy Camp, *Wolf 1125* (SU). Trinity County: Mount Bolly, Sept. 27, 1879, *Kleeberger* (CAS). Humboldt County: Somes Bar, Klamath River, *Chandler 1516* (C); Chaparral Mt. at Bug Creek, *Kildale 10357* in part (SU). Lake County: Eel River, Hullville, *Heller 6020* (GH, M, NY, Ph, RM, SU, US, isotypes of *P. intonsus*); summit Mount Sanhedrin, July 28, 1902, *Heller* (GH, M, NY, Ph, US); between Bartlett Springs and Clear Lake, *Abrams 6287* (A, NY, RM, SU). Monterey County: Tassajara Hot Springs, Oct. 2, 1921, *Clemens* (CAS); W. of Twin Peaks, Santa Lucia Mts., Aug. 1, 1903, *Dudley* (NY, SU).

Pubescence on the stems and foliage seems to have no selective value in this species. While the farthest inland stations (Butte County and Shasta County) produce pubescent individuals, the same type occurs freely in the Coast Ranges with the glabrous form. The two forms have almost completely overlapping ranges, as shown in figure 2, and intergrades between them are frequent. Since there is no geographic segregation evident, which if present would indicate that a phylogenetically

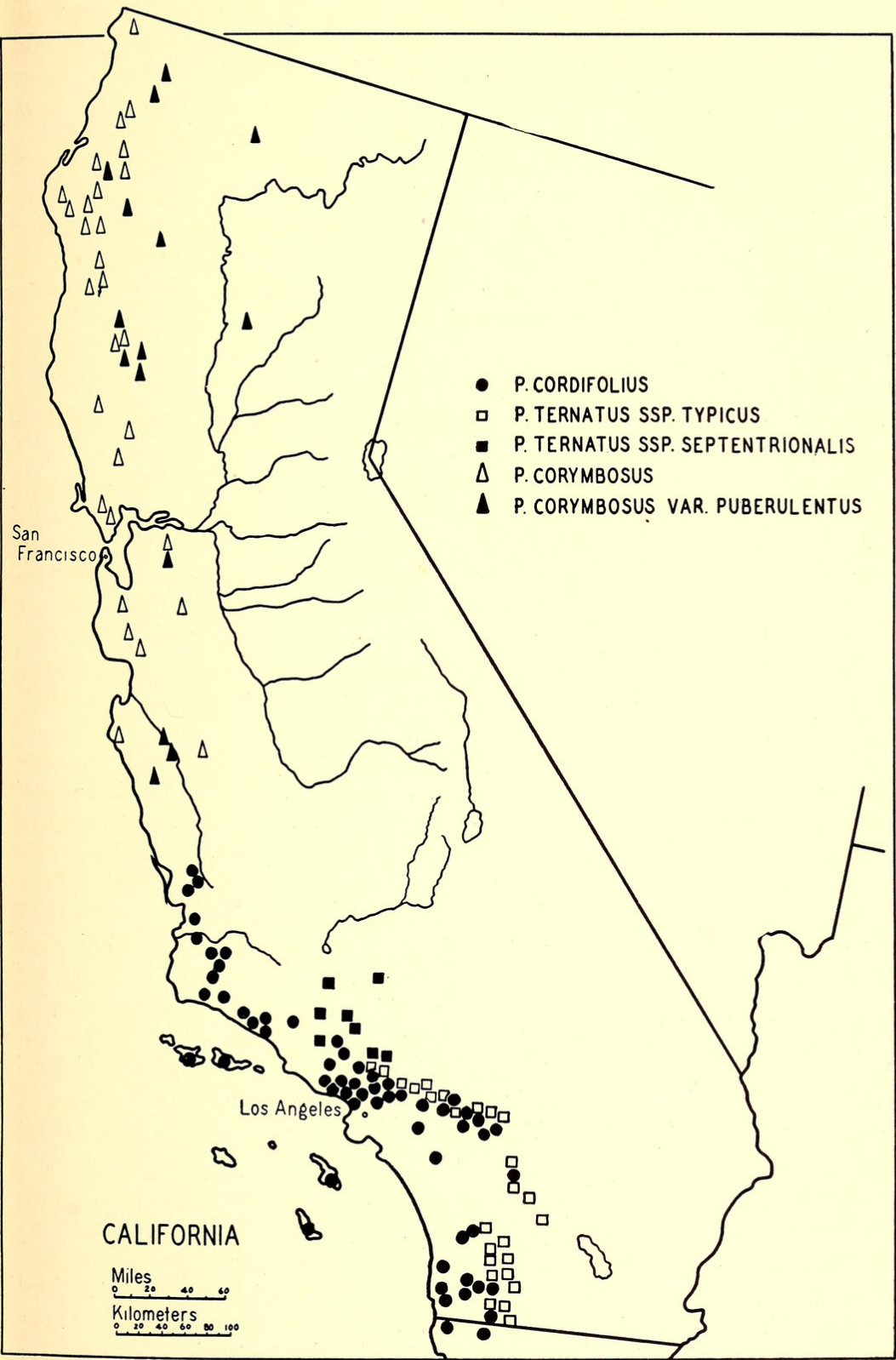


FIG. 2. Distribution of the red-flowered species of section *Hesperothamnus*.

valuable character with survival value was involved, the pubescent type can only attain to varietal rank.

8. *PENSTEMON TERNATUS* Torr.

Penstemon ternatus Torr. in Gray, Bot. Mex. Bound. 115. 1859.

Shrub 5–15 dm. high, the wandlike glaucous stems sometimes scandent, glabrous: leaves bright green, glabrous, 1–5 cm. long, 2–9 mm. wide, linear-lanceolate, tapering to base and apex, ternate (rarely opposite), remotely serrulate: inflorescence a racemose panicle, glabrous (except in subsp.), 7–30 or 50 cm. long; peduncles up to 2 cm. long; calyx 3–5 mm. long; sepals lance-ovate, acuminate: corolla scarlet, 23–30 mm. long, *ca.* 5 mm. broad at throat, tubular; upper lip erect, 5–6 mm. long, not strongly keeled: sterile filament densely bearded for its entire length, well included: anther-sacs 1 mm. long.

Southern California and northern Lower California.

8a. *PENSTEMON TERNATUS* subsp. *TYPICUS* nom. nov.

Frequent in chaparral in the Upper Sonoran and Transition zones of the coastal drainage from the San Gabriel and San Bernardino mountains southward to San Pedro Martir, Baja California, at elevations of 300 to 2000 meters. Type locality: "Mountains east of San Diego; June; *Parry*."

CALIFORNIA. Los Angeles County: Pacoima Canyon, *Ewan* 4741 (GH); Tejunga Canyon, *Braunton* 1275 (C); Prairie Fork, San Gabriel River, *Johnston* 1676 (Po, RM, SU); Claremont, *Baker* 5067 (C, NY, Ph, Po, SU). San Bernardino County: Cajon Pass, *Abrams & McGregor* 698 (NY, SU, US); San Bernardino, *Parish* 4183 (C, CAS, GH, NY, US); Seven Oaks, *Munz* 12661 (A, C, Po); Clark's Ranch, *Abrams* 2939 (GH, NY, Ph, SU, US). Riverside County: Chalk Hill, San Jacinto Mts., *Hall* 2634 (NY, Ph, SU, US); Santa Rosa Mts., *Munz* 5852 (Po). San Diego County: Palomar Mt., *Chandler* 5441 (C, NY); Warners Hot Springs, 1911, *Coombs* (CAS, US); Potrero to Cottonwood Valley, *Abrams* 3726 (A, GH, NY, Ph, SU, US); Descanso, *Spencer* 919 (GH, Ph). MEXICO. Baja California: Guadalupe Mt. June 1, 1883, *Orcutt* (Carnegie Museum, Pittsburgh); San Pedro Martir, May 6, 1893, *Brandegge* (C).

8b. *PENSTEMON TERNATUS* subsp. *SEPTENTRIONALIS*

(*Munz et Johnst.*) comb. nov.

Penstemon ternatus var. *septentrionalis* *Munz et Johnst.* Bull. So. Calif. Acad. Sci. 23: 28. 1924.

In mountains to the northwest of subsp. *typicus*, largely on drainages not facing the coast, in adjacent portions of Kern, Ventura, and Los Angeles counties. Type: "Abrams & McGregor 394, Oakgrove Canyon, Liebre Mts. (GH)."

CALIFORNIA. Kern County: Tehachapi, 1895, *Davidson* (C); Fort Tejon, *Xantus* 63 (GH, NY, US). Ventura County: Mount Pinos, below Mutau Flat, *Dudley & Lamb* 4769 (SU, US); Red-reef Canyon, *McMinn* 1120 (SU). Los Angeles County: Sandbergs, Liebre Mts., *Munz* 4418 (Po); Oakgrove Canyon, Liebre Mts., *Abrams & McGregor* 394 (type, GH; isotypes, NY, SU, US); Soledad Canyon, *Braunton* 1011 (Ph); Acton, Mount Gleason, *Elmer* 3597 (C, CAS, GH, NY, SU, US).

DISCUSSION ON PHYLOGENY AND SPECIFIC DELIMITATION

The distributions of the various units in the section *Hesperothamnus* are depicted on the accompanying distributional maps. In figure 1 the five species with brownish, white, or yellow flowers are mapped; these are insect-pollinated, bumblebees perhaps acting as the chief agents of pollination. In figure 2 the three species with red tubular flowers are located and these species are visited regularly by humming birds. If we follow the dictum that humming bird-pollinated species are derived from the insect-pollinated, the red-flowered species should be the last ones treated, as they are in this classification.

Penstemon Rothrockii is taken up first and its relatively simple corolla would indicate its merit for this position. Also, the spicate inflorescence is much less complicated in this species than in the others, and the fact that the flowers are often alternate instead of opposite toward the summit of the inflorescence would indicate a primitive rather than a derived type. The discontinuity of its distribution is brought out in figure 1, and it is to be noted that with the exception of the water-shed toward the headwaters of the Kern River, its distribution is to the east of the Sierran crest. A peculiarity by which this species differs from many others that occur both in the southern Sierra Nevada and the mountains of southern California is that *P. Rothrockii* subsp. *jacintensis* has not been discovered in the San Bernardino Mountains. While *P. Rothrockii* occurs on mountain chains of a desert region, it is at high elevations.

Penstemon breviflorus breaks up into two subspecies with very natural distributions. Subspecies *typicus* occurs in the South Coast Ranges and into the southern Sierra Nevada by way of the Tehachapi Mountains and adjacent ranges. This has a glandular-pubescent calyx, which is in correlation with its distribution through the warmer southern ranges, while subsp. *glabrisepalus*, lacking this pubescence, occurs in a cooler district through the central Sierra Nevada north to Shasta County and into the North Coast Range. From the Lake Tahoe region to Tulare County, a certain proportion of subsp. *typicus* occurs with the much more predominant subsp. *glabrisepalus* and here hybridization occurs.

Penstemon Lemmonii is confined to the mountains of northern California where it is found in less exposed situations than its

near relative, *P. breviflorus*. The inflorescence of the former is the more complicated, its numerous peduncles terminated by many-flowered corymbs.

The close affinity between *P. antirrhinoides* and *P. microphyllus* has been touched upon. A glance at the map shows their geographic relations. The former is found in the coastal mountains; the latter in the interior. The morphological differences between the species reflect the selective powers of the different climates under which they grow. The distribution of these two species suggests that the pallid, canescent herbage and viscid-pubescent calyx that aid in distinguishing *P. microphyllus* either are characters of survival value or are linked to physiologic characters of importance for survival in this climate. Such characters indicate that each of these is a species selected by the environment, a natural species, or again, an ecospecies to use the apt term of Turesson.

Penstemon antirrhinoides and *P. microphyllus* stand a little to one side of the phylogenetic line that appears to connect the first three species mentioned.

Turning to figure 2, it will be observed that *P. cordifolius* is rather strictly a coastal species occurring in chaparral of the lowlands. On the islands it develops extra large leaves, but similar forms occur at the northern and southern extremities of its range, as well as at other points, so this character is too erratic for use in subdivision of the species.

Penstemon ternatus is shown to be somewhat farther removed from the coast and higher in the mountains, but it too is found in chaparral. The southern subspecies, *typicus*, is confined to the western and southern sides of the higher ranges, but its northern subspecies, *septentrionalis*, with added glandular-pubescent within the inflorescence, occurs in the Tehachapi and Liebre mountains and the Mount Pinos region where the thermodynamic influence of the ocean is less pronounced. The ternate leaves of this species are very unusual in *Penstemon*, but here again the affinities within the section are demonstrated, for ternate leaves occasionally are found in *P. cordifolius*.

Penstemon corymbosus occurs wholly to the north of the other red-flowered species. Its chief center of distribution is in the belt of the coast redwoods, but it also penetrates the Inner North Coast Range freely. There is a tendency for var. *puberulentus* to occur in more arid situations farther toward the interior than does the glabrous genuine form, but field studies confirm the impression gathered in the herbarium that the two occur together and intergrade much too freely to accord the variety subspecific rank. The fact that both extend the entire length of the range should be considered also and calls for the explanation that the variety deserves to be recognized, because the character involved is for the most part clear-cut and even outstanding.

These three red-flowered species have individual specializations: the inflorescence of *P. corymbosus* seems certainly to be derived from the paniculate type; the pendant inflorescence of *P. cordifolius*, with the correlated twisting of the flowers to arrange themselves normally, is peculiar to this species as is the definite scandent habit. *P. ternatus* has some tendency to be scandent too and has specialized ternate branching and leaves; its corolla, too, is the most narrow found in this section.

The connections between the red-flowered species and the others seem to occur between *P. antirrhinoides* and *P. cordifolius*, which hybridize, which have a rather similar robust habit, and which occur in the same region; also, between *P. breviflorus* and *P. ternatus*, which mimic each other's habit but are probably not in a direct line of descent; and between *P. Lemmonii* and *P. corymbosus*, whose habital similarities are probably due more to their common occurrence in the moister northern mountains than to a close phylogenetic relationship.

Carnegie Institution of Washington,
Stanford University, October 4, 1935.

NEW AND NOTEWORTHY NORTHWESTERN PLANTS—VI¹

HAROLD ST. JOHN

JUNCACEAE

LUZULA CAMPESTRIS (L.) DC. var. **columbiana** St. John var. nov. *Planta viridis cristata, caulibus paucis vel pluribus 16–48 cm. altis; foliis 2–4 mm. latis quam caules valide brevioribus, foliis caulinis 2–3 similaribus villosis-ciliatis ad basin; bracteis inferioribus quam inflorescentias brevioribus vel superantibus; capitulis 1–5 ovatis vel cylindratis 10–30-floriferis 6–11 mm. longis, capitulis terminalibus brevis pedunculatis, capitulis lateralibus cum pedunculis 1.5–6.5 cm. longis; bracteis florum pallidis hyalinis ovato-lanceolatis acuminatis laceratis; sepalis 2–2.5 mm. longis plerumque atro-brunneis lanceolatis acuminatis ad marginem hyalinis; petalis latioribus; fructibus ovali-trigonis atro-brunneis vel atrescentibus ad apicem 2–2.5 mm. longis.*

Plants bright green, tufted; stems few to several, 16–48 cm. tall; basal leaves much shorter than the stems, 2–4 mm. broad; cauline leaves 2–3, similar, villous ciliate at base; lowest bract shorter than or exceeding the inflorescence; heads 1–5, ovate to short cylindric, 10–30-flowered, 6–11 mm. long, the terminal one short stalked, the lateral ones on slender rays 1.5–6.5 cm. long; floral bracts pale, hyaline, ovate-lanceolate, acuminate, lacerate;

¹ Contribution No. 50 from the Department of Botany, State College of Washington.



Keck, David Daniels. 1936. "STUDIES IN PENSTEMON—II. THE SECTION HESPEROTHAMNUS." *Madroño; a West American journal of botany* 3, 200–219.

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