spicuously dilated and overlapping to form a bulbous base to the stem; cymes few, the pedicels usually ascending, commonly 1–3 cm. long in fruit; calyx-lobes oblong, mostly obtuse, 2–3 mm. long; corolla campanulate and more or less funnelform, 6–9 mm. long, the lobes oval, 2–3 mm. long; anthers oblong, 1 mm. or less long; capsule oblong-ovoid, 4–7 mm. long; seeds 1–1.5 mm. long.

Wet rocks, Boreal Zones; mountains of Washington, Oregon, and northern California, north to Alaska and the Aleutian Islands and east to Alberta and Montana. Type locality: Sitka, Alaska. June–Sept.

Family 132. BORAGINÀCEAE.*

Borage Family.

Herbs, shrubs, or some tropical species trees. Leaves simple, alternate, or rarely opposite or whorled, commonly entire and pubescent, hispid or setose. Flowers perfect and usually regular, in one-sided scorpioid spikes, racemes, cymes or scattered. Calyx commonly 5-lobed or 5-parted, usually persistent, the lobes valvate. Corolla sympetalous, regular or rarely more or less irregular, 5-lobed, sometimes crested or appendaged in the throat. Stamens as many as corolla-lobes and alternate with them, inserted on the tube or throat of the corolla and usually included. Ovary superior, of two 2-ovuled carpels, entire or the carpels commonly deeply 2-lobed, making it appear as of four 1-ovuled carpels; style simple, entire or 2-cleft; ovules anatropous or amphitropous. Fruit mostly of four 1-seeded nutlets or rarely of two 2-seeded carpels. Endosperm none; embryo straight or curved.

A family of about 95 genera and 1,800 species, of world-wide distribution, but with one of the principal centers of distribution in southwestern United States.

Style deeply 2-cleft or 2-parted, each branch with a capitate stigma. (*Ehretioideae.*) 1. *Coldenia.*

Style entire, with a simple or obscurely lobed stigma.

Ovary undivided, shallowly lobed, the style borne on its summit; stigma annular-peltate. (*Heliotropioideae.*)

Fruit 2-lobed, each lobe splitting into 2 nutlets; stigma capped by a tuft of bristles; annuals, with solitary axillary flowers. 2. *Euploca.*

Fruit not lobed, splitting into 4 nutlets; stigma discoid, naked; flowers in scorpioid spikes; perennials. 3. *Heliotropium.*

Ovary 4-parted; style borne on the gynobase and arising between the lobes. (*Boraginoideae.*)

Calyx not armed with prickles and not becoming bur-like in fruit.

Nutlets widely spreading in fruit, armed with barbed or hooked prickles. (*Cynoglosseae.*)

Nutlets flat, armed on the margins with hooked bristles; slender annuals; corolla white. 4. *Pectocarya.*

Nutlets subglobose, armed all over with barbed prickles; perennials; corolla usually blue. 5. *Cynoglossum.*

Nutlets erect, not armed with prickles, except in *Lappula* and *Hackelia*, or minutely so in some species of *Allocarya.*

Attachment of nutlet surrounded by a tumid annular rim, strongly convex and leaving a pit upon the flat or low-convex receptacle. (*Anchuseae.*)

Stamens appendaged dorsally, closely crowded around the style; corolla rotate. 6. *Borago.*

Stamens unappendaged, included within the tubular corolla.

Corolla tubular-campanulate, throat campanulate-dilated, lobes short, erect or recurved at apex. 7. *Symphytum.*

Corolla funnelform or salverform, lobes usually elongated and spreading.

Corolla-tube bent near the middle, limb slightly irregular and oblique. 8. *Lycopsis.*

Corolla-tube straight, limb regular and not oblique. 9. *Anchusa.*

Attachment of nutlet not surrounded by a rim and not leaving a pit on the receptacle.

Receptacle flat or merely convex; nutlets attached by the base. (*Lithospermeae.*)

Flowers blue or white.

Corolla salverform, the lobes rounded and spreading. 10. *Myosotis.*

Corolla tubular or funnelform, the lobes erect or nearly so. 11. *Mertensia.*

Flowers yellow, bracteate; corolla-tube cylindrical, the lobes spreading. 12. *Lithospermum.*

Receptacle conical or elongated, to which the nutlets are attached more or less laterally. (*Eritrichieae.*)

Fruiting calyx not greatly enlarged and membranous.

Nutlets conspicuously armed with armed prickles, and also sometimes dorsally.

Annuals; pedicels erect in fruit; gynobase subulate. 13. *Lappula.*

Perennials or biennials; pedicels recurved in fruit; gynobase broadly pyramidal. 14. *Hackelia.*

Nutlets not armed with conspicuous prickles.

Corolla white or blue, at least not bright yellow or orange, the throat usually crested.

Corolla bright blue; low depresssed perennials. 15. *Eritrichium.*

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* In the concept of the species, especially in *Allocarya* and *Cryptantha*, the author has followed fairly closely the monographic treatment of Dr. I. M. Johnston.

Corolla white, sometimes cream-colored or pale yellow in the throat; mostly annuals.
Calyx circumscissile. 16. *Greeneocharis.*
Calyx not circumscissile, or rarely so in *Plagiobothrys.*
Nutlets keeled on the ventral side, not grooved or if so the groove enclosing the keel; calyx and pedicels persistent.
Lower leaves opposite, not forming a rosette; nutlets attached by a scar or groove, not carunculate, mostly erect; corolla-tube often yellowish within. 17. *Allocarya.*
Lower leaves alternate; nutlets attached above the base to a caruncle or thickened scar, oblique or incurved; corolla white throughout.
Nutlets with the caruncle borne on a stipe-like base; lowest leaves not in a rosette. 18. *Echidiocarya.*
Nutlets with the caruncle borne in a hollow or transverse groove; lowest leaves mostly in a rosette. 19. *Plagiobothrys.*
Nutlets not keeled on the ventral side, but grooved above the basal scar and attached from the scar along the ventral groove to the middle or apex; calyx and pedicels falling away with the nutlets; corolla-throat with crests; leaves all alternate.
Annuals.
Stems dichotomously branched; racemes with each flower in the axil of a foliaceous bract; style dilated in fruit; gynobase columnar. 20. *Eremocarya.*
Stems branched but not dichotomously; racemes spike-like and bractless or few-bracted, rarely bracted throughout, if so, the bracts unequal; style not dilated in fruit; gynobase subulate. 21. *Cryptantha.*
Perennials, often cespitose. 22. *Oreocarya.*
Corolla bright yellow or orange, the throat open or inconspicuously constricted, not crested. 23. *Amsinckia.*
Fruiting calyx greatly enlarged and membranous. 24. *Asperugo.*
Calyx armed with prickles, irregular and bur-like in fruit. 25. *Harpagonella.*

1. COLDÈNIA L. Sp. Pl. 125. 1753.

Low herbaceous or suffrutescent plants, canescent or hispid. Leaves small, entire, usually strongly veined. Flowers small, generally white, sessile and solitary or often clustered in the axils of the leaves, 4-merous or commonly 5-merous. Calyx deeply lobed into narrow segments. Corolla with a short tube, naked or scaly within; lobes short and rounded, imbricated. Stamens 4–5, included, their filaments adnate to the corolla-tube. Style 2-cleft or 2-parted. Ovary 2-celled or sometimes 4-celled by the septum-like placentae, entire or 4-lobed. Fruit with a thin usually dry exocarp, separating into 4 nutlets. [Name in honor of Dr. Cadwallader Colden, Colonial Lieutenant-Governor of New York and correspondent of Linnaeus.]

A genus of about 20 species, native of the western hemisphere, with one species also in the tropics of the Old World. Type species, *Coldenia procumbens* L.

Fruit merely 4-sulcate, bearing the style in its rounded summit; stems not dichotomous; leaves not conspicuously veined; perennial, woody at base. 1. *C. canescens.*
Fruit deeply 4-lobed, bearing the style between the lobes; stems dichotomously branched.
Plants perennial, stems woody below or from a stout woody root; corolla bluish.
Leaves with 4–6 rib-like veins, the surface of at least the younger ones distinctly plicate, densely white-silky pubescent, margin entire. 2. *C. plicata.*
Leaves 3–4-veined, the veins somewhat irregular, not plicate, margin somewhat sinuate. 3. *C. Palmeri.*
Plants annual, prostrate; corolla pink or white. 4. *C. Nuttallii.*

1. Coldenia canéscens A. DC. Shrubby Coldenia. Fig. 4162.

Coldenia canescens A. DC. Prod. 9: 559. 1845.

Coldenia canescens var. *subnudata* I. M. Johnston, Proc. Calif. Acad. IV. 12: 1137. 1924.

Low, much-branched shrub often forming mats, 5–15 cm. high, the older main branches woody and becoming stout and gnarled. Leaves white-tomentose with intermingling short-villous hairs, oblong-lanceolate to ovate, 6–10 mm. long, plane or commonly with the entire margins revolute, longer than the petioles; calyx 4–6 mm. long; corolla white, 6–7 mm. long; style slightly exserted above the calyx-lobes; fruit depressed-globose, about 2 mm. wide, glabrous or sparsely hairy at the summit.

Rocky ridges or benches, Lower Sonoran Zone; eastern parts of the Colorado Desert, Riverside and Imperial Counties, California, east to Texas and south to Lower California and northern Mexico. Type locality: between Santander and Victoria, Tamaulipas, Mexico. March–May.

Coldenia canescens var. pulchélla I. M. Johnston, Journ. Arnold Arb. 20: 379. 1939. Flowers larger; corolla 9–12 mm. long with the limb 5–8 mm. in diameter, blue or lavender. A local variation found in the Chocolate Mountains, Imperial County, California, and adjacent Arizona. Type locality: Kofa Mountains, Yuma County, Arizona.

2. Coldenia plicàta (Torr.) Coville. Plicate Coldenia. Fig. 4163.

Tiquilia brevifolia var. *plicata* Torr. Bot. Mex. Bound. 136. 1859.
Coldenia Palmeri of S. Wats. and recent authors, not A. Gray.
Coldenia plicata Coville, Contr. U.S. Nat. Herb. 4: 163. 1893.

Stems several from a woody base, finely and usually openly branched dichotomously, forming a mat or rounded tuft up to 5 dm. broad; branchlets somewhat 4-angled, rather thinly short-tomentose. Leaves broadly to narrowly obovate or sometimes ovate, narrowed to a petiole of about equal length, 5–10 mm. long, conspicuously plicate by 4–7 pairs of lateral ribs, densely white-silky pubescent on both sides, with a few scattering short-hispid hairs intermingling especially toward the entire narrowly revolute margin; flowers clustered in the forks and at the ends of the branches; calyx-lobes subulate, densely villous-tomentose, especially on the inside, 2–2.5 mm. long; corolla blue or lavender, 4 mm. long, the limb about 2.5 mm. broad; style-branches exserted beyond the calyx-lobes; nutlets about 1 mm. long, ovoid or globular, smooth and shining, usually one or more aborted.

Usually in sandy soils, Lower Sonoran Zone; in the Mojave Desert along the Colorado River below Needles, and in the Colorado Desert from San Gorgonio Pass east to Arizona and south to Lower California. Type locality: "desert west of the Colorado, California." April–Aug.

3. Coldenia Pálmeri A. Gray. Palmer's Coldenia. Fig. 4164.

Coldenia Palmeri A. Gray, Proc. Amer. Acad. 8: 292. 1870.
Coldenia brevicalyx S. Wats. Proc. Amer. Acad. 24: 62. 1889.

Stems several from the crown of deep-seated woody roots, woody at base, fimbriate or spreading forming a mat or rounded tuft, 2–4 dm. high, branchlets dichotomous, thinly hirsutulous-tomentose, the whitish bark exfoliating in age. Leaves ovate, obovate or rhombic, 4–10 mm. long on petioles as long or longer, the margins sinuate-revolute, irregularly veined with 2–3 pairs of lateral veins impressed on the back but not plicate, appressed-pubescent and with a few scattering hispid hairs especially near the margin; calyx 2–3.5 mm. long, glabrescent or short-pubescent within; corolla 5–7 mm. long; nutlets nearly globose, about 1 mm. in diameter.

Sandy soil, Lower Sonoran Zone; western side of the Colorado Desert, California, east to southwestern Nevada and western Colorado, south to Lower California. Type locality: lower Colorado River. April–June.

4. Coldenia Nuttállii Hook. Nuttall's Coldenia. Fig. 4165.

Coldenia Nuttallii Hook. Kew Journ. Bot. 3: 296. 1851.
Tiquilia parviflora Nutt. ex Hook. loc. cit. as a synonym.
Tiquilia brevifolia Nutt. ex Torr. Bot. Mex. Bound. 136. 1859.

Prostrate annual, with slender dichotomously branching stems forming a mat 1–3 dm. broad, rather thinly appressed-pubescent. Leaves ovate to suborbicular, 4–8 mm. long, narrowly revolute and often hispid on the margin, with 2–3 pairs of rather distinct veins impressed on the back, thinly strigose on the upper surface with rather stiff hairs, the hairs a little longer and more spreading on the lower surface; petioles slender, usually as long or longer than the leaves; flowers in compact clusters in the forks and at the ends of the branches; calyx-lobes linear-subulate, 4–5 mm. long, villous on the back and sparsely but conspicuously hispid on the margins; corolla pink or nearly white, little exceeding the calyx, the limb 2–2.5 mm. broad, the tube with 5 triangular scales near the base; nutlets oblong-ovoid, smooth and shining.

Sandy or alkaline places, on plains and hillsides, lower Arid Transition Zone to Lower Sonoran Zone; eastern Washington southward east to the Cascade-Sierra Nevada Divide to the Mojave Desert, California, east to Idaho, Nevada, Wyoming, and Utah. Type locality: "Rocky Mountains." Collected by Nuttall. May–Aug.

2. EÙPLOCA Nutt. Trans. Amer. Phil. Soc. II. 5: 189. 1837.

Low branching usually pubescent annuals with alternate leaves. Flowers scattered, solitary in the leaf-axils. Calyx-lobes 5. Corolla salverform, the tube cylindric, naked in the throat, limb 5-angled, strongly plicate in the bud. Stamens 5; anthers slightly cohering by their minutely bearded tips. Ovary 4-celled; style long and filiform; apex of the stigma truncate and bearded with a tuft of penicillate bristles. Fruit didymous, the two lobes each splitting into 2 hemispherical 1-seeded nutlets. [Name Greek, meaning well and a woven thing.]

A monotypic genus of the arid southwestern United States and Mexico. Type species, *Euploca convolvulacea* Nutt.

1. Euploca convolvulàcea subsp. califórnica (Greene) Abrams. Bindweed Heliotrope or Euploca. Fig. 4166.

Heliotropium californicum Greene, Bull. Calif. Acad. 1: 202. 1885.
Heliotropium convolvulaceum var. *californicum* I. M. Johnston, Contr. Arnold Arb. No. 3: 83. 1932.
Euploca albiflora var. *californica* Jepson & Hoover in Jepson, Fl. Calif. 3: 299. 1943.

Stems branched and usually spreading, 4–10 cm. high, the entire plant more or less densely hispid with both spreading and upwardly appressed whitish hairs pustulate at the base. Leaves varying from broadly ovate to narrowly lanceolate, commonly ovate, 1.5–3 cm. long, acute or abruptly short-acuminate at apex, rounded to acutish at base, grayish green and densely hispid on both sides, the hairs except on the margin more or less appressed; flowers borne solitary near

the base of the petiole or on the opposite side of the stem, 2–4 mm. long; calyx-lobes linear-lanceolate, attenuate above the nutlets; corolla white, fragrant, densely appressed-hispid exteriorly, the tube 5–8 mm. long, the limb 8–10 mm. broad; nutlets smooth and glabrous, 2 mm. high.

Open sandy desert playas and hills, Lower Sonoran Zone; eastern Mojave Desert, San Bernardino County and eastern Colorado Desert, Riverside County, California, east to adjacent Arizona. Type locality: Amboy, Mojave Desert, San Bernardino County. April–May.

3. HELIOTRÒPIUM [Tourn.] L. Sp. Pl. 130. 1753.

Herbs or shrubs with alternate mostly entire petioled leaves. Flowers small, usually in terminal scorpioid spikes or racemes, or rarely scattered. Calyx-lobes 5, narrow. Corolla blue or white, commonly funnelform; lobes 5, imbricated or induplicate, inflexed at the tip. Stamens 5, included; filaments adnate to the corolla-tube; anther-sacs sometimes appendaged at the tip. Ovary 4-celled or 2-celled and with 2 more or less intruding placentae; styles united. Ovules entire or 2–4-grooved, pendulous with lateral attachments. Fruit 4-grooved or 4-lobed, or sometimes didymous but separating into 4 nutlets. [Name Greek, meaning sun-turning, in reference to the summer solstice, when the first-described species was supposed to bloom.]

About 125 species, widely distributed in warm-temperate and tropical regions. Type species, *Heliotropium europaeum* L.

1. Heliotropium curassàvicum L. Seaside Heliotrope. Fig. 4167.

Heliotropium curassavicum L. Sp. Pl. 130. 1753.

Annual or short-lived perennial, fleshy, glaucous, glabrous throughout; stems diffusely branching, 1–6 dm. long. Leaves succulent, varying from linear to obovate, but commonly spatulate, 1–4 cm. long, obtuse, narrowed to a thick petiole; spikes mostly in pairs sometimes 3 to 5, often 6–12 cm. long; calyx-segments ovate-lanceolate, acute, 2–3 mm. long; corolla 3–5 mm. long, white with violet-purple eye on the throat; stigma glabrous; stamens included, the anthers subsessile; fruit subglobose, at length separating into 4 nutlets.

Usually in more or less alkaline or saline places, Sonoran and Transition Zones; Washington south to southern California, east across the continent and south into Mexico; widely distributed in all continents. Type locality: "Habitat in Americae calidioris maritimis." Mar.–Oct.

Two varieties more or less geographically distinct are usually recognizable in the Pacific States, but the characters are not constant.

Heliotropium curassavicum var. obovàtum A. DC. Prod. 9: 538. 1845. (*Heliotropium spathulatum* Rydb. Bull. Torrey Club 30: 262. 1903.) Leaves spatulate to obovate; corolla white or slightly tinged with blue, 6–8 mm. and the limb about as broad; nutlets 2.5–3 mm. long. Eastern Washington, eastern Oregon and northwestern Nevada, east to the Rocky Mountains. Type locality: "Columbia River," probably near the Blue Mountains, Oregon.

Heliotropium curassavicum var. oculàtum (Heller) I. M. Johnston ex Tidestrom, Proc. Biol. Soc. Wash. 48: 42. 1935. (*Heliotropium oculatum* Heller. Muhlenbergia 1: 58. 1904; *H. spathulatum* subsp. *oculatum* Ewan, Bull. S. Calif. Acad. 4: 56. 1942.) Middle cauline leaves oblanceloate to spatulate, smaller lower and upper ones commonly oblong and acutish; corolla-limb about 4 mm. wide, the lobes white or bluish and the throat with a violet-purple eye. Coastal northern California, Sacramento and San Joaquin Valleys to Lower California, east to the Mojave and Colorado Deserts. Type locality: sand along the Russian River near Healdsburg, Sonoma County, California.

4. PECTOCÁRYA DC. ex Meisn. Gen. 279. 1840.

Low often spreading annual herbs, with slender stems and narrowly linear leaves, canescent with a close-appressed pubescence. Flowers scattered along the stems or branches, on short pedicels, solitary in the axils. Calyx 5-parted, the lobes narrow, spreading or reflexed in fruit. Corolla white, tube shorter than the calyx, lobes broadly oval, the throat nearly closed by prominent crests. Stamens included. Style very short. Nutlets flattened, thin, widely divergent either radiately or in pairs, their margins, at least toward the apex, with a row of hooked bristles. [Name Greek, meaning combed and nut, referring to the pectinate border of the nutlets.]

About 10 species natives of western North America and Peru and Chile. Type species, *Cynoglossum lateriflorum* Lam.

Nutlets divergent in pairs; calyx-lobes not uncinate-bristly at apex.
- Nutlets oblong or linear, the body without uncinate bristles.
  - Nutlets not heteromorphic, all 4 wing-margined or toothed.
    - Nutlets with margins pectinately toothed, the teeth ending in uncinate bristles on the sides, and also bearing a tuft of uncinate bristles at the apex.
      - Margin of the nutlet very narrow or wanting, the teeth being nearly or quite distinct.
        - Nutlets straight or slightly incurved, uncinate-bristly only at apex and base. 1. *P. linearis ferocula.*
        - Nutlets strongly recurved, the teeth along the sides subulate. 2. *P. recurvata.*
      - Margin of nutlet conspicuous, the teeth confluent at base. 3. *P. platycarpa.*
    - Nutlets with margins entire or undulate along the sides, armed only at the apex with uncinate bristles. 4. *P. penicillata.*
  - Nutlets heteromorphic, 1 of each divergent pair wingless, or merely margined, the other with a broad somewhat incurved uncinate-toothed wing. 5. *P. heterocarpa.*
- Nutlets orbicular or nearly so, both the body and the very thin conspicous wing beset with slender uncinate bristles. 6. *P. sctosa.*

Nutlets equally divergent, cuneate- or obovate-rhomboid; calyx with uncinate bristles at apex. 7. *P. pusilla.*

1. **Pectocarya lineàris** var. **ferócula** I. M. Johnston. Slender Pectocarya. Fig. 4168.

Pectocarya linearis var. *ferocula* I. M. Johnston, Contr. Arnold Arb. No. 3: 95. 1932.

Stems slender, usually diffusely branched from the base, spreading or prostrate, 8–25 cm. long, herbage canescent-strigillose throughout. Leaves narrowly linear, acute, 5–25 mm. long, 1 mm. or less wide; calyx-lobes 1.5–2 mm. long, strigillose; corolla about 2 mm. long; nutlets divergent in pairs, narrowly oblong, the margin winged on the sides and pectinately toothed, the 5–7 teeth dilated at base and slightly united, the apex uncinate-bristly.

Dry usually sandy or gravelly slopes and mesas, Upper and Lower Sonoran Zones; islands off the coast of southern California and on the mainland from San Benito and Monterey Counties south in the cismontane region to San Diego County, and Lower California; also in Argentina. Type locality: "steep grassy slopes, Lady Harbor, Santa Cruz Isl.," California. March–May.

2. **Pectocarya recurvàta** I. M. Johnston. Recurved Pectocarya. Fig. 4169.

Pectocarya recurvata I. M. Johnston, Contr. Arnold Arb. No. 3: 97. 1932.

Stems slender, simple below, with 2 to several erect or ascending branches above, or sometimes diffusely branched throughout and more spreading, 5–25 cm. long; herbage cinereous-strigose. Leaves narrowly linear, acute, 1–3.5 cm. long, 0.5–2 mm. wide; calyx-lobes barely 2 mm. long in fruit, acute; nutlets divergent in pairs, linear, strongly recurved, the wing divided to or almost to the body into prominent subulate straw-colored uncinate bristles, at the apex the wing prolonged into a short scarious tip, uncinate-bristly on the margin.

Sandy and gravelly mountain slopes and benches, Lower Sonoran Zone; Mojave and Colorado Deserts from the Panamint Mountains, Inyo County, California, southward to Lower California and eastward to southern Nevada, Arizona, and Sonora. Type locality: near Chandler, Maricopa County, Arizona. March–May.

3. **Pectocarya platycárpa** Munz & Jtn. Broad-fruited Pectocarya. Fig. 4170.

Pectocarya gracilis var. *platycarpa* Munz & Jtn. Contr. Gray Herb. No. 70: 36. 1924.
Pectocarya platycarpa Munz & Jtn. Contr. Gray Herb. No. 81: 81. 1928.

Stems slender, diffusely branched from the base, prostrate or widely ascending 5–20 cm. long, cinereous-strigillose throughout. Leaves narrowly linear to linear-oblanceolate, 0.5–1.5 mm. wide, 1–3.5 cm. long; calyx-lobes nearly as long as the nutlets; corolla 2 mm. long; nutlets divergent in pairs, sometimes heteromorphous, linear-oblong or spatulate-oblong, 2.5–3 mm. long, with a wide conspicuous stramineous margin bearing irregular uncinate-tipped teeth, the odd nutlet, when differentiated, with more deeply dissected wing and with more pubescent body.

Dry gravelly slopes and benches, Lower Sonoran Zone; Mojave Desert, California, east to southern Nevada and Utah, south through the Colorado Desert to Lower California and Sonora. Type locality: mesas near Camp Lowell, Arizona. Feb.–May.

4. **Pectocarya penicillàta** (Hook. & Arn.) A. DC. Winged Pectocarya. Fig. 4171.

Cynoglossum penicillatum Hook. & Arn. Bot. Beechey 371. 1838.
Pectocarya penicillata A. DC. Prod. 10: 120. 1846.
Pectocarya linearis var. *penicillata* M. E. Jones, Proc. Calif. Acad. II. 5: 709. 1895.
Pectocarya miser A. Nels. Bot. Gaz. 37: 278. 1904.

Stems more or less diffusely branched from the base, ascending or spreading, 5–20 cm. long, herbage canescently strigose. Leaves narrowly linear to almost filiform, the margins often revolute; nutlets divergent in pairs, all similar, oblong, 2–3 mm. long, margin of the nutlets prominently unequal; wing fringed at apex with slender hooked bristles, narrower and without bristles in the middle, broader at the base and with a few minute bristles; all the bristles slender, not triangular-dilated at base.

Dry sandy or gravelly soils, Arid Transition Zone to Lower Sonoran Zone; British Columbia and eastern Washington south through the Pacific States to Lower California, and eastward to Idaho, Nevada, western Wyoming, Arizona, and Sonora. Type locality: California. Collected by Douglas. Feb.–June.

5. **Pectocarya heterocárpa** I. M. Johnston. Chuckwalla Pectocarya. Fig. 4172.

Pectocarya penicillata var. *heterocarpa* I. M. Johnston, Contr. Gray Herb. No. 70: 37. 1924.
Pectocarya heterocarpa I. M. Johnston, Journ. Arnold Arb. 20: 399. 1939.

Diffusely branched from the base; stems slender, ascending or spreading, 3–15 cm. long, strigose and canescent throughout. Leaves narrowly linear, 1–3 cm. long, 1–2 mm. wide, the hairs on the basal ones often pustulate at base; corolla minute, its limb about 1.5 mm. broad; fruiting nutlets widely divergent dissimilar, 2 narrower and with or without a narrow margin, and 2 prominently wing-margined, the wings pectinately bristly at the apex, irregular, few-toothed and with or without scattering bristles on the sides.

Sandy or gravelly plains and slopes, Lower Sonoran Zone; western edges of San Joaquin Valley, Kern County, south through the Mojave and Colorado Deserts, California, to Lower California, southern Nevada, Arizona, and Sonora. Type locality: Corn Springs, Chuckwalla Valley, Riverside County. Jan.–May.

6. **Pectocarya setòsa** A. Gray. Bristly Pectocarya. Fig. 4173.

Pectocarya setosa A. Gray, Proc. Amer. Acad. 12: 81. 1876.
Gruvelia setosa Rydb. Bull. Torrey Club 40: 479. 1913.
Pectocarya setosa var. *aptera* I. M. Johnston, Contr. Gray Herb. No. 70: 38. 1924.
Pectocarya setosa var. *holoptera* I. M. Johnston, op. cit. 39.

Stem usually diffusely branched from the base, ascending, slender to rather stout, 5–20 cm. high, herbage rather thinly strigose and setose with spreading bristle-like hairs. Leaves linear to linear-oblanceolate, 5–20 mm. long; calyx-lobes narrowly linear, 3–4 mm. long in fruit, armed with 3–6 stout straight divergent bristles; nutlets divergent in pairs, broadly obovate or orbicular, 2 borders all around with a thin scarious wing, 2 wingless, the body of the nutlets and usually the wing bearing slender uncinate bristles, the wing usually slightly undulate and slightly curved upward saucer-like.

Dry sandy or gravelly flats or slopes, Upper and Lower Sonoran Zones; Yakima County, eastern Washington and central Idaho southward through the arid region east of the Cascades and the Sierra Nevada to the deserts of southern California, and Lower California, east to Idaho, Utah, and Arizona. Type locality: "desert plains of the upper Mohave River." April–June.

7. **Pectocarya pusílla** (A. DC.) A. Gray. Little Pectocarya. Fig. 4174.

Gruvelia pusilla A. DC. Prod. 10: 119. 1846.
Pectocarya chilensis var. *californica* Torr. Pacif. R. Rep. 4: 124. 1857.
Pectocarya pusilla A. Gray, Proc. Amer. Acad. 12: 81. 1876.
Pectocarya pusilla var. *flagillaris* Brand, Pflanzenreich 4^{252}: 96. 1921.

Stems very slender, simple or few-branched, or sometimes diffusely branched from the base, 10–20 cm. long, herbage rather sparingly strigose. Leaves linear or narrowly oblanceolate, 5–15 mm. long; calyx-lobes hispidulous and with several uncinate bristles at the tip; corolla barely equaling the calyx; nutlets 4, or rarely reduced to 2, uniformly divergent, cuneate-rhomboid, 2.5–3 mm. long, upper face slightly concave between the central rib and the raised margin, sparsely hirsutulous and bearing conspicuous uncinate bristles on the margin.

Open woods, Upper Sonoran and Transition Zones; Klickitat County, Washington, and Wasco County, Oregon, south to Monterey and Kern Counties, California; also in Chile. Type locality: Chile. April–June.

5. **CYNOGLÓSSUM** [Tourn.] L. Sp. Pl. 134. 1753.

Perennial or biennial, mostly tall herbs with the basal leaves usually long-petioled and the flowers purple, blue or white in usually bractless and more or less scorpioid in paniculate racemes. Calyx 5-cleft or 5-parted, the segments often enlarged and spreading or reflexed in fruit. Corolla funnelform or salverform, the tube short, the throat closed by 5 scales opposite the imbricated rounded lobes. Stamens included; filaments short. Ovary deeply 4-lobed, separating into 4 diverging nutlets; style slender. Nutlets equally divergent, horizontal, or obliquely ascending in a depressed gynobase, covered all over with short barbed prickles. [Name Greek, meaning hound's tongue.]

A genus of about 75 species of wide geographic distribution. Type species, *Cynoglossum officinale* L.

Biennial; nutlets ascending on the pyramidal gynobase, the depressed upper surface surrounded by a raised margin; leaves lanceolate to oblong; introduced species. 1. *C. officinale.*

Perennials; nutlets horizontal or nearly so, on a depressed gynobase, rounded on the back and without a raised margin; native species.

Stems hirsute–pubescent; lower leaves oblanceolate or spatulate, gradually narrowed to the winged petioles. 2. *C. occidentale.*

Stems glabrous; lower leaves broadly ovate, abruptly narrowed to an elongated petiole. 3. *C. grande.*

1. **Cynoglossum officinàle** L. Hound's Tongue. Fig. 4175.

Cynoglossum officinale L. Sp. Pl. 134. 1753.

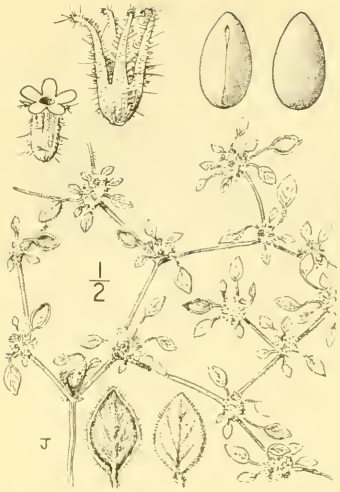
Biennial, villous-tomentose throughout; stems stout, erect, leafy to the top, 4–5 dm. high. Lower leaves oblong to oblong-lanceolate, slender-petioled, 15–30 cm. long, 2–7 cm. wide; upper leaves lanceolate, acute or acuminate, sessile or the uppermost clasping; racemes several to many, simple or branched, sparingly bracted or bractless; much-elongated in fruit; pedicels 5–12 mm. long; calyx-lobes ovate-lanceolate, obtuse or acutish, 5–7 mm. long in fruit; corolla reddish purple, the broad tube 3–5 mm. long, the limb 6–8 mm. broad; nutlets ascending on the pyramidal gynobase, about 6 mm. high, flattened on the upper surface and margined, splitting away from the gynobase at maturity but hanging attached to the subulate style.

Native of Europe and Asia, but introduced and widely distributed over central and eastern North America. In the Pacific States it has become established in Oregon, especially in Wallowa and Marion Counties. Type locality: Europe. May–July.

2. **Cynoglossum occidentàle** A. Gray. Western Hound's Tongue. Fig. 4176.

Cynoglossum occidentale A. Gray, Proc. Amer. Acad. 10: 58. 1874.
Cynoglossum viride Eastw. Proc. Calif. Acad. II. 6: 428. *pl. 59.* 1896.

Perennial, the stems 1 to several from the rootcrown, erect, 2–4 dm. high, herbage rather thinly hirsute throughout with recurved or somewhat spreading hairs, or more densely so and somewhat canescent. Lower leaves oblanceolate or linear-oblanceolate, narrowed to a winged petiole, and including it, often 20–25 cm. long; the upper shorter becoming sessile or cordate-



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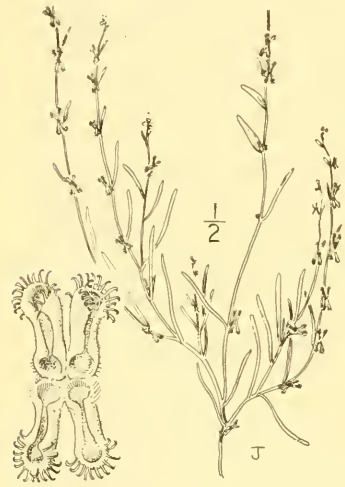

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4165. Coldenia Nuttallii
4166. Euploca convolvulacea
4167. Heliotropium curassavicum
4168. Pectocarya linearis
4169. Pectocarya recurvata
4170. Pectocarya platycarpa
4171. Pectocarya penicillata
4172. Pectocarya heterocarpa
4173. Pectocarya setosa

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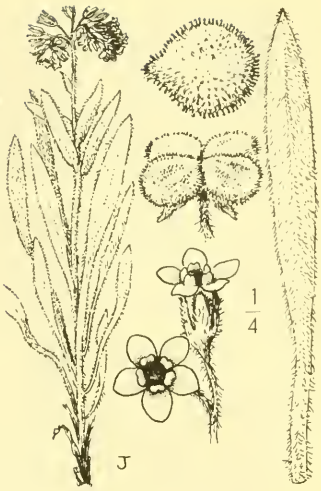

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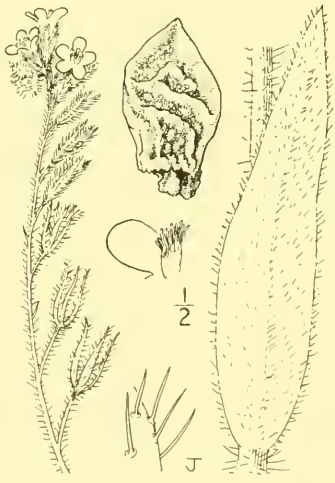

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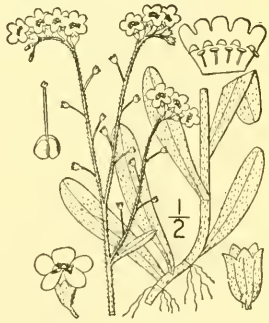

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4174. Pectocarya pusilla
4175. Cynoglossum officinale
4176. Cynoglossum occidentale
4177. Cynoglossum grande
4178. Borago officinalis
4179. Symphytum asperrimum
4180. Lycopsis arvensis
4181. Anchusa azurea
4182. Myosotis scorpioides

clasping and oblong to lanceolate; panicles rather long peduncled, small, usually of only 2 or 3 short branches, villous-hirsute; calyx 5–7 mm. long, lobes linear-lanceolate; corolla blue, more or less tinged with pink or brownish pink, tube 4–6 mm. long, limb about as broad; nutlets widely spreading, broadly obovoid, 7–9 mm. long, rounded on the upper surface and evenly and densely covered with glochidiate spines.

Open pine forests, Arid Transition Zone; Jackson County in western Oregon, and on the eastern slope of the Cascade Mountains from Jefferson County south to northern Humboldt and Trinity Counties in the Coast Ranges and to the central Sierra Nevada, California. Type locality: "Sierra Nevada, in the northeastern part of California, Rev. Mr. Burgess, and Sierra County, J. G. Lemmon." May–Aug.

3. **Cynoglossum grande** Dougl. Grand Hound's Tongue. Fig. 4177.

Cynoglossum grande Dougl. ex. Lehm. Stirp. Pug. 2: 25. 1830.
Cynoglossum laeve A. Gray, Syn. Fl. N. Amer. 2¹: 188. 1878.
Cynoglossum grande var. *laeve* A. Gray, op. cit. ed. 2. 2¹: 421. 1886.
Cynoglossum Austiniae Eastw. Bull. Torrey Club 32: 203. 1905.

Perennial, stems erect, 3–8 dm. high, glabrous. Leaves basal or on the lower part of the stem, ovate, 7–15 cm. long, mostly 5–10 cm. wide, long-petioled, glabrous or sparsely hirsutulous above, rather densely so below; panicle long-peduncled, loosely flowered; calyx-lobes narrowly oblong, more or less densely appressed-villous, 5–7 mm. long; corolla deep blue, the tube often purple, a little longer than the calxy-lobes, the lobes rounded; crests conspicuously lunate; nutlets depressed-globose, 5–6 mm. long.

Open or shaded ground, Transition and Upper Sonoran Zones; southern Washington in Skamania and Klickitat Counties, south mostly west of the Cascade Mountains and Sierra Nevada to San Luis Obispo and Tulare Counties, California. Type locality: "Am. bor. occid." March–June.

6. **BORÀGO** [Tourn.] L. Sp. Pl. 137. 1753.

Hirsute or hispid annual or biennial herbs with alternate, entire leaves and blue flowers in terminal leafy racemes. Calyx deeply 5-cleft or 5-parted. Corolla rotate, tube very short, throat closed by scales, limb 5-lobed, the lobes imbricated, acute. Stamens 5, inserted on the corolla-tube; filaments dilated below, narrowed above to a slender appendage; anthers linear, erect and connivent with a beak-like cone. Ovary 4-divided; style filiform. Nutlets 4, ovoid, erect, attached by their bases to the flat receptacle; scar of attachment large, concave. [Name Middle Latin, meaning rough hair, alluding to the foliage.]

A genus of 3 species, native of the Mediterranean region. Type species, *Borago officinalis* L.

1. **Borago officinàlis** L. Borage. Fig. 4178.

Borago officinalis L. Sp. Pl. 137. 1753.

Stem erect, 3–8 dm. high, with ascending or spreading branches. Leaves obolng to broadly obovate, 5–10 cm. long, rounded to acute at apex, uppermost clasping, lower narrowed to a winged petiole; pedicels spreading or recurving, 2–5 cm. long; calyx-lobes linear-lanceolate, 7–10 mm. long; corolla 15–20 mm. broad, bright blue; anther-beak dark purple, about 6–7 mm. long; nutlets 4 mm. long.

An escape from gardens and sparingly naturalized in the Pacific States. Native of Europe.

7. **SÝMPHYTUM** [Tourn.] L. Sp. Pl. 136. 1753.

Erect, hairy, perennial herbs with thick mucilaginous roots. Leaves alternate or the uppermost nearly opposite, and more or less clasping, the lower long-petioled. Flowers yellow-blue or purple, in terminal, simple, or forked scorpioid racemes. Calyx deeply 5-cleft. Corolla tubular, slightly dilated above, 5-toothed or 5-lobed, the lobes short, the throat with 5 crests below the lobes. Stamens 5, included; inserted on the corolla-tube; filaments slender. Ovary 4-divided; style filiform. Nutlets 4, obliquely ovoid, wrinkled, inserted by their bases to the flat receptacle; scar of attachment broad, concave, dentate. [Name Greek, meaning grow-together, because of its supposed healing virtues.]

A genus of about 15 species, natives of the Old World. Type species, *Symphytum officinale* L.

1. **Symphytum aspérrimum** Donn. Rough Comfrey. Fig. 4179.

Symphytum asperrimum Donn ex Sims, Bot. Mag. 24: *pl. 929.* 1806.

Stems erect, branched, 6–10 dm. high, from a thick deep root; herbage pubescent with rather stiff recurved hairs. Leaves 8–20 cm. long, ovate-lanceolate to oblong-lanceolate, long-acuminate at apex, narrowed at base, all but the uppermost petioled, the petioles often narrowly winged; flower-clusters rather loose; calyx 4 mm. long; corolla bluish purple, 12–15 mm. long.

Sparingly naturalized in the Pacific States: Whatcom County, Washington, and Humboldt County, California. Native of Europe. May–July.

8. **LYCÓPSIS** L. Sp. Pl. 138. 1753.

Bristly hispid annual herbs with alternate leaves, and small blue flowers in leafy-bracted spike-like scorpioid racemes. Calyx 5-parted. Corolla salverform and slightly

irregular, tube curved, limb somewhat unequally inserted on the tube, throat closed by hispid hairs. Stamens 5, included, inserted on the corolla-tube; filaments short. Ovary 4-divided; style filiform. Nutlets 4, wrinkled, erect, attached at base to the flat receptacle, scar of attachment concave. [Name Greek, meaning wolf-face.]

A genus of 4 or 5 species, natives of the Old World. Type species, *Lycopsis arvensis* L.

1. Lycopsis arvénsis L. Small Bugloss. Fig. 4180.

Lycopsis arvensis L. Sp. Pl. 139. 1753.

Stem erect or ascending, 3–6 dm. high, often becoming diffusely branched and the branches procumbent. Leaves lanceolate to narrowly oblong or the lower oblanceolate, 2.5–5 cm. long, sessile, or the lower narrowed to a short petiole, obtuse at apex or the uppermost much-reduced and acutish, entire or irregularly dentate; flowers in terminal scorpioid racemes, crowded, short-pedicelled; calyx-lobes linear-lanceolate; corolla blue or purplish, tube 3–4 mm. long, curved, limb 4–5 mm. broad.

Native of Eurasia; widely naturalized in fields and waste places in eastern United States, but less frequent in the Pacific States: Upland, southern California. Jan.–Feb.

9. ANCHÙSA L. Sp. Pl. 133. 1753.

Annual, biennial, or perennial herbs with blue or purple flowers in panicled, scorpioid racemes. Calyx divided into narrow lobes. Corolla trumpet-shaped, the tube straight, the throat closed by scales, the limb with widely spreading lobes. Stamens included. Style slender. Ovary 4-parted. Nutlets 4, their attachment surrounded by an annular ring leaving a pit on the low gynobase. [The ancient Greek name of the alkanet, and of a cosmetic derived from *Anchusa tinctoria* L.]

An Old World genus of about 40 species. Type species, *Anchusa officinalis* L.

1. Anchusa azùrea L. Italian Anchusa or Alkanet. Fig. 4181.

Anchusa azurea Mill. Gard. Dict. ed. 8. no 9. 1768.
Anchusa italica Retz. Obs. 1: 12. 1779.

Perennial, 6–15 dm. high, coarsely hirsute, the hairs often pustulate at base. Leaves ovate-lanceolate or the upper narrower, uppermost sessile and clasping, the basal on winged petioles, often 2–5 dm. long; calyx divided almost to the base, lobes linear-acuminate; corolla blue, the limb 12–20 mm. broad; nutlets erect, oblong and nearly twice as long as broad.

Frequently cultivated in the Pacific States and locally established, especially in western (Portland, Salem, Medford) Oregon. June–Aug.

Anchusa officinàlis L. Sp. Pl. 133. 1753. Leaves narrower, 1–2.5 cm. wide; calyx divided to the middle or a little below, lobes lanceolate or narrowly triangular; corolla smaller, limb 5–10 mm. broad; nutlets horizontal, ovoid, 2–3 mm. long; fruiting panicle loose and broad, racemes 6–12 cm. long. Reported (M. E. Peck, Man. Pl. Oregon) as established in the valleys of the Imnaha River, Wallowa County, Oregon. Native of Europe.

Anchusa capénsis Thunb. Prod. Pl. Cap. 34. 1794. Cauline leaves narrower, usually less than 1 cm. wide; calyx-lobes deltoid, shorter than the tube; nutlets horizontal, ovoid, 1.5–2 mm. long; fruiting panicle narrow and more compact, racemes 2–5 cm. long. This South African species has been reported (I. M. Johnston, Contr. Gray Herb. No. 70: 9. 1924.) as growing spontaneously in Salem, Oregon.

10. MYOSÒTIS [Dill.] L. Sp. Pl. 131. 1753.

Low, slender, annual or perennial herbs, diffuse or erect, with alternate entire leaves. Flowers small, blue, pink, or white in many-flowered elongated and more or less 1-sided racemes, bractless or sometimes leafy-bracted at base. Calyx 5-cleft, the lobes narrow, spreading or erect in fruit. Corolla salverform, 5-lobed, the lobes rounded, convolute in the bud, the throat crested. Stamens 5, included, inserted on the corolla-tube. Ovary 4-divided, style filiform. Nutlets erect, glabrous or pubescent, attached by their bases to the gynobase, the scar of attachment small, flat. [Name Greek, meaning mouse-ear.]

A genus of about 30 species of wide geographic distribution. Type species, *Myosotis scorpioides* L.

Calyx sparsely hairy with closely appressed short straight hairs, neither hooked nor gland-tipped.
- Stems coarse, angled, often stoloniferous at base; styles usually much longer than the nutlets; corolla 6–9 mm. broad. 1. *M. scorpioides.*
- Stems slender, terete, branched at base, without stolons; styles shorter than the nutlets; corolla 3–6 mm. broad. 2. *M. laxa.*

Calyx with uncinate spreading hairs, at least on the tube.
- Calyx very unequally cleft, usually 2-lipped; corolla white, 1–2 mm. broad. 3. *M. virginica.*
- Calyx equally cleft or nearly so; corolla commonly blue.
  - Corolla-limb flat, 5–8 mm. broad. 4. *M. sylvatica.*
  - Corolla-limb concave, 1.5–4 mm. broad.
    - Pedicels equaling or exceeding the fruiting calyx; calyx-lobes spreading. 5. *M. arvensis.*
    - Pedicels shorter than the fruiting calyx; calyx-lobes erect.
      - Flowers in terminal racemes, also scattered among leaves to near the base of stem; styles always shorter than nutlets.
        - Pedicels slender, spreading; seeds black. 6. *M. micrantha.*
        - Pedicels erect, or nearly so; seeds grayish buff. 7. *M. stricta.*
      - Flowers all in terminal racemes, none scattered among the lower leaves; styles often much longer than nutlets, these black. 8. *M. versicolor.*

1. **Myosotis scorpioìdes** L. Forget-me-not. Fig. 4182.

Myosotis scorpioides L. Sp. Pl. 131. 1753.
Myosotis scorpioides var. *palustris* L. loc. cit.
Myosotis palustris Lam. Fl. Fr. 2: 283. 1778.

Perennial, with slender rootstocks or stolons, herbage appressed-pubescent with straight pointed hairs; stems slender, 1.5–4 dm. long, decumbent or ascending, rooting at the lower nodes. Leaves oblanceolate to oblong-oblanceolate, 2.5–8 cm. long, 4–12 mm. wide, upper stem-leaves sessile, the lower narrowed to a winged petiole; racemes loosely many-flowered; fruiting pedicels longer than the calyx; calyx with straight appressed hairs, the lobes equal, ovate-triangular, acute, shorter than the tube, more or less spreading in fruit; corolla blue with a yellow eye, the limb flat, 6–8 mm. broad; nutlets angled and keeled on the inside.

Wet meadows and margins of streams, Transition (especially the Humid) and Canadian Zones; escaped from cultivation and well established in many localities in Washington and western Oregon and northern California; also northeastern United States. Native of Europe and Asia. May–July.

2. **Myosotis láxa** Lehm. Smaller Forget-me-not. Fig. 4183.

Myosotis laxa Lehm. Asperif. 1: 83. 1818.
Myosotis palustris var. *micrantha* Lehm. in Hook. Fl. Bor. Amer. 2: 81. 1838.
Myosotis palustris var. *laxa* A. Gray, Man. ed. 5. 365. 1867.

Perennial, with slender decumbent spreading stems, rooting at the nodes, 1.5–5 dm. long, herbage appressed-pubescent with appressed pointed hairs as in the preceding species. Leaves oblong or oblong-lanceolate to spatulate, obtuse; racemes loosely flowered; pedicels much longer than the calyx, widely spreading; calyx with straight appressed hairs, the lobes equal, ovate-lanceolate, acute, as long as the tube; corolla blue with yellow eye, limb concave, about 4 mm. broad; nutlets convex on both the dorsal and ventral side.

Wet places, in marshes and along streams, Transition and Canadian Zones; British Columbia south mainly west of the Cascade Mountains to Del Norte County, California, extending eastward to Newfoundland and northeastern United States. Type locality: "Habitat in America septentrionalis." May–Aug.

Myosotis alpéstris Schmidt, Fl. Boëm. 3: 26. 1794. Howell (Fl. N.W. Amer. 492. 1901.) reported this species as ranging from "the mountains of Oregon to Kotzebue Sound and the northern Rocky Mountains." Unfortunately there are no specimens in the Howell Herbarium, and as this is the only record for the Pacific States the species inclusion in our flora must await authentication.

3. **Myosotis virgínica** (L.) B.S.P. Spring or Early Scorpion Grass. Fig. 4184.

Lycopsis virginica L. Sp. Pl. 139. 1753.
Myosotis macrosperma Engelm. Amer. Journ. Sci. 46: 98. 1844.
Myosotis virginica B.S.P. Prel. Cat. N.Y. 37. 1888.
Myosotis virginica var. *macrosperma* Fernald, Rhodora 10: 55. 1908.

Annual or biennial, hirsute with mostly spreading hairs, erect, 1–3 dm. high, branched, the branches erect. Leaves oblong to linear-oblong, 1–3 cm. long, obtuse, sessile or the lower spatulate and narrowed to a short petiole; racemes terminating the branches; pedicels ascending or erect, shorter than the fruiting calyx, appressed-pubescent with straight hairs; calyx unequally 5-cleft and somewhat 2-lipped, the lobes longer than the tube, narrowly lanceolate, connivent in fruit, densely hispid, the hairs of the tube mostly hooked at the apex, those of the lobes stouter and usually straight; corolla white, limb 1–2 mm. wide; nutlets convex on the dorsal side, keeled on the ventral.

Usually in moist ground, especially in fields, Humid and Arid Transition Zones; western Washington to Idaho, south in the Pacific States through western Oregon to Trinity County, California; also generally distributed throughout eastern North America. Type locality: "in Virginia ad vias." April–June.

4. **Myosotis sylvática** Hoffm. Wood Forget-me-not. Fig. 4185.

Myosotis sylvatica Hoffm. Deutsch. Fl. ed. 1. 61. 1791.

Perennial, with creeping rootstocks, stems solitary or often many-branched, erect or commonly decumbent, 2–4.5 dm. long, thinly to rather densely hirsute with mostly spreading hairs. Leaves thinly to densely pubescent with appressed hairs, upper sessile, oblong to oblong-lanceolate, lower and basal mostly spatulate, 1–2.5 cm. broad, narrowed at base to a more or less winged petiole of about equal length; racemes usually several; fruiting pedicels spreading, often slightly curved, the lower longer, the upper about equaling the calyx; calyx with hooked hairs except at tip of the lobes, lobes linear-lanceolate, about equaling the tube; corolla light blue, limb 5–6 mm. broad.

Garden plant, naturalized locally in moist shady places; Humboldt County to San Mateo County, California. Type locality: in Europe. Feb.–July.

5. **Myosotis arvénsis** (L.) Hill. Field Scorpion Grass or Mouse-ear. Fig. 4186.

Myosotis scorpioides var. *arvensis* L. Sp. Pl. 131. 1753.
Myosotis arvensis Hill, Veg. Syst. 7: 55. 1764.
Myosotis intermedia Link in Schultz, Prod. Fl. Starg. Suppl. 1: 12. 1819.

Annual or biennial, stems erect or ascending, branched, 1.5–4.5 dm. high, hirsute-pubescent. Basal leaves petioled, oblanceolate, obtuse; stem-leaves sessile, the lower oblanceolate, the upper oblong or oblong-oblanceolate, 1–3 cm. long; racemes loosely flowered; fruiting pedicels, except

the uppermost, longer than the calyx, some of the hairs on the tube minutely hooked at apex, those on the lobes bristly and straight, lobes narrowly triangular-lanceolate, about equaling or longer than the tube; corolla blue or white, limb 2–3 mm. wide, concave; nutlets dark brown and glossy, convex on the dorsal, ventral side angled by the prominent keel, lateral angles narrowly margined.

In fields and waste places; frequent in western Washington and western Oregon. Adventive from Europe, but more widely naturalized in eastern United States. April–July.

6. **Myosotis micrántha** Pall. Blue Scorpion Grass. Fig. 4187.

Myosotis micrantha Pall. in Lehm. Neue Schr. Naturf. Ges. Halle 3^2: 24. 1817.

Annual or biennial, stems slender, 1–2 dm. high, simple or branched, usually from near the base, erect or ascending, rather thinly hirsute-pubescent toward the base, appressed-pubescent above. Leaves with thinly hirsute-pubescent spreading hairs, the basal oblanceolate, narrowed to a narrowly winged petiole, often with uncinate hairs, stem-leaves narrowly linear-oblong to oblong-lanceolate, sessile, obtuse or acutish; racemes slender, rather distinctly flowered; fruiting pedicels very slender, much shorter than the calyx, appressed-puberulent; calyx-lobes about equal, triangular-lanceolate, about equaling the tube in fruit, hairs on the tube spreading and minutely hooked at apex, those on the lobes straight and appressed; style shorter than the nutlets, these 1 mm. long, black.

Fields and roadsides; adventive in western Oregon, and coastal northwestern California; naturalized in eastern United States; native of Europe. May–July.

7. **Myosotis stricta** Link. Strict Scorpion Grass. Fig. 4188.

Myosotis stricta Link in Roem. & Sch. Syst. Veg. 4: 104. 1819.

Annual, stems usually branched from near the base, slender, erect or ascending, 8–15 cm.

4183. Myosotis laxa
4184. Myosotis virginica
4185. Myosotis sylvatica
4186. Myosotis arvensis
4187. Myosotis micrantha
4188. Myosotis stricta

high, cinereous throughout, pubescence more or less spreading below, appressed above. Basal leaves oblanceolate, 5–10 mm. long, rounded or obtuse at apex, abruptly narrowed to a rather short winged petiole, thinly pubescent above, glabrous beneath except the midrib; stem-leaves oblong, sessile, rather densely appressed-pilose; raceme simple, extending to near the base of the branches, bracteate below, naked above; pedicels ascending, rather stout, 1 mm. long or less; fruiting calyx 3–4 mm. long, the lobes triangular-subulate, about equaling or slightly longer than the tube, appressed-pubescent, the tube also clothed with spreading hooked bristles; style shorter than the nutlets, these buff-colored; corolla blue.

Well established on sandy plains and in open pine forests, Arid Transition Zone; Stevens County, northeastern Washington; also in eastern North America; native of Europe and northern Asia. May–June.

8. **Myosotis versícolor** (Pers.) Smith. Yellow and Blue Scorpion Grass. Fig. 4189.

Myosotis arvensis var. *versicolor* Pers. Syn. Pl. 1: 156. 1805.

Myosotis versicolor Smith, Engl. Bot. 7: *pl. 480. fig. 1.* 1798, and 36: under *pl. 2558.* 1814.

Annual, stems branching from the base or commonly simple below and branching above, 15–30 cm. high, hirsute below with spreading hairs, appressed-pubescent above with straight hairs. Basal leaves spatulate, narrowing to a petiole often as long as the blade, stem-leaves oblong, sessile, obtuse at apex, or the uppermost reduced, oblong-lanceolate and acute; racemes loosely flowered; pedicels usually ascending, much shorter than the fruiting calyx; calyx-tube with spreading, minutely hooked hairs, the lobes narrowly linear-lanceolate, rather densely appressed-pubescent; corolla pale yellow changing to violet and blue, limb about 2 mm. broad; style longer than the mature nutlets.

Fields, waste places and roadsides, mainly Humid and Arid Transition Zones; Olympic Peninsula and Whatcom County, Washington, to Sonoma and Plumas Counties, California; also, but more sparingly, east of the Cascades; Stevens County, Washington, and Wallowa County, Oregon; naturalized from Europe. April–July.

11. **MERTÉNSIA** Roth, Catal. Bot. 1: 34. 1797.

Perennial, glabrous or pubescent herbs, with broad, alternate leaves and rather larger blue, purple or white flowers in terminal panicles, cymes or racemes. Calyx-lobes linear to lanceolate, little enlarged in fruit. Corolla tubular-funnelform or trumpet-shaped, unappendaged or crested in the throat, the lobes little spreading. Stamens inserted on the corolla-throat, included or slightly exserted, filaments flattened or filiform; anthers oblong or linear. Ovary 4-divided; style filiform. Nutlets erect, coriaceous, wrinkled when mature, attached above their base to the convex or flattened receptacle. [Name in honor of the German botanist, C. F. Mertens.]

A genus of about 45 species, natives of the northern hemisphere, especially developed in western North America. Type species, *Mertensia pulmonarioides* Roth.

Corolla campanulate, not divided into a tube and limb. (*Neuranthia*) — 1. *M. bella.*
Corolla not campanulate, divided into a tube and limb. (*Eumertensia*)
- Cauline leaves with lateral veins.
  - Corolla-limb longer than the tube.
    - Anthers rarely over 3 mm. long, usually straight; leaves glabrous above, pubescent beneath. — 2. *M. paniculata borealis.*
    - Anthers 4–5 mm. long, usually curved; calyx-lobes 5–7 mm. long. — 3. *M. platyphylla.*
  - Corolla-limb shorter than the tube or about equaling it.
    - Calyx-lobes obtuse or acutish, ovate or oblong. — 4. *M. ciliata.*
    - Calyx-lobes acute, lanceolate or triangular; anthers 1.5–2.5 mm. long. — 5. *M. umbratilis.*
- Cauline leaves without lateral veins; corolla-tube usually much shorter than the limb.
  - Plants with stout elongated root. — 6. *M. oblongifolia.*
  - Plants with shallow-seated tuberous roots. — 7. *M. longiflora.*

1. **Mertensia bélla** Piper. Oregon Lungwort. Fig. 4190.

Mertensia bella Piper, Proc. Biol. Soc. Wash. 31: 76. 1918.

Mertensia siskiyouensis Applegate, Contr. Dudley Herb. 1: 154. 1930.

Stem solitary from a globose tuber, 2–5 dm. high, slender, glabrous to sparsely pilose, simple or with 1 or 2 short branches at the apex. Leaves elliptic to ovate, 2–5 cm. long, the uppermost reduced and lanceolate, the lower obtuse or rounded at apex, glabrous beneath, strigose above; racemes 2–4, in usually long slender peduncles in the upper axils; pedicels 6–12 mm. long, strigose; calyx-lobes 3–4 mm. long, linear-lanceolate, acute, strigose; corolla bright blue, 5–7 mm. long; tube short, about half as long as the calyx, dilating into the broad campanulate limb, lobes about 2 mm. long, broadly ovate; style half as long as the corolla.

Moist slopes, mainly Canadian Zone; western slopes of the Cascades, Lane County, and the Siskiyou Mountains, Josephine County, Oregon. Type locality: Horse Pasture Mountain, Lane County, Oregon. May–July.

2. Mertensia paniculàta var. boreàlis (J. F. Macbride) L. O. Williams. Tall Lungwort. Fig. 4191.

Mertensia pratensis var. *borealis* J. F. Macbride, Contr. Gray Herb. No. 48: 8. 1916.
Mertensia paniculata var. *borealis* L. O. Williams, Ann. Mo. Bot. Gard. 24: 49. 1937.
Mertensia brachycalyx Piper, Contr. U.S. Nat. Herb. 11: 477. 1906.
Mertensia leptophylla Piper, op. cit. 478.

Stems 1 to several from a stout elongated root, 1–7 dm. high, glabrous or sparingly pubescent. Basal leaves 5–20 cm. long, 2.5–10 cm. wide, elliptic-lanceolate to ovate-subcordate, acute to acuminate, lower surface thinly pubescent with spreading hairs or glabrous, upper surface short-strigillose or sometimes glabrate, pinnately veined, their petioles 10–25 cm. long; cauline leaves 5–18 cm. long, 1–8 cm. broad, ovate to lanceolate, sharply acuminate, petioles winged, gradually shorter upward on the stem; inflorescence a modified scorpioid cyme, elongated in age; pedicels strigose; calyx-lobes narrowly linear-lanceolate, ciliate on the margin, glabrate or strigose on the back; corolla blue, rarely white, often pink when young, tube 4.5–7 mm. long, the limb 6–9 mm. long, a little longer than the tube, well-expanded, pubescent or glabrous within; anthers 2.2–3.3 mm. long; style about as long as or exceeding the corolla.

Moist woods and meadows, mainly Canadian Zone; southern British Columbia, Olympic and Cascade Mountains, Washington to the Cascades, Oregon, east to Idaho and western Montana. Type locality: "divide between St. Joe and Clearwater rivers," Idaho. June–July.

Mertensia paniculata (Ait.) G. Don, Gen. Hist. Pl. 4: 318. 1838. (*Pulmonaria paniculata* Ait. Hort. Kew. 1: 181. 1789.) The typical species reaches the Pacific States in Stevens and Spokane Counties, northeastern Washington. It differs mainly from the variety *borealis* in having the upper surface of the leaves scabrous with short-appressed hairs and the lower surface with rough spreading hairs. This typical form of the species ranges from Alaska and the Yukon to Quebec and south to British Columbia, Idaho, Montana, and Wisconsin, reaching the Pacific States in northeastern Washington (Ferry, Stevens, and Spokane Counties). Type locality: Hudson Bay.

3. Mertensia platyphýlla Heller. Broad-leaved Lungwort. Fig. 4192.

Mertensia platyphylla Heller, Bull. Torrey Club 26: 548. 1899.
Mertensia paniculata var. *platyphylla* G. N. Jones, Univ. Wash. Pub. Biol. 5: 220. 1936.

Stems 1 or few from the elongated root, erect 3–9 dm. high, glabrous or with scattering recurved or spreading hairs. Basal leaves ovate to oblong-ovate, rather abruptly acuminate at apex, usually subcordate at base, mostly 6–10 cm. long, shorter than the rather slender petioles; cauline leaves 5–10 cm. long, ovate-lanceolate to ovate, acuminate at apex, obtuse at base, the lower on petioles about half as long as the blade, the uppermost short-petioled or subsessile, thinly and minutely strigose on the upper surface, glabrous or sparingly hairy especially on the veins beneath; scorpioid cymes congested at first, becoming elongated in age; pedicels strigose; calyx-lobes linear-lanceolate, usually glabrous without, strigose within, ciliate on the margins, about 6 mm. long in flower, 10–12 mm. long in fruit; corolla blue, the tube 2.5–6 mm. long, the limb moderately expanded, 6–9 mm. long, always exceeding the tube; crests conspicuous; anthers 4–5 mm. long; style equaling or a little longer than the corolla; nutlets 5-7 mm. long, rugosely roughened all over or sometimes smooth on the inner face.

Edges of moist woods and along streams, Humid Transition Zone; western Washington in the Puget Sound region and Chehalis County south at least to the Nisqually River. Type locality: near Montesano, altitude 200 feet, Chehalis County. May–Aug.

Mertensia platyphylla var. subcordàta (Greene) L. O. Williams, Ann. Mo. Bot. Gard. 24: 60. 1937. (*Mertensia subcordata* Greene, Pittonia 4: 89. 1899; *M. paniculata* var. *subcordata* J. F. Macbride, Contr. Gray Herb. No. 48: 7. 1916.) Closely resembling the typical species; cauline leaves sometimes slightly subcordate, and herbage in age often nearly glabrous; calyx-lobes 2.5–4 mm. long, broadly lanceolate to triangular or oblong, usually obtuse. Moist places, Humid Transition Zone; Clatsop and Multnomah Counties south to Coos and Douglas Counties, Oregon. Type locality: "Umpqua Valley at Roseburg, Oregon."

4. Mertensia ciliàta (James) G. Don. Ciliate Lungwort. Fig. 4193.

Pulmonaria ciliata James ex Torr. Ann. Lyc. N.Y. 2: 224. 1828.
Mertensia ciliata G. Don, Gen. Hist. Pl. 4: 372. 1838.

Stems erect or ascending, 1–10 dm. high, usually several from the stout branching rootstock. Basal leaves oblong to ovate or lanceolate, subcordate at base, 4–15 cm. long, ciliate on the margins, often papillate on the upper surface, petioles longer or shorter than the blades; stem-leaves lanceolate to ovate, acute to acuminate at apex, attenuate or subcordate at base, the lower short-petiolate, the upper sessile; inflorescence becoming lax in age; calyx-lobes 1.5–3 mm. long, obtuse or acutish, ciliate or papillate on the margins otherwise glabrous; corolla-tube 6–8 mm. long, glabrous or with crisped hairs within, the limb about equaling the tube, sometimes a little longer, only slightly expanded; anthers 1–2.5 mm. long; style as long or slightly longer than the corolla; nutlets rugose or mammillate.

Moist meadows or stream banks, mainly Canadian Zone; Idaho and Montana south to Utah and Nevada; reaching the Pacific States only in eastern Oregon, where it occurs in the mountains east of Prairie City, Grant County, and in Steen Mountains, Harney County. Type locality: "along streams within the Rocky Mts." Collected by James. May–June.

Mertensia ciliata var. stomatechoides (Kell.) Jepson, Man. Fl. Pl. Calif. 842. 1925. (*Mertensia stomatechoides* Kell. Proc. Calif. Acad. 2: 148. 1863.) Leaves generally narrower, those of the stem mostly oblong- to linear-lanceolate; calyx-lobes 2.5–6 mm. long; style commonly well exceeding the corolla. Gearhart, Warner, and Steen Mountains, southern Oregon, south to western Nevada and in the Sierra Nevada to Tulare County, California. Type locality: headwater of Carson River, Sierra Nevada, California.

5. Mertensia umbrátilis Greenm. Shade Lungwort. Fig. 4194.

Mertensia umbratilis Greenm. Erythea 7: 118. 1899.
Mertensia infirma Piper, Contr. U.S. Nat. Herb. 11: 476. 1906.
Mertensia ambigua Piper, op. cit. 477.

Stems erect or ascending, 2–5 dm. high, 1 to several from the stout, simple or few-branched rootstock. Lowest leaves obovate-spatulate, 16–20 cm. long, tapering to a winged petiole nearly equal in length to the blade and sheathing at base; upper stem-leaves short-petiolate to subsessile, oblong-lanceolate, 4–10 cm. long; glabrous to hirsute in the upper surface, glabrous or rarely pubescent on the lower, ciliate on the margin; inflorescence rather congested at the apex, not becoming lax in age; calyx 3–8 mm. long, the lobes lanceolate, acute, ciliate on the margins, otherwise glabrous; corolla-tube 7–14 mm., mostly about 10 mm. long, glabrous within, the limb 5–9 mm. long, moderately expanded; anthers 1.5–2.5 mm. long; crests prominent; style about equaling to slightly exceeding the corolla; nutlets 4 mm. long, rugose.

Mostly on rocky slopes, especially in sagebrush areas, Arid Transition Zone; Chelan and Kittitas Counties, Washington, to Crook and Union Counties, Oregon. Type locality: "on dry mountains near Sparta, Union County, Oregon." April–June.

6. Mertensia oblongifòlia (Nutt.) G. Don. Leafy Lungwort. Fig. 4195.

Pulmonaria oblongifolia Nutt. Journ. Acad. Phila. 7: 43. 1834.
Mertensia oblongifolia G. Don, Gen. Hist. Pl. 4: 372. 1838.
Mertensia nutans subsp. *subclava* Piper, Contr. U.S. Nat. Herb. 11: 479. 1906.
Mertensia foliosa var. *subclava* J. F. Macbride, Contr. Gray Herb. No. 48: 18. 1916.

Stems 1 to several from the simple or branched crown of an elongated rootstock, erect or ascending, 1–3 dm. high. Basal leaves oblong to oblong-ovate or sometimes spatulate, 3–8 cm. long, strigose on the upper surface, glabrous beneath; petiole usually longer than the blade; cauline leaves sessile or the lower short-petiolate, linear to oblong-elliptic, 2–8 cm. long; inflorescence at first congested becoming loosely panicled in age; calyx 3–7 mm. long, divided almost to the base, the lobes linear to linear-lanceolate, acute, ciliate on the margins, otherwise glabrous or nearly so; corolla-tube 5–12 mm. long, glabrous within or rarely with a few scattered hairs; limb 4–7 mm. long; anthers 2 mm. or less in length, oblong; styles included; nutlets rugose.

Moist slopes and meadows, Arid Transition and Canadian Zones; Yakima County, eastern Washington east to Montana, south to Lake and Harney Counties, Oregon and Elko County, Nevada. Rarely collected in the Pacific States. Type locality: "sources of the Columbia River." Collected by Wyeth. April–July.

Mertensia oblongifolia var. **nevadénsis** (A. Nels.) L. O. Williams, Ann. Mo. Bot. Gard. **24**: 125. 1937. (*Mertensia foliosa* A. Nels. Bull. Torrey Club **26**: 243. 1899; *M. nutans* Howell, Fl. N.W. Amer. 491. 1901; *M. nevadensis* A. Nels. Proc. Biol. Soc. Wash. 17: 96. 1904; *M. praecox* Smiley ex J. F. Macbride, Contr. Gray Herb. No. 48: 10. 1916; *M. foliosa* var. *nevadensis* J. F. Macbride, op. cit. 19.) Differs chiefly from the species by both surfaces of the leaves being glabrous on the upper surface, sometimes pustulate and rarely the pustules near the apex of the leaf producing minute mucros. This is the common representative of the species in the Pacific States; ranging along the eastern edge of the Cascades of Washington from Chelan County to Klickitat County and southward to the east side of the Sierra Nevada, Sierra County, California, eastward to Montana, Wyoming, and Utah. Type locality: "Hunter Creek Canyon, near Reno, Nevada."

Mertensia oblongifolia var. **amoèna** (A. Nels.) L. O. Williams, Ann. Mo. Bot. Gard. **24**: 130. 1937. (*Mertensia amoena* A. Nels. Bot. Gaz. 30: 195. 1900; *M. Cusickii* Piper, Bull. Torrey Club 29: 643. 1902; *M. pubescens* Piper, Contr. U.S. Nat. Herb. 11: 479. 1906; *M. Bakeri amoena* A. Nels. in Coult. & Nels. Man. Bot. Rocky Mts. 422. 1909.) Similar to the species but often taller; leaves more or less densely villous-pubescent on both sides. Moist slopes, east of the Cascades, Washington, south in the Pacific States to the Warner Mountains, Modoc County, California, and Steen Mountains, Harney County, Oregon (type locality for *M. Cusickii*), east to Montana, Wyoming, Nevada, and Utah. Type locality: among sabebrush on moist slope, Monida, Madison County, Montana.

7. Mertensia longiflòra Greene. Long-flowered Lungwort. Fig. 4196.

Mertensia longiflora Greene, Pittonia 3: 261. 1898.
Mertensia pulchella Piper, Contr. U.S. Nat. Herb. 11: 478. 1906.
Mertensia Horneri Piper, op. cit. 479.
Mertensia longiflora var. *pulchella* J. F. Macbride, Contr. Gray Herb. No. 48: 17. 1916.

Stems 1 or sometimes 2 or 3 from a shallow tuberous root, slender, 1–2.5 dm. high, including subterranean part. Basal leaves seldom developed on roots producing flowering stems, oval to spatulate, 2–5 cm. long, on winged petioles, those at the base of flowering stems usually reduced to linear scarious bracts; cauline leaves oblong-lanceolate or -oblanceolate to broadly oval, 2–8 cm. long, obtuse, glabrous to strigose or hirsute above, glabrous beneath; inflorescence often congested, the pedicels short, 1–6 mm. long; calyx-lobes lanceolate to linear-lanceolate, 3–5 mm. long, ciliate on the margins, otherwise glabrous; corolla-tube 8–15 mm. long, glabrous within or with a few scattering hairs near the base; limb usually much shorter than the tube; anthers 1–1.5 mm. long, filaments about as broad as the anthers; style about equaling or somewhat exceeding the corolla; nutlets 3–4 mm. long, rugose.

Moist basaltic or sandy soils, Arid Transition and Canadian Zones; Chelan and Stevens Counties, Washington, south to Klamath County and Wallowa and Blue Mountains, Oregon, and Modoc County, northeastern California; extending beyond our range to eastern British Columbia, Idaho, and western Montana. Type locality: "Collected in eastern Washington [Medical Lake] in May, 1893, by Messrs. Sandberg and Leiberg." April–June.

12. LITHOSPÉRMUM [Tourn.] L. Sp. Pl. 132. 1753.

Annual or perennial, pubescent, hirsute or hispid herbs, with alternate leaves, and small white, yellow or blue flowers in leafy-bracted spikes or racemes. Calyx 5-parted

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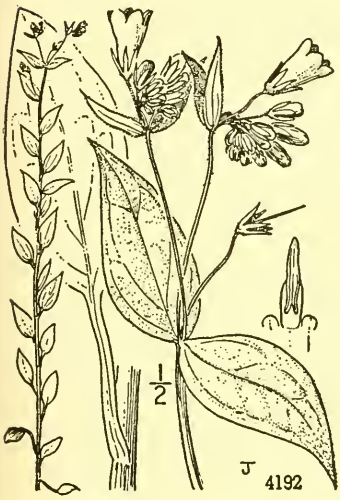

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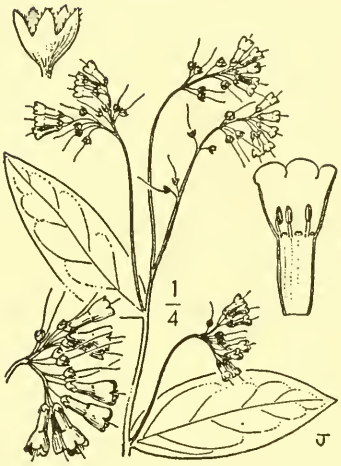

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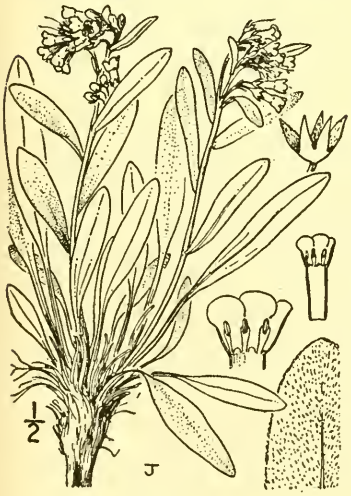

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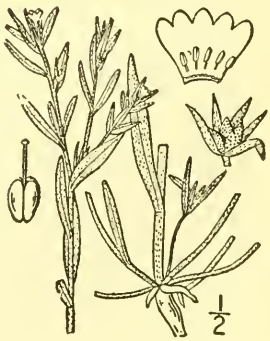


4197

4189. Myosotis versicolor
4190. Mertensia bella
4191. Mertensia paniculata
4192. Mertensia platyphylla
4193. Mertensia ciliata
4194. Mertensia umbratilis
4195. Mertensia oblongifolia
4196. Mertensia longiflora
4197. Lithospermum arvense

or 5-cleft into narrow segments or lobes. Corolla funnelform or salverform, 5-lobed, the throat naked, pubescent or crested, lobes entire or erose-denticulate, tube sometimes pubescent at the base within. Stamens 5, included, inserted on the throat of the corolla; filaments short. Ovary 4-divided; style slender or filiform; stigma capitate or 2-lobed. Nutlets 4 or fewer, erect, attached by their bases to the nearly flat receptacle; scar of attachment not concave. [Name Greek, meaning stone and seed.]

A genus of about 40 species, natives mainly of the northern hemisphere, a few in South America and Africa. Type species, *Lithospermum officinale* L.

Annual; nutlets densely tuberculate and dull. 1. *L. arvense.*

Perennial, stems several from a stout often purplish root; nutlets smooth and polished, whitish.

Corolla greenish yellow, its tube about equaling the calyx-lobes; upper leaves crowded, narrowly linear-lanceolate, attenuate at apex. 2. *L. ruderale.*

Corolla golden yellow, its tube well exceeding calyx-lobes; upper leaves not crowded, elliptic-ovate to ovate-lanceolate, obtuse or acute at apex. 3. *L. californicum.*

1. **Lithospermum arvénse** L. Corn Gromwell. Fig. 4197.

Lithospermum orvense L. Sp. Pl. 132. 1753.

Annual, appressed-pubescent, the stem erect, usually branched, 1.5–5 dm. high. Leaves narrowly lanceolate to nearly linear, sessile, mostly appressed, 2–2.5 cm. long, 3–5 mm. wide, obtuse or acutish at apex; flowers white, sessile or nearly so in terminal spikes, becoming distinct in age; corolla about 6 mm. long; calyx-segments equaling or slightly exceeding the corolla-tube; nutlets brown, wrinkled and pitted, about 2 mm. long; convex on the dorsal side, keeled on the inner side.

Grassy hillsides and grain fields, naturalized from Europe; Kittitas and Spokane Counties, Washington; Multnomah County, Oregon. May–July.

2. **Lithospermum ruderàle** Dougl. Western Gromwell or Columbia Puccoon. Fig. 4198.

Lithospermum ruderale Dougl. ex. Lehm. Stirp. Pug. 2: 28. 1830.
Lithospermum pilosum Nutt. Journ. Acad. Phila. 7: 43. 1834.
Lithospermum Torreyi Nutt. op. cit. 44.
Lithospermum laxum Greene, Pittonia 3: 263. 1898.
Lithospermum rudcrale var. *lanceolatum* A. Nels. Bot. Gaz. 52: 272. 1911.

Stems usually several from a large root, erect or decumbent, rather stout, 2–5 dm. high, simple or branched, hirsute and somewhat hispid to densely villous. Leaves numerous, usually crowded above, mostly ascending or sometimes reflexed, linear-lanceolate to lanceolate, 3–8 cm. long, 2–12 mm. wide, softly to rather harshly pubescent on both sides, scabrous on the margins; flowers in the axils of the upper leaves; pedicels stout, 1–3 mm. long; calyx-lobes in fruit subulate, 7–10 mm. long; corolla pale, often greenish yellow, 9–12 mm. long, tube broad, scarcely dilated at the throat, lobes about 3 mm. long; nutlets broadly ovoid, 5–6 mm. long, usually abruptly attenuate at apex into a stout beak, whitish, smooth and highly polished.

Dry plains and hillsides, Arid Transition Zone; British Columbia south in the Pacific States east of the Cascade Mountains of Washington and Oregon to Placer County, California, east to Alberta, Montana, and Colorado. Type locality: "gravelly banks of the Columbia and Multnomah [Willamette] Rivers." April–June.

3. **Lithospermum califórnicum** A. Gray. California Gromwell or Shasta Puccoon. Fig. 4199.

Lithospermum californicum A. Gray, Proc. Amer. Acad. 10: 51. 1874.
Lithospermum ruderale var. *californicum* Jepson, Man. Fl. Pl. Calif. 843. 1925.

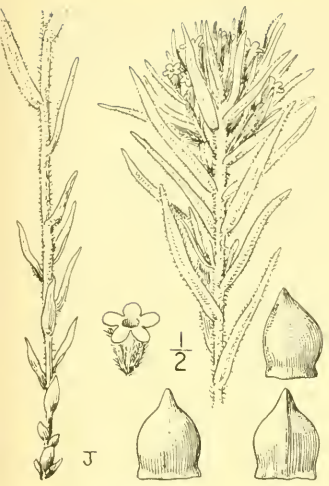
Stems usually several from a stout root, erect or ascending, 12–45 cm. high, spreading-hirsute. Leaves variable, the lower linear-lanceolate to narrowly lanceolate and shorter than the upper, these not congested at the summit of the stem, oblong-lanceolate to ovate, appressed-pubescent with ascending rather harsh hairs, especially on the upper surface, lateral veins usually evident; stem usually branched and forming a paniculate inflorescence; corolla golden yellow, 12–18 mm. long, the slender tube dilated into the throat, twice as long as the calyx, limb 8 mm. broad; fruiting calyx-lobes 7–10 mm. long, linear-lanceolate; nutlets broadly ovoid, short-beaked, whitish, smooth and polished.

Dry rocky slopes and ridges, Arid Transition Zone; Siskiyou Mountains, Josephine and Jackson Counties, Oregon, south to Del Norte and Placer Counties, California. Type locality: Grass Valley, Nevada County, California. April–June.

Échium plantagíneum L. Mant. 2: 202. 1771. Stems erect, solitary or several from a biennial root, 3–6 dm. high, villous-hirsute, hairs pustulate at base, spreading or more or less appressed. Upper leaves lanceolate or linear-lanceolate, sessile or clasping, the basal narrowly oblanceolate, tapering to a petiole about as long as or shorter than the blades, bristly hirsute with rather short appressed hairs more or less pustulate at base; flowers mostly bracteate, in racemosely arranged scorpioid racemes; pedicels short; calyx-lobes lanceolate-acuminate, about 10 mm. long in fruit, much longer than the tube; corolla blue, 15–20 mm. long, irregular with a campanulate throat and oblique limb, lobes unequal; stamens exserted; nutlets 4, erect, wrinkled. Adventive in California; Carmel, Monterey County, and De Luz, San Diego County.

13. **LÁPPULA** [Rivin.] Moench, Meth. 416. 1794.

Annual herbs with linear or oblong leaves. Flowers in paniculate leafy-bracted



4198

4198. Lithospermum ruderale

4200

4199. Lithospermum californicum

4199

4200. Lappula echinata

racemes, pedicels erect in fruit. Corolla blue or white, salverform, small, tube short, closed by 5 scales, lobes obtuse, spreading. Stamens included; filaments very short. Ovary 4-lobed; style short. Nutlets 4, erect or incurved, attached all along their ventral keel to a subulate gynobase. [Name Latin, meaning a bur.]

About 14 species, native mostly of the north temperate regions. Type species, *Myosotis Lappula* L.

Marginal spines of the achenes in 2 rows, slender, not confluent at base.	1. *L. echinata.*
Marginal spines in 1 row, the bases often more or less confluent.	2. *L. Redowskii.*

1. Lappula echinàta Gilib. European Stickseed. Fig. 4200.

Myosotis Lappula L. Sp. Pl. 131. 1753.
Lappula echinata Gilib. Fl. Lithuan. 1: 25. 1781.
Lappula Myosotis Moench, Meth. 417. 1794.
Echinospermum Lappula Lehm. Asperif. 121. 1818.
Lappula Lappula Karst. Deutsch. Fl. 979. 1880–1883.

Annual, with erect, simple to freely branched stem, 1.5–6 dm. high, villous-hirsute with upwardly more or less appressed hairs. Lower leaves narrowly oblanceolate, the others linear-sessile, ascending, 2.5–5 cm. long, appressed villous-hirsute, passing into the bracts of the racemes; pedicels 1–3 mm. long; calyx-lobes linear, spreading and 2.5–3 mm. long in fruit; corolla blue, tube surpassing the calyx, limb 3–4 mm. wide; nutlets 3.5–4 mm. long, strongly muricate-prickly dorsally, prickles in 2 rows on the margin, long and slender, not confluent at base.

Dry plains, hillsides, and fields, Arid Transition and Upper Sonoran Zones; introduced in eastern Washington and eastern Oregon to Idaho, Nevada, and eastward across the continent. Type locality: in Europe. June–Aug.

2. Lappula Redówskii (Hornem.) Greene. Western Stickseed. Fig. 4201.

Myosotis Redowskii Hornem. Hort. Hafn. 1: 174. 1813.
Echinospermum Redowskii Lehm. Asperif. 127. 1818.
Echinospermum Redowskii var. *occidentale* S. Wats. Bot. King Expl. 246. *pl. 23. figs. 9–10.* 1871.
Lappula occidentalis Greene, Pittonia 4: 97. 1899.

Annual, the stems simple or few-branched at base and erect or sometimes diffuse, 15–35 cm. high, herbage more or less canescent with a strigose and also villous pubescence. Leaves narrowly linear to narrowly lanceolate or the lower narrowly oblanceolate, 1–3 cm. long; flowers in the axils of small foliaceous bracts, forming open and at length elongated terminal racemes; pedicels 1–2 mm. long; calyx-segments narrowly lanceolate, erect or but little spreading in fruit, a little shorter than the corolla-tube; corolla blue, 3–4 mm. long, conspicuously crested on the throat; nutlets 2–2.5 mm. long, bordered by a single row of barbed prickles, the prickles distinct at base or joined by a narrow margin, the dorsal area of nutlets above the prickles ovate, distinctly tuberculate.

Dry hillsides and valleys, mainly Arid Transition and Upper Sonoran Zones; British Columbia southward east of the Cascade Mountains and Sierra Nevada to the San Bernardino Mountains, California, east to the Dakotas and Texas; also in Eurasia and Argentina. Type locality: in Asia. April–July.

Lappula Redowskii var. cupulàta (A. Gray) M. E. Jones, Bull. Univ. Montana No. 15. 44. 1910. (*Echinospermum Redowskii* var. *cupulatum* A. Gray, Bot. Calif. 1: 530. 1876; *Lappula cupulata* Rydb. Bull. Torrey Club 28: 31. 1901; *L. texana* var. *columbiana* (A. Nels.) I. M. Johnston, Contr. Gray Herb. No. 70: 50. 1924; *L. Redowskii* var. *desertorum* (Greene) I. M. Johnston, Contr. Arnold Arb. No. 3: 93. 1932.) Dis-

tinguished from the typical species by having the marginal prickles confluent at least to about the middle, forming a cup-like margin. Southeastern Washington southward east of the Cascade-Sierra Divide to the deserts of southern California, eastward to Montana, Wyoming, and New Mexico. Type locality: "Dry plains, along the eastern side of the Sierra Nevada (Watson, etc.)." Watson's specimens, which Western botanists generally have taken as the type, were from the Trinity Mountains, Nevada.

14. HACKÈLIA* Opiz in Bercht. Oekon. Fl. Böhm. 2: 146. 1838.

Biennial or perennial usually rather tall herbs with linear or oblong leaves. Inflorescence naked or bracteate at the branches of the panicle; pedicels recurved or deflexed in fruit. Calyx 5-parted, spreading or reflexed in fruit. Corolla blue, pinkish or white, the throat prominently crested. Style shorter than the nutlets. Nutlets beset with glochidiate bristles, attached below the middle to the broadly pyramidal gynobase by a large, oblique, ovate or deltoid areola, ventral keel extending over only upper half of nutlet. [Named in honor of P. Hackel, a German professor of agriculture.]

A genus of about 35 species, of wide geographical distribution, but mostly in the north temperate regions. Type species, *Hackelia deflexa* Opiz.

Racemes several to many, paniculately disposed, bracteate.
- Annuals; mature nutlets 2–3.5 mm. long. 1. *H. deflexa americana.*
- Perennials; mature nutlets 4–8 mm. long.
  - Dorsal surface of the nutlet without barbed prickles or bearing few to several, these shorter than the marginal ones which are flattened at the base and form a conspicuous border to the nutlet.
    - Marginal prickles distinct or united only at the base.
      - Corolla 5–7 mm. broad.
        - Branches of inflorescence rather strict, numerous, many-flowered; plants 5–10 dm. high, rather coarse. 2. *H. floribunda.*
        - Branches of the inflorescence open, spreading, with fewer branches and flowers; plants 3–6 dm. high.
          - Nutlets broadly ovate; basal leaves few, stems leafy above, the leaves not conspicuously reduced in size. 3. *H. Jessicae.*
          - Nutlets narrowly ovate; basal leaves many, stem-leaves few, reduced in size. 4. *H. Cusickii.*
      - Corolla 8–18 mm. broad (sometimes less in *arida*).
        - Corolla blue.
          - Herbage short-tomentose, mostly appressed; corolla 8–10 mm. broad. 5. *H. amethystina.*
          - Herbage bristly hirsute; corolla 12–15 mm. broad. 6. *H. setosa.*
        - Corolla white (sometimes pale blue in *diffusa*).
          - Leaves oblanceolate to ovate-lanceolate.
            - Corolla 8–12 mm. broad; herbage soft-hirsute. 7. *H. diffusa.*
            - Corolla 12–18 mm. broad; herbage strigillose-tomentose. 8. *H. bella.*
          - Leaves linear-lanceolate to linear. 9. *H. arida.*
    - Marginal prickles united one-third to one-half their length, usually rolled inward to form a cup-like margin to the nutlet.
      - Corolla large, 12–20 mm. broad.
        - Herbage strigose-pubescent with intermingling spreading hairs; leaves linear to linear-lanceolate; flowers blue. 10. *H. ciliata.*
        - Herbage hispid; leaves oblong-spatulate to oblanceolate; flowers white. 11. *H. venusta.*
      - Corolla small, 4–10 mm. broad, white.
        - Corolla-appendages hairy; pedicels longer than the mature fruit. 12. *H. cinerea.*
        - Corolla-appendages smooth; pedicels equaling or shorter than the mature fruit. 13. *H. hispida.*
  - Dorsal surface of the nutlet evenly beset with barbed prickles, these not strongly flattened to form a conspicuous border to the nutlet.
    - Corolla rotate; corolla-tube not or but little exceeding the calyx.
      - Corolla 6–10 mm. broad, white; prickles stout, up to 2.5 mm. long; surface of the nutlet dull, conspicuously muriculate. 14. *H. californica.*
      - Corolla 12–18 mm. broad, pink fading blue; prickles slender, up to 5 mm. long; surface of the nutlet shining, smooth. 15. *H. mundula.*
    - Corolla short-salverform, the tube well surpassing the calyx.
      - Corolla 12–20 mm. broad; corolla-appendages large, about one-third as long as the corolla-lobes, pubescence velvety. 16. *H. velutina.*
      - Corolla 6–8 mm. broad, about one-sixth as long as the corolla-lobes, pubescence not velvety. 17. *H. nervosa.*

Racemes 1–3, terminal, umbel-like, not bracteate. 18. *H. Sharsmithii.*

1. Hackelia defléxa var. americàna (A. Gray) Fernald & Jtn. Nodding Stickseed. Fig. 4202.

Echinospermum deflexum var. *americanum* A. Gray, Proc. Amer. Acad. 17: 244. 1882.
Lappula deflexa var. *americana* Greene, Pittonia 2: 183. 1891.
Lappula americana Rydb. Bull. Torrey Club 24: 294. 1897.
Hackelia deflexa var. *americana* Fernald & Jtn. Rhodora 26: 124. 1924.

Slender-stemmed annual 6–10 dm. high, herbage green, the rough, sparse puberulence spreading or appressed, hairs somewhat enlarged at base. Leaves oblong-lanceolate to lanceolate, petioled, 6–10 cm. long, length of petiole reduced on the upper leaves, these becoming sessile;

* Text contributed by Roxana Stinchfield Ferris.

inflorescence of slender lax racemes, many-flowered, pedicels slender, 6–9 mm. in fruit; calyx 1.5–2 mm. long; corolla blue or whitish, about 3 mm. broad, appendages broader than long, scarcely retuse, protuberances not closing throat, very finely papillose; face of nutlet narrowly ovate, scarcely 2 mm. long, muricate and sparsely hispidulus, occasionally with 2 or 3 short prickles, the marginal glochidiate prickles 10–12 on each side, broadened at base, some short but approximately equal length, the longest equaling the width of the nutlet.

Wooded slopes and thickets, Transition Zones; British Columbia south to Okanogan County, Washington, and east to Ontario and Michigan and Iowa. Type locality: not given. June–July.

2. **Hackelia floribúnda** (Lehm.) I. M. Johnston. Many-flowered Stickseed. Fig. 4203.

Echinospermum floribundum Lehm. Stirp. Pug. 2: 24. 1830.
Lappula floribunda Greene, Pittonia 2: 182. 1891.
Hackelia floribunda I. M. Johnston, Contr. Gray Herb. No. 68: 46. 1943.

Stem erect, stout from a short-lived perennial root, 5–12 dm. high, the rough pubescence deflexed, mixed with some spreading hairs. Leaves oblanceolate to lanceolate, hirsutulous-appressed, basal leaves petiolate with spreading hairs, the stem-leaves sessile above; racemes of the inflorescence many, rather strict, densely flowered, pedicels short, about 5–7 mm. long in fruit; corolla blue, 5–7 mm. broad, appendages small, obscurely papillate, not closing the throat; face of nutlet with a median ridge, muriculate, hirsutulous, without short glochidiate prickles, the marginal spines much flattened at base, distinct or somewhat confluent, 4–6 on each side, mostly exceeding in width the face of the nutlet.

Brushy slopes and borders of woods, Transition and Canadian Zones; British Columbia and Washington and Oregon east of the Cascade Mountains to Mono County, California; also western Ontario and Minnesota to northern New Mexico and Arizona. Type locality: "Lake Pentanguishene to the Rocky Mountains. *Drummond*," according to Lehmann in Hooker, Fl. Bor. Amer. 2: 84. 1838. June–July.

3. **Hackelia Jéssicae** (McGregor) Brand. Jessica's Stickseed. Fig. 4204.

Lappula micrantha Eastw. Bull. Torrey Club 30: 497. 1903. Not *Hackelia micrantha* Opiz.
Lappula Jessicae McGregor, Bull. Torrey Club 37: 262. 1910.
Hackelia Eastwoodiae I. M. Johnston, Contr. Gray Herb. No. 68: 47. 1923.
Hackelia Jessicae Brand, Pflanzenreich 4^{252}: 132. 1931.
Lappula floribunda var. *Jessicae* Jepson & Hoover in Jepson, Fl. Calif. 3: 307. 1943.

Stems erect or ascending, from a stout root, sparsely to rather densely villous-hirsute. Basal leaves 8–15 cm. long, the blades oblanceolate, 15–20 mm. wide, narrowed to a winged petiole of about equal length; upper stem-leaves sessile, lanceolate, acute, the reduced ones subtending the lower racemes often ovate-lanceolate; racemes several in an open panicle; pedicels slender, at length recurved-reflexed, 5–10 mm. long; calyx-lobes oblong to oblong-lanceolate, 2–3 mm. long; corolla small, pale blue, 3.5–5 mm. broad, tube often whitish, 1.5–2 mm. long, lobes oblong-obovate, crests yellowish, rounded, puberulent; nutlets 4–6 mm. long, marginal prickles broadly dilated at base, about 10, distinct, often with a shorter one in between, dorsal face broadly ovate, usually flattened with an indistinct median ridge, puberulent and in age more or less muriculate, usually with 1 or more short barbed prickles near the center.

Usually on moist banks or slopes, Canadian Zone; British Columbia, Washington and Idaho south to North Coast Ranges and the Sierra Nevada, California, and western Nevada. A variable species apparently intergrading with *H. Cusickii*, a species to which it is allied. Type locality: Halfmoon Lake, Eldorado County, California. June–Aug.

4. **Hackelia Cusíckii** (Piper) Brand. Cusick's Stickseed. Fig. 4205.

Lappula Cusickii Piper, Bull. Torrey Club 29: 542. 1902.
Lappula arida var. *Cusickii* Nels. & Macbr. Bot. Gaz 61: 41. 1916.
Hackelia arida var. *Cusickii* I. M. Johnston, Contr. Gray Herb. No. 68: 48. 1923.
Hackelia Cusickii Brand, Pflanzenreich 4^{252}: 131. 1931.

Perennial, stems erect or ascending, 15–30 cm. high, crown of the woody caudex usually thickly clothed with old leaf-bases, whole plant bluish-canescent with rather densely appressed puberulence. Lower leaves many, linear-lanceolate or narrowly oblanceolate, 4–10 mm. wide, acute, more or less hirsute-ciliate on the elongated petioles, upper stem-leaves sessile and much shorter, ciliate on the margin of the blade at base; inflorescence racemose-corymbose, with about 5 branches; calyx-lobes linear, acute, 2 mm. long; corolla blue, 5–6 mm. broad, appendages short-pilose, about as long as broad, emarginate; nutlets narrowly ovate, 4–5 mm. long, their marginal prickles a little shorter than the width of the nutlet, 3–5 broad-based long prickles on each side with much shorter slender prickles in between, all somewhat united at base; dorsal face of nutlet with a faint central ridge, densely muriculate and with a few irregularly dispersed short slender barbed prickles.

Dry slopes, often among junipers, mainly Arid Transition Zone; eastern Oregon from Gilliam County to Klamath and Malheur Counties, and to Modoc County, California. Type locality: "Logan Mountains, eastern Oregon, 6500 feet altitude, in the shelter of juniper." May–July.

Hackelia saxátilis (Piper) Brand, Pflanzenreich 4^{252}: 133. 1931. (*Lappula saxatilis* Piper, Bull. Torrey Club 29: 541. 1902.) Stems rather slender, 2–3 dm. high, herbage thinly cinereous throughout with a fine soft spreading and reflexed pubescence and occasional longer villous hairs intermixed, especially on the petioles of the lower leaves and on the margins of the upper ones. Lower leaves oblanceolate, acute, with petioles about as long as the blades; upper leaves linear-lanceolate, sessile; branches of the spreading inflorescence 6–10-flowered; corolla blue, rotate, about 7 mm. broad; appendages pubescent, broader than long; nutlets 3–4 mm.

long, 3–5 long glochidiate prickles on each side with 1–3 short prickles between, all slightly united at base; dorsal surface muriculate, bearing a few short glochidiate bristles. Rocky sides of canyons, Klickitat River, Klickitat County, Washington. Known only from the type locality.

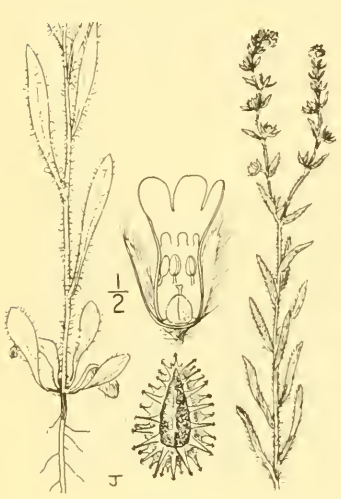
Hackelia pàtens (Nutt.) I. M. Johnston, Journ. Arnold Arb. 16: 194. 1935. (*Rochelia patens* Nutt. Journ. Acad. Phila. 7: 44. 1834; *Lappula coerulescens* Rydb. Mem. N.Y. Bot. Gard. 1: 328. 1900; *L. coerulescens* var. *brevicula* Jepson, Fl. Calif. 3: 307. 1943.) Stems 2 or 3, short, deflexed-hirsute, with some hairs spreading, arising from a woody caudex covered with old leaf-bases; basal leaves many, oblanceolate to lanceolate, stem-leaves reduced upwards, pubescence rather dense, short, appressed; branches of the inflorescence 5–10-flowered, pedicels short, elongating somewhat in fruit; corolla blue or whitish, small, appendages somewhat broader than long, obscurely papillose; nutlets small, marginal glochidiate prickles 3–5 on each side, a few short prickles interspersed, the longest prickles surpassing the body of the nutlet; face of the nutlet with a faint median ridge, muriculate and occasionally bearing 1 or 2 short prickles. Western Montana and Idaho to Utah and Nevada. In California but one specimen (*Jepson*, Poison Creek, White Mountains, Inyo County), the type of *L. coerulescens* var. *brevicula*, has been seen. Until more material is available it seems best to assign it to the species above, to which it is closely related. Type locality: "near the Flat-Head River." Collected by Wyeth.

5. **Hackelia amethystìna** J. T. Howell. Howell's Stickseed. Fig. 4206.

Hackelia amethystina J. T. Howell in Eastw. Leaflets West. Bot. 3: 125. 1942.

Stems stout, erect, 5–8 dm. high, greenish, more or less short-canescent with appressed or spreading hairs. Basal leaves petioled, narrowly elliptic, about 10 cm. long, acute at apex, stem-leaves sessile and subclasping, lanceolate to ovate; inflorescence short-canescent, 15–25 cm. long, bracts broadly ovate, pedicels slender, about 1 cm. long in fruit; corolla blue, 9–10 mm. broad, appendages subquadrate, papillose, conspicuous; nutlets 5–6 mm. long, dorsal face broadly ovate, hirsutulous, faintly muriculate, with 6–10 very short prickles, the marginal glochidiate prickles slender, bluish in age, somewhat dilated at base, free or a little united, 9–13 on each side, to 5 mm. long but of varying lengths.

Wooded slopes, Transition Zones; Tehama and Glenn Counties to eastern Mendocino County, California. Type locality: Log Spring Ridge between Log Spring and Government Flat, Tehama County. May–July.



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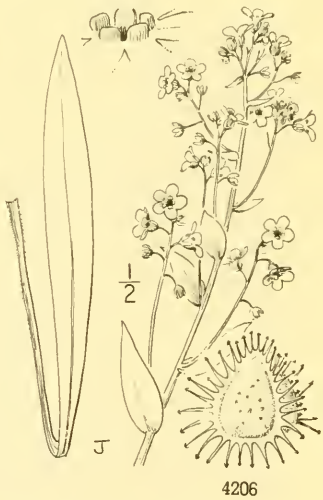

4206

4201. Lappula Redowskii
4202. Hackelia deflexa
4203. Hackelia floribunda
4204. Hackelia Jessicae
4205. Hackelia Cusickii
4206. Hackelia amethystina

6. Hackelia setòsa (Piper) I. M. Johnston. Bristly Stickseed. Fig. 4207.

Lappula setosa Piper, Bull. Torrey Club 29: 544. 1902.
Hackelia setosa I. M. Johnston, Contr. Gray Herb. No. 68: 46. 1923.

Stems 1 to several from the often-branched crown of the woody root, 3–6 dm. high, plant bristly-hirsute throughout without any finer pubescence. Basal leaves linear-oblanceolate, acutish to obtuse, 6–10 cm. long, blade and petiole of about equal length; cauline leaves sessile or nearly so, linear to linear-lanceolate, gradually reduced above and passing into the bracts of the inflorescence; calyx-lobes oblong-linear, obtuse, 3–4 mm. long, hispid; corolla bright to light blue, 12–15 mm. broad, the tube not exceeding the calyx; appendages semicircular, short-pilose, protuberance small; nutlets 5 mm. long, the long and alternating short marginal prickles confluent at the bases to form a narrow wing, dorsal surface nearly plane, minutely muriculate bearing several short barbed bristles.

Open woods or brushy openings in forests, Canadian and Transition Zones; Siskiyou Mountains, southwestern Oregon, to Humboldt and northern Lake Counties in North Coast Ranges and to Sierra County in the Sierra Nevada, California. Type locality: Sierra Valley, Plumas County, California. June–July.

7. Hackelia diffùsa (Lehm.) Greene. Diffuse Stickseed. Fig. 4208.

Echinospermum diffusum Lehm. Stirp. Pug. 2: 23. 1830.
Lappula diffusa Greene, Pittonia 2: 182. 1891.
Lappula Hendersonii Piper, Bull. Torrey Club 29: 529. 1902.
Hackelia diffusa I. M. Johnston, Contr. Gray Herb. No. 68: 48. 1923.

Stems usually several or many from a large root, diffusely spreading, 3–7 dm. long, soft-hirsute. Lower leaves oblanceolate, tapering into a margined petiole, 8–15 cm. long, upper oblong, sessile, gradually smaller above, the uppermost becoming bract-like; racemes paniculate; corolla rotate, white varying to blue, 8–12 mm. broad, appendages puberulent; fruiting pedicels deflexed, about 5 mm. long; nutlets about 5 mm. long, marginal prickles subulate, very flat, as long as the width of the nutlet or nearly so; dorsal surface of nutlet narrowly ovate, muriculate, bearing numerous short barbed prickles.

Shady cliffs and moist rocky ground, Transition and Canadian Zones; British Columbia south on the eastern slope of the Cascade Mountains in Yakima and Klickitat Counties, Washington, and Wasco and Sherman Counties, Oregon. Type locality: "N.W. America." Collected by Douglas. May–July.

8. Hackelia bélla (J. F. Macbride) I. M. Johnston. Showy Stickseed. Fig. 4209.

Lappula bella J. F. Macbride, Contr. Gray Herb. No. 48: 39. 1916.
Lappula Rattanii Brand, Rep. Spec. Nov. 18: 311. 1922.
Hackelia bella I. M. Johnston, Contr. Gray Herb. No. 68: 47. 1923.
Hackelia Rattanii Brand, Pflanzenreich 4^{252}: 129. 1931.

Perennial, stems erect or ascending, 5–6 dm. high, rather densely strigillose above, retrorsely so below. Basal leaves oblanceolate, 10–15 cm. long, 1–2 cm. wide, narrowed below to a petiole nearly as long, rather densely strigillose-tomentose; upper stem-leaves broadly lanceolate-ovate to oblong, sessile and subcordate-clasping at base; inflorescence open; pedicels becoming reflexed, the longer 10–15 mm. long; calyx-lobes oblong to oblong-ovate, 4–6 mm. long in fruit; corolla white, tube about 4 mm. long, limb 12–18 mm. broad, appendages pubescent; nutlets ovoid, 6–7 mm. long; dorsal face muriculate and with a few scattering short obscurely barbed prickles, marginal prickles in a single row, long, slender, broadened at base and sometimes slightly united into a narrow wing.

Open slopes, Canadian Zone; Coast Ranges from southern Siskiyou County to Mendocino County, California. Type locality: Dorleska, Salmon Mountains, Trinity County, in the Canadian Zone, at an altitude of 2,000 meters. June–Aug.

9. Hackelia árida (Piper) I. M. Johnston. Sagebrush Stickseed. Fig. 4210.

Lappula arida Piper, Bull. Torrey Club 28: 44. 1901.
Hackelia arida I. M. Johnston, Contr. Gray Herb. No. 68: 48. 1923.
Lappula Cottonii Piper, Bull. Torrey Club 29: 549. 1902.

Stems erect, 3–5 dm. high, branched above, canescently hirsute throughout with mostly appressed hairs. Basal leaves linear to narrowly lanceolate, acute, attenuate into the petiole, 8–20 cm. long, 5–8 mm. wide; stem-leaves linear, 4–12 cm. long, 5 mm. wide, sessile by a broad base, more or less hirsute-ciliate; racemes 5–10 cm. long, loosely flowered; calyx-lobes linear-oblong, 2 mm. long, very obtuse; corolla white, rotate, 10–12 mm. broad, the fornices broader than long, obscurely retuse, short-pilose; marginal prickles of nutlets all barbed, united at base, unequal in length, the longer about half as long as the width of the nutlet; dorsal surface muriculate and with 6–10 short barbed bristles centrally placed; inner surface hispidulous or muriculate; scar oblong-ovate, central.

Dry sagebrush plains, Upper Sonoran Zone; eastern Washington from Chelan County to Yakima County east to Spokane County. Type locality: Ellensburg, Klickitat County. May–June.

10. Hackelia ciliàta (Dougl.) I. M. Johnston. Okanogan Stickseed. Fig. 4211.

Cynoglossum ciliatum Dougl. ex Lehm. Stirp. Pug. 2: 24. 1830.
Echinospermum ciliatum A. Gray, Proc. Amer. Acad. 17: 225. 1882.
Lappula ciliata Greene, Pittonia 2: 182. 1891.
Hackelia ciliata I. M. Johnston, Contr. Gray Herb. No. 68: 46. 1923.

Stems usually only 1 or 2 from a woody root, erect or ascending, 3–6 dm. high; canescent

with a dense fine pubescence, scattering pointed hirsute hairs intermingling, the finer pubescence appressed above, retrorsely so toward the base. Lower leaves crowded at the base, linear to linear-oblanceolate, 6–8 cm. long, 4–8 mm. wide, narrowed to petioles one-third to nearly as long as the blades, acute or acuminate; upper leaves linear, sessile, acuminate, 2–3.5 cm. long; inflorescence open, the lower branches often 12–18 cm. long in fruit; pedicels slender, recurved-spreading, the lower 10–15 mm. long; calyx-lobes linear-oblong, mostly acute, 3 mm. long in fruit; corolla blue, the tube equaling the calyx-lobes, limb 12–15 mm. broad; appendages short-pilose, crest suborbicular, retuse at apex; nutlets oblong-ovoid; marginal prickles united about one-third their length, mostly exceeding the width of the nutlet; dorsal surface finely muriculate and puberulent, and with a few very short barbed prickles near the center.

Canyon slopes, in sandy or rocky soils, Arid Transition Zone; northeastern Washington, from Okanogan County to Stevens, Lincoln and Spokane Counties, northward into adjacent British Columbia. Type locality: "Kettle Falls and Spokane River." Collected by Douglas. May–June.

11. Hackelia venústa (Piper) St. John. Showy Stickseed. Fig. 4212.

Lappula venusta Piper, Proc. Biol. Soc. Wash. 37: 93. 1924.
Hackelia venusta St. John, Research Stud. St. Coll. Wash. 1: 104. 1929.

Perennial, leafy stems several, erect, ascending, 2–3 dm. high, hirsute or hispid retrorsely so below, upwardly appressed above, the hairs with enlarged bases. Leaves green and hispid on both sides; lower leaves 3–4 cm. long, the blades oblong-spatulate about as long as the winged petiole, 5–10 mm. wide; upper leaves sessile, linear-oblanceolate, rounded to acutish at apex, 2–4 cm. long; inflorescence loosely cymose in age; bracts of the racemose branches lanceolate to linear; pedicels recurved in age 1–2 cm. long; calyx-lobes linear, acute, 4 mm. long; corolla white, 15–20 mm. broad, tube about equaling the calyx-lobes, lobes orbicular-obovate; appendages yellow, oblong, broadest above, emarginate, minutely roughened; anthers oblong, yellow; nutlets trigonous, 6 mm. long; marginal prickles united at base about one-third their length; dorsal surface convex, sparsely muriculate and with about 10 barbed bristles.

Rocky slopes, Arid Transition Zone; Chelan County, eastern Washington. Type locality: "Between Tumwater and Drury, Chelan County." May–July.

12. Hackelia cinérea (Piper) I. M. Johnston. Gray Stickseed. Fig. 4213.

Lappula cinerea Piper, Bull. Torrey Club 29: 544. 1902.
Hackelia cinerea I. M. Johnston, Contr. Gray Herb. No. 68: 46. 1923.

Stems erect, 4–6 dm. high, cinereous throughout with appressed pubescence, and with intermingling hispid hairs, some of these, especially on the basal leaves, pustulate at base. Lower leaves linear to linear-oblong, 5–10 cm. long, stem-leaves sessile, reduced upward, obtuse with upper ones acutish; inflorescence loose, the branches mostly 3–5, often 15–20 cm. long, 5–15-flowered; bracts narrowly linear, acute, the uppermost minute or wanting; pedicels slender, recurved-reflexed, the lower often 10–15 mm. long; calyx-lobes linear-lanceolate, acute; corolla white, tube 2 mm. long, lobes obovate-orbicular, 3 mm. long; appendages short-pilose, the crest semiorbicular, marginate at apex; nutlets 3–4 mm. long, marginal prickles united at base for about half their length, rather numerous and of uneven length, often curving outwards; dorsal surface with indistinct medium ridge, muriculate and bearing several short glochidiate bristles.

Dry rocky or gravelly slopes, Arid Transition Zone; Chelan County, eastern Washington, to Idaho, Montana, and Wyoming. Type locality: "Salmon River bluffs, Idaho, altitude 2,500 feet." May–July.

13. Hackelia híspida (A. Gray) I. M. Johnston. Rough Stickseed. Fig. 4214.

Echinospermum hispidum A. Gray, Proc. Amer. Acad. 16: 106. 1881.
Echinospermum diffusum var. *hispidum* A. Gray, Proc. Amer. Acad. 17: 225. 1882.
Lappula hispida Greene, Pittonia 2: 182. 1891.
Hackelia hispida I. M. Johnston, Contr. Gray Herb. No. 68: 46. 1923.

Stems stout, erect or ascending, 3–5 dm. high, hispid with spreading hairs. Lower stem-leaves oblanceolate, narrowed to a winged petiole, central ones sessile, lanceolate, those subtending the lower branches of the inflorescence broadly lanceolate or ovate-lanceolate, subclasping, all loosely hispid, the hairs conspicuously pustulate at base; inflorescence open; pedicels often shorter than the fruit; calyx-lobes oblong, 2 mm. long; corolla white or greenish, tube barely equaling the calyx-lobes, lobes broadest at base, limb 4–6 mm. broad; appendages smooth, lunate, much broader than long; nutlets about 4 mm. long, marginal prickles united to about their middle and curved outward to form a cup-like border; dorsal surface of nutlet often nearly smooth or in age thinly mucronate-roughened, and often with a few short glochidiate bristles near the center.

Dry rocky slopes, Arid Transition Zone; Douglas County, Washington, to northeastern Oregon. Type locality: Pine Creek, Wallowa County, Oregon. May–June.

14. Hackelia califórnica (A. Gray) I. M. Johnston. California Stickseed. Fig. 4215.

Echinospermum californicum A. Gray, Proc. Amer. Acad. 17: 225. 1882.
Lappula californica Piper, Bull. Torrey Club 29: 546. 1902.
Hackelia californica I. M. Johnston, Contr. Gray Herb. No. 68: 47. 1923.
Hackelia elegans Brand, Pflanzenreich 4^{252}: 128. 1931.
Lappula elegans Piper ex Brand, loc. cit. as a synonym.

Stems usually several, erect or ascending, leafy, 4–6 dm. high, villous-tomentose with spread-

ing hairs as are the petioles. Lower leaves 10–20 cm. long, oblong-oblanceolate to narrowly spatulate, acute or rounded at apex, blade gradually narrowed to a petiole of about equal or shorter length, 1–2.5 cm. wide; upper stem-leaves sessile or subsessile, linear-oblong to broadly lanceolate, acute or acutish, all rather sparsely strigose; inflorescence at first narrow becoming loose and widely branched in age; calyx-lobes ovate, 2–2.5 mm. long; corolla white, the tube equaling the calyx-lobes, limb 6–10 mm. broad; appendages broader than long, puberulent; nutlets 5 mm. long, the dorsal face dull, muriculate, covered with subequal barbed prickles.

Open forests and edges of mountain meadows, Transition and Canadian Zones; southern Oregon in Jackson and Klamath Counties, south in the Coast Ranges to Humboldt and Lake Counties, and in the Sierra Nevada to Alpine County, California. Type locality: Mount Shasta, California. June–Aug.

15. **Hackelia múndula** (Jepson) Ferris. Pink Stickseed. Fig. 4216.

Lappula californica var. *mundula* Jepson, Fl. Calif. 3: 309. 1943.

Stems 1 to several from a woody root, 5–9 dm. high, more or less velvety-pubescent throughout. Leaves oblanceolate, acute or obtuse at apex, 8–15 cm. long, stem-leaves sessile, reduced upward, the bracts tending to be broad and clasping; inflorescence with spreading branches, widely divaricate in fruit, fruiting pedicels 8–14 mm. long; flowers pink with whitish centers, fading blue, 12–20 mm. broad; tube about equaling the calyx, crests conspicuous, erect-spreading, narrowly ovate, slightly emarginate, puberulent; nutlets 6–8 mm. long, the dorsal face shining, smooth, prickles slender, 2.5–5 mm. long.

North slopes in red fir forests, Canadian Zone; in the Sierra Nevada from Yosemite National Park to Tulare County, California. Type locality near Long Meadow, Tulare County. June–July.

16. **Hackelia velutìna** (Piper) I. M. Johnston. Velvety Stickseed. Fig. 4217.

Lappula velutina Piper, Bull. Torrey Club 29: 546. 1902.
Hackelia velutina I. M. Johnston, Contr. Gray Herb. No. 68: 47. 1923.
Hackelia longituba I. M. Johnston, Journ. Arnold Arb. 29: 237. 1948.

Stems 1 to several from the perennial root, 3–8 dm. high, clothed throughout with densely velvety pubescence. Lower leaves spatulate-oblanceolate, acutish to obtuse, 8–14 cm. long, petiole about as long or longer than the blades; cauline leaves scattered or often numerous, oblong-linear to lanceolate, sessile with broad, often suborbicular bases, acute or obtuse at apex, gradually reduced upwards, 2–8 cm. long; inflorescence rather compact, spreading in fruit, the branches 5–10-flowered, fruiting pedicels 5–10 mm. long; calyx-lobes oblong, obtuse, densely canescent; corolla blue, tube 5 mm. long, well-exceeding the calyx, limb 12–20 mm. broad; appendages spreading, white, conspicuous, approximately one-third as long as the corolla-lobes, the deeply 2-lobed crests pilose, equaled in length by the oblong protuberance; nutlets 6–8 mm. long, the dorsal face dull, muriculate, beset with rather slender barbed prickles 2–3.5 mm. long and rather thinly puberulent.

Dry open forests, mainly Transition and Canadian Zones; Sierra Nevada, from Plumas County to Tulare County, California. Type locality: "General Grant Grove," Tulare County. June–Aug.

17. **Hackelia nervòsa** (Greene) I. M. Johnston. Sierra Stickseed. Fig. 4218.

Echinospermum nervosum Kell. Proc. Calif. Acad. 2: 146. *fig. 42.* 1862.
Lappula nervosa Greene, Pittonia 2: 182. 1891.
Hackelia nervosa I. M. Johnston, Contr. Gray Herb. No. 68: 47. 1923.

Stems 1 to several, erect, 2–5 dm. high, glabrous or pilose with spreading hairs. Basal leaves oblong-spatulate to linear-spatulate, narrowed to more or less winged petioles of about equal length, lower stem-leaves shorter, subsessile and acutish, those subtending the lower branches of the inflorescence ovate-lanceolate, subclasping at base, very acute or short-acuminate at apex, retrorsely appressed-pubescent beneath, strigose above, often thinly so on the upper leaves, harshly pubescent in age; racemes slender, 2–10-flowered; pedicels slender, at length spreading or recurved; calyx-lobes oblong to oblong-ovate, 2.5–3 mm. long; corolla blue, the buds pink, the tube 4 mm. long, pinkish; limb 6–8 mm. broad; appendages small, one-sixth as long as the corolla-lobes; stamens inserted on upper part of corolla-tube; nutlet 5 mm. long, broad-ovoid, dorsal face hispidulous, covered all over with long barbed prickles.

Moist places, Canadian Zone; Sierra Nevada from Plumas County to Fresno County, California. Type locality: head waters of Carson River, Alpine County. July–Aug.

18. **Hackelia Sharsmíthii** I. M. Johnston. Sharsmith's Stickseed. Fig. 4219.

Hackelia Sharsmithii I. M. Johnston, Journ. Arnold Arb. 20: 398. 1939.
Lappula Sharsmithii Jepson & Bailey in Jepson, Fl. Calif. 3: 308. 1943.

Stems usually several from the branched crown of the stout perennial root, slender, 1–3 dm. high, strigose with strongly reflexed hairs. Leaves green, rather thinly reflexed-strigose, the lower oval to oblong-lanceolate, 2.5–7 cm. long, decurrent on the petiole of about the same length or longer, the upper clasping, ovate to ovate-lanceolate, 2–3.5 cm. long, acute at apex; racemes 2 or 3, terminal, 2–6 cm. long; pedicels 1–6 mm. long, recurved, strigose; calyx 2–2.5 mm. long, strigose; corolla blue with a yellow center, about 6 mm. broad; appendages lunate, ciliate on the margins above; nutlets ovoid, 2–2.5 mm. long, the marginal glochidiate prickles subulate, often bluish at tip, distinct or united at base to form a narrow wing, dorsal prickles 1 to few, short.

Shaded spots in shelter of rocks, Arctic-Alpine Zone; Mount Whitney region in Tulare and Inyo Counties, California. Type locality: Lone Pine Canyon, altitude 11,000 feet, Inyo County, California. Aug.–Sept.

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4207. Hackelia setosa
4208. Hackelia diffusa
4209. Hackelia bella

4210. Hackelia arida
4211. Hackelia ciliata
4212. Hackelia venusta

4213. Hackelia cinerea
4214. Hackelia hispida
4215. Hackelia californica

15. ERITRÍCHIUM Schrad. in Gaud. Fl. Helv. 2: 57. 1828.

Low depressed cushion-like perennials, with the short stems densely clothed with small often imbricate leaves. Flowers few in a raceme-like cluster terminating the slender flowering stems. Calyx-lobes ascending, linear. Corolla blue, funnelform, with short tube. Nutlets obliquely attached to the conical gynobase, smooth, the apex obliquely truncate, with a distinct, entire or toothed margin. [Name Greek, meaning wool and small hair, the original species being woolly-pubescent.]

A genus of about 30 species, inhabiting the boreal and temperate regions; 4 or 5 are North American. Type species, *Eritrichium nanum* Schrad.

1. Eritrichium elongàtum (Rydb.) Wight. Pale Alpine Forget-me-not. Fig. 4220.

Eritrichium aretioides var. *elongatum* Rydb. Mem. N.Y. Bot. Gard. 1: 327. 1900.
Eritrichium elongatum Wight, Bull. Torrey Club 29: 408. *fig. d.* 1902.
Oreocarya pulvinata A. Nels. Bot. Gaz. 40: 63. 1905.

Densely cespitose, forming cushion-like mats. Leaves closely overlapping, oblanceolate, 4–8 mm. long, 1.5–2 mm. broad, acute or obtuse, pilose, especially on the margins and tips, with long white hairs; flowering stems 2–6 cm. long, with scattered narrowly linear leaves; flowers in a short terminal raceme-like cluster; calyx-lobes linear, 3 mm. long; corolla-tube equaling the calxy-lobes, limb bright blue, 4–6 mm. broad, crests in the throat puberulent; nutlets smooth, 2 mm. long.

Rocky ridges, Boreal Zones; Wallowa Mountains, Oregon, east to Idaho, Montana, Wyoming and Colorado. Type locality: Spanish Basin, Montana. July–Aug.

Eritrichium Howárdii (A. Gray) Rydb. Mem. N.Y. Bot. Gard. 1: 327. 1900. (*Cynoglossum Howardii* A. Gray, Syn. Fl. N. Amer. ed. 2. 2^1: 188. 1886.) Similar to *E. elongatum*; leaves with dense closely appressed pubescence; dorsal surface of nutlet papillose and hispid; corolla-limb 7–9 mm. broad. Montana and northern Wyoming, mostly on the eastern side of the Rocky Mountains. Reported from the Cascades, Washington, on the basis of a specimen said to have been collected by Tweedy, but this is possibly a slip in labeling, as Tweedy also collected the species in Montana. Type locality: "Rocky Mountains in Montana."

16. GREENEÓCHARIS Guerke & Harms in Engler & Prantl, Nat. Pflanzenf. Regist. 460. 1899.

Low, densely branched annuals with hispid or canescent herbage, containing a purple dye that leaves a stained impression of the plant on pressing paper. Flowers in leafy-bracted spikes terminating the numerous branchlets. Calyx 5-cleft to the middle, the tube scarious and circumscissile near the middle, the upper part bearing the lobes falling away, the lower cupulate, densely hispid, and persistent around the ovoid nutlets. [Named in honor of E. L. Greene, noted American botanist, and the Greek word meaning grace or beauty.]

A monotypic genus of western North America.

1. Greeneocharis circumscíssa (Hook. & Arn.) Rydb. Greeneocharis. Fig. 4221.

Lithospermum ? circumscissum Hook. & Arn. Bot. Beechey 370. 1838.
Piptocalyx circumscissus Torr. in S. Wats. Bot. King. Expl. 240. 1871.
Krynitzkia circumscissa A. Gray, Proc. Amer. Acad. 20: 275. 1885.
Greeneocharis circumscissa Rydb. Bull. Torrey Club 36: 677. 1909.

Stems few to many from the base, strigose, more or less branched above, often forming a dense hemispheric mass 2–10 cm. high, the outer ones often decumbent. Leaves 3–15 mm. long, 1–2 mm. broad, the lower narrowly oblanceolate, the upper linear, obtuse, strigose or short-hispid; flowers in the axils of foliaceous bracts in short rather indefinite raceme-like clusters; corolla minute, limb 1–2.5 mm. broad; fruiting calyx 2.5–4 mm. long, the tube nearly as long as the lobes, at length circumscissile just below the sinuses, basal part persistent, cupulate, appressed-hispid; mature calyx-lobes narrowly linear-lanceolate, firm, more or less hispid, midrib slender; pedicels about 0.5 mm. long; nutlets 4, all similar or one slightly longer, triangular-ovoid to oblong-lanceolate, about 1.5 mm. long, smooth or obscurely muriculate; gynobase about two-thirds height of nutlets, pyramidal-oblong; style equaling or slightly exceeding nutlets.

Sandy or gravelly soils, Sonoran and Arid Transition Zones; eastern Washington south through eastern Oregon and California, east of the Sierra Nevada, to the mountain ranges of southern California and northern Lower California, east to southern Idaho, Utah and Arizona. Type locality: Snake Fort, Snake River, Idaho. April–Aug.

Greeneocharis circumscissa var. híspida J. F. Macbride, Proc. Amer. Acad. 51: 546. 1916. (*Krynitzkia dichotoma* Greene, Bull. Calif. Acad. 1: 206. 1885; *Wheelerella dichotoma* Grant, Bull. S. Calif. Acad. 5: 28. 1906; *Cryptantha circumscissa* var. *hispida* I. M. Johnston, Contr. Gray Herb. No. 74: 42. 1925.) Distinguished from the typical species by the spreading hispid pubescence of the stems. Sierra Nevada, California, on the western slopes in Fresno, Tulare and Kern Counties, and on the eastern slopes in the Lake Tahoe and Mount Whitney regions; also in western Nevada in the Carson Valley region. Type locality: Mount Whitney trail, California.

17. ALLOCÀRYA Greene, Pittonia 1: 12. 1887.

Low spreading annuals with linear entire leaves, the lowest opposite, and small flowers

in terminal spikes or racemes. Pedicels thickened at the summit and persistent. Calyx 5-divided, persistent, the segments narrow. Corolla salverform, white, yellow in the throat. Stamens included. Ovary 4-divided; style short. Nutlets crustaceous, smooth or variously roughened, attached at their bases or below the middle to the receptacle; scar of the attachment concave or raised. [Name Greek, meaning diverse and nut, referring to the great diversity of the surface of the nutlets.]

A western North American genus of about 40 species, all but one annuals. Type species, *Myosotis Chorisiana* Cham.

Plants perennial, coarse, densely soft-villous with spreading hairs. 1. *A. mollis.*

Plants slender, annuals.

Stems floriferous to near the base, prostrate; lower pedicels stout and recurved; calyx with indurated midrib, its lobes irregularly spreading or recurved in age.

Nutlets broadly ovoid, shiny, sparsely if at all tuberculate; scar surrounded by a high collar, about one-fourth length of nutlet. 2. *A. scripta.*

Nutlets lanceolate-ovoid, dull, granulate and tuberculate, scar not surrounded by a high collar, about one-fifth length of nutlet. 3. *A. humistrata.*

Stems not floriferous to base or if so the pedicels not stout and recurved.

Scar longer, deeply excavated, lateral one-fourth to half the length of the nutlet; nutlets often with prickles.

Spikes mostly geminate; plant erect, glabrous or nearly so and somewhat succulent; corolla 4–6 mm. broad. 4. *A. stricta.*

Spikes solitary at the ends of the branches, not geminate.

Nutlets broad, about two-thirds to nearly as broad as long; usually armed with prickles.

Nutlets not transversely rugose on the dorsal side, 2.5–3 mm. long; keel with prickles. 5. *A. Greenei.*

Nutlets transversely rugose on the dorsal side, 1.5–2 mm. long; keel and transverse ridges with prickles.

Prickles short and stout, covered with minute subulate trichomes. 6. *A. hystricula.*

Prickles long and slender, glochidiate at apex. 7. *A. acanthocarpa.*

Nutlets slender, about one-half as broad as long.

Dorsal keel thin and knife-like, armed with prickles; dorsal surface between keels smooth or tuberculate, glossy. 8. *A. Austiniae.*

Dorsal keel broader, not knife-like; dorsal surface between keels transversely rugose, dull not glossy. 9. *A. glyptocarpa.*

Scar smaller, one-fifth as long as nutlet or shorter, slightly if at all excavated, but margins sometimes upturned, thus becoming somewhat concave.

Nutlet-attachment exactly or practically basal, often substipitate; calyx-lobes strongly costate; plants somewhat succulent.

Stems prostrate; calyx-lobes connivent and turned to one side of flower. 10. *A. leptoclada.*

Stems erect or ascending; calyx-lobes spreading, not connivent to one side.

Plant with fistulous-enlarged stems; lateral keel of nutlets well-developed; calyx-ribs prominently indurated. 11. *A. glabra.*

Plant with slender not fistulous stems; lateral keels less prominent; calyx-ribs only slightly indurate. 12. *A. stipitata.*

Nutlet-attachment lateral to obliquely basal; calyx-ribs rarely enlarged.

Scar linear or nearly so and borne on the edge of a knife-like keel or rarely cuneate and sessile in *undulata*; coastal plants.

Ventral keel in an elongate depression, only near the base becoming groove-like. 13. *A. undulata.*

Ventral keel in a deep longitudinal groove the whole length, the groove sometimes infolding and more or less concealing the keel.

Nutlets dull and granulate or tuberculate; stems prostrate or trailing. 14. *A. Chorisiana.*

Nutlets smooth and shining; stems erect. 15. *A. lithocarya.*

Scar broad, not linear.

Racemes prevailingly geminate and bractless; erect dichotomous plants of the northwest coast; corolla 4–9 mm. broad.

Pubescence fine and soft, mostly appressed. 16. *A. figurata.*

Pubescence spreading and more or less hispid. 17. *A. hirta.*

Racemes solitary and bracteate at least at base.

Stems with distinctly spreading hairs.

Nutlets less than 2 mm. long, transverse ridges on dorsal side prominent; scar lateral in a groove formed by ridges; racemes with 1 or 2 bracts near base. 18. *A. Cooperi.*

Nutlets 2–2.5 mm. long, with low transverse ridges on dorsal side; scar supra-basal, oblique, not sunken in a groove; racemes well-bracted. 19. *A. salsa.*

Stems strigose or appressed-hispidulous.

Scar of nutlet in an areole broader than long or areole wanting; nutlets often asymmetrical.

Corolla 2–5 mm. broad; plants mostly erect; calyx-lobes distinctly ferruginous.

Racemes rather dense, bracteate only at base, often geminate. 20. *A. granulata.*

Racemes loose, bracteate to the middle or above, simple. 21. *A. Scouleri.*

Corolla 1–2 mm. broad; plants mostly spreading; calyx-lobes little if at all ferruginous.

Scar ovate to triangular, with thick margins divergent; nutlets dull. 22. *A. cognata.*

Scar elongate, with thick knife-like erect or inflexed margins; nutlets glossy. 23. *A. Cusickii.*

Scar of nutlet in an areole longer than broad; nutlets symmetrical or nearly so.

Ventral keel not in a groove.

Corolla 3–7 mm. broad; racemes bractless or nearly so. 24. *A. tenera.*

Corolla 1–3 mm. broad; racemes bracteate more or less throughout.

Scar suprabasal or nearly basal, oblique to the ventral keel. 25. *A. bracteata.*

Scar distinctly lateral, parallel with the ventral keel or nearly so.

Scar linear-oblong; nutlets usually muriculate or minutely bristly. 26. *A. hispidula.*

Scar ovate or deltoid; nutlets not muriculate or bristly. 27. *A. trachycarpa.*

Ventral keel in a conspicuous groove at least below middle.

Nutlets with a thick bony pericarp, densely tuberculate and granulate. 28. *A. diffusa.*

Nutlets with a thin pericarp, tuberculate, or more commonly granulate. 29. *A. californica.*

1. **Allocarya móllis** (A. Gray) Greene. Downy Allocarya. Fig. 4222.

Eritrichium molle A. Gray, Proc. Amer. Acad. 19: 89. 1883.

Krynitzkia mollis A. Gray, op. cit. 20: 267. 1885.

Allocarya mollis Greene, Pittonia 1: 20. 1887.

Plagiobothrys mollis I. M. Johnston, Contr. Gray Herb. No. 68: 74. 1923.

Perennial with a fleshy taproot, soft villous-tomentous throughout; stems usually many, branched, 1–5 dm. long, ascending or trailing. Leaves numerous, opposite, linear or the lower linear-spatulate; racemes mostly solitary at the ends of the branches, naked or bracteate below; mature calyx 4–5 mm. long, lobes lanceolate; corolla 5–10 mm. broad; nutlets ovoid, about 1.5 mm. long, gray, median keel distinct only near apex but occasionally extending to middle, transverse ridges irregular, merging at their ends to form an indefinite lateral ridge or sometimes represented by tubercles; scar conspicuous, ovate or triangular.

Moist alkaline soils, Upper Sonoran and Arid Transition Zones; Klamath and Harney Counties, Oregon, south to Modoc and Sierra Counties, California, and adjacent Nevada. Type locality: "Sierra Valley, California, on alkaline wet flats and borders of ponds." June–Aug.

Allocarya mollis var. vestìta (Greene) Jepson, Fl. W. Mid. Calif. 442. 1901. (*Allocarya vestita* Greene, Erythea 3: 125. 1895; *Plagiobothrys mollis* var. *vestitus* I. M. Johnston, Contr. Gray Herb. No. 68: 75. 1923.) Plants more rank, usually decumbent; upper leaves alternate; racemes usually 2 at end of branches, bractless; nutlets brown, more or less reticulate, the interspaces longer, somewhat granulate, lateral keels not evident. Known only from a single collection by Congdon near Petaluma, Sonoma County, California.

2. **Allocarya scrípta** Greene. Scribe's Allocarya. Fig. 4223.

Allocarya scripta Greene, Pittonia 1: 142. 1887.

Plagiobothrys scriptus I. M. Johnston, Contr. Arnold Arb. No. 3: 27. 1932.

Branches prostrate, 1–2 dm. long or sometimes much reduced and shorter than the basal leaves, strigose. Leaves linear or narrowly oblanceolate, 5–20 mm. long, thinly strigose-hispidulose especially in the midvein and margins; spikes leafy-bracteate, pedicels reflexed; calyx accrescent, the lobes loosely erect, at length contorted; corolla 2 mm. broad; nutlets 2 mm. long, deltoid-ovoid, acute, the dorsal side with fine white keel and reticulations, beset with tufts of bristles, the areolae between large, dark-colored and finely papillate; ventral side with a high thin keel extending to the broad scar, this about one-fourth the length of nutlet and with a broad dorsal pit surrounded by a prominent border or margin.

A little-known species originally collected by Dr. Parry in 1887, locality not definitely known, and again at Ione, Amador County, *Eastwood, 1114*, and near La Grange, Stanislaus County, *Hoover 2053*. Mr. Hoover also found at La Grange a dwarf acaulescent form. March.

3. **Allocarya humistràta** Greene. Dwarf Allocarya. Fig. 4224.

Allocarya humistrata Greene, Pittonia 1: 16. 1887.

Plagiobothrys humistratus I. M. Johnston, Contr. Gray Herb. No. 68: 77. 1923.

Allocarya humistrata var. *similis* Jepson, Man. Fl. Pl. Calif. 853. 1925.

Allocarya limicola Piper, Contr. U.S. Nat. Herb. 22: 97. 1920.

Allocarya sigillata Piper, loc. cit.

Stems several from the base, mostly prostrate, rather stout, glabrous or sparsely puberulent. Leaves linear, 1–2 cm. long; spikes 5–10 cm. long, rather remotely flowered in age; fruiting pedicels stout, erect, or sometimes spreading or slightly deflexed; calyx accrescent in fruit and 6–10 mm. long, erect, sometimes all turned to one side forming a row; nutlets ovoid, sparsely short-bristly and tuberculate on the dorsal side, keeled on the ventral side and sparingly rugulose; scar ovate-deltoid, subbasal.

Low places especially in "hog wallows," Sonoran Zones; Livermore, Sacramento and San Joaquin Valleys. Type locality: Antioch, California. March–May.

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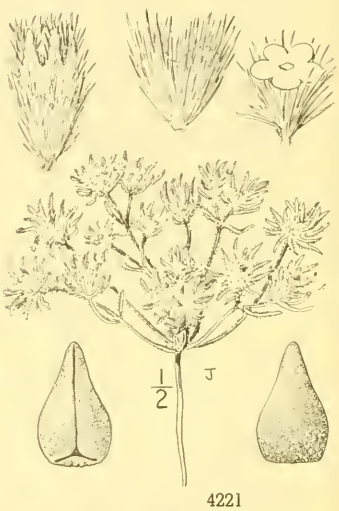

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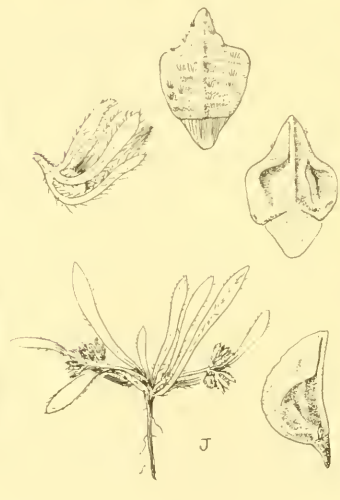

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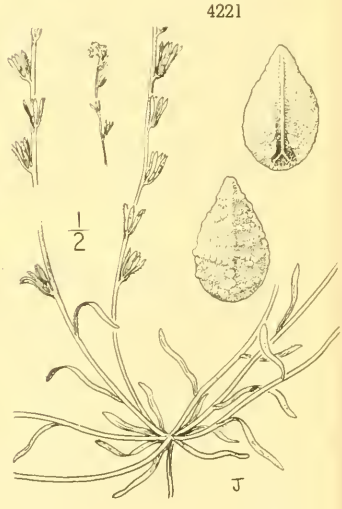

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4216. Hackelia mundula
4217. Hackelia velutina
4218. Hackelia nervosa

4219. Hackelia Sharsmithii
4220. Eritrichium elongatum
4221. Greeneocharis circumscissa

4222. Allocarya mollis
4223. Allocarya scripta
4224. Allocarya humistrata

4. **Allocarya stricta** Greene. Calistoga Allocarya. Fig. 4225.

Allocarya stricta Greene, Pittonia 2: 231. 1892.
Allocarya californica var. *stricta* Jepson, Fl. W. Mid. Calif. 443. 1901.
Plagiobothrys strictus I. M. Johnston, Contr. Gray Herb. No. 68: 78. 1923.

Annual, nearly or quite glabrous, somewhat succulent; stems simple or branched, 1–4 dm. high, branches strict, elongated, and usually dichotomous. Leaves glabrous or with a few short ascending hairs pustulate at base, linear, 3–9 cm. long; racemes solitary or commonly several, 3–15 cm.; mature calyx about 3 mm. long, usually rusty-strigose; corolla 4–5 mm. broad; nutlets ovoid, about 1.5 mm. long, median keel distinct to along the middle, angles slightly keeled, dorsal surface granulate and transversely ridged with more or less distinct rows of tubercles, ventral surfaces with approximate narrow diagonally transverse ridges; scar lateral, excavated, lanceolate, about one-third the length of the nutlet.

A well-marked endemic, found on alkaline flats near the sulphur springs, Calistoga, Napa County, California. March–June.

5. **Allocarya Greènei** (A. Gray) Greene. Greene's Allocarya. Fig. 4226.

Echinospermum Greenei A. Gray, Proc. Amer. Acad. 12: 163. 1877.
Allocarya Echinoglochin Greene, Pittonia 1: 15. 1887.
Allocarya Greenei Greene, Man. Bay. Reg. 259. 1894.
Plagiobothrys Greenei I. M. Johnston, Contr. Gray Herb. No. 68: 76. 1923.

Annual, stem simple or branched from near the base, ascending or spreading, 1–4 dm. long, herbage strigulose throughout except the glabrous or nearly glabrous upper surface of the leaves. Basal leaves linear or linear-spatulate, 1–6 cm. long, rather crowded but mostly withering before plant matures; stem-leaves few, the lower usually opposite the upper, alternate; racemes loose, 5–15 cm. long; lower flowers usually bracteate; mature calyx 3–7 mm. long, rather densely strigose; corolla 2.5–4 mm. broad; nutlets broadly ovoid, 2.5–3 mm. broad, constricted near the apex, armed along the keels and in the spaces between the firm subulate glochidiate prickles, transverse ridges absent; scar deep, broadly flanked, ovate or deltoid.

Gravelly or clay soils, especially on the bottom of desiccated winter pools, Upper Sonoran Zone; Rogue River Valley, Jackson County, Oregon, to Sonoma and San Joaquin Counties, California. Type locality: Yreka, Siskiyou County, California. March–May.

6. **Allocarya hystrícula** Piper. Bearded Allocarya. Fig. 4227.

Allocarya hystricula Piper, Contr. U.S. Nat Herb. 22: 87. 1920.
Allocarya Greenei var. *hystricula* Jepson, Man. Fl. Pl. Calif. 853. 1925.
Echinoglochin hystricula Brand, Rep. Spec. Nov. 21: 253. 1925.
Plagiobothrys hystriculus I. M. Johnston, Contr. Arnold Arb. No. 3: 32. 1932.

Slender annual with decumbent, sparsely strigose branches 3–4 dm. long, the branches often simple. Lower leaves linear to linear-oblanceolate, acute, 1–2 cm. long, strigose on both sides but more thinly on the upper; racemes elongated, loosely flowered, the lower flowers bracteate; corolla shorter than the calyx, about 1 mm. broad; calyx conspicuously bristly with ascending or somewhat appressed bristles, lobes strongly accrescent, becoming 5–6 mm. long; nutlets broadly ovoid, 2 mm. long, dorsal side obscurely ridged on the median line, densely covered with bristles, these armed their whole length with divaricate barbs and joined at their bases by ridges, interspaces granulate, ventral side keeled and obliquely rugulose but not bristly; scar sunken, ovate, half as long as the nutlet.

Grassy hillsides and plains, Upper Sonoran Zone; Solano County, California. Type locality: Montezuma Hills, Solano County. April–May.

7. **Allocarya acanthocárpa** Piper. Adobe Allocarya. Fig. 4228.

Allocarya acanthocarpa Piper, Contr. U.S. Nat. Herb. 22: 87. 1920.
Plagiobothrys Piperi I. M. Johnston, Contr. Gray Herb. No. 68: 75. 1923.
Plagiobothrys acanthocarpus I. M. Johnston, Contr. Arnold Arb. No. 3: 33. 1932.

Annual, herbage strigose; stems slender, usually branched below, spreading or erect, 1–4 dm. long, the branches simple or branched. Lower leaves linear to spatulate-linear, 2–6 cm. long; upper leaves and bracts linear to narrowly oblong; racemes bracted becoming loose and elongated; mature calyx 3–6 mm. long, in age often stellately spreading; corolla scarcely surpassing the calyx, 1–2.5 mm. broad; nutlets ovoid, mostly 1.5–2 mm. long, contracted toward the apex, dorsal side reticulate with thin ridges, keel and ridges armed with minutely barbed subulate spines, interspaces tuberculate; ventral side distinctly keeled from the large ovate or deltoid excavated scar, the sides bearing transverse ridges, keel and ridges unarmed.

Vernal pools and adobe flats, Sonoran Zones; Lower Sacramento Valley, San Joaquin Valley and lower South Coast Ranges south to San Diego County, California, and northern Lower California. Type locality: Caliente, Kern County, California. March–May.

The following species described by Piper (Contr. U.S. Nat. Herb. 22: 88–91. 1920.) are referable to this species: *Allocarya oligochacta, A. echinacea, A. Eastwoodiae, A. spiculifera, A. anaglyptica, A. papillata, A. microcarpa.*

8. **Allocarya Austíniae** Greene. Austin's Allocarya. Fig. 4229.

Allocarya Austiniae Greene, Pittonia 1: 18. 1887.
Allocarya cristata Piper, Contr. U.S. Nat. Herb. 22: 89. 1920.
Echinoglochin Austiniae Brand, Rep. Spec. Nov. 21: 253. 1925.
Allocarya Austiniae var. *cristata* Jepson, Man. Fl. Pl. Calif. 853. 1925.
Plagiobothrys Austiniae I. M. Johnston, Contr. Arnold Arb. No. 3: 36. 1932.
Allocarya Austiniae var. *nuda* Hoover, Leaflets West. Bot. 1: 228. 1936.

Stems branching from the base, the branches simple, erect or ascending above the decumbent base, about 1 dm. long, slender, strigose. Basal leaves tufted, linear, 2–3 cm. long, pustulate-setose on the margins and the midvein beneath, otherwise glabrous; stem-leaves usually only 1 or 2, strigose; raceme solitary and simple, about as long as the sterile portion of the stem, loosely flowered, only the lower flowers bracteate; pedicels densely strigose, the lower about 2 mm. long; corolla 1.5–2 mm. broad; calyx-lobes 4 mm. long in fruit, densely strigose-hirsute, and usually rufous at the tip, base of the tube about 3 mm. broad; nutlet about 3 mm. long, the body somewhat quadrate, abruptly narrowed into a beak-like tip about as long as the body, dorsal keel high and armed partly or throughout with stout spines or processes, the lateral angles also often similarly armed, the processes armed with coarse recurving hairs, ventral side prominently keeled and rugulose especially toward the base, also sometimes spiny; scar mostly triangular.

Usually in clay depressions, Upper Sonoran Zone; Redding, Shasta County, southward along the eastern side of the Sacramento Valley and the foothills of the Sierra Nevada to Stanislaus County, California. Type locality: Butte County. April–May.

9. **Allocarya glyptocárpa** Piper. Sculptured Allocarya. Fig. 4230.

Allocarya glyptocarpa Piper, Contr. U.S. Nat. Herb. 22: 80. 1920.
Glyptocaryopsis glyptocarpa Brand, Pflanzenreich 4^{252}: 104. 1931.
Plagiobothrys glyptocarpus I. M. Johnston, Contr. Arnold Arb. No. 3: 37. 1932.

Annual, stems branching from near the base, branches simple, slender, ascending, 1–5 dm. high, strigose. Lower leaves linear or narrowly spatulate, 4–8 cm. long; upper leaves oblanceolate to oblong-linear; racemes simple, loosely flowered, elongated, bracteate near the base; calyx-lobes becoming 3–5 mm. long; corolla 5–9 mm. broad; nutlets narrowly ovoid, about 2 mm. long, incurved, acute or constricted above and somewhat beaked; dorsal side prominently keeled, transverse ridges prominent but irregular, interspaces finely tuberculate, ventral side keeled down to the scar, the sides with prominent and approximately diagonal ridges; scar deeply excavated, narrowly triangular, nearly half as long as the nutlet.

Moist places, along streams, Upper Sonoran Zone; Jackson County, Oregon, to Lake and Butte Counties, California. Type locality: "Moist cultivated ground, eight miles north of Oroville," Butte County, California. March–June.

Allocarya glyptocarpa subsp. **modésta** (I. M. Johnston) Abrams. (*Plagiobothrys glyptocarpus* var. *modestus* I. M. Johnston, Contr. Arnold Arb. No. 3: 38. 1932.) Flowers small, corolla 2–3 mm. broad. Known only from the type locality: "in the yellow pine and oak belt, Cedar Crest near Grass Valley, Nevada County," California.

Allocarya distantiflòra Piper, Contr. U.S. Nat. Herb. 22: 91. 1920. (*Glyptocaryopsis distantiflora* Brand, Pflanzenreich 4^{252}: 105. 1931; *Plagiobothrys distantiflorus* I. M. Johnston, Contr. Arnold Arb. No. 3: 36. 1932.) Similar to *Plagiobothrys glyptocarpus* and probably not specifically distinct. Flowers smaller, barely exceeding the calyx and 1–2 mm. broad; nutlet ovoid, much-constricted above the middle, sharply angled, 1.5 mm. long, the dorsal side dentately keeled its entire length and coarsely transverse-rugulose, ventral side keeled from scar to apex. Collected at Madera, California, and known only from the type locality.

10. **Allocarya leptoclàda** Greene. Smooth-stemmed Allocarya. Fig. 4231.

Eritrichium californicum var. *subglochidiatum* A. Gray, Bot. Calif. 1: 526. 1876.
Allocarya leptoclada Greene, Pittonia 3: 109. 1896.
Allocarya orthocarpa Greene, op. cit. 4: 235. 1901.
Allocarya versicolor Brand, Rep. Spec. Nov. 19: 71. 1923.
Plagiobothrys leptocladus I. M. Johnston, Contr. Arnold Arb. No. 3: 38. 1932.

Stem branched from the base, the branches prostrate, 1–3 dm. long, straight, slender and somewhat wiry, thinly strigose, often floriferous nearly to the base. Leaves narrowly linear, the lower 3–10 cm. long, glabrous or nearly so above, thinly strigose beneath, the hairs mostly pustulate at base; racemes simple, becoming loosely flowered; mature calyx-lobes usually accrescent, 3–8 mm. long, barely 1 mm. wide, connivent or sometimes spreading, more or less definitely curved toward one side; corolla 1–2 mm. broad; nutlets narrowly to broadly lanceolate, acute; dorsal side keeled only above the middle, more or less obliquely or transversely rugose, smooth, granulate or penicillate-hairy; ventral side keeled down to the basal scar, this horizontal or slightly oblique, not surrounded by a ridge, but frequently with a downwardly directed dorsal flange.

In heavy, usually alkaline soils, Sonoran Zones; Sherman and Malheur Counties, eastern Oregon, to southern Idaho and northern Utah, and south in the central valleys of northern California and coastal valleys of southern California to northern Lower California. Type locality: Pine Creek, Eureka County, Nevada. March–July.

The following species described by Piper (Contr. U.S. Nat. Herb. 22: 92–96. 1920) are referable to this species: *A. oricola, A. divergens, A. Wilcoxii, A. tuberculata, A. charaxata.*

11. **Allocarya glàbra** (A. Gray) J. F. Macbride. Glabrous Allocarya. Fig. 4232.

Lithospermum glabrum A. Gray, Proc. Amer. Acad. 17: 227. 1882.
Allocarya salina Jepson, Fl. W. Mid. Calif. 442. 1901.
Allocarya glabra J. F. Macbride, Proc. Amer. Acad. 51: 543. 1916.
Plagiobothrys glaber I. M. Johnston, Contr. Gray Herb. No. 68: 77. 1923.

Stems erect, with stout erect branches from near the base, 1–2 dm. high, succulent, very sparsely strigillose. Lower leaves linear, 5–8 cm. long, upper ones linear-oblanceolate and shorter, glabrous above, sparsely pustulate and strigose below; racemes rather densely flowered, erect and somewhat fistulous, leaf-bracted at base, unilateral with the flowers somewhat 2-ranked; corolla about equaling the calyx-lobes, the limb about 1.5 mm. broad; fruiting calyx sessile, accrescent, 8–10 mm. long, the lobes united below with a tube about 2 mm. long, becoming firm by the indurated midrib; nutlets lanceolate, 2 mm. long, the body flattened and the apex attenuate and beak-like; dorsal side with a cauline keel and two rather definite lateral ones, also with a few transverse ridges mostly above the middle, tuberculate; ventral side keeled the whole length, weakly tuberculate; scar basal, circular, substipitate.

Salt marshes and alkaline flats, Upper Sonoran Zone; margin of San Francisco Bay in Alameda and Santa Clara Counties, and near Hollister, San Benito County. Type locality: "Apache Pass, S. Arizona, *Lemmon*, 1881." "Some misplacement of labels is to be suspected, for the form is common in the Alameda marsh lands, particularly about Mount Eden." K. Brandegee, Zoe 5: 94–95. 1901.

12. **Allocarya stipitàta** Greene. Stipitate Allocarya. Fig. 4233.

Allocarya stipitata Greene, Pittonia 1: 19. 1887.
Lappula stipitata Druce, Rep. Bot. Exch. Cl. Brit. Isles 5: 38. 1918.
Allocarya ambigens Piper, Contr. U.S. Nat. Herb. 22: 96. 1920.
Plagiobothrys stipitatus I. M. Johnston, Contr. Gray Herb. No. 68: 77. 1923.

Stems erect or ascending, 1–5 dm. high, branching at or above the base, somewhat succulent, yellowish green and shining, but very finely strigose. Basal leaves linear or narrowly spatulate, upper leaves similar but shorter; racemes at length elongated and rigidly erect and wiry, mostly unilateral, leafy-bracteate below; pedicels stout and strict; calyx accrescent, the base and lower part of lobes developing prominent indurated midribs; lobes lanceolate to linear, 5–8 mm. long, erect or spreading; corolla 5–12 mm. broad, well surpassing the calyx; nutlets lanceolate to narrowly ovoid, 1.5–2.5 mm. long, often constricted above into a short beak, straight or only slightly curved, rugose above the middle with oblique ridges, tuberculate below; ventral side keeled to the base, tuberculate or somewhat rugose; scar basal, small, sessile or obscurely stipitate.

Low places in heavy soils, Upper Sonoran Zone; Upper Rogue River Valley, Jackson County, Oregon, Sacramento Valley and surrounding foothills, also Sonoma, Napa, and (Hollister) San Benito Counties, California. Type locality: Sacramento Valley, California. March–June.

Allocarya stipitata subsp. micrántha Piper, Contr. U.S. Nat. Herb. 22: 94. 1920. (*Plagiobothrys stipitatus* var. *micranthus* I. M. Johnston, Contr. Arnold Arb. No. 3: 45. 1932.) Corolla 2.5 mm. broad, otherwise like the typical species. Moist places, Upper Sonoran and Arid Transition Zones; Harney County, Oregon; California, common in the Sacramento Valley, but with widely scattered stations throughout the state from Larsen and Lake Counties to Campo, San Diego County and the Sierra Nevada (Yosemite Valley and Giant Forest). Type locality: Stockton, California.

13. **Allocarya undulàta** Piper. Coast Allocarya. Fig. 4234.

Allocarya undulata Piper, Contr. U.S. Nat. Herb. 22: 104. 1920.
Allocarya inornata Piper, op. cit. 106.
Allocarya Chorisiana var. *undulata* Jepson, Man. Fl. Pl. Calif. 852. 1925.
Plagiobothrys undulatus I. M. Johnston, Contr. Arnold Arb. No. 3: 46. 1932.

Stems branching near the base, branches slender ascending or more or less sprawling in age, 1–3 dm. long. Lower leaves linear, 3–6 cm. long; racemes usually with a few scattered bracts, loosely flowered; calyx slightly accrescent, rather sparsely villous-hispidulous, lobes about 2 mm. long, lanceolate, erect; corolla 1.5–2 mm. broad; nutlets ovoid or lanceolate-ovoid, depressed, dorsal side keeled toward the apex and transversely rugose with crowded low undulate ridges, these becoming reduced to tubercles toward the base, finely granulate; ventral side keeled from the apex to scar, scar linear or nearly so, about one-fifth length of nutlet and lying in an elongate depression formed by low ridges paralleling it.

Moist adobe or dry soils in valleys and mesas near the coast, Transition and Upper Sonoran Zones; Marin County to San Diego County, California. Type locality: grain field near ocean, Santa Barbara. April–Aug.

14. **Allocarya Chorisiàna** (Cham.) Greene. Artist's Allocarya. Fig. 4235.

Myosotis Chorisiana Cham. Linnaea 4: 444. 1829.
Eritrichium Chorisianum A. DC. Prod. 10: 130. 1846.
Eritrichium connatifolium Kell. Proc. Calif. Acad. 2: 163. *fig. 51.* 1862.
Krynitzkia Chorisiana A. Gray, Proc. Amer. Acad. 20: 267. 1885.
Allocarya Chorisiana Greene, Pittonia 1: 13. 1887.

Stems usually trailing and simple up to the fourth or sixth pair of leaves, 1–4 dm. long, sparsely strigose; internodes usually elongated. Leaves linear, all opposite up to the flowering branches, the lowest ones connate at base; bracts subtending the lower flowers, broadly lanceolate; racemes loose and elongated in age; pedicels slender, 2–15 or rarely 30 mm. long, often spreading or recurved, strigose, especially so toward the apex; calyx about 4 mm. long, lobes lanceolate, ascending or erect, strigose; corolla showy, 6–10 mm. broad; nutlets ovoid, dorsal side keeled only toward the apex, transverse ridges irregularly scattered or somewhat reticulate,

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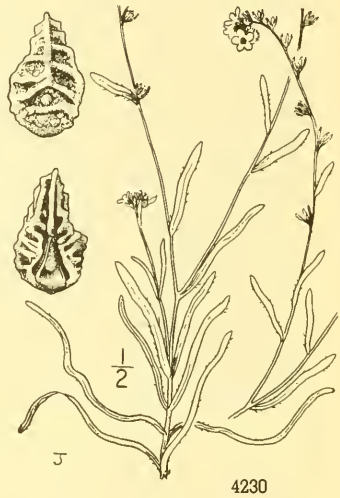

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4225. Allocarya stricta
4226. Allocarya Greenei
4227. Allocarya hystricula
4228. Allocarya acanthocarpa
4229. Allocarya Austiniae
4230. Allocarya glyptocarpa
4231. Allocarya leptoclada
4232. Allocarya glabra
4233. Allocarya stipitata

tuberculate, surface granulate; ventral side with the sides diagonally rugose, and forming a narrow longitudinal groove enclosing the thin keel and the knife-like attachment, both of about equal length.

Moist places and grassy slopes, Upper Sonoran Zone; San Francisco to Santa Cruz and inland to Crystal Lake, San Mateo County, California. Type locality: San Francisco. March–May.

This species was discovered in 1816 by botanists of the Romanzoff Expedition, and named for L. J. Choris, the artist of that famous expedition.

Allocarya Chorisiana var. **Hickmánii** Jepson, Man. Fl. Pl. Calif. 852. 1925. (*Allocarya Hickmanii* Greene, Pittonia 1: 13. 1887; *A. myriantha* Greene, Erythea 3: 125. 1895; *A. Jonesii* Brand, Rep. Spec. Nov. 18: 313. 1922; *Plagiobothrys Chorisianus* var. *Hickmanii* I. M. Johnston, Contr. Arnold Arb. No. 3: 49. 1932.) Stems branched from the base, prostrate, the lower internodes short; pedicels mostly shorter than the calyx; corolla 5–6 mm. broad. Pescadero, Santa Cruz County, south along the coast to northern San Luis Obispo County, California. Type locality: southern Monterey County.

15. **Allocarya lithocàrya** Greene. Sculptured Allocarya. Fig. 4236.

Krynitzkia lithocarya Greene ex A. Gray, Proc. Amer. Acad. 20: 265. 1885.

Allocarya lithocarya Greene, Pittonia 1: 12. 1887.

Plagiobothrys lithocaryus I. M. Johnston, Contr. Gray Herb. No. 68: 76. 1923.

Stems erect, simple or with a few ascending branches, strigose. Leaves linear, 1.5–3.5 cm. long, strigose on both sides; racemes loosely flowered in age, leafy-bracteate at least below; pedicels slender, the lowest often 5–10 mm. long; corolla 2 mm. broad, slightly exceeding the calyx; fruiting calyx-lobes about 4 mm. long; nutlets whitish, smooth and shining, ovoid, 2.5 mm. long, rounded and rather faintly keeled on the dorsal side, somewhat flattened on the ventral side, with the keel hidden, from above the middle downward, by a groove-like infolding of the lateral angles; scar linear, but similarly hidden by the folds.

A local endemic, Upper Sonoran Zone; near Lakeport, Lake County (*Curran*), and Potter Valley, eastern Mendocino County (*Purpus*). Type locality: Lakeport. April–May.

16. **Allocarya figuràta** Piper. Fragrant Allocarya. Fig. 4237.

Allocarya figurata Piper, Contr. U.S. Nat. Herb. 22: 101. 1920.

Plagiobothrys figuratus I. M. Johnston ex M. E. Peck, Man. Pl. Oregon 609. 1941.

Allocarya Scouleri and *Plagiobothrys Scouleri* of authors, but not as to synoptic type (*Myosotis Scouleri* Hook. & Arn.)

Stems erect, simple below or freely branched from the base, 1.5–4.5 dm. high, strigose. Lower leaves subulate-linear, 4–12 cm. long, the upper linear to linear-lanceoate, 1–5 cm. long, strigose; racemes mostly geminate, 5–20 cm. long in age, bractless or sometimes with a single bract at base; pedicels slender, 0.5–2 mm. long; calyx at maturity 3–5 mm. long, villous and more or less ferruginous; corolla showy, 4–8 mm. broad; nutlets ovoid, 1–1.5 mm. long, dorsal side keeled to about the middle and more or less reticulate-rugose, the keel and ridges usually tuberculate-dentate, the interspaces commonly granulate or minutely tuberculate; ventral side with a small lateral suprabasal ovate scar, and diagonal on either side of the thin keel.

Wet meadows and water courses, mostly Humid Transition Zone; Vancouver Island and western Washington to Curry and Jackson Counties, Oregon. Type locality: "Frye's Ranch, Illahe, Curry County, Oregon." April–July.

17. **Allocarya hírta** Greene. Rough Allocarya. Fig. 4238.

Allocarya hirta Greene, Pittonia 1: 161. 1888.

Allocarya Scouleri var. *hirta* Nels. & Macbr. Bot. Gaz. 61: 36. 1916.

Allocarya calycosa Piper, Contr. U.S. Nat. Herb. 22: 101. 1920.

Plagiobothrys Scouleri var. *hirtus* I. M. Johnston, Contr. Arnold Arb. No. 3: 52. 1932.

Plagiobothrys hirtus I. M. Johnston, Journ. Arnold Arb. 16: 193. 1935.

Annual with an erect stoutish stem, about 3 dm. high, usually simple below, glabrate below, setose-hirsute above, especially on the branches, with spreading hairs, branches ascending. Leaves of the main stem opposite, connate at base, linear, 2.5–4 cm. long, nearly or quite glabrous except for marginal setose, pustulate bristles, those of the branches mostly alternate and shorter, pustulate-setose throughout with no appressed pubescence; racemes in pairs terminating the branches, bractless; pedicels slender, 1–2 mm. long; calyx 4 mm. long in fruit, the lobes erect, densely setose-hirsute; corolla 5 mm. broad; nutlets ovoid, barely 2 mm. long, grayish brown, the dorsal side rounded, ridges inconspicuously reticulate, rather obscurely rugulose and tuberculate; ventral side rugulose and sparingly tuberculate, prominently keeled.

Boggy ground, Humid Transition Zone; Umpqua Valley, apparently very local in the vicinity of Drain. Type locality: "Umpqua Valley, Oregon, 25 June, 1887, Thomas Howell [no. 1227]." May–July.

Allocarya hirta subsp. corallicárpa (Piper) Abrams. (*Allocarya corallicarpa* Piper, Proc. Biol. Soc. Wash. 37: 93. 1924; *Plagiobothrys Scouleri* var. *corallicarpus* I. M. Johnston, Contr. Arnold Arb. No. 3: 52. 1932; *P. hirtus* var. *corallicarpus* I. M. Johnston, Journ. Arnold Arb. 16: 193. 1935.) Nutlets deeply and irregularly alveolate with conspicuous high thin ridges and papillae. Upper Rogue River Valley, Jackson and Josephine Counties, Oregon. Type locality: Grants Pass, Oregon.

18. Allocarya Coòperi Greene. Cooper's Allocarya. Fig. 4239.

Eritrichium Cooperi A. Gray, Proc. Amer. Acad. 19: 89. 1883.
Krynitzkia Cooperi A. Gray, op. cit. 20: 267. 1885.
Allocarya Cooperi Greene, Pittonia 1: 19. 1887.
Plagiobothrys Parishii I. M. Johnston, Contr. Gray Herb. No. 68: 78. 1923.

Stems densely branched from the base, prostrate, slender, 5–30 cm. long, hispidulous with whitish spreading hairs. Leaves linear or the upper oblong, 2–4 mm. broad; racemes becoming loose and slender, 3–10 cm. long, usually with 1 to few bracts below the middle; pedicels slender, 1–2 mm. long or the lowest sometimes longer; mature calyx tending to be deciduous, 2–3 mm. long, hispidulous with ascending hairs; corolla white with yellow throat, 3–5 mm. broad; nutlets about 1.5 mm. long, the axial one often a little larger and duller than the others, ovoid to broadly lanceolate, rather abruptly acute at apex; dorsal side keeled near the apex, strongly rugulose with transverse ridges, then sometimes reduced to tubercles toward the base; ventral side reticulate-rugulose; scar of the axial nutlet triangular-ovate, the other nutlets with a linear or nearly linear scar.

Wet alkaline soils, about desert springs, Sonoran Zones; Owens Valley, Inyo County, and western Mojave Desert (Rabbit Springs, Lovejoy Springs and Camp Cady), California. Type locality: Camp Cady, between Dagget and the Mojave Sink. March–June.

19. Allocarya sálsa Brandg. Salty Allocarya. Fig. 4240.

Allocarya salsa Brandg. Bot. Gaz. 27: 452. 1899.
Allocarya jucunda Piper, Bull. Torrey Club 29: 643. 1902.
Allocarya Cusickii var. *jucunda* Nels. & Macbr. Bot. Gaz. 61: 36. 1916.
Plagiobothrys salsus I. M. Johnston, Contr. Gray Herb. No. 68: 78. 1923.

Stems branched from or near the base, erect or ascending, 6–16 cm. long, glabrate or sparsely hirsute. Leaves linear to narrowly oblong-oblanceolate, 3–6 cm. long, bristly ciliate on the margins and sometimes sparsely pustulate-hirsute on the upper surface, especially near the apex; racemes leafy-bracted, loosely flowered; calyx subsessile, 4–5 mm. long, bristly hirsute, strongly ridged at base; corolla 3–4 mm. broad; nutlets lanceolate, 2–2.5 mm. long; dorsal side rugulose with transverse ridges above the middle, granulated below the middle but without ridges; keel on ventral side low, vein-like, extending to the small ovate-lanceolate basal scar, the sides with a few indistinct ascending lines.

Soda springs or alkaline ridges and marshes, Upper Sonoran Zone; Lake, Harney, and Malheur Counties, southeastern Oregon south to Nevada. Type locality: "Alkaline soil, Twin springs, Nevada." May–July.

Allocarya lamprocárpa Piper, Proc. Biol. Soc. Wash. 37: 94. 1924. (*Plagiobothrys lamprocarpus* I. M. Johnston, Contr. Arnold Arb. No. 3: 56. 1932.) Stems erect, 1–3 dm. high, strigose. Leaves pustulate and appressed-hispidulous beneath, glabrate above; racemes unilateral, slender, bracteate toward the base; pedicels less than 1 mm. long; mature calyx setulous, thickened at base; lobes narrowly lanceolate, 1–2 mm. long, erect or ascending; nutlet solitary, glossy, broadly ovoid and somewhat plano-convex, incurved and somewhat contracted at apex, oblique and hollowed at base, dorsal side broadly keeled to the middle and with low, broad transverse ridges, ventral side with the lower half of the keel seated in a deep grove; scar small, concave, triangular-ovate. A local species known only from the type locality: "in moist places in an old road," Grants Pass, Josephine County, Oregon.

20. Allocarya granulàta Piper. Oregon Allocarya. Fig. 4241.

Allocarya granulata Piper, Contr. U.S. Nat. Herb. 22: 109. 1920.
Allocarya fragilis Brand, Rep. Spec. Nov. 18: 312. 1922.
Plagiobothrys granulatus I. M. Johnston, Contr. Arnold Arb. No. 3: 57. 1932.

Stems erect, 1–3 dm. high, branching from near the base, the branches strict or ascending, often re-branched, more or less strigose. Leaves appressed-hispidulous to glabrate, the lower linear, 3–7 cm. long; racemes slender, usually solitary, rather closely flowered, only the lowest flowers bracteate; pedicels 1 mm. or less in length, erect or ascending; mature calyx appressed-hispidulous, 2.5–3 mm. long, linear or nearly so, erect or nearly so, the tips ferruginous; corolla 2–3.5 mm. broad; nutlet ovoid to narrowly so, about 1.5 mm. long, dorsal side with transverse ridges and a medial keel, granulate to tuberculate and sometimes somewhat muricate; ventral side broadly angulate, dorso-ventrally rounded at base; scar suprabasal, small, ovate, and oblique or nearly lateral.

Low moist ground, Humid Transition Zone; Chehalis and Pierce Counties to Klickitat County, Washington, and Willamette Valley, Oregon. Type locality: Salem, Oregon. May–Aug.

21. Allocarya Scoùleri (Hook. & Arn.) Greene. Scouler's Allocarya. Fig. 4242.

Myosotis Scouleri Hook. & Arn. Bot. Beechey 370. 1840.
Allocarya Scouleri Greene, Pittonia 1: 18, as to synoptic type. 1887.
Allocarya media Piper, Contr. U.S. Nat. Herb. 22: 107. 1920.
Allocarya divaricata Piper, loc. cit.
Plagiobothrys medius I. M. Johnston, Contr. Arnold Arb. No. 3: 58. 1932.
Plagiobothrys Scouleri I. M. Johnston, Journ. Arnold Arb. 16: 192. 1935.

Stems branched at base, slender, strigose, 1–3 dm. long, erect or ascending. Leaves strigose beneath, sparingly so or glabrous above, the lower linear, the upper linear to linear-oblanceolate; racemes simple, loosely flowered, bracted to about the middle; pedicels about 1 mm. long, or the lowest sometimes 5–10 mm. long; calyx appressed-hispidulous, usually ferruginous at apex when young; mature lobes 3–4 or rarely 5 mm. long, linear-lanceolate, erect or ascending;

nutlets ovoid or lanceolate-ovoid, 1.5–2 mm. long; dorsal side finely granulate, keeled toward the apex, ridges evident or obscure, more or less diagonal and frequently anastomosing, toward the base more or less reduced to tubercles, interspaces sparsely tuberculate; ventral side keeled almost to base, with or without ridges or wrinkles; scar ovate to elliptic, suprabasal, or on the oblique basal portion of nutlet.

Wet places, Humid Transition Zone; Vancouver Island, and the Olympic Peninsula, Washington. Type locality: "N.W. Coast, Dr. Scouler." May–July.

22. **Allocarya cognàta** Greene. Cognate Allocarya. Fig. 4243.

Allocarya cognata Greene, Pittonia, **4**: 235. 1901.

Allocarya microcalyx Brand, Rep. Spec. Nov. 19: 71. 1923.

Allocarya filicaulis Brand, op. cit. 72.

Plagiobothrys cognatus I. M. Johnston, Contr. Arnold Arb. No. 3: 59. 1932.

Stems usually branched at base, erect or spreading, 5–25 cm. long, rather finely appressed-pubescent or strigose. Leaves strigose and pustulate beneath, less so or glabrate above, the lower 2–7 cm. long, the upper shorter, often linear-spatulate; racemes simple, slender, usually loosely flowered, bracteate throughout or usually only below the middle; pedicels 1 mm. long or often less, erect or ascending; corolla 1–2 mm. broad; nutlets oblong-ovoid to broadly ovoid, about 1.5–2 mm. long, somewhat constricted and acute at apex, obtuse or rounded at base; dorsal side keeled down to about the middle or below, with irregular transverse ridges, these often reduced to scattered tuberculations or entirely absent toward the base, surface finely granulated or sometimes with glochidiate bristles; ventral side keeled down to the basal ovate scar, the sides diagonally ridged or wrinkled, especially above the middle.

Damp flats or borders of meadows, often in alkaline soils, Upper Sonoran and Arid Transition Zones; northeastern Washington and Idaho southeast of the Cascades, through eastern Oregon to the Sierra Nevada, central California, Nevada, Utah and northern Arizona. Type locality: Cache Valley, Utah. June–Aug.

23. **Allocarya Cusíckii** Greene. Cusick's Allocarya. Fig. 4244.

Allocarya Cusickii Greene, Pittonia **1**: 17. 1887.

Allocarya ambigens Piper, Contr. U.S. Nat. Herb. **22**: 96. 1920.

Allocarya insculpta Piper, op. cit. 109.

Plagiobothrys Cusickii I. M. Johnston, Contr. Arnold Arb. **3**: 63. 1932.

Stems branched from the base, slender, prostrate or ascending, 5–20 cm. long, sparsely strigose. Leaves strigose beneath, the hairs pustulate at base, upper surfaces nearly or quite glabrous, the hairs often more abundant and more spreading on the margins, lower linear, 3–10 cm. long, upper shorter, linear to lanceolate; racemes solitary, slender, loosely or sometimes densely flowered, bracteate at least below the middle; pedicels 1 mm. long or less, slender; calyx finely appressed-hispidulous, only slightly accrescent in age; lobes linear or linear-lanceolate, 1.5–4 mm. long, erect or ascending; corolla 1–1.5 mm. broad; nutlets lanceolate to oblong-ovoid, 1–2 mm. long, usually abruptly angled at base; dorsal surface glossy, not granulate, keeled near the apex, with irregular more or less oblique ridges, tuberculate in the interspaces and toward the base; ventral side keeled to well below the middle, oblique toward the base and bearing the deep small scar; axial nutlet firmly attached with a broad ovate or deltoid scar.

Alkaline soils, Arid Transition and Upper Sonoran Zones; east of the Cascades in Washington and Oregon to northeastern California, east to Idaho and Nevada. Type locality: "Union County, Oregon" and "Reno, Nevada." May–Aug.

24. **Allocarya ténera** Greene. Slender Allocarya. Fig. 4245.

Allocarya tenera Greene, Pittonia **3**: 109. 1896.

Allocarya gracilis Piper, Contr. U.S. Nat. Herb. **22**: 98. 1920.

Plagiobothrys tener I. M. Johnston, Contr. Arnold Arb. No. 3: 66. 1932.

Allocarya hispidula var. *tenera* Jepson, Fl. Calif. **3**: 365. 1943.

Stems branching from the base, spreading or ascending, very slender, 6–15 cm. high, sparsely and inconspicuously strigose. Basal leaves narrowly linear-oblanceolate, about 2 cm. long, 1–2 mm. broad, sparsely pustulate-setulous on the margins and midvein, stem-leaves few, narrowly linear, 5–15 mm. long; racemes bractless or bracteate only at base; pedicels, at least the lower, slender, 1–2 mm. long; corolla 3–7 mm. broad; fruiting calyx-tube distinctly 4-ribbed, the lobes erect, 1.5 mm. long, narrowly linear-lanceolate or the margins involute, strigose; nutlets ovoid about 1 mm. long, reticulate-rugulose, the ridges thin and tuberculate-roughened on the margins; interspaces finely tuberculate, ventral side diagonally rugulose, keeled above the scar, this lanceolate-ovate, extending from the base almost to the middle of the nutlet.

Wet places, mostly Upper Sonoran and Arid Transition Zones; Modoc and Shasta Counties south in the North Coast Ranges to Lake County, California. Type locality: Adams Springs, Lake County, California. May–July.

Also referable to this species are: *Allocarya laxa* Piper, Contr. U.S. Nat Herb. **22**: 98. 1920; *A. pratensis* Piper, op. cit. 99; *A. vallata* Piper, op. cit. 101; *A. scalpocarpa* Piper, op. cit. 111.

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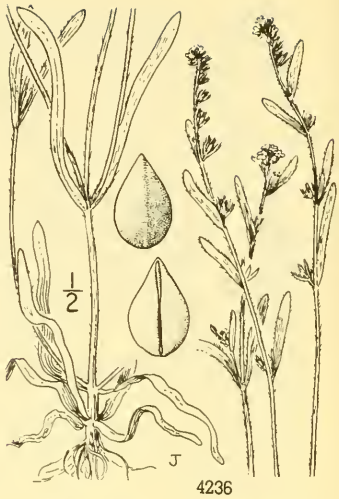

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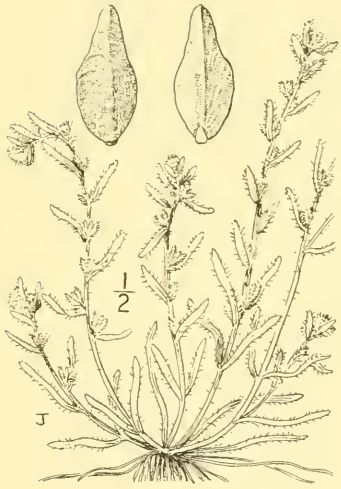

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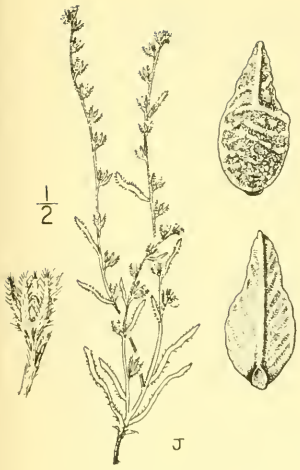
4234. Allocarya undulata
4235. Allocarya Chorisiana
4236. Allocarya lithocarya

4237. Allocarya figurata
4238. Allocarya hirta
4239. Allocarya Cooperi

4240. Allocarya salsa
4241. Allocarya granulata
4242. Allocarya Scouleri



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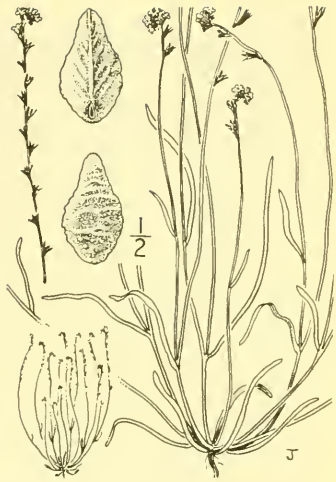

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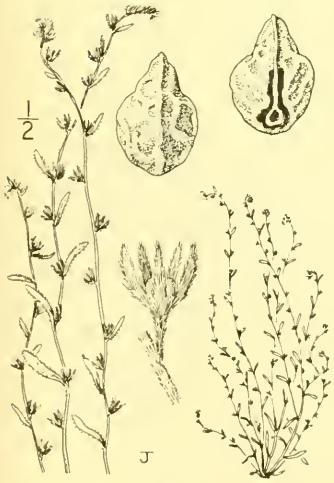

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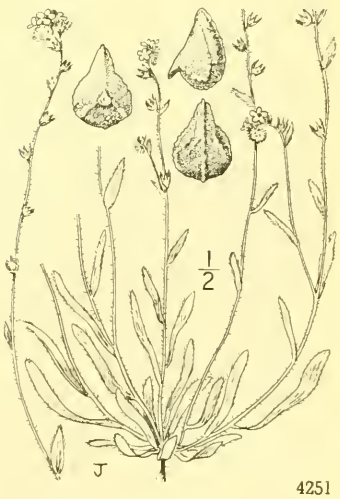


4251

4243. Allocarya cognata
4244. Allocarya Cusickii
4245. Allocarya tenera
4246. Allocarya bracteata
4247. Allocarya hispidula
4248. Allocarya trachycarpa
4249. Allocarya diffusa
4250. Allocarya californica
4251. Echidiocarya californica

25. Allocarya bracteàta Howell. Bracted Allocarya. Fig. 4246.

Allocarya bracteata Howell, Fl. N.W. Amer. 481. 1901.
Allocarya Leibergii Piper, Contr. U.S. Nat. Herb. 22: 95. 1920.
Allocarya conjuncta Piper, op. cit. 109.
Allocarya commixta Brand, Rep. Spec. Nov. 18: 312. 1922.
Allocarya Piperi Brand, op. cit. 19: 70. 1923.
Allocarya aculeolata Piper, Proc. Biol. Soc. Wash. 37: 94. 1924.
Allocarya charaxata var. *debilis* Brand, Pflanzenreich 4^{252}: 165. 1931.
Plagiobothrys bracteatus I. M. Johnston, Contr. Arnold Arb. No. 3: 68. 1932.
Allocarya Cusickii var. *vallicola* Jepson, Fl. Calif. 3: 364. 1943.
Allocarya Cusickii var. *debilis* Jepson, loc. cit.

Stems branched from the base, decumbent or ascending, rarely erect, 1–4 dm. long, usually rather thinly strigose. Lower leaves linear, the lower 4–10 cm. long, the upper linear or linear-oblanceolate; racemes slender and elongated in age, bracteate below; pedicels about 1 mm. long or the lowermost longer, ascending; calyx more or less accrescent; lobes lanceolate, 2–4 mm. long, ascending; corolla 1–3 mm. broad; nutlets 2 mm. or less long, oblong-ovoid; dorsal side somewhat keeled above the middle, the surface granulate, the sides with somewhat oblique transverse ridges or wrinkles, these below the middle becoming more or less obscure and often replaced by tuberculations, interspaces narrow and sparsely or not at all tuberculate; ventral side keeled to well below the middle; scar small, oblique or almost basal, ovate to elliptic or cuneate, concave, surrounded by an irregular ridge.

Dry beds of pools and ditches, Upper Sonoran and Transition Zones; Douglas County, Oregon, southward west of the Cascades and the Sierra Nevada to northern Lower California. A common and variable species. Type locality: "In wet places, Umpqua Valley Oregon." April–June.

26. Allocarya hispídula Greene. Harsh Allocarya. Fig. 4247.

Allocarya hispidula Greene, Pittonia 1: 17. 1887.
Allocarya penicillata Greene, op. cit. 18.
Plagiobothrys hispidulus I. M. Johnston, Contr. Arnold Arb. No. 3: 71. 1932.

Stems branching from the base, prostrate or loosely ascending, 5–40 cm. long, strigose. Leaves appressed-hispidulous, the hairs somewhat pustulate, the upper surface sometimes glabrate; lower linear, the upper linear or linear-oblanceolate; racemes slender, usually elongated and loosely flowered in age, leafy-bracted at least to the middle; pedicels 1 mm. long or the lowermost sometimes 5–10 mm. long; calyx more or less accrescent in age, strigose or appressed-hispidulous; lobes linear to narrowly lanceolate, 2–3 mm. long, rarely less, ascending; corolla 1–2 mm. broad; nutlets 1.5–2 mm. long, ovoid to ovoid-lanceolate, abruptly rounded and somewhat angulate at base; dorsal side keeled above the middle, rather closely and obliquely transverse-ridged, the ridges often anastomosing, both the keel and the ridges often muriculate and frequently dentate with papillae, or with minute hyaline more or less branched hairs, lateral angles keeled; ventral side keeled and angulate to below the middle; scar linear-oblong, lateral usually concave, encircled by a ridge.

Moist meadows or flats, Canadian and Transition Zones; Washington mostly east of the Cascades to Idaho, south to Oregon both west and east of the Cascades, and California in the North Coast Ranges and Sierra Nevada to the San Bernardino Mountains, California. June–Aug.

Other proposed species referable here are: *Allocarya cryocarpa* Piper, Contr. U.S. Nat. Herb. 22: 98. 1920; *A. cervina* and *A. ramosa* Piper, op. cit. 100; *A. nigra* Brand, Rep. Spec. Nov. 19: 71. 1923.

27. Allocarya trachycárpa (A. Gray) Greene. Rough-fruited Allocarya. Fig. 4248.

Krynitzkia trachycarpa A. Gray, Proc. Amer. Acad. 20: 266. 1885.
Allocarya trachycarpa Greene, Pittonia 1: 14. 1887.
Allocarya interrasilis Piper, Contr. U.S. Nat. Herb. 22: 108. 1920.
Plagiobothrys trachycarpus I. M. Johnston, Contr. Gray Herb. No. 68: 78. 1923.

Stems much-branched at the base, prostrate or laxly ascending, strigose, 5–45 cm. long. Basal leaves linear, 5–10 cm. long, the upper oblanceolate to linear-oblanceolate, 1–2 cm. long; strigose-hispidulous below and on the margin, glabrate above; racemes becoming very loosely flowered, bracteate throughout with foliaceous bracts; pedicels 1 mm. long or less, ascending; mature calyx more or less accrescent, strigose; lobes linear to linear-lanceolate, 1.5–3 mm. long, ascending or somewhat spreading, usually rusty-pubescent at tip; corolla 1–2.5 mm. broad; nutlets ovoid and somewhat angulate, about 2 mm. long; dorsal side distinctly keeled to the middle or beyond, also keeled on the angles, transverse ridges more or less parallel, narrow and frequently tuberculate or papillate-dentate, interspaces usually broad and tuberculate; ventral side with a prominent keel; scar distinct, lateral, broad and much-expanded, concave, surrounded by a prominent ridge.

Meadows and desiccated lands, Upper Sonoran Zone; California Coast Ranges from Contra Costa and San Joaquin Counties to Los Angeles County. Type locality: probably near Walnut Creek, Contra Costa County, according to Johnston (Contr. Arnold Arb. No. 3: 76. 1932.) May–July.

28. Allocarya diffùsa Greene. Diffuse Allocarya. Fig. 4249.

Allocarya diffusa Greene, Pittonia 1: 14. 1887.
Plagiobothrys diffusus I. M. Johnston, Contr. Arnold Arb. No. 3: 77. 1932.

Very closely resembling *A. trachycarpa* in habit, and differing only in its nutlets, these

broadly ovoid, about 1.5 mm. long and 1 mm. broad; dorsal side conspicuously convex, keeled to the middle or lower, ridges somewhat irregular and reticulately joined, interspaces small and distinctly tuberculate; ventral side with the prominent ridge surrounding the scar prolonged upward along the keel forming a groove for the latter up the middle; scar lateral with the expanded margins strongly upturned, thus appearing narrow and deeply convex.

Heavy soils in the vicinity of Mountain Lake in the Presidio, San Francisco. A local endemic closely related to *A. trachycarpa* and *A. Californica*. April–June.

29. **Allocarya califórnica** (Fisch. & Mey.) Greene. California Allocarya. Fig. 4250.

Myosotis californica Fisch. & Mey. Ind. Sem. Hort. Petrop. 2: 42. 1835.
Allocarya californica Greene, Pittonia 1: 20. 1887.
Allocarya scalpta Piper, Contr. U.S. Nat. Herb. 22: 104. 1920.
Allocarya areolata Piper, op. cit. 105.
Allocarya reticulata Piper, loc. cit.
Allocarya dispar Piper, op. cit. 109.
Plagiobothrys reticulatus var. *rossianorum* I. M. Johnston, Contr. Arnold Arb. No. 3: 79. 1932.

Stems usually much-branched at base, slender, decumbent or spreading, 1–3 dm. long, strigose. Leaves appressed-hispidulous, lower linear to linear-spatulate, upper narrowly oblong or somewhat oblong-oblanceolate; racemes slender, simple, elongated in age, leafy-bracteate toward the base; calyx appressed-hispidulous; lobes linear to lanceolate, 2.5–4 mm. long; corolla 1.5–3 mm. broad; nutlets ovoid, 0.6–1 mm. long and half as broad; dorsal side convex, keeled only near the apex, ridges low and rounded, anastomosing, the interspaces thickly and finely granulate, tubercles wanting or sparse and obscure; ventral side strongly keeled; scar small, elliptic to ovate, concave, ridge surrounding it with the ends prolonged above it, forming distinct ridges along either side of the keel to about the middle.

Damp depressions, Humid Transition Zone; coastal valleys from Coos Bay, Oregon, to Marin County, California. Type locality: Fort Ross, Sonoma County, California. May–July.

Allocarya californica var. minùta (Piper) Jepson & Hoover in Jepson, Fl. Calif. 3: 363. 1943. (*Allocarya minuta* Piper, Contr. U.S. Nat. Herb. 22: 104. 1920.) Stems 1 to several, erect, simple or branched; calyx 1.5–2 mm. long; corolla 3.5–4 mm. broad; nutlets smaller, 1 mm. long or less, finely and sparsely granulate in the interspaces. Humboldt Bay region, California. Type locality: Fort Seward, Humboldt County, California.

18. **ECHIDIOCÀRYA** A. Gray in Benth. & Hook. Gen. Pl. 2: 854. 1876.

Annual, usually diffusely branched herbs with the lowest leaves opposite, the others alternate. Flowers in slender spikes, bracteate or the upper bractless. Calyx parted to the base or nearly so, the lobes linear-lanceolate. Corolla white, the throat not crested. Nutlets 4, incurved, rugulose-muriculate dorsally, conspicuously keeled ventrally; scar elevated on a prominent cylindrical stipe. [Name Greek, meaning a diminutive viper and nutlet, in reference to the peculiar shape of the stipe.]

A genus of three species, two in southwestern United States and adjacent Mexico, and one in Chile. Type species, *Echidiocarya californica* A. Gray.

1. **Echidiocarya califórnica** A. Gray. California Echidiocarya. Fig. 4251.

Echidiocarya californica A. Gray, Proc. Amer. Acad. 12: 164. 1877.
Plagiobothrys Cooperi A. Gray, op. cit. 20: 285. 1885.
Plagiobothrys californicus Greene, Bull. Calif. Acad. 2: 407. 1887.
Plagiobothrys allocaryoides Brand ex Fedde, Rep. Spec. Nov. 20: 47. 1924.
Allocaryastrum californicum Brand, Pflanzenreich 4^{252}: 100. 1931.

Stems several to many from the base, decumbent or prostrate, slender, 1–4 dm. long, often diffusely branched, hirsute with spreading hairs. Leaves often numerous below, the lower oblanceolate, 1–2 cm. long, 2–5 mm. wide, rounded or obtuse at apex, rather thinly hirsute with ascending hairs or sometimes canescent with an appressed pubescence; upper stem-leaves and lower floral bracts mostly lanceolate or linear-lanceolate or sometimes narrowly oblong; spikes slender, at length elongated and remotely flowered, often bractless above the middle; calyx 3 mm. long in fruit, lobed to the base, the lobes linear-lanceolate, hirsute and sparingly hispid; corolla 4–6 mm. broad; nutlets usually 4, ovoid, 1.5 mm. long; dorsal keel thin above, reduced to a mere line and fading out a little below the middle of the nutlet, rugae irregular, raised and thin or reduced to lines, often muriculate; scar a short stipe near the base of the akene, the ventral surface sharply angled with a thin median keel.

Grassy slopes and mesas, Upper Sonoran Zone; South Coast Ranges at Vancouver Pinnacles, San Benito County and Estrella, San Luis Obispo County; Pampa, Kern County, and in cismontane southern California from Santa Barbara and San Bernardino Counties south to San Diego County, California. Type locality: "San Bernardino Co." Feb.–May.

Echidiocarya californica subsp. grácilis (Brand) Abrams. (*Plagiobothrys californicus* var. *gracilis* I. M. Johnston, Contr. Gray Herb. No. 68: 73. 1923; *Allocaryastrum gracile* Brand, Pflanzenreich 4^{252}: 100. 1931.) Stems very slender, hispidulous with spreading hairs; leaves linear-lanceolate, 2–2.5 mm. wide, acute or acutish; calyx-lobes very narrow; corolla 1.5–2 mm. broad; nutlets 1–1.5 mm. long. Vicinity of San Diego south to northern Lower California; and on the following Channel Islands: Santa Cruz, San Clemente and Santa Catalina. Type locality: San Diego.

Echidiocarya californica subsp. fulvéscens (Brand) Abrams. (*Plagiobothrys californicus* var. *fulvescens* I. M. Johnston, Contr. Gray Herb. No. 68: 74. 1923; *Allocaryastrum ursinum* var. *fulvescens* Brand, Pflanzen-

reich 4[252]: 101. 1931.) Stems slender, elongated, prostrate, herbage short hispid-pubescent when young; leaves oblanceolate, 3–5 mm. wide; spikes very slender, elongated and remotely flowered; corolla about 2 mm. broad. Mostly in foothills and mountains near the coast from the Santa Ynez Mountains, Santa Barbara County to northern Lower California; also on Santa Rosa, Santa Catalina and Anacapa Islands. Type locality: Santa Barbara, California.

Echidiocarya californica var. ursina Jepson, Fl. Calif. 3: 370. 1943. (*Echidiocarya ursina* A. Gray, Proc. Amer. Acad. 19: 90. 1883; *Plagiobothrys californicus* var. *ursinus* I. M. Johnston, Contr. Gray Herb. No. 68: 74. 1923.) Dense and compact with stout much-branched stems 2–8 cm. long; spikes short; flowers concealed by the leaves and bracts; corolla 1.5–2 mm. broad. Sandy or gravelly soils, San Bernardino and San Jacinto Mountains, southern California. Type locality: Bear Valley, San Bernardino Mountains.

19. PLAGIOBÓTHRYS Fisch. & Mey. Ind. Sem. Hort. Petrop. 2: 46. 1835.

Slender, glabrate or mostly soft-pubescent, annual or perennial herbs. Leaves mostly linear or linear-lanceolate, alternate above and either opposite at base or forming a rosette. Flowers in bractless or bracteate spike-like racemes, the racemes more or less scorpioid and usually elongated in fruit. Pedicels persistent, short or sometimes almost obsolete. Corolla small, white, salverform, with crests or processes at the mouth of the throat. Nutlets narrowly to broadly ovoid, erect or incurved.

A genus of about 50 species, mainly inhabiting western United States and Chile. Type species, *Plagiobothrys rufescens* Fisch. & Mey.

Caruncle of nutlet elongated, extending along the crest of the ventral keel; nutlets trigonous. I. *Amsinckiopsis.*

Caruncle of nutlet orbicular or nearly so, sunken in transverse groove at base of ventral keel.

Inflorescence glomerate; caruncle at or above the middle of the nutlet; basal leaves not persisting in fruit; caruncle fragile. II. *Sonnea.*

Inflorescence racemose and elongate in age; basal leaves forming a persistent rosette; caruncle cartilaginous. III. *Euplagiobothrys.*

I. *Amsinckiopsis.*

Corolla 4–7 mm. broad; nutlets irregularly rugose. 1. *P. Kingii.*

Corolla 1–2.5 mm. broad; nutlets conspicuously tessellate. 2. *P. Jonesii.*

II. *Sonnea.*

Represented by a single species. 3. *P. hispidus.*

III. *Euplagiobothrys.*

Calyx circumscissile, in age less than 4 mm. long; lobes usually connivent over fruit; nutlets usually only 1 or 2 maturing; midrib and margin of leaves purple-stained.

Flowers in a simple bracteate raceme; corolla 3 mm. broad; nutlets strongly arched in lateral outline. 4. *P. arizonicus.*

Flowers in usually furcate-branched racemes, bracts wanting or sometimes 1 or 2 at base of racemes; nutlets not strongly arched in lateral outline. 5. *P. nothofulvus.*

Calyx not circumscissile or if so strongly accrescent and over 4 mm. long, erect or spreading; mature nutlets usually 4.

Bristles of calyx-lobes uncinate. 6. *P. uncinatus.*

Bristles of calyx-lobes not uncinate.

Nutlets with a conspicuous annular caruncle, 2.3–3.3 mm. long; corolla-tube longer than calyx; not purple-stained.

Racemes bractless; areolae on dorsal surface of nutlet regular and rectangular, and dorsal keel not winged. 7. *P. campestris.*

Racemes bracteate; dorsal side of nutlet not areolate, or rugose-curved or interrupted forming irregular areolae. 8. *P. infectivus.*

Nutlets with a solid caruncle, less than 2.3 mm. long.

Transverse dorsal rugae of nutlets very thin and sharp, enclosing polygonal granulate areolae. 9. *P. canescens.*

Transverse dorsal rugae low and broad, separated by shallow lineate grooves.

Nutlets ovoid, usually constricted only at apex, the base rounded or sometimes slightly constricted; plant conspicuously purple-stained. 10. *P. Torreyi.*

Nutlets cruciform, being abruptly and equally constricted at apex and base, shining; plants little or not at all purple-stained.

Spikes bracteate; calyx nearly as broad as long; stems 1 or few from the base, stout. 11. *P. shastensis.*

Spikes bractless or with bract only at base; calyx about half as broad as long; stems usually many from base. 12. *P. tenella.*

1. Plagiobothrys Kingii (S. Wats.) A. Gray. King's Popcorn Flower. Fig. 4252.

Eritrichium Kingii S. Wats. Bot. King. Expl. 243. *pl. 23. figs. 3–5.* 1871.
Plagiobothrys Kingii A. Gray, Proc. Amer. Acad. 20: 281. 1885.
Sonnea Kingii Greene, Pittonia 1: 23. 1887.

Stems 1 to several, erect or ascending, 1–4 dm. high, bristly-hirsute with spreading hairs. Basal leaves linear-oblanceolate, the cauline linear, 3–6 cm. long, the short floral ones usually lanceolate, hirsute with sparsely or slightly ascending hairs; flowers in short dense spikes, these becoming elongate and loosely flowered in fruit; calyx-lobes 4–6 mm. long, rather stiffly hirsute on the margins and apex, and also bearing stout straight straw-colored bristles; corolla 4–7 mm. broad; nutlets 4, cuneate-ovoid, acute and incurved at apex, dorsal side with low keel and with similar keel on the lateral angles, the transverse rugae irregular, forming rather broad papillate areolae; scar elongate and keel-like, medial.

Sandy deserts, Upper Sonoran Zone; western Nevada and Inyo County, California, east to Utah. Type locality: "Truckee Pass and in the Trinity [Virginia] Mountains, Nevada; 4,500–6,000 feet altitude." May–June.

Plagiobothrys Kingii var. **Harknéssii** (Greene) Jepson, Man. Fl. Pl. Calif. 856. 1925. (*Sonnea Harknessii* Greene, Pittonia 1: 23. 1887; *Plagiobothrys Harknessii* Nels. & Macbr. Bot. Gaz. 62: 143. 1916.) Racemes short and conglomerate, or a few scattering ones loosely flowered and longer; scar of nutlet elongated and extending nearly the whole length of the ventral keel. Southeastern Oregon, Malheur County, south through western Nevada to Mono Lake and Owens Lake, California. Type locality: Mono Lake, California.

2. **Plagiobothrys Jònesii** A. Gray. Jones' Plagiobothrys. Fig. 4253.

Plagiobothrys Jonesii A. Gray, Syn. Fl. N. Amer. ed. 2. 2¹: 430. 1886.
Sonnea Jonesii Greene, Pittonia 1: 23. 1887.

Stems erect, 1 to several from the base, divergently branched, 1–3 dm. high, hispid with spreading bristly hairs pustulate at base, and also retrorse-puberulent. Basal leaves linear or narrowly oblanceolate, cauline mostly lanceolate with pubescence similar to stem but thinner; racemes terminating the branches, mostly conspicuously leafy-bracted at base, 1.5–3 cm. long, the lower leaves of the branches often bearing one or few axillary flowers; calyx-lobes subulate-linear, 6–8 mm. long; corolla 1–2 mm. broad; nutlets 3 mm. long, incurved and 4-angled by the dorsal and ventral keels and the 2 lateral ridges, abruptly pointed at apex, the keel and lateral angles tuberculate, the concave surface between densely tessellate; scar narrow or medial-narrow merging into the keel above, and with a diverging lateral ridge extending to either side.

Washes and rocky slopes of the deserts, Sonoran Zones, Inyo County south to the Whipple Mountains, San Bernardino County, California. Type locality: Needles, California. April–May.

3. **Plagiobothrys híspidus** A. Gray. Bristly Popcorn Flower. Fig. 4254.

Plagiobothrys hispidus A. Gray, Proc. Amer. Acad. 20: 286. 1885.
Sonnea hispida Greene, Pittonia 1: 22. 1887.

Stems solitary and few-branched above, to several and much-branched, 5–20 cm. high, hispid and sparsely tomentulose. Leaves hispid with ascending hairs slightly pustulate at base, the surface green and without finer pubescence, lower linear, 1.5–2.5 cm. long, upper lanceolate, sometimes broadly so, 0.5–2 cm. long, obtuse; flowers in small terminal glomerate clusters and also sometimes solitary in the axils; calyx-lobes lanceolate, somewhat closed over the nutlets, about 2 mm. long; corolla 1 mm. broad; nutlets usually solitary, only 1 mm. long, ovoid, tuberculate, strongly ribbed dorsally and on the angles; scar a little above the middle tapering into the sharp keel above, the ventral surface densely tuberculate below the scar, nearly smooth above.

Sandy and gravelly soils, Arid Transition and Canadian Zones; Deschutes County, Oregon, southward east of the Cascades and the Sierra Nevada, to Mono County, California, and western Nevada. Type locality: Truckee, California. June–Aug.

4. **Plagiobothrys arizònicus** (A. Gray) Greene. Arizona Popcorn Flower. Fig. 4255.

Eritrichium canescens var. *arizonicum* A. Gray, Proc. Amer. Acad. 17: 227. 1882.
Plagiobothrys arizonicus Greene ex A. Gray, op. cit. 20: 284. 1885.

Stems slender, several from the base, ascending, simple or few-branched, 1–4 dm. high, hirsute-hispid with spreading hairs and also rather sparingly villous-pubescent. Leaves hirsute-hispid with more or less appressed hairs, pustulate at base, without shorter pubescence, the lower linear-oblanceolate, 1.5–5 cm. long, upper linear-oblong to lanceolate; roots, lower parts of stems and veins of the leaves, or sometimes the whole plant, purplish; spikes at length elongated, remotely flowered and bractless or with a few foliaceous bracts; calyx about 3 mm. long, cleft to about the middle, lobes narrow-attenuate, connivent, hirsute-hispid, the tube at length usually circumscissile near the base; corolla 2–2.5 mm. broad; nutlets 1–4 commonly 2, ovoid and abruptly acute at apex, median and lateral keels often tuberculate, and with connecting transverse rugae, the aerolae between smooth or minutely papillate; scar median, seated in a sunken area at the base of the keel.

Gravelly or sandy soils, Upper Sonoran Zone; Inner Coast Ranges and San Joaquin Valley, south to the Tehachapi Mountains, and mostly on the desert slopes to San Diego County, California, east to New Mexico and Sonora. Type locality: "Arizona, *Greene, Pringle.*" March–June.

Plagiobothrys arizonicus var. **catalinénsis** A. Gray, Syn. Fl. N. Amer. ed. 2. 2¹: 431. 1886. (*Plagiobothrys canescens* var. *catalinensis* Jepson, Man. Fl. Pl. Calif. 856. 1925; *P. catalinensis* J. F. Macbride, Proc. Amer. Acad. 51: 546. 1916.) Closely resembling the typical species but calyx-lobes variable on the same plant, some distinctly connivent over the mature nutlets, others on another branch of the same plant only slightly connivent, suggesting a possible hybrid origin between *P. canescens* and *P. arizonicus*. Santa Catalina and San Clemente Islands, California. Type locality: "Santa Catalina Island, off Los Angeles, California."

5. **Plagiobothrys nothofúlvus** A. Gray. Rusty Popcorn Flower. Fig. 4256.

Eritrichium nothofulvum A. Gray, Proc. Amer. Acad. 17: 227. 1882.
Plagiobothrys nothofulvus A. Gray, op. cit. 20: 285. 1885.

Stems 1 to several from the base, erect or ascending, 2–4 dm. high, villous-tomentose with spreading hairs. Basal leaves oblanceolate, 3–10 cm. long, 5–15 mm. wide, acute at apex, sparsely villous, cauline leaves few, linear-lanceolate; roots, bases of the stems and the margins and midrib of the leaves purple-stained; spikes on terminal once- or twice-forked branches, usually without foliaceous bracts, at length elongated and loosely flowered; calyx densely appressed-hirsute, the hairs, especially on the lobes, rusty-colored, 2–3 mm. long in fruit, the lobes erect about as long as the tube, this at length circumscissile near the base; corolla 6–8 mm. broad;

mature nutlets varying from 1–4 but usually 3, orbicular-ovoid, abruptly constricted into an acute beak-like apex, median dorsal keel and lateral ones usually prominent, transverse rugae 4 or 5, the intervals rectangular, minutely papillate; scar annular, median at the base of the narrow ventral keel.

Grassy fields and hillsides, Upper Sonoran Zone; Klickitat County, Washington, and Wasco County, Oregon, southward mostly west of the Cascades to San Diego County and east to the Providence Mountains, California. Type locality: California. Collected by Douglas. March–May.

Plagiobothrys myosotoides (Lehm.) Brand, Pflanzenreich 4[252]: 108. 1931. (*Lithospermum tinctorium* Ruiz & Pavon, Fl. Peruv. 2: 4. *pl. 114. fig. 6.* 1799. Not L. 1753; *L. myosotoides* Lehm. Asperif. 319. 1818; *Plagiobothrys tinctorius* A. Gray, Proc. Amer. Acad. 20: 283. 1885.) In habit much like *P. Torreyi* but the sculpturing of the nutlets more like that of *P. tenellus*; strongly keeled dorsally and also with ridges separated by broad intervals that are sometimes papillate, not shining. A Chilean species of which only two collections have been reported from California: ridge between Isabel Valley and Arroyo Bayo, Mount Hamilton Range, and Big Sandy Valley, Black Mountain, Fresno County.

6. Plagiobothrys uncinàtus J. T. Howell. Hooked Popcorn Flower. Fig. 4257.

Plagiobothrys uncinatus J. T. Howell, Leaflets West. Bot. 2: 255. 1940.

Stems usually several from the base and bushy-branched, 8–30 cm. high, reddish, thinly hirsute with spreading hairs, without finer pubescence. Basal leaves linear-oblong, 2–2.5 cm. long including the petiole, 3–4 mm. wide, hispidulous, cauline leaves oblong-ovate to narrowly ovate, 3–10 mm. long; flowers scattered along the stems and solitary in the leaf-axils, also in small terminal clusters, subsessile; calyx divided almost to base, densely uncinate-bristly, lobes about 1 mm. long in anthesis, 2–2.5 mm. in fruit; corolla 1.5 mm. long, about 1 mm. broad; nutlets 1–1.3 mm. long, somewhat quadrate, rounded at base, abruptly pointed at apex, the dorsal side slightly keeled toward the apex, transversely rugulose and tuberculate, the ventral side narrowly keeled above the middle.

Slopes of canyons, Upper Sonoran Zone; Gabilan and Santa Lucia Mountains, California. Type locality: Santa Lucia Camp, Santa Lucia Mountains, Monterey County. April–May.

7. Plagiobothrys campéstris Greene. Fulvous Popcorn Flower. Fig. 4258.

Plagiobothrys californicus Greene, Pittonia 2: 231. 1892. Not Greene, Bull. Calif. Acad. 2: 407. 1887.
Plagiobothrys campestris Greene, Pittonia 2: 282. 1892.
Plagiobothrys rufescens var. *campestris* Jepson, Fl. W. Mid. Calif. 446. 1901.
Plagiobothrys fulvus var. *campestris* I. M. Johnston, Contr. Gray Herb. No. 68: 70. 1923.

Stem solitary or rarely 2 or more from the base, 3–6 dm. high or the branches sometimes spreading and more or less decumbent, villous-hirsute with spreading hairs, and sparsely tomentose. Leaves hirsute with appressed hairs on both surfaces and spreading ones on the margins, the basal spatulate-oblanceolate, the cauline sessile and linear, the lower 3–5 cm. long, the upper gradually shorter; spicate racemes loosely flowered, often 3–4 dm. long; calyx often fulvous when young, the lobes lanceolate, about 5 mm. long and erect in fruit; corolla 3–4 mm. broad; nutlets 2.5–3 mm. long, triangular-ovoid, short-acuminate, dorsal side thin-keeled, the median keel extending over the apex, transverse rugae usually several or sometimes nearly obsolete; scar annular.

Open valleys and foothills, Upper Sonoran Zone; Umpqua Valley, western Oregon, southward west of the Cascade–Sierra Nevada Divide, to Santa Clara County in the Coast Ranges and to the foothills of the Sierra Nevada, Fresno County, California. Type locality: "Interior California." March–May.

8. Plagiobothrys infectìvus I. M. Johnston. Dye Popcorn Flower. Fig. 4259.

Plagiobothrys infectivus I. M. Johnston, Journ. Arnold Arb. 20: 380. 1939.

Stem solitary and erect or several from the base and spreading, 2–4 dm. long, villous-hirsute with spreading hairs or somewhat retrorse; root, lower part of stem, midvein and margin of leaves purple-stained. Leaves linear, 2–8 cm. long, nearly glabrous beneath, appressed-hirsute above; spikes 10–20 cm. long, loosely flowered, leafy-bracteate throughout; calyx cleft to the base into broadly lanceolate acuminate lobes, 5–7 mm. long, rusty-hirsute when young, midvein purple-stained; corolla slightly exserted, 3 mm. broad, often rose-colored in drying; mature nutlets usually 4, broadly ovoid, 3–3.5 mm. long, abruptly constricted into a short acute apex; median keel thin, prominent at least on the acute beak, lateral keels distinct on the beak but sometimes obscure on the body, ventral keel prominent above the median scar, this raised and annular, dorsal surface tuberculate, with few or no rugae, the ventral surface with several irregular rugae.

Usually in adobe soils, on open hills, Upper Sonoran Zone; Inner Coast Ranges especially on the eastern side, from Colusa County to San Luis Obispo County, California. Type locality: Hospital Canyon, western San Joaquin County. March–May.

9. Plagiobothrys canéscens Benth. Valley Popcorn Flower. Fig. 4260.

Plagiobothrys canescens Benth. Pl. Hartw. 326. 1849.
Eritrichium canescens A. Gray, Proc. Amer. Acad. 10: 53. 1874.
Plagiobothrys microcarpa Greene, Pittonia 1: 21. 1887.

Stems usually with several branches from or near the base, ascending or more commonly decumbent and widely spreading, villous-tomentose throughout. Leaves linear or the basal linear-oblanceolate, 1.5–5 cm. long; spikes elongated and loosely flowered in age, bracteate; fruiting calyx 4–6 mm. long, densely villous-hirsute, cleft to below the middle, the lobes erect or rarely curved over the nutlets, broadly lanceolate, somewhat acuminate at apex; corolla about 3 mm. broad; nutlets usually 4, orbicular-ovoid, constricted above into a short beak-like

apex, 2 mm. long, strongly incurved, transverse rugae usually prominent, forming rectangular finely papillate intervals; scar medial, annular, and usually slightly raised.

Plains and hillsides, in gravelly adobe or even alkaline soils, Upper Sonoran Zone; Sierra Nevada foothills, Siskiyou County, Sacramento Valley and the South Coast Ranges from Contra Costa County, southward to San Diego County and the Channel Islands, California. Type locality: "In arenosis vallis Sacramento." Collected by Hartweg on his trip from Sacramento to Chico. March–May.

10. **Plagiobothrys Tórreyi** A. Gray. Torrey's Popcorn Flower. Fig. 4261.

Eritrichium Torreyi A. Gray, Proc. Amer. Acad. 10: 58. 1874.
Plagiobothrys Torreyi A. Gray, Proc. Amer. Acad. 20: 284. 1885.
Cryptantha Torreyi Rydb. Mem. N.Y. Bot. Gard. 1: 331. 1900.
Plagiobothrys Torreyi var. *diffusa* I. M. Johnston, Contr. Gray Herb. No. 68: 71. 1923.

Stems slender, 1 to several from the base, sometimes few-branched and erect or ascending but usually diffusely branched and decumbent, 5–20 cm. long, hirsute with spreading hairs. Leaves linear-oblong to oblong or the uppermost oblong-ovate, sessile, 5–20 mm. long, the basal narrowed at base often longer, green, rather sparsely hirsute-hispid on both sides; flowers solitary in the axils of foliaceous bracts; calyx 2.5 mm. long in fruit, hirsute and sparsely hispid; corolla 1.5–2 mm. long, equaling or exceeding the calyx-lobes; nutlets shining, broadly ovoid, abruptly pointed at apex, keeled on the back but faintly so below the middle, the sides with about 7 low ridges with narrow sinuses between them, smooth or with few scattering whitish tubercles.

Usually in moist soils, open woods or edges of mountain meadows, Arid Transition and Canadian Zones; central and southern Sierra Nevada and San Bernardino Mountains, California. Type locality: Yosemite Valley. May–Aug.

11. **Plagiobothrys shastênsis** Greene. Shasta Popcorn Flower. Fig. 4262.

Plagiobothrys shastensis Greene ex. A. Gray, Proc. Amer. Acad. 20: 285. 1885.

Stems erect, 1 to few arising from the tuft of basal leaves, simple or branching above, 1–3 dm. high, pilose. Basal leaves linear-oblanceolate, 1–3 cm. long, rather thinly appressed-hirsute above, or rather densely so near the margin, the hairs pointed at apex, pustulate at base, lower surface glabrous or nearly so; cauline leaves linear, sessile, 5–10 mm. long, rather densely appressed-hirsute; spikes often geminate, loosely flowered, 1–10 cm. long, bracteate throughout; calyx cleft to the middle, about 4 mm. long in flower, 6–7 mm. in fruit, hirsute, often ferruginous when young; corolla 2.5 mm. broad, lobes 1 mm. long, ascending; nutlets broadly ovoid, somewhat 4-angled, abruptly acute, 2–2.5 mm. long, shining, keeled on the back and on the lateral angles, the intervals between the keels marked by broad flat transverse ridges separated by narrow line-like grooves.

Open hillsides and gravelly flats or washes, Upper Sonoran and Arid Transition Zones; a rather uncommon species occurring on both sides of the Cascades, southern Oregon to northern Inner Coast Ranges and Sierra Nevada foothills to Merced County, California. Type locality: "California, in valley at the base of Mount Shasta, *E. L. Greene*, coll. 1876." An apparent duplicate of the type in the Dudley Herbarium is labelled in Greene's handwriting "Shasta River, Siskiyou Co. June 10, 1876." May–July.

12. **Plagiobothrys tenéllus** (Nutt.) A. Gray. Slender Popcorn Flower. Fig. 4263.

Myosotis tenella Nutt. ex Hook. Kew Journ. Bot. 3: 295. 1851.
Plagiobothrys tenellus A. Gray, Proc. Amer. Acad. 20: 283. 1885.
Plagiobothrys parvulus Greene, Pittonia 3: 261. 1898.
Plagiobothrys asper Greene, op. cit. 262.
Plagiobothrys echinatus Greene, loc. cit.
Plagiobothrys colorans Greene, loc. cit.
Plagiobothrys humifusus M. E. Jones, Contr. West. Bot. No. 13: 7. 1910.
Plagiobothrys tenellus var. *parvulus* subvar. *humifusus* Brand, Pflanzenreich 4^{252}: 108. 1931.

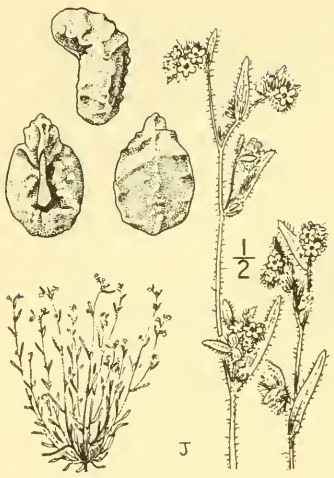
Stems slender, erect, freely branching from the base or sometimes simple, 5–25 cm. high, soft-villous with spreading and reflexed hairs. Leaves of the basal rosette oblong-lanceolate or oblong-oblanceolate, obtuse or acutish, villous, 1–2.5 cm. long, cauline distinct, the lower ones linear-oblong, the upper becoming lanceolate or ovate-lanceolate, gradually reduced in size; spikes elongated in age and loosely flowered, only the lowest flowers bracteate; calyx densely short-villous with whitish or more often rufous hairs, about 3 mm. high in age; corolla-limb about 2–3 mm. broad; nutlets 1.5–2 mm. long, thick-cruciform, light-colored, sharply ridged dorsally and on the margins, the ridges commonly tuberculate.

Grassy slopes and meadows, Arid Transition and Upper Sonoran Zones; British Columbia and Idaho south to northern Lower California, Utah and Arizona. Type locality: "Sunny rocky slopes of the mountains along the valley of Coeur d'Aleine River," Idaho. March–June.

20. **EREMOCÀRYA** Greene, Pittonia 1: 58. 1887.

Small, hirsute-canescent, densely branched annual, the root imparting a deep purple stain. Leaves forming a rosulate basal tuft, the numerous racemose branches repeatedly dichotomous and leafy-bracted. Flowers in dense leafy-bracted racemes, with short filiform pedicels. Calyx 5-parted to the base, campanulate in fruit and persistent. Corolla white. Style persistent, becoming enlarged in fruit and broader than the capitate stigma. Gynobase columnar and simulating the style. Nutlets 4, erect and uniform, attached their whole length; groove open, little dilated at base. [Name Greek, meaning desert and nutlet.]

A monotypic genus of the arid southwestern United States and northwestern Mexico.



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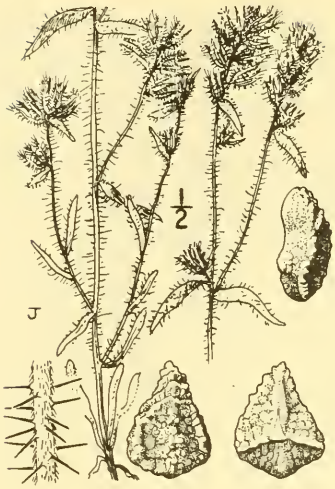

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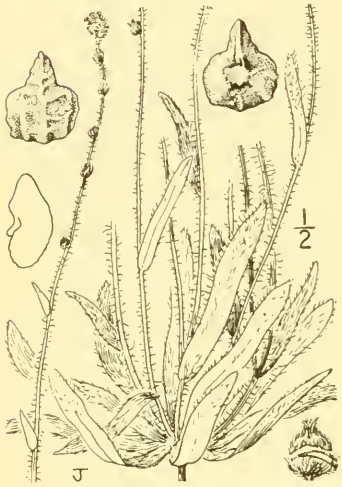

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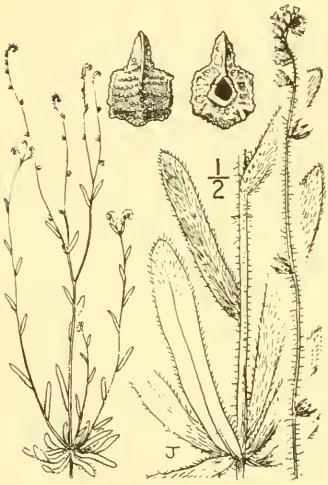

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4252. Plagiobothrys Kingii
4253. Plagiobothrys Jonesii
4254. Plagiobothrys hispidus

4255. Plagiobothrys arizonicus
4256. Plagiobothrys nothofulvus
4257. Plagiobothrys uncinatus

4258. Plagiobothrys campestris
4259. Plagiobothrys infectivus
4260. Plagiobothrys canescens

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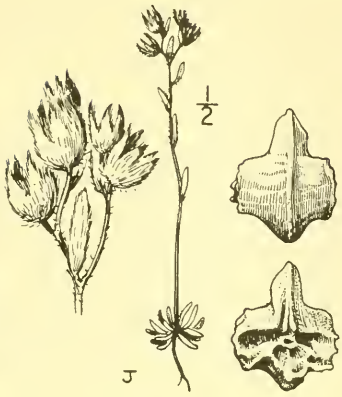

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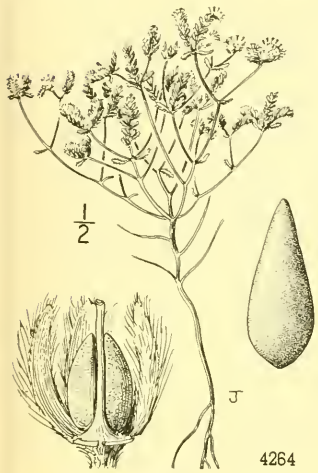

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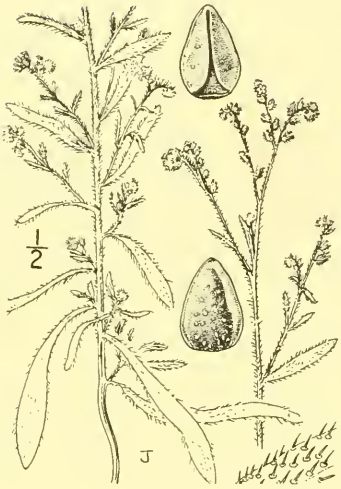

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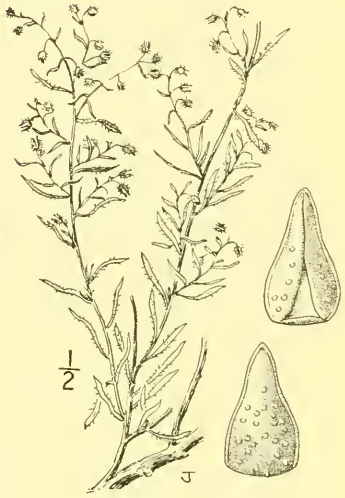

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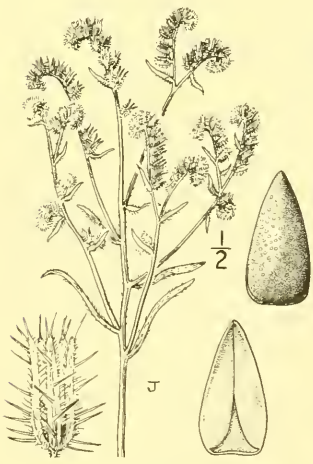

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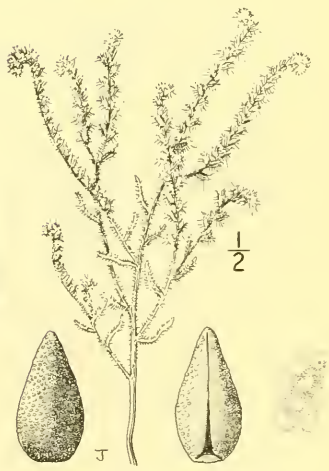

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4261. Plagiobothrys Torreyi
4262. Plagiobothrys shastensis
4263. Plagiobothrys tenellus
4264. Eremocarya micrantha
4265. Cryptantha holoptera
4266. Cryptantha racemosa
4267. Cryptantha inaequata
4268. Cryptantha costata
4269. Cryptantha angustifolia

1. Eremocarya micrántha (Torr.) Greene. Eremocarya. Fig. 4264.

Eritrichium micranthum Torr. Bot. Mex. Bound. 141. 1859.
Krynitzkia micrantha A. Gray, Proc. Amer. Acad. 20: 275. 1885.
Eremocarya micrantha Greene, Pittonia 1: 59. 1887.
Cryptantha micrantha I. M. Johnston, Contr. Gray Herb. No. 68: 56. 1923.

Annual, the root and usually the lower part of the stems purple-staining, 3–10 cm. high, the branchlets slender and more or less dichotomous, brownish beneath the light gray strigose pubescence. Leaves oblong-oblanceolate, 3–7 mm. long, whitish-strigose or short-hirsute; spikes numerous, leafy-bracted throughout, densely flowered and unilateral, rarely over 1 cm. long; flowers distinctly biserrate; corolla inconspicuous, the limb 0.5–1 mm. broad; fruiting calyx-lobes about 2 mm. long, oblong-lanceolate, erect, short-hispid; nutlets 4, 1–1.3 mm. long, smooth or tuberculate, 1 nutlet sometimes a little longer and more persistent than the others; groove extending to the apex of the nutlet, scarcely broadened at base; gynobase subulate, nearly as long as the calyx-lobes and bearing the sessile stigma at the apex.

Dry sandy soils, Sonoran Zones; Inyo County, California, south through the Mojave and Colorado Deserts and cismontane southern California to northern Lower California, east to Nevada, southern Utah, Arizona and southwestern Texas. Type locality: "Sand hills, Frontera, Texas, and in other places along the Rio Grande." March–June.

Eremocarya micrantha var. lépida (A. Gray) J. F. Macbride, 51: 545. 1916. (*Eritrichium micranthum* var. *lepidum* A. Gray, Syn. Fl. N. Amer. 2^1: 193. 1878; *Eremocarya lepida* Greene, Pittonia 1: 59. 1887; *Cryptantha micrantha* var. *lepida* I. M. Johnston, Contr. Gray Herb. No. 68: 57. 1923; *Eremocarya Abramsiana* Brand, Pflanzenreich 4^{252}: 77. 1931.) Plants a little more robust, commonly 8–15 cm. high; corolla 1.5–3.5 mm. broad. Mountain valleys, Arid Transition Zone; Mount Pinos, Ventura County, south through the mountains of southern California to northern Lower California. Type locality: "San Diego Co., *D. Cleveland*," but probably from the Laguna or Cuyamaca Mountains east of San Diego.

21. CRYPTÁNTHA Lehm. ex Fisch. & Mey. Ind. Sem. Hort. Petrop. 2: 35. 1836.

Mostly low, erect, branching, setose or hispid annual herbs with narrow alternate entire leaves and small white flowers in scorpioid bractless or bracteate spikes. Calyx 5-parted or 5-cleft, erect or spreading in fruit, at length deciduous. Corolla small, funnelform, usually with 5 scales closing the throat. Stamens included; filaments short. Ovary 4-divided; style short; stigma capitate. Nutlets erect, rounded more or less on the back, obtuse, acute or winged on the margins, attached laterally to the conical or elongated receptacle; scar elongated. [Name Greek, meaning hidden flower; the original species had cleistogamous flowers.]

A New World genus of about 60 species, mainly western North America, but some also in western and southern South America. Type species, *Cryptantha glomerata* Lehm.

Surface of nutlets papillate, tuberculate or muricate, or sometimes when heteromorphous the odd nutlet smooth.
  Lateral angles of nutlets sharply angled or knife-like or prominently winged.
    Nutlets 4, triangular-ovate or triangular-oblong, homomorphic or heteromorphic; odd nutlet abaxial. I. *Angustifoliae.*
    Nutlets 1–4, lanceolate; lateral angles knife-like or distinctly winged; odd nutlet axial. II. *Pterocaryae.*
  Lateral angles of nutlets rounded or obtuse, not winged.
    Nutlets heteromorphic, 1–4, the large nutlet axial and sometimes less roughened. III. *Maritimae.*
    Nutlets homomorphic, all alike or nearly so, normally 4, sometimes fewer by abortion even on the same plant.
      Nutlets lanceolate to ovate-lanceolate, convex on the dorsal side. IV. *Barbigerae.*
      Nutlets ovate or triangular-ovate.
        Dorsal side of nutlets obtuse and with at least a faint median ridge. V. *Muricatae.*
        Dorsal side of nutlets flat or low-convex, without median ridge. VI. *Ambiguae.*
Surface of nutlets smooth and shining, their lateral angles rounded or obtuse.
  Groove of nutlets median.
    Hairs of calyx straight or soft and somewhat wavy, not encrusted or hooked; nutlets 1–4.
      Dorsal side of nutlets low-convex or flat; nutlets 1–4, homomorphic.
        Nutlets ovate to lanceolate, their lateral angles obtuse or rounded. VI. *Ambiguae.*
        Nutlets oblong-ovate to lanceolate, sharply angled on the sides especially toward the apex. VII. *Mohavenses.*
      Dorsal side of nutlets rounded-convex, lateral angles rounded or obtuse.
        Nutlets lanceolate, nearly homomorphic, the axial one always present and slightly larger than the others.
          Nutlets 1 or rarely 2. VIII. *Graciles.*
          Nutlets 4. IX. *Ramulosissimae.*
        Nutlets ovate or ovate-lanceolate, the abaxial one always present. X. *Leiocarpae.*
    Hairs of calyx-lobes arcuate or uncinate, and with a pallid incrustation; nutlet 1. XI. *Flaccidae.*
  Groove of nutlet eccentric, one side of nutlet on lower surface appearing as if somewhat deformed. XII. *Affines.*

I. Angustifoliae.

Lateral angles of nutlets distinctly winged; pedicels slender, 1–4 mm. long.
  Nutlets broadly winged, homomorphic. 1. *C. holoptera.*
  Nutlets narrowly winged, heteromorphic; plants flowering as an annual, but often persisting several years and suffruticose. 2. *C. racemosa.*

Lateral angles of nutlets knife-like or merely sharply acute; pedicels stout, very short, less than 1 mm. long.
Margins of lateral angles knife-like.
Nutlets heteromorphic. 3. *C. inaequata.*
Nutlets homomorphic. 4. *C. costata.*
Margins of lateral angles merely sharply angled. 5. *C. angustifolia.*

II. Pterocaryae.

Mature nutlets 1 or rarely 2, usually with knife-like lateral angles. 6. *C. utahensis.*
Mature nutlets 4, usually distinctly winged.
Corolla conspicuous, 4–7 mm. broad; nutlets homomorphic, narrowly winged. 7. *C. oxygona.*
Corolla inconspicuous, about 1 mm. broad; nutlets heteromorphic; odd one often wingless, the others rather broadly winged. 8. *C. pterocarya.*

III. Maritimae.

Fruiting calyx conspicuously recurved or deflexed, the axial lobe longest and most conspicuously hirsute; nutlets bent. 9. *C. recurvata.*
Fruiting calyx spreading or erect, the abaxial lobe most conspicuously hirsute; nutlets straight.
Calyx ascending or spreading, not gibbose at base.
Nutlets triangular-ovate; calyx minute, subglobose, the lobes barely surpassing the nutlets. 10. *C. micromeres.*
Nutlets oblong-lanceolate; calyx oblong, the lobes distinctly surpassing the nutlets. 11. *C. maritima.*
Calyx strictly erect and closely appressed to the rachis, gibbose on the axial side at base. 12. *C. dumetorum.*

IV. Barbigerae.

Nutlets 1 or rarely 2; style short, half as long as nutlet or less.
Corolla inconspicuous, less than 1 mm. broad. 13. *C. decipiens.*
Corolla conspicuous, 2–3.5 mm. broad. 14. *C. corollata.*
Nutlets normally 4; style two-thirds as long to longer than the nutlets.
Plants hirsute with spreading hairs.
Corolla conspicuous, commonly 5 mm. broad but varying from 2–8 mm. in width. 15. *C. intermedia.*
Corolla inconspicuous, 1–2 mm. broad. 16. *C. barbigera.*
Plants strigose; corolla inconspicuous, 1–2 mm. broad.
Nutlets verrucose or verrucose-muricate. 17. *C. nevadensis.*
Nutlets spinular-muricate. 18. *C. scoparia.*

V. Muricatae.

A single species. 19. *C. muricata.*

VI. Ambiguae.

Dorsal surface of nutlets more or less roughened.
Nutlets usually solitary, more or less roughened.
Nutlets horizontal, bent; pedicels stout, less than 1 mm. long; calyx distinctly bristly on the midrib. 20. *C. excavata.*
Nutlets erect, straight; calyx-lobes not bristly on the midrib.
Pedicels slender, 2–3 mm. long; calyx-lobes villous with long white hairs. 21. *C. crinita.*
Pedicels stout, usually less than 1 mm. long; hairs on calyx-lobes straight and ascending, those on the midribs a little longer but not bristly. 22. *C. Milobakeri.*
Nutlets 4, erect; pedicels stout, about 1 mm. or less in length.
Corolla conspicuous, the limb 4–7 mm. broad. 23. *C. Hendersonii.*
Corolla inconspicuous, the limb 0.5–2 mm. broad.
Flowers in definite spikes.
Nutlets 2–2.5 mm. long; spikes naked or bracted only at base.
Stems closely strigose; spikes generally geminate or ternate; calyx-lobes armed on midrib with reflexed or arcuate bristles; nutlets broadly ovate, tessellate-papillate. 24. *C. simulans.*
Stems spreading-hirsute; spikes generally solitary; calyx-lobes armed on midrib with straight spreading tawny bristles; nutlets low-convex on the back.
Nutlets grayish, conspicuously echinate on the back. 25. *C. echinella.*
Nutlets with low rounded tubercules on the back or nearly smooth toward the base. 26. *C. ambigua.*
Nutlets minute, 1.5 mm. long; spikes bracted throughout. 27. *C. Traskiae.*
Flowers solitary or in glomerules in the axils of the leaves, forming a thyrsus or panicle. 28. *C. Hooveri.*
Dorsal surface of nutlets smooth, but sometimes faintly tessellate.
Corolla inconspicuous, limb about 1 mm. wide. 29. *C. Torreyana.*
Corolla conspicuous, limb 3–6 mm. wide.
Plants slender, not stiff, stems slender, erect with slender ascending branches; racemes geminate, bractless; fruiting calyx about 2 mm. long.
Corolla-limb 3–4 mm. broad; calyx with the abaxial lobe bearing 1 or more elongated spreading bristles; nutlets grayish-mottled with brown. 30. *C. incana.*
Corolla-limb 5–6 mm. broad; calyx rather uniformly hispid, the abaxial lobe without elongated spreading bristles; nutlets dark colored, not mottled. 31. *C. grandiflora.*
Plants stiff, low and widely branched; spikes mostly solitary, sometimes bracteate below; calyx 5–7 mm. long. 32. *C. mariposae.*

VII. Mohavenses.

Corolla conspicuous, limb 4–7 mm. wide; style distinctly surpassing the nutlets. 33. *C. mohavensis.*
Corolla inconspicuous, limb about 1 mm. wide; style included or about equaling the nutlets. 34. *C. Watsonii.*

VIII. Graciles.

A single species. 35. *C. gracilis.*

IX. Ramulosissimae.

A single species. 36. *C. Fendleri.*

X. Leiocarpae.

Hairs on upper part of calyx-lobes spreading or ascending.
Styles about two-thirds to nearly as high as nutlets.
Spikes bracteate, dense, mostly 8–15 mm. long; nutlets usually 4, rarely reduced to 1 by abortion. 37. *C. leiocarpa.*
Spikes naked, or the lowest flowers sometimes bracteate.
Nutlets 1–4, low-rounded on the back, flattened on the ventral side, not circular in cross section.
Fruiting calyx 2–4 mm. long, moderately white-bristly. 38. *C. Clevelandii.*
Fruiting calyx 6–10 mm. long, conspicuously tawny-bristly; spikes stiffly erect, 5–15 cm. long. 39. *C. Ganderi.*
Nutlets 1, lanceolate, rounded on both sides and circular in cross section. 40. *C. hispidula.*
Styles less than half the length of nutlets; fruiting calyx 1.5–2 mm. long; nutlet 1, lanceolate-attenuate or rostellate. 41. *C. microstachys.*
Hairs on the upper part of calyx-lobes decidedly reflexed. 42. *C. nemaclada.*

XI. Flaccidae.

Nutlets with an open areole at base of groove; style about two-thirds the height of nutlets; plants often coarse. 43. *C. rostellata.*
Nutlets with closed groove; styles less than one-half as high as nutlets; very slender plants.
Nutlets rounded dorsally and on the margins, only slightly compressed, ovate-lanceolate and rostrate-acuminate. 44. *C. flaccida.*
Nutlets flattened on both surfaces and angled on the margins, ovate, acute or short-acuminate. 45. *C. sparsiflora.*

XII. Affines.

Nutlets 4; style at least two-thirds the height of nutlets; plants erect; flowers in spikes 2–8 cm. long. 46. *C. affinis.*
Nutlets 1; style less than one-half the height of nutlets; plants spreading; flowers in axillary glomerules. 47. *C. glomeriflora.*

1. **Cryptantha holóptera** (A. Gray) J. F. Macbride. Winged Cryptantha. Fig. 4265.

Eritrichium holopterum A. Gray, Proc. Amer. Acad. 12: 81. 1876.
Krynitzkia holoptera A. Gray, op. cit. 20: 276. 1885.
Cryptantha holoptera J. F. Macbride, Contr. Gray Herb. No. 48: 48. 1916.

Stems erect, 1–6 dm. high, branches usually many along the main stem, ascending, spreading-hispid and strigose. Leaves linear-lanceolate, the upper sessile, the lower petioled, 2.5–6 cm. long, 2–8 or rarely 10 mm. wide, acute or obtuse, conspicuously pustulate and hispid below, somewhat less so above; racemes geminate, naked or with a few bracts below, mostly 4–5 cm. long, sometimes longer; corolla 2 mm. broad, the lobes ascending; fruiting calyx oblong-ovoid, 2.5–3.5 mm. long, the lobes lanceolate, somewhat connivent, hispid on the thickened midrib, strigose on the margins; nutlets 4, similar, 1.5–2.5 mm. long, oblong-ovoid or triangular-ovate, the dorsal side dark with pale tubercles, margins narrowly to broadly winged, groove open or closed above, dilated into an areole at base; style distinctly surpassing the nutlets but shorter than the calyx-lobes.

Gravelly or rocky slopes and ridges, Lower Sonoran Zone; Inyo County south to southern border of Imperial County, California, east to Mohave and Yuma Counties, Arizona. Type locality: Ehrenberg, Arizona. Feb.–April.

2. **Cryptantha racemòsa** (S. Wats.) Greene. Bushy Cryptantha. Fig. 4266.

Eritrichium racemosum S. Wats. in A. Gray, Proc. Amer. Acad. 17: 226. 1882.
Krynitzkia ramosissima A. Gray, op. cit. 20: 277. 1885.
Cryptantha suffruticosa Piper, Proc. Biol. Soc. Wash. 32: 42. 1919.
Cryptantha racemosa var. *lignosa* I. M. Johnston, Univ. Calif. Pub. Bot. 7: 445. 1922.
Johnstonella racemosa Brand, Rep. Spec. Nov. 21: 249. 1925.

Flowering as an annual but commonly persisting several years and the stem becoming distinctly woody below, mostly bushy-branched, forming clumps 3–7 dm. high, ultimate branchlets very slender, strigose, epidermis at length exfoliating, leaving the older woody stems glabrous and brown. Leaves linear-subulate to narrowly oblanceolate, 0.5–4 cm. long; racemes slender, loosely flowered, terminating the spreading or ascending paniculately disposed branchlets, 2–4 cm. long, minutely bracteate; pedicels slender, often recurved; fruiting calyx 2 mm. high; lobes narrowly linear-lanceolate, slightly keeled on the back, armed with stiff spreading bristles and strigose; corolla slightly exserted, limb about 1 mm. broad; nutlets 4, triangular-ovoid, acute at apex and slightly curved outward, groove open or closed above broadening below into a triangular areola, heteromorphous, the odd nutlet 1–2 mm. long, finely muricate or tuberculate, light

or dark with pale tubercles; gynobase subulate, about equaling the 3 consimilar nutlets; style much surpassing the nutlets.

Sandy flats or rocky ridges, Lower Sonoran Zone; Inyo County, California, south to northeastern Lower California and east to southern Nevada and Mohave and Yuma Counties, Arizona. Type locality: Mesquite Station, Imperial County, California. March–June.

3. **Cryptantha inaequàta** I. M. Johnston. Panamint Cryptantha. Fig. 4267.

Cryptantha inaequata I. M. Johnston, Univ. Calif. Pub. Bot. 7: 444. 1922.
Johnstonella inaequata Brand, Rep. Spec. Nov. 21: 250. 1925.

Stems erect or ascending, 3–4 dm. high, branched throughout or sometimes the basal branches elongated and simple or nearly so, strigose and bristly with slender spreading hairs. Leaves linear or the lower narrowly oblanceolate, 1.5–4 cm. long, 1–4 mm. wide, hispid or strigose, pustulate, especially underneath; spikes mostly geminate, 4–8 cm. long, loosely or rather densely flowered, bractless or rarely with 1 or 2 small bracts; corolla minute, tube 1–2 mm. long, limb 1.5–2.5 mm. broad; fruiting calyx stiffly ascending, ovoid-oblong, 3–4 cm. long, distinctly biseriate, sessile or nearly so; calyx-lobes rigid, slightly connivent, hispid on the thickened midrib, villous-ciliate on the margins; nutlets 4, heteromorphous, brown with pale tubercles, about 1 mm. long, odd one similar in color but a little longer and more persistent; gynobase columnar, equaling the 3 consimilar nutlets; style a little exceeding or equaling the odd nutlet.

Desert slopes, Sonoran Zones; eastern Mojave Desert, Inyo and San Bernardino Counties, California. Type locality: Pleasant Canyon, Panamint Mountains, Inyo County, California. March–May.

Cryptantha saxòrum Jepson, Fl. Calif. 3: 345. 1943. Stem widely branching from the base, 5–7 cm. high, spreading-hispid. Leaves lanceolate, 8–24 mm. long, the hairs on the upper surface pustulate at base; spikes dense, 1–2 cm. long, conspicuously bracteate; calyx short-bristly, densely tufted with white hairs at base; corolla-limb 1 mm. wide; nutlets 4, equal, ovoid, light brown, thinly papillate both sides, the ventral side convexly 2-planed, ventral groove closed with forked areole at base. Known only from the type collection: "lava hill 1 mile sw. of Bicycle Lake, near Tiefort Mt., Mohave Desert."

4. **Cryptantha costàta** Brandg. Ribbed Cryptantha. Fig. 4268.

Cryptantha costata Brandg. Bot. Gaz. 27: 453. 1899.
Cryptantha seorsa J. F. Macbride, Contr. Gray Herb. No. 48: 46. 1916.

Annual, stems stout, branched throughout, 1–2 dm. high, whitish-canescent with strigose-villous pubescence, and somewhat hispid, especially on the branches. Leaves linear to narrowly lanceolate, 1–3 cm. long, often becoming more or less convolute, villous-strigose above, short-hispid and pustulate beneath; racemes spike-like, rather rigid, 2–5 cm. long, sparsely bracteate, rather densely flowered; corolla about 2 mm. long, lobes broad and ascending; fruiting calyx 4–6 mm. long, oblong-ovoid, its lobes linear-lanceolate, somewhat connivent above the nutlets but the tips slightly spreading, hispid on the thickened midrib; nutlets 4, similar or 1 slightly larger than the others, barely 2 mm. long, narrowly trianguar, strongly convex on the back, inconspicuously rugulose or verrucose, the margins sharp or narrowly winged; groove dilated below into a deltoid shallow areola; gynobase subulate, equaling the nutlets; style much surpassing the nutlets.

Sandy washes and benches, Lower Sonoran Zone; Inyo County to San Diego County, California, eastward to adjacent Arizona. Type locality; Borrego Springs, San Diego County, California. Feb.–May.

5. **Cryptantha angustifòlia** (Torr.) Greene. Narrow-leaved Cryptantha. Fig. 4269.

Eritrichium angustifolium Torr. Pacif. R. Rep. 5: 363. 1858.
Krynitzkia angustifolia A. Gray, Proc. Amer. Acad. 20: 272. 1885.
Cryptantha angustifolia Greene, Pittonia 1: 112. 1887.

Stems diffusely branched from the base, 0.5–3 cm. high, villous-hispid with spreading or ascending, light ashy gray hairs, the lowest branches decumbent or ascending. Leaves narrowly linear, 1.5–4 cm. long, 1–2 or rarely 4 mm. wide, hispid and pustulate; spikes usually geminate, about 3–5 cm. long, bractless or with 1 or 2 bracts near the base; corolla minute, limb 1–2.5 mm. broad; fruiting calyx 3–4 mm. long, stiffly ascending and conspicuously biseriate, subsessile; lobes linear-lanceolate, slightly connivent, hispid on the thickened midrib, short-villous on the margins, lower lobe longest and more conspicuously hispid; nutlets 4, about 1 mm. long, heteromorphous, groove slightly open above broadening at base; gynobase columnar, equaling the 3 similar nutlets but shorter than the odd more persistent one; style usually surpassing the odd nutlet.

Sandy or gravelly washes, Lower Sonoran Zone; Death Valley region, Inyo County, California, south through the Mojave and Colorado Deserts to northeastern Lower California, east to western Texas and Sonora. Type locality: Yuma, Arizona. March–June.

6. **Cryptantha utahénsis** (A. Gray) Greene. Scented Cryptantha. Fig. 4270.

Eritrichium holopterum var. *submolle* A. Gray, Proc. Amer Acad. 13: 374. 1878.
Krynitzkia utahensis A. Gray, Syn. Fl. N. Amer. ed. 2. 2^1: 427. 1886.
Cryptantha utahensis Greene, Pittonia 1: 120. 1887.
Cryptantha submollis Coville, Contr. U.S. Nat. Herb. 4: 166. 1893.

Usually with a main erect stem with a few scattered ascending or erect branches, 1–3 dm. high, strigose or appressed short-hispid. Leaves elongated below, mostly linear, 3–5 cm. long,

the upper smaller and spreading, appressed short-hispid and pustulate especially beneath; spikes usually geminate, commonly 1–2 cm. long, dense, bractless; corolla rather conspicuous, 2–3 mm. broad; fruiting calyx ovoid to oblong-ovoid, 2–3 mm. long, subsessile, spreading or slightly recurved, densely villous-hispid below with slender, ascending, whitish hairs; mature calyx-lobes connivent, rather sparsely hispid; only 1 or rarely 2 nutlets maturing, broadly lanceolate, granulate or muricate-papillate, nearly flat on the back, sharply angled on the sides; style usually barely equaling the nutlets.

Sandy or rocky places, desert washes and hillsides, Lower Sonoran Zone; deserts of southern California, in Inyo, San Bernardino, and Riverside Counties, east through southern Nevada to southern Utah, and Mohave County, Arizona. Type locality: St. George, Utah. March–May.

7. **Cryptantha oxýgona** (A. Gray) Greene. Sharp-nut Cryptantha. Fig. 4271.

Eritrichium oxygonum A. Gray, Proc. Amer. Acad. 19: 89. 1883.
Krynitzkia oxygona A. Gray, op. cit. 20: 277. 1885.
Cryptantha oxygona Greene, Pittonia 1: 120. 1887.

Stems usually with several ascending branches from or near the base, 1–4 dm. high, strigose with very slender pointed hairs. Leaves linear to linear-lanceolate, 1–4 cm. long, pubescent on both sides, as on stem but the hairs appressed and more distinctly pustulate; spikes in pairs or more often in threes, 1–3 cm. long, usually densely flowered, bractless; corolla-limb 4–7 mm. broad; fruiting calyx ovoid or oblong-ovoid, ascending, 2.5–4 mm. long, symmetrical; mature calyx-lobes slightly connivent, silky-strigose on the margin, midrib thicker and usually sparsely hispid; nutlets 4, similar, oblong-ovoid, 2–2.5 mm. long, muriculate or tuberculate, narrowly winged on the margin; groove broadly forked below, often forming a triangular areola; style distinctly surpassing the nutlets.

Dry slopes, Upper Sonoran Zone; Inner Coast Ranges bordering the San Joaquin Valley in Fresno and Merced Counties; east side of the Sierra Nevada from Madera County south to the desert slopes of the Santa Rosa Mountains, Riverside County, California. Type locality: "on hills bordering the Mohave Desert." April–May.

8. **Cryptantha pterocàrya** (Torr.) Greene. Wing-nut Cryptantha. Fig. 4272.

Eritrichium pterocaryum Torr. Bot. Mex. Bound. 142. 1859.
Eritrichium pterocaryum var. *pectinatum* A. Gray, Proc. Amer Acad. 10: 61. 1874.
Krynitzkia pterocaryum var. *pectinata* A. Gray, op. cit. 20: 276. 1885.
Cryptantha pterocarya Greene, Pittonia 1: 120. 1887.

Stems erect, branched throughout with ascending branches, 1–5 dm. high, short-hirsute with either appressed or ascending slender pointed hairs. Leaves linear or the reduced uppermost ones lanceolate or oblong, strigose or the hairs ascending, conspicuously pustulate on the lower surface, less so on the upper; spikes usually in pairs, bractless or rarely with 1 or 2 bracts below, 2–6 or rarely 10 cm. long, usually becoming loosely flowered in age; corolla inconspicuous, 0.5–1 mm. or rarely 2 mm. broad; fruiting calyx distinctly accrescent, 3–5 mm. long, symmetrical, ascending on short pedicels; mature calyx-lobes ovate to ovate-lanceolate, somewhat connivent, thin, margins more or less tawny, hirsutulous, midrib slightly thickened and sparsely hispid; nutlets 4, heteromorphous, the body oblong-lanceolate to lanceolate, 2–2.5 or rarely 3 mm. long, muricate or verrucose, axial one not margined, the other three with usually broad wings, these either entire, crenate or lobed; style surpassing the body of nutlets.

Sandy or gravelly places, Upper and Lower Sonoran Zones; east of the Cascades and the Sierra Nevada from southern Washington to the deserts of California and northern Lower California; east to southern Idaho, Utah, Arizona, and northern Sonora. Type locality: Walla Walla, Washington, as designated by I. M. Johnston, Contr. Gray Herb. No. 74: 53. 1925. April–June.

Cryptantha pterocarya var. **Purpùsii** Jepson, Man. Fl. Pl. Calif. 849. 1925. Inflorescence denser; calyx smaller; nutlets heteromorphous, one not margined, the other with the wing-margin narrower than in the typical species, and knife-like. Southern California deserts; Argus Mountains, Darwin, and San Bernardino Mountains. Type locality: Argus Mountains, Inyo County, California.

Cryptantha pterocarya var. **cyclóptera** (Greene) J. F. Macbride, Contr. Gray Herb. No. 48: 44. 1916. (*Krynitzkia cycloptera* Greene, Bull. Calif. Acad. 1: 207. 1884.) Nutlets all wing-margined, otherwise like the typical material. Deserts of southern California east to southern Utah, Arizona, New Mexico, and southwestern Texas. Type locality: near Tucson, Arizona.

9. **Cryptantha recurvàta** Coville. Curved-nut Cryptantha. Fig. 4273.

Cryptantha recurvata Coville, Contr. U.S. Nat. Herb. 4: 165. *pl. 16.* 1893.

Stems branched from the base, slender, ascending or decumbent at base, 1–3 dm. high, strigose, root often dye-staining. Basal leaves oblanceolate or spatulate, 1.5–2 cm. long, those of the stem remote, linear or lanceolate, 5–10 mm. long, rounded or obtuse, rather finely appressed-hispid and minutely pustulate; spikes bractless, solitary or geminate, slender, loose in age, 2–10 cm. long; corolla scarcely exserted, about 2 mm. long, limb 1.5 mm. broad; fruiting calyx slender, distinctly asymmetrical, bent and recurved, 3 mm. long; mature calyx-lobes very narrowly linear, midrib thickened and hispid; ovary 2-parted; mature perfect nutlet oblong-lanceolate, curved inwardly, dull brownish, granulate-papillate, rounded on the angles; gynobase about one-half as long as perfect nutlet, and about as long as the abortive one.

Sandy or gravelly places, Sonoran Zones; Alvord Desert, southeastern Oregon, White and Panamint Mountains, California, east to Nevada and Utah. Type locality: Surprise Canyon, Panamint Mountains, California. April–June.

10. **Cryptantha micrómeres** (A. Gray) Greene. Minute-flowered Cryptantha. Fig. 4274.

Eritrichium micromeres A. Gray, Proc. Amer. Acad. 19: 90. 1883.
Krynitzkia micromeres A. Gray, op. cit. 20: 274. 1885.
Cryptantha micromeres Greene, Pittonia 1: 113. 1887.

Stems simple below and erect, or branched from the base and branches ascending, 1–3 dm. high, divaricately short-hispid throughout. Leaves linear or oblong-linear, 1–4 cm. long, short-hispid on both sides with ascending hairs, the upper side rather inconspicuously pustulate; spikes 1–3, very slender, bractless, 2–8 cm. long; corolla minute, nearly tubular, about 0.5 mm. broad; fruiting calyx barely over 1 mm. long, subglobose, early deciduous; mature calyx-lobes ovate, strongly connivent, slenderly hispid, the bristles in the midribs often minutely uncinate; nutlets 4, triangular-ovoid, 0.7–1 mm. long, papillate on the odd slightly larger one, sometimes smooth; style equaling or slightly surpassing the odd nutlet.

Grassy hillsides, Upper Sonoran Zone; Marin and Amador Counties, California, to northwestern Lower California, also on Santa Cruz and Santa Catalina Islands. Type locality: Santa Cruz, California. April–July.

11. **Cryptantha marítima** Greene. Guadalupe Cryptantha. Fig. 4275.

Krynitzkia maritima Greene, Bull. Calif. Acad. 1: 204. 1885.
Krynitzkia ramosissima Greene, op. cit. 203. August 1885; not A. Gray, January 1885.
Cryptantha maritima Greene, Pittonia 1: 117. 1887.

Stems loosely branched, 1–3.5 dm. high, rather sparsely strigose or sparsely hispid, brown or reddish. Leaves narrowly linear to linear-lanceolate, acutish, hispid and conspicuously pustulate; spikelets 1–6 cm. long, usually more or less crowded or glomerate at the ends of the lateral branchlets, usually leafy-bracted throughout; corolla minute, tubular, 1.5–2 mm. long, 0.5–1 mm. broad; fruiting calyx asymmetrical, 2–3.5 mm. long; mature calyx-lobes linear-lanceolate, connivent, firm, three of the lobes hispid on the midrib and more or less villous, especially on the margins; ovules 2; nutlets 1–2, heteromorphous, the odd nutlet frequently the only one maturing, smooth, shining, and brownish, oblong-lanceolate, 1–2 mm. long, persistent; consimilar nutlets, when present, grayish and muriculate, readily deciduous; style about equaling consimilar nutlets.

Dry washes and desert slopes, Sonoran Zones; Inyo County, California, south to Lower California, and east to Nevada, Arizona, and Sonora. Type locality: Guadalupe Island, Lower California. April–May.

Cryptantha maritima var. pilòsa I. M. Johnston, Univ. Calif. Pub. Bot. 7: 445. 1922. Calyx-lobes densely white-villous. Same general range as the species. Type locality: Los Angeles Bay, Lower California.

12. **Cryptantha dumetòrum** Greene. Bush-loving Cryptantha. Fig. 4276.

Krynitzkia dumetorum Greene ex A. Gray, Proc. Amer. Acad. 20: 272. 1885.
Cryptantha dumetorum Greene, Pittonia 1: 112. 1887.
Cryptantha intermedia var. *dumetorum* Jepson, Man. Fl. Pl. Calif. 849. 1925.

Stems becoming diffusely branched and at length sprawling or scrambling among low bushes, very brittle, sparsely strigose. Leaves lanceolate, 2–4 cm. long, sparsely hispid, and conspicuously pustulate; spikes solitary or geminate, 5–10 cm. long, usually loosely flowered, naked or sometimes with foliaceous bracts toward the base; corolla minute, limb about 1 mm. broad; calyx closely appressed to rachis, 2–3 mm. long, asymmetrical, base very oblique; mature calyx-lobes connivent, the 3 outer deflexed-hispid on the thickened midrib; nutlets 4, granulate and muriculate, heteromorphous, the odd one with base enlarged and distorting the calyx, 2–3 mm. long, with a broad open groove, the 3 consimilar ones a little shorter, lanceolate and the groove closed or very narrow; style shorter or equaling the nutlets.

Sandy valleys or hillsides, Sonoran Zones; western and central Mojave Desert, California, east to southwestern Nevada. Type locality: Tehachapi Pass, Kern County. April–May.

13. **Cryptantha decípiens** (M. E. Jones) Heller. Gravel Cryptantha. Fig. 4277.

Krynitzkia decipiens M. E. Jones, Contr. West. Bot. No. 13: 6. 1910.
Cryptantha decipiens Heller, Muhlenbergia 8: 48. 1912.

Stems 1–4 dm. high, slender, loosely branched, strigose and sometimes short-hispid. Leaves few, linear, obtuse, 1–3 cm. long, strigose or short-hispid, pustulate; spikes slender, geminate or rarely solitary or ternate, bractless, usually becoming loosely flowered, 4–10 cm. long; corolla inconspicuous, less than 1 mm. broad; fruiting calyx ovoid to ovoid-oblong, strictly ascending, 3–4 mm. long; mature calyx-lobes narrowly linear, connivent, with the tips usually spreading, midrib thickened, usually conspicuously hirsute-hispid, margins strigose, the abaxial lobe longer and more densely hirsute; nutlets 1 or rarely 2, next abaxial calyx-lobe, ovoid-lanceolate, muriculate-granulate to tuberculate, usually brownish, convex on the back, rounded on the sides, groove open or closed, dilated below into a definite areola; gynobase short, half to a third as high as nutlet; style very short, well surpassed by nutlet.

Sandy or gravelly slopes, Lower Sonoran Zone; Mojave Desert, Kern and Inyo Counties, south through the deserts to the southern boundary of the state, east to southwestern Nevada and western Arizona. Type locality: Yucca, Arizona. March–May.

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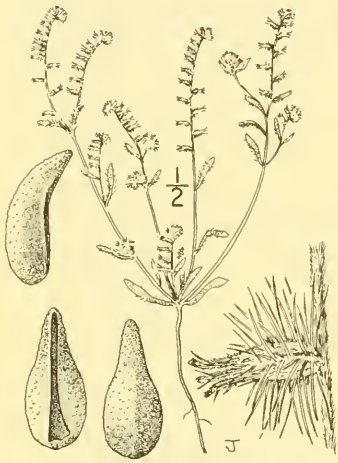

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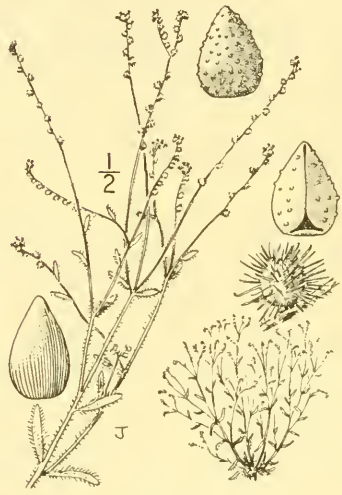

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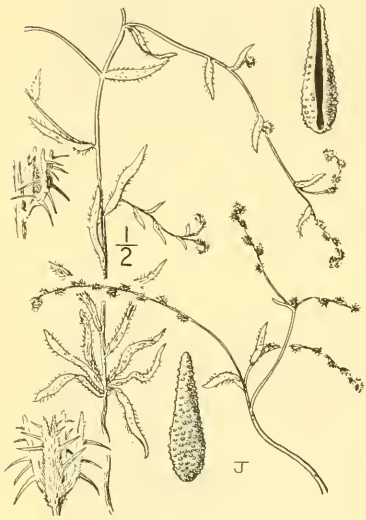

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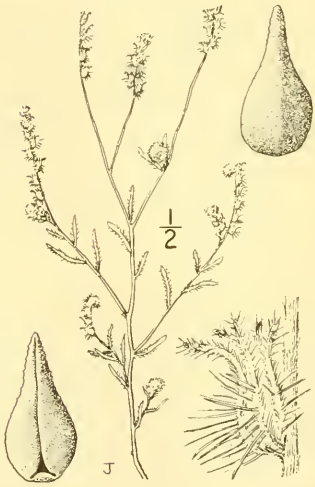

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4270. Cryptantha utahensis
4271. Cryptantha oxygona
4272. Cryptantha pterocarya

4273. Cryptantha recurvata
4274. Cryptantha micromeres
4275. Cryptantha maritima

4276. Cryptantha dumetorum
4277. Cryptantha decipiens
4278. Cryptantha corollata

14. **Cryptantha corollàta** I. M. Johnston. Coast Range Cryptantha. Fig. 4278.

Cryptantha decipiens var. *corollata* I. M. Johnston, Contr. Gray Herb. No. 74: 61. 1925.
Cryptantha corollata I. M. Johnston, Journ. Arnold Arb. 18: 24. 1937.

Stems slender, erect, 2–3 dm. high, with few ascending branches from the middle or above, or sometimes more abundantly branched throughout, appressed-hispidulous throughout, sometimes also hirsute-hispid with spreading hairs, especially toward the base. Leaves mostly narrowly linear, acute, strigose, bristly hispid on the margins and midvein; spikes naked, geminate or ternate, 4–12 cm. long; corolla 2–3.5 mm. broad; fruiting calyx ascending, about 3 mm. long, white-strigose, the outer lobes also bristly with spreading often slightly subulate bristles; nutlet 1, ovoid-lanceolate, acuminate, 2 mm. long, brownish, granulate and papillate-muriculate on both sides, low-convex on the back but with a low broadish ridge toward the base; groove closed throughout and raised into a narrow keel, dilated at base into a small areola.

Canyons and hillsides, Upper Sonoran Zone; California Coast Ranges from San Benito and Monterey Counties to Riverside County. Type locality: "towards foothills, Ojai Valley," Ventura County. March–June.

Cryptantha corollata subsp. **Rattânii** (Greene) Abrams. (*Cryptantha Rattanii* Greene, Pittonia 1: 160. 1888.) Habit of the typical species, but stems hirsute-hispid with spreading hairs as well as strigose; corolla usually larger, 3–5 mm.; nutlets usually 2 or 3 maturing. Open slopes and flats, Upper Sonoran Zone; watershed of the Salinas and Carmel Rivers, Monterey County, California. Type locality: "Monterey County." Johnston (Journ. Arnold Arb. 20: 390. 1939.) designated the Hickman specimens in Greene's herbarium the type. Dr. Greene definitely stated that he described the taxonomically important fruit character from Hickman's plant, and that Rattan's specimens from San Jose "were young and only beginning to flower."

15. **Cryptantha intermèdia** (A. Gray) Greene. Common Cryptantha. Fig. 4279.

Eritrichium intermedium A. Gray, Proc. Amer. Acad. 17: 225. 1882.
Krynitzkia intermedia A. Gray, op. cit. 20: 273. 1885.
Cryptantha intermedia var. *Johnstonii* J. F. Macbride, Contr. Gray Herb. No. 56: 59. 1918.
Cryptantha Hansenii Brand, Rep. Spec. Nov. 24: 58. 1927.
Cryptantha Hansenii var. *pulchella* Brand, loc. cit.

Stems diffusely branched from the base or more commonly stiffly erect and branching above, 1.5–5 dm. high, hispid with spreading or sometimes appressed hairs. Leaves lanceolate to linear, acute or obtuse, hispid or strigose; spikes geminate or ternate, bractless, 5–15 cm. long; corolla commonly varying from 2–8 mm. but commonly about 5 mm. broad; fruiting calyx 2–7 mm. long, ascending or strict; mature calyx-lobes linear-lanceolate, connivent above with spreading tips, short-villous or appressed-hirsute, midrib pungently hispid, especially on the abaxial lobe; nutlets usually 4, homomorphous, ovoid-lanceolate, about 2 mm. long, coarsely and densely tuberculate on both surfaces, grayish or somewhat brownish, margins slightly angled; groove closed or narrow, gradually dilated below into a small areola; styles about equaling to slightly surpassing the nutlets.

Dry sandy or gravelly flats on hillsides, Upper Sonoran Zone; western Siskiyou County, California, southward west of the Sierra Nevada to cismontane southern California and northern Lower California. Type locality: Los Angeles, California. March–July.

16. **Cryptantha barbígera** (A. Gray) Greene. Bearded Cryptantha. Fig. 4280.

Eritrichium barbigerum A. Gray, Syn. Fl. N. Amer. 2[1]: 194. 1878.
Krynitzkia barbigera A. Gray, Proc. Amer. Acad. 20: 273. 1885.
Cryptantha barbigera Greene, Pittonia 1: 114. 1887.

Stems erect, solitary or several from the base, branches strictly ascending or spreading, very bristly hispid, sparsely or not at all strigose except in the inflorescence. Leaves broadly oblong to linear, obtuse, more or less pilose and hirsute below on the midrib and margins with rather stiff spreading hairs, more or less pustulate; corolla inconspicuous, limb 1–2 mm. broad; fruiting calyx ascending, 5–10 mm. long, narrowly oblong-ovoid to oblong-lanceolate, spreading or recurved, white-villous, especially on the margins, the midrib with a few pustulate bristles; nutlets 1–4, lanceolate-ovoid, 1.5–2.5 mm. long, strongly verrucose, usually brownish, rounded on the back and obscurely angled or rounded on the margins; groove gradually broadening toward the base with a triangular areola; style equaling or slightly surpassing the nutlets.

Desert regions, Sonoran Zones; Inyo County south through the Mojave and Colorado Deserts, California, to northeastern Lower California, east through southern Nevada to southern Utah, Arizona, New Mexico and Sonora. Type locality: Utah (*Parry, 171*) as designated by I. M. Johnston, Contr. Gray Herb. No. 74: 66. 1925. Feb.–May.

Cryptantha barbigera var. **Fergusòniae** J. F. Macbride, Contr. Gray Herb. No. 56: 59. 1918. (*Cryptantha Fergusoniae* Brand, Rep. Spec. Nov. 24: 58. 1927.) Essentially like the typical species except corolla larger, the limb 4–6 mm. broad. In the larger corolla this variety shows also close relationship with *Cryptantha intermedia*. Vicinity of Palm Springs, Riverside County, California.

17. **Cryptantha nevadénsis** Nels. & Kenn. Nevada Cryptantha. Fig. 4281.

Cryptantha nevadensis Nels. & Kenn. Proc. Biol. Soc. Wash. 19: 157. 1906.
Krynitzkia barbigera var. *inops* Brandg. Zoe 5: 228. (September) 1906.
Cryptantha arcnicola Heller, Muhlembergia 2: 242. (December) 1906.
Cryptantha leptophylla Rydb. Bull. Torrey Club 36: 678. 1909.
Cryptantha barbigera var. *inops* J. F. Macbride, Proc. Amer. Acad. 51: 548. 1916.

Stems slender, 1–5 dm. high, 1 to several, erect or usually flexuous, closely short-strigose, mostly laxly branched. Leaves linear to linear-oblanceolate, acute or obtuse, 1–6 mm. broad, appressed-short-hispid, more or less pustulate; spikes in pairs or threes, terminal, also scattered

along the stem on short slender axillary branchlets, sometimes bracted, congested, or especially the terminal, elongated; corolla inconspicuous, limb 1–2 mm. broad; fruiting calyx oblong-ovoid to lanceolate, 8–12 mm. long; mature calyx-lobes linear or linear-lanceolate, connivent above with the tips recurved, more or less villous on the margins, and hispid on the midrib; nutlets 4, lanceolate, long-acuminate, about 2.5 mm. long, verrucose, conspicuously muriculate toward the apex; groove open or closed, dilated below into a small areola; style almost or quite equaling the nutlets.

Deserts, Sonoran Zones; Inyo County, California, south to the Colorado Desert and northern Lower California, east to Nevada, Utah, and Arizona. Type locality: Reno, Washoe County, Nevada. April–May.

Cryptantha nevadensis var. **rígida** I. M. Johnston, Contr. Gray Herb. No. 74: 68. 1925. Stems slender, erect, more or less hirsute-hispid with spreading hairs; calyx 5–10 mm. long; nutlets oblong-ovoid, acute, verrucose, about 2 mm. long. Inner Coast Ranges, Stanislaus County, and eastern slopes of the Santa Lucia Mountains, Monterey County, south to southern San Joaquin Valley and the western end of the Mojave Desert, California; also western Arizona. Type locality: "hills bordering Mojave Desert."

18. **Cryptantha scopària** A. Nels. Desert Cryptantha. Fig. 4282.

Cryptantha muriculata var. *montana* A. Nels. Erythea 7: 69. 1899.
Cryptantha scoparia A. Nels. Bot. Gaz. 54: 144. 1912.

Stems with several to many stiffly erect branches, 10–35 cm. high, closely short-strigose and frequently sparsely hispid. Leaves narrowly linear to linear-lanceolate, 2–4 cm. long, strictly ascending, hispidulous with ascending often pustulate hairs; spikes stiffly erect, solitary or geminate, bractless, 2–10 cm. long; corolla inconspicuous, about 1 mm. wide at the tips of the ascending lobes; fruiting calyx oblong-ovoid, 5–6 mm. long, strictly ascending; mature calyx-lobes linear-lanceolate, rather stiff, somewhat connivent above with the tips slightly spreading, midrib costate, armed with stout divaricate whitish bristles, margins ascending-hispidulous; nutlets 4, homomorphous, lanceolate, sometimes broadly so, barely 2 mm. long, brownish and shining, sharply muriculate especially toward the apex, rounded at base and on the margins, groove narrow, forked below into a subulate areola.

Dry sagebrush plains, usually in sandy soils, Upper Sonoran Zone; Yakima County, Washington, and Harney and Malheur Counties, Oregon; also Idaho and Wyoming. Type locality: sagebrush land, Minidoka, Wyoming. May–July.

19. **Cryptantha muricàta** (Hook. & Arn.) Nels. & Macbr. Prickly Cryptantha. Fig. 4283.

Myosotis muricata Hook. & Arn. Bot. Beechey 369. 1838.
Eritrichium ? muriculatum A. DC. Prod. 10: 132. 1846.
Krynitzkia muriculata A. Gray, Proc. Amer. Acad. 20: 273. 1885.
Cryptantha muriculata Greene, Pittonia 1: 113. 1887.
Cryptantha horridula Greene, op. cit. 5: 55. 1902.
Cryptantha muricata Nels. & Macbr. Bot. Gaz. 61: 42. 1916.

Stems erect, usually stout and simple below, several-branched above, 1–8 dm. high, conspicuously hirsute-hispid with spreading hairs, also strigose, especially above. Leaves linear, 1.5–3 cm. long, cinereous short-hirsute; spikes terminating the main branches, in twos or threes or often in fours, 4–10 cm. long in fruit, those of the comparatively few lateral branchlets smaller, geminate or ternate; corolla 2–6 mm. broad; fruiting calyx ovoid, 2–4 cm. long, the lobes lanceolate, connivent, short-hirsute on the sides with ascending hairs, midrib tawny-hispid; nutlets 4, homomorphous, ovoid-triangular, 1.5–2.5 mm. long, dull or somewhat shiny, conspicuously grayish, muriculate or tuberculate on both sides, sometimes somewhat verrucose dorsally, lateral angles usually acute and prominent; ventral groove slightly open or usually closed, broadly forked at base.

Dry gravelly slopes or washes, Upper Sonoran Zone; California Coast Ranges from Contra Costa County to Los Angeles County. Type locality: California. Collected by Douglas. April–July.

Cryptantha muricata var. **denticulàta** (Greene) I. M. Johnston, Contr. Gray Herb. No. 74:71. 1925. (*Krynitzkia denticulata* Greene, Bull. Calif. Acad. 1: 205. 1885; *Cryptantha denticulata* Greene, Pittonia 1: 114. 1887; *C. vitrea* Eastw. Proc. Calif. Acad. III. 2: 292. 1902; *C. densiflora* Nels. & Kenn. Proc. Biol. Soc. Wash. 19: 156. 1906.) Stems with a few well-developed lateral branches as in the typical species, but usually more slender; spikes not numerous, mostly geminate or ternate; corolla inconspicuous, 1–2 mm. broad. Gravelly slopes and flats, Arid Transition Zone; central Sierra Nevada, California, and western Nevada, south to the San Gabriel and San Bernardino Mountains, California. Type locality: western Nevada.

Cryptantha muricata var. **Jònesii** (A. Gray) I. M. Johnston, Plant World 22: 114. 1919. (*Krynitzkia Jonesii* A. Gray, Proc. Amer. Acad. 20: 274. 1885; *Cryptantha Jonesii* Greene, Pittonia 1: 113. 1887.) Stems usually stout, commonly solitary and erect or sometimes several and fastigiate, bearing to below the middle many short lateral floriferous branchlets; spikes numerous, those on the ascending lateral branchlets short, grouped along the stem to form an elongated paniculate inflorescence. Dry ridges and plains, mostly Upper Sonoran Zone; Coast Ranges (Glenn County) and Sierra Nevada (Nevada County) south to San Diego County, California, and adjacent Lower California, east to Nevada and Arizona. Type locality: Santa Cruz, California.

20. **Cryptantha excavàta** Brandg. Deep-scarred Cryptantha. Fig. 4284.

Cryptantha excavata Brandg. Bot. Gaz. 27: 452. 1899.
Cryptantha abortiva Greene ex C. F. Baker, West Amer. Pl. 2: 10. 1903. (Nomen nudum.)

Stem simple below, branching above the base, 15–25 cm. high, branches slender, hirsute with more or less appressed hairs. Leaves linear, the lower 1.5–2 cm. long, the lower especially with the hairs conspicuously pustulate; spikes in twos or more often in threes, becoming 3–10 cm. long and loosely flowered; corolla-limb well-exserted, 2–3 mm. broad; fruiting calyx 2–2.5 mm.

long, as broad as long, the lobes often slightly spreading at the tip, villous with ascending hairs and also hispid mostly below the middle with spreading subulate bristles; nutlet solitary, horizontal or nearly so, ovoid-acuminate, obcompressed, the surface finely muriculate-papillose and with scattered tubercles and a few rather obscure rugose ridges, keeled dorsally, ventral side keeled above, the groove below opening with a large triangular deeply excavated scar.

Mostly in gravelly or sandy soils, Upper Sonoran Zone; Inner North Coast Ranges, in eastern Lake County, and Colusa and Yolo Counties, California. Type locality: Sites, Colusa County. April–May.

21. **Cryptantha crinìta** Greene. Silky Cryptantha. Fig. 4285.

Cryptantha crinita Greene, Erythea 3: 66. 1895.

Stems 15–30 cm. high, branching from near the base, the branches rather strict, strigose and also hirsute. Leaves linear or very narrowly oblanceolate, the lower 2–3 cm. long; spikes usually in pairs on very slender peduncles, dense and conspicuously white-villous when young, elongating to 4–6 cm. in age; pedicels 1–2 mm. long; corolla 3–4 mm. broad; fruiting calyx 5–6 mm. long, densely and conspicuously white-villous-hirsute, the lobes erect; nutlets solitary, ovoid, abruptly attenuate above, 2.5 mm. long, the dorsal side rounded on the back, microscopically papillate and with a few low obscure tubercles.

Gravelly or sandy places in creek bottoms, Upper Sonoran Zone; foothills at the head of the Sacramento Valley, Shasta County, California. Type locality: Cow Creek, Shasta County. April–May.

22. **Cryptantha Milobàkeri** I. M. Johnston. Milo Baker's Cryptantha. Fig. 4286.

Cryptantha Milobakeri I. M. Johnston, Journ. Arnold Arb. 21: 63. 1940.
Cryptantha Torreyana var. *scrutata* Jepson, Fl. Calif. 3: 351. 1943.

Stems erect, 2–4.5 dm. high, with rather strictly ascending branches, moderately pubescent with rather slender appressed hairs and also similar but a little longer spreading hairs. Leaves linear-oblong to linear-lanceolate, 1–3 cm. long, with appressed or ascending hairs; spikes geminate or rarely ternate, 5–15 cm. long, often with a flower in the axil of the geminate ones; fruiting calyx 3–5 mm. long, densely hirsute-pilose with straight ascending whitish hairs, the hairs a little longer on the little enlarged midribs but otherwise similar and not at all retrorse; corolla 2–4 mm. broad; ovules 4; nutlets 1, or rarely 2 or 4, lanceolate-ovoid, 2–2.5 mm. long, smooth or inconspicuously tessellate, low-convex on the back, rounded on the margins; groove closed down to the forked base; style extending to about three-fourths the height of the nutlet.

Gravelly or rocky slopes, Transition Zones; western Siskiyou Mountains, southern Oregon, south in the Coast Ranges to Humboldt and Lake Counties, California. Type locality: between Kelseyville and Lower Lake, Lake County, California. May–July.

23. **Cryptantha Hendersònii** (A. Nels.) Piper. Henderson's Cryptantha. Fig. 4287.

Allocarya Hendersonii A. Nels. Erythea 7: 69. 1899.
Cryptantha monosperma Greene, Pittonia 5: 53. 1902.
Cryptantha grisea Greene, loc. cit.
Cryptantha trifurca Eastw. Bull. Torrey Club 32: 203. 1905.
Cryptantha Hendersonii Piper ex J. C. Nels. Torreya 20: 44. 1920.
Cryptantha scabrella Piper, Proc. Biol. Soc. Wash. 37: 95. 1924.
Cryptantha fragilis M. E. Peck, Torreya 32: 152. 1932.

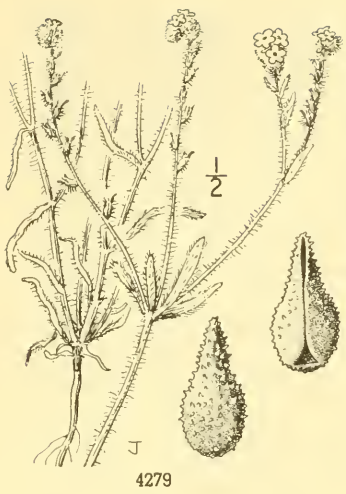
Stems erect with few ascending branches, 1.5–5 dm. high, hirsute. Leaves oblanceolate to linear, acute or obtuse, appressed-hirsute; spikes commonly ternate, naked or rarely with 1 or 2 bracts at base, mostly 5–10, rarely 20 cm. long; corolla conspicuous, 4–7 mm. broad; fruiting calyx 3–6 mm. long, ovoid, or ovoid-oblong, the lower becoming distant; pedicels about 0.5 mm. long; lobes linear to linear-lanceolate, connivent above with the tips spreading, densely appressed-hirsute on the margins, midribs but little thickened, beset with spreading whitish or slightly yellowish bristles; nutlets 4, or sometimes fewer by abortion, pale, ovoid, acute, 2–3 mm. long, very finely muriculate, with a few low rounded papillae interspersed, low-convex on the back, rounded on the margins; groove closed or very narrow, broadly forked at base; style reaching to about four-fifths the height of nutlets.

Usually in sandy or rocky situations, Upper Sonoran and Arid Transition Zones; British Columbia to Idaho, south mainly east of the Cascades to southern Oregon and northeastern California. Type locality: Potlatch River, Idaho. May–July.

24. **Cryptantha símulans** Greene. Pine Cryptantha. Fig. 4288.

Cryptantha simulans Greene, Pittonia 5: 54. 1902.
Cryptantha Steubelii Brand, Rep. Spec. Nov. 24: 58. 1927.
Cryptantha ambigua f. *simulans* Brand, Pflanzenreich 4^{252}: 68. 1931.

Stems erect with few ascending branches, 1.5–4 dm. high, the surface pallid beneath the strigose whitish hairs. Leaves linear to linear-oblanceolate, 1–3 cm. long, strigose on both sides; spikes solitary or frequently in twos or threes, usually elongate and sparsely flowered, bractless, corolla 0.5–1.5 mm. broad; fruiting calyx-lobes linear-lanceolate, connivent above with the tips spreading, midrib armed with reflexed or spreading-arcuate bristles, margin villous-hirsute with ascending hairs; nutlets 4, all similar, 2–2.5 mm. long, broadly ovoid, tes-



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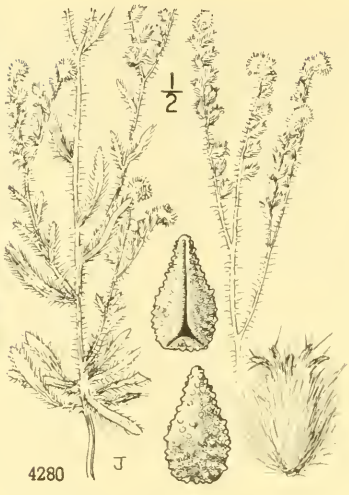

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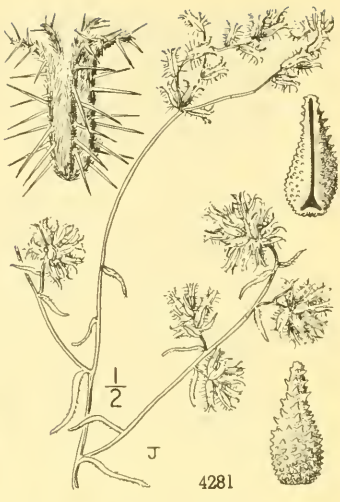

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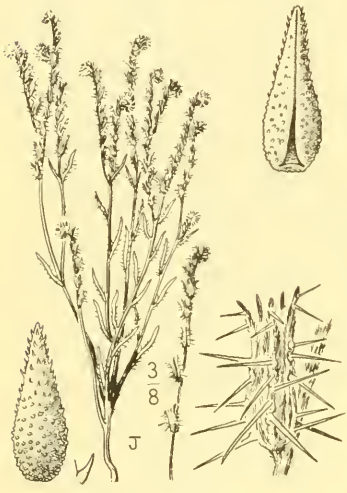

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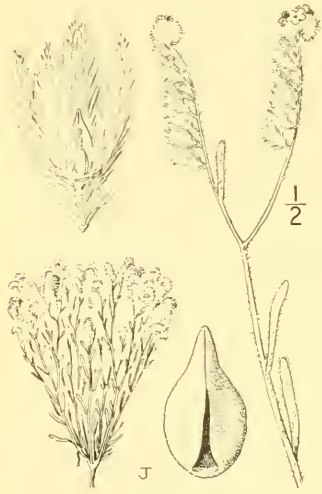

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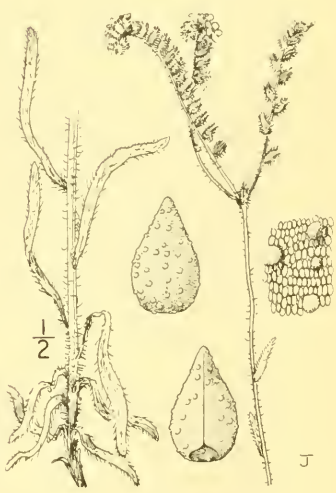

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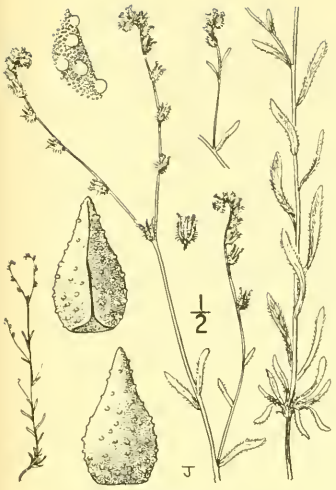
4279. Cryptantha intermedia
4280. Cryptantha barbigera
4281. Cryptantha nevadensis

4282. Cryptantha scoparia
4283. Cryptantha muricata
4284. Cryptantha excavata

4285. Cryptantha crinita
4286. Cryptantha Milobakeri
4287. Cryptantha Hendersonii



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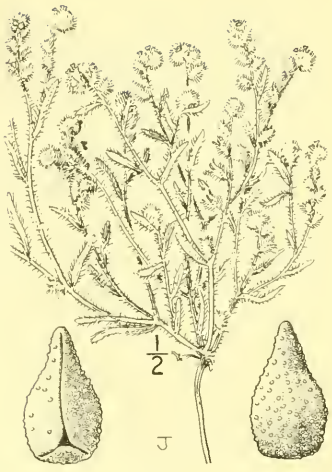

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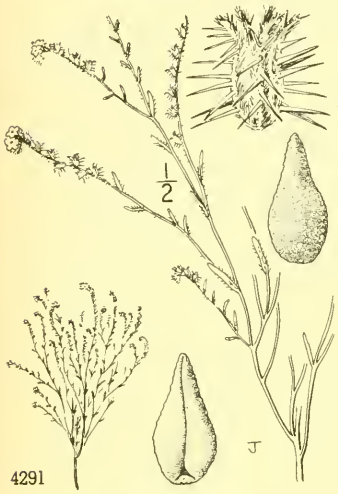

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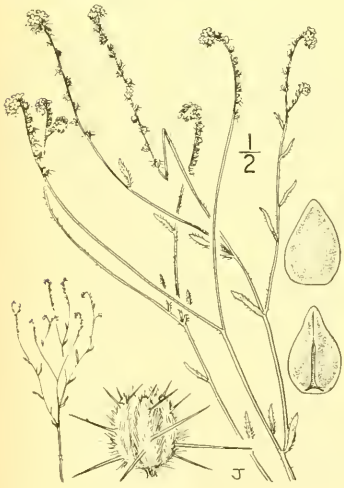

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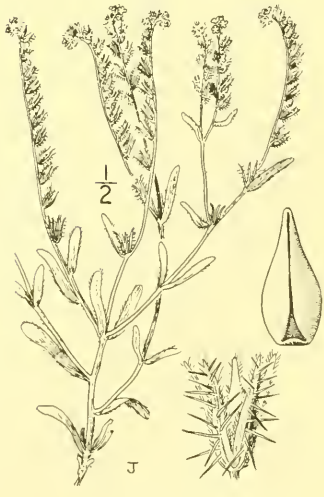


4296

4288. Cryptantha simulans
4289. Cryptantha echinella
4290. Cryptantha ambigua

4291. Cryptantha Traskiae
4292. Cryptantha Hooveri
4293. Cryptantha Torreyana

4294. Cryptantha incana
4295. Cryptantha grandiflora
4296. Cryptantha mariposae

sellate-papillate, angles rounded, ventral groove broadly forked below and closed throughout; style a little shorter than the nutlets.

Dry sandy or gravelly slopes or flats, in open pine forests. Arid Transition Zone; locally in southern Washington and Western Idaho; generally from Klamath County, southern Oregon, south to the Trinity Mountains, California, and through the Sierra Nevada and southern California ranges to the Cuyamaca Mountains. Type locality: Amador County, California. May–July.

25. **Cryptantha echinélla** Greene. Prickly Cryptantha. Fig. 4289.

Cryptantha echinella Greene, Pittonia 1: 115. 1887.
Cryptantha ambigua var. *echinella* Jepson & Hoover, Fl. Calif. 3: 336. 1943.

Stems erect, sparsely branched, 0.5–3 or rarely 4 dm. high, short-hirsute to hirsute-hispid. Leaves linear-oblanceolate to oblanceolate, 1–4 cm. long, obtusish, appressed-hispid, minutely pustulate; spikes solitary or geminate, often leafy-bracted below, 1–5 cm. long; corolla inconspicuous, 1–1.5 mm. rarely about 2 mm. broad; fruiting calyx oblong-ovoid, spreading, 5–6 mm. long; mature calyx-lobes linear-lanceolate, connivent above, the tips usually recurved, midrib prominently pale-tawny hispid, margins appressed-hirsutulous; nutlets 4, broadly ovoid, 2 mm. long, grayish and conspicuously papillate-echinate, rounded on the back, groove closed or very narrowly open, widely forked at base; style slightly surpassed by nutlet.

Flats and dry ridges, Canadian and upper Arid Transition Zones; Sierra Nevada, from Nevada County south to the San Bernardino and Panamint Mountains, California, and east to the Charleston Mountains, Nevada. Type locality: Mount Stanford, above Donner Lake, Nevada County, California. July–Aug.

26. **Cryptantha ambígua** (A. Gray) Greene. Wilkes' Cryptantha. Fig. 4290.

Eritrichium muriculatum var. *ambiguum* A. Gray, Syn. Fl. N. Amer. 2^1: 194. 1878.
Krynitzkia ambigua A. Gray, Proc. Amer. Acad. 20: 273. 1885.
Cryptantha ambigua Greene, Pittonia 1: 113. 1887.
Cryptantha polycarpa Greene, op. cit. 114.
Cryptantha multicaulis A. Nels. Bot. Gaz. 30: 194. 1900.
Cryptantha ambigua var. *robustior* Brand, Pflanzenreich 4^{252}: 69. 1931.

Stems usually loosely branched from the base, ascending, 10–25 cm. high, hirsute and somewhat strigose. Leaves linear to narrowly lanceolate, 2–3 cm. or rarely 5 cm. long, 1–4 mm. wide, obtuse to acutish, more or less appressed hispid-hirsute, the hairs usually pustulate at base; spikes often solitary, 5–15 cm. long, bractless or the lowermost flowers sometimes bracteate; corolla 1–2 mm. broad; fruiting calyx 4–7 mm. long, crowded or distant, tube rounded-obconic at base, lobes linear or linear-lanceolate, more or less connivent, midrib thickened, tawny-hispid, margins strigose-hirsute; nutlets 4, broadly ovoid, 1.6–2 mm. long, granulate and tuberculate or rarely nearly smooth toward the base, sides obtuse and rounded, groove closed or somewhat dilated at the always forked base; gynobase two-thirds the length of the nutlet; style reaching to the apex of nutlet or a little shorter.

Dry slopes and ridges, open pine forests and sagebrush, Arid Transition Zone; Klickitat and Walla Walla Counties, Washington, south through eastern Oregon and eastern sides of the Sierra Nevada to Nevada County, California, east to western Montana, Wyoming, and Utah. Type locality: probably in the Walla Walla region of southeastern Washington. Type collected by the Wilkes Expedition. (I. M. Johnston, Contr. Gray Herb. No. 74: 83–85. 1925.) June–July.

27. **Cryptantha Tráskiae** I. M. Johnston. Trask's Cryptantha. Fig. 4291.

Cryptantha Traskiae I. M. Johnston, Contr. Gray Herb. No. 74: 77. 1925.
Cryptantha Torreyana var. *Traskiae* Jepson, Fl. Calif. 3: 351. 1943.

Stems 8–20 cm. high, with few to rather numerous slender laxly ascending branches, strigose or with also a few spreading hairs. Leaves linear, 0.5–2 cm. long, 1–1.5 mm. broad, acute, strigose or hispidulous; spikes solitary or geminate, 1–5 cm. long; lower flowers subtended by narrowly linear bracts; corolla inconspicuous, limb spreading, 1.5–2 mm. broad; fruiting calyx subsessile, 2–3 mm. long; mature lobes linear-lanceolate, appressed-hirsutulous on the margin, midrib armed with short, divergent, usually yellowish bristles; nutlets 4, homomorphous, 1.5 mm. long, ovoid, finely tuberculate throughout or only toward the apex, more or less mottled gray and brown, dorsal side low-convex, margins rounded; groove narrow, extended to the apex, dilated at base into a narrowly triangular areola.

Gravelly or rocky soils, Upper Sonoran Zone; San Nicolas and San Clemente Islands, southern California. Type locality: bare wind-swept cliffs, San Nicolas Island. April–July.

28. **Cryptantha Hoòveri** I. M. Johnston. Hoover's Cryptantha. Fig. 4292.

Cryptantha Hooveri I. M. Johnston, Journ. Arnold Arb. 18: 23. 1937.

Stems solitary or branched at the base, branches acute or the outer ones often decumbent at base, 5–15 cm. high, rather densely strigose with whitish hairs, more or less purple-staining at base. Basal leaves narrowly spatulate, 1–2.5 cm. long, obtuse or acutish; cauline leaves ascending, narrowly linear, about 1 mm. wide, acute, revolute on the margins, hispidulous with appressed or ascending hairs, or on the uppermost leaves hirsute-hispidulous; flowers solitary or in glomerules in the axils of the leaves, forming a narrow elongated and rather dense thyrsus or panicle; corolla inconspicuous, tubular, 2–2.5 mm. long; fruiting calyx 4–5 mm. long, lobes linear, densely ascending-villous on the margins, midrib with several straight yellowish bristles; nutlets 4, homomorphic, triangular-ovoid, about 1.5 mm. long, acute at the apex,

dorsal side convex, prominently papillate, ventral side sparsely tuberculate; groove very narrow above, abruptly dilated at base into a deltoid areola.

Sandy soil, Sonoran Zones; San Joaquin Valley, from Contra Costa County to Madera County, California. Type locality: eight miles west of Chowchilla, Madera County. April–May.

Cryptantha Clòkeyi I. M. Johnston, Journ. Arnold Arb. 20: 387. 1939. (*Cryptantha muricata* var. *Clokcyi* Jepson, Fl. Calif. 3: 338. 1943.) Stems 10–15 cm. high, erect, usually with ascending branches from near the middle. Leaves toward the base linear-lanceolate, 2–3 cm. long, 2 mm. broad, pilose, the hairs on the upper surface pustulate at base; spikes solitary or geminate, 3–6 cm. long; fruiting calyx 7–10 mm. long, the lobes long-attenuate; corolla-limb 2 mm. wide; nutlets triangular-ovoid, about 3 mm. long, minutely granulate and conspicuously papillate or tuberculate, the groove closed or open, furcate at base; style distinctly exserted above the nutlet. Type locality: "north of Barstow, San Bernardino Co., 2800 ft." "The plant is probably rare and local since Mr. Clokey has failed to rediscover it along the road north of Barstow where he originally found it."

29. **Cryptantha Torreyàna** (A. Gray) Greene. Torrey's Cryptantha. Fig. 4293.

Krynitzkia Torreyana A. Gray, Proc. Amer. Acad. 20: 271. 1885.
Krynitzkia Torreyana var. *calycosa* A. Gray, loc. cit.
Cryptantha Torreyana Greene, Pittonia 1: 118. 1887.
Cryptantha calycosa Rydb. Mem. N.Y. Bot. Gard. 1: 331. 1900.
Cryptantha flexuosa A. Nels. in Coult. & Nels. Man. Bot. Rocky Mts. 416. 1909.
Cryptantha Torreyana var. *calistogae* I. M. Johnston, Contr. Gray Herb. No. 74: 80. 1925.

Stems erect, 1–4 dm. high, solitary or several with erect or more often spreading branches, finely strigose and sparsely hirsutulous. Leaves oblanceolate to linear, erect or spreading, obtuse or rounded at apex, 2–5 cm. long, hirsutulous; spikes commonly geminate, bractless, becoming elongated and loosely flowered or sometimes remaining congested and glomerate; corolla inconspicuous, lobes short, ascending; fruiting calyx ovoid or oblong-ovoid, 3–7 mm. long; mature calyx-lobes linear-lanceolate, connivent above with tips usually spreading, midrib somewhat thickened below, bristly-hispid, margins appressed-hirsute; nutlets usually 4, broadly ovoid, smooth and shiny, often mottled, almost flat on the back, sides rounded or obtuse; groove broadly forked below, closed throughout.

Open slopes or in partial shade, mainly Transition Zones; southern Alaska and British Columbia southward through the Pacific States on both sides of the Cascades to Marin County, California, in the Coast Ranges and to Kern County in the Sierra Nevada, east to Idaho, Nevada, Utah and Wyoming. Type locality: Yosemite Valley (*Torrey 337*), according to I. M. Johnston, Contr. Gray Herb. No. 74: 81. 1925. May–Aug.

Cryptantha Torreyana var. **pùmila** (Heller) I. M. Johnston, Contr. Gray Herb. No. 74: 80. 1925. (*Cryptantha pumila* Heller, Muhlenbergia 2: 242. 1906.) Plants 1–2 dm. high, usually conspicuously spreading-hirsute; fruiting calyx 2–3.5 mm. long. Marin, Contra Costa and Santa Clara Counties, California. Type locality: "near the summit of Mt. Tamalpais, Marin County."

30. **Cryptantha incàna** Greene. Tulare Cryptantha. Fig. 4294.

Cryptantha incana Greene, Leaflets Bot. Obs. 1: 79. 1904.
Cryptantha Torreyana var. *incana* Jepson, Man. Fl. Pl. Calif. 850. 1925.

Stems slender, with several ascending branches, 15–45 cm. high, cinereous-hispidulous and minutely strigose. Leaves linear or sometimes narrowly linear-oblanceolate, appressed-hispidulous; spikes geminate, bractless, elongate and slender in fruit; corolla 4 mm. broad; fruiting calyx more or less ascending, 2–2.5 mm. long, tips of the lobes erect, not attenuate, hirsutulous-hispidulous with ascending hairs, the abaxial lobe especially with 1 or few straight spreading bristles; ovules 4; nutlets 2, ovoid-lanceolate, rounded below, rather abruptly attenuate at apex, 1.5 to nearly 2 mm. long, smooth and polished, grayish mottled with brown.

Dry ground, Arid Transition Zone; southern Sierra Nevada, Tulare County, California. Type locality: Nine-Mile Creek, altitude 5,800 feet. June–Aug.

31. **Cryptantha grandiflòra** Rydb. Clearwater Cryptantha. Fig. 4295.

Cryptantha grandiflora Rydb. Bull. Torrey Club 36: 679. 1909.
Cryptantha hispidula var. *Elmeri* Brand, Pflanzenreich 4^{252}: 60. 1931.

Stems 1.5–4 dm. high, with 2 to several ascending branches, whitish-hirsute. Leaves broadly linear, lanceolate or oblong, 2–5 cm. long, 2–5 mm. wide, hirsute, the hairs with pustulate bases; spikes becoming lax and 5–10 cm. long in fruit; calyx-lobes 2.5–3 mm. long, becoming 4–5 mm. long in fruit, very hispid; corolla white with yellow crests, 3.5–4 mm. long, the limb 5–6 mm. wide; nutlets 1 or 2, ovoid, 2.5 mm. long, dark-colored, smooth and shining, groove narrow, 2-forked at base.

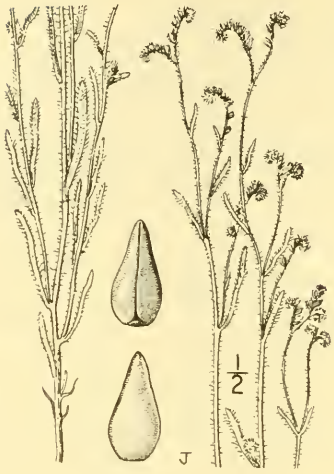
Gravelly or stony ground, Arid Transition Zone; Kittitas and Whitman Counties, Washington, to the Wallowa Mountains, northeastern Oregon, and east to western Idaho. Type locality: "Valley of Clearwater River," Nez Perces County, Idaho. April–June.

32. **Cryptantha maripòsae** I. M. Johnston. Mariposa Cryptantha. Fig. 4296.

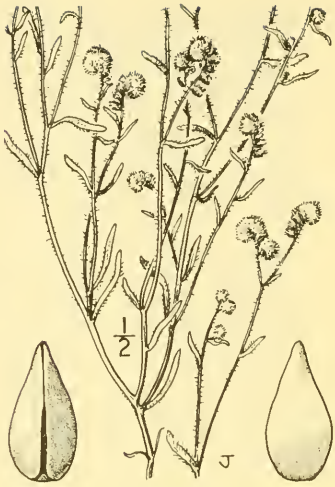
Cryptantha mariposae I. M. Johnston, Contr. Gray Herb. No. 74: 73. 1925.

Stems erect, with few to several ascending branches, 7–20 cm. high or, in dwarf plants sometimes simple, the larger more or less corymbosely branched, rather finely and closely strigose. Leaves oblong or the upper sometimes oblong-lanceolate, 8–18 mm. long, both sides hirsute with mostly ascending hairs with rather obscurely pustulate bases; spikes solitary or in pairs, bractless or the lowest flower sometimes bracteate; corolla about 2 mm. broad; fruiting calyx 4–5 mm. long and about half as broad, the lobes linear-subulate, erect, with slightly spreading tips, villous on the sides with ascending hairs and conspicuously setose-hispid with

4297



4298



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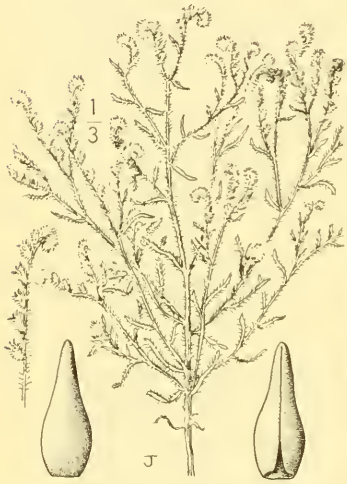

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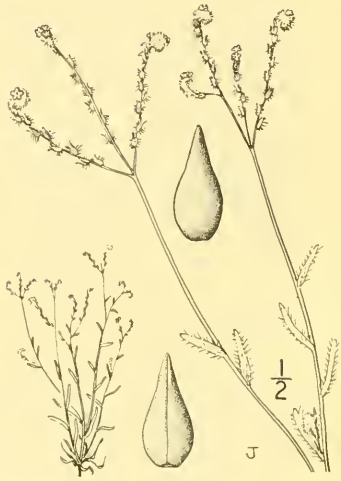
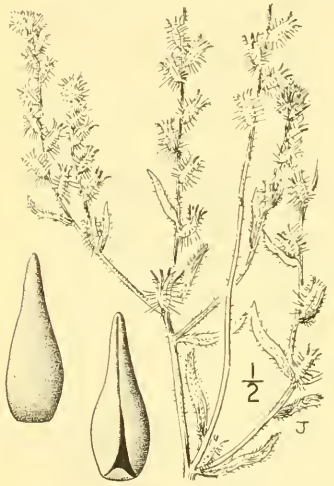


4302



4303

4304

4305

4297. Cryptantha mohavensis
4298. Cryptantha Watsonii
4299. Cryptantha gracilis
4300. Cryptantha Fendleri
4301. Cryptantha leiocarpa
4302. Cryptantha Clevelandii
4303. Cryptantha Ganderi
4304. Cryptantha hispidula
4305. Cryptantha microstachys

spreading bristles on the prominent midrib; nutlets 4, or rarely 2–3, ovoid below, abruptly narrowed above into an attenuate beak, rounded dorsally on the body but becoming angled upward into the beak, brownish or mottled, shining, thinly or rather thickly muricate-tuberculate; ventral groove narrow, opening into a rounded open scar at base.

Serpentine outcrops, Upper Sonoran Zone; Sierra Nevada foothills from Calaveras County to Mariposa County, California. Type locality: "Mariposa County." April–May.

33. **Cryptantha mohavénsis** Greene. Mojave Cryptantha. Fig. 4297.

Krynitzkia mohavensis Greene, Bull. Calif. Acad. 1: 207. 1885.
Cryptantha mohavensis Greene, Pittonia 1: 120. 1887.
Cryptantha fallax Greene, op. cit. 5: 54. 1902.

Stems erect and usually well-branched, 1–4 dm. high, short-hirsute with spreading or, especially on the upper parts, ascending hairs. Leaves narrowly linear to linear-lanceolate, hirsute-hispid with rather short more or less ascending hairs, minutely pustulate; spikes in twos or threes, usually crowded, 2–6 cm. long, bractless; corolla 4–7 mm. broad; fruiting calyx oblong-ovoid, 3–5 mm. long; mature calyx-lobes lanceolate, connivent above, margins appressed silky-pubescent, midrib sparsely hispid; nutlets 4, all similar, smooth and shining, rarely obscurely tessellate, oblong-ovoid to lanceolate-ovoid, 2–2.5 mm. long, flattish dorsally, lateral angles obtuse, groove closed above, forked below and often forming a small triangular areola; style distinctly surpassing the nutlets.

Sandy soils, Upper Sonoran Zone; eastern base of the Sierra Nevada near Bishop, Inyo County, California, and Tehachapi Mountains south to the desert slopes of the Sierra Liebre and San Gabriel Mountains, California. Type locality: "Mojave Desert." May–June.

34. **Cryptantha Watsònii** (A. Gray) Greene. Watson's Cryptantha. Fig. 4298.

Krynitzkia Watsonii A. Gray, Proc. Amer. Acad. 20: 271. 1885.
Cryptantha Watsonii Greene, Pittonia 1: 120. 1887.
Cryptantha vinctens Nels. & Macbr. Bot. Gaz. 62: 143. 1916.

Stems slender, solitary and usually strictly branched, 1–3 dm. high, spreading, short-hirsute. Leaves narrowly linear to narrowly oblanceolate, ascending, hirsute, rarely pustulate; spikes solitary or in pairs, 1–4 cm. long, rarely longer, bractless or rarely bracted below; corolla about 1 mm. broad; fruiting calyx ovoid to oblong-ovoid, 2–3.5 mm. long, the lower becoming distant; mature calyx-lobes lanceolate, the tips connivent, hirsute with ascending hairs, the midrib also with a few spreading bristles; nutlets 4, all similar, lanceolate, 1.5–2 mm. long, smooth and shiny or sometimes dull and minutely tessellate, nearly flat on the dorsal side, distinctly angled on the margins, groove forked at base, closed or nearly so; style equaling or a little shorter than the nutlets.

Slopes and flats, in dry rocky or sandy soils, Arid Transition Zone; east of the Cascades from Okanogan County, Washington, south through Oregon and Nevada to Inyo County, California, east to Montana and Utah. Type locality: Wasatch Mountains, Utah. May–Sept.

35. **Cryptantha grácilis** Osterhout. Slender Cryptantha. Fig. 4299.

Cryptantha gracilis Osterhout, Bull. Torrey Club 30: 236. 1903.
Cryptantha Hillmanii Nels. & Kenn. Proc. Biol. Soc. Wash. 19: 157. 1906.
Cryptantha gracilis var. *Hillmanii* Munz & Jtn. Bull. Torrey Club 49: 39. 1922.

Stems slender, simple with ascending branches above or frequently with several elongated branches below, 1–2 dm. high, rather densely hirsute-hispid with rather short spreading hairs. Leaves linear or narrowly oblanceolate, the lower 1.5–3 cm. long, the upper usually much reduced, pubescence similar to that on the stem but usually pustulate; spikelets solitary or in pairs, 1–2 cm. long, usually dense, bractless; corolla 1 mm. or less in width; fruiting calyx ovoid, divaricately spreading, 2–3 mm. long; mature calyx-lobes lanceolate, erect at apex, rather densely tawny hirsute-villous, midrib with a few hirsute-hispid bristles not strongly differentiated from the rest of the pubescence; nutlets 1 or rarely 2–3 and unequally developed, lanceolate, 1.5–2 mm. long, smooth and shiny, nearly flat on dorsal side, sides rounded at least above, groove usually open to above the middle, scarcely forked below; style about three-fourths the height of the nutlet.

Dry, usually brushy slopes, Upper Sonoran Zone; White Mountains, Inyo County and the higher ranges of eastern Mojave Desert, California, east through Nevada and northern Arizona to Snake River, Idaho, and Colorado. Type locality: Glenwood Springs, Colorado. April–July.

36. **Cryptantha Féndleri** (A. Gray) Greene. Fendler's Cryptantha. Fig. 4300.

Krynitzkia Fendleri A. Gray, Proc. Amer. Acad. 20: 268. 1885.
Eritrichium hispidum var. *leiocarpum* Kuntze, Rev. Gen. Pl. 2: 437. 1891.
Cryptantha ramulosissima A. Nels. Erythea 7: 68. 1899.
Cryptantha wyomingensis Gandoger, Bull. Soc. Bot. Fr. 65: 62. 1918.

Stem erect, usually evident throughout and bearing lateral branches mostly above the middle, sometimes rather bushy-branched from near the base, 1–5 dm. high, rather densely and conspicuously hirsute-hispid with more or less ascending hairs. Leaves narrowly linear to narrowly oblanceolate, acute, appressed-hirsute, often pustulate on the lower surface; spikes solitary or in pairs, 2–12 cm. long, loosely flowered, bractless or rarely bracted below; corolla about 1 mm. broad; fruiting calyx ovate-oblong, 4–5 or rarely 6–7 mm. long, ascending; mature calyx-lobes loosely connivent with the tips somewhat spreading, margins white-hirsute with

ascending hairs, midrib hispid; nutlets 4, all similar, or sometimes reduced to 1–3, smooth and somewhat shiny, lanceolate, acuminate, convex on dorsal face, rounded or obtuse on the sides, groove closed above, opening below into a deltoid areola; style equaling or slightly surpassing the nutlets.

Usually on sagebrush plains, Upper Sonoran and Arid Transition Zones; southeastern Washington and northeastern Oregon, east to Saskatchewan and western Nebraska, and south to northern Arizona and New Mexico. Type locality: New Mexico. June–Aug.

37. **Cryptantha leiocárpa** (Fisch. & Mey.) Greene. Coast Cryptantha. Fig. 4301.

Echinospermum leiocarpum Fisch. & Mey. Ind. Sem. Hort. Petrop. 2: 36. 1835.
Krynitzkia leiocarpa Fisch. & Mey. op. cit. 7: 52. 1841.
Eritrichium leiocarpum S. Wats. Bot. King Expl. 244. 1871.
Cryptantha leiocarpa Greene, Pittonia 1: 117. 1887.
Cryptantha leiocarpa var. *eremocaryoides* Brand, Pflanzenreich 4^{252}: 53. 1931.

Stems at first erect, later commonly widely branched from the base and more or less decumbent, 1–3 dm. long, more or less densely hirsute-hispid, with white appressed or ascending hairs. Leaves linear or sometimes oblanceolate, usually narrowly so, ascending, acute or obtuse, appressed pilose-hispid on both sides; spikes usually numerous, those on the short lateral branchlets usually short and congested, those terminating the principal branches often in pairs and becoming 2–4 cm. or rarely 6 cm. long and conspicuously leafy-bracted; corolla 1–2.5 mm. broad; fruiting calyx ovoid to oblong-ovoid, 2–3 mm. long, crowded or becoming loose below; mature calyx-lobes somewhat connivent above, midrib thickened, conspicuously tawny-hispid with spreading bristles, margins appressed-hirsute; nutlets 4, rarely reduced to 1 by abortion, ovoid-lanceolate, 2 mm. long, smooth, shiny, usually mottled with brown and light gray, rounded on the back, ventral side obtusely rounded, margin obtuse, groove closed to the base, obscurely or commonly not at all forked at base; style equaling or slightly surpassing the nutlets.

Sandy soils along the coast, mainly Humid Transition Zone; Gold Beach, southern Oregon to Surf, Santa Barbara County, California. Type locality: Fort Ross, California. April–June.

38. **Cryptantha Clevelándii** Greene. Cleveland's Cryptantha. Fig. 4302.

Cryptantha Clevelandii Greene, Pittonia, 1: 117. 1887.
Cryptantha Brandegei I. M. Johnston, Contr. Gray Herb. No. 68: 53. 1923.
Cryptantha Abramsii I. M. Johnston, op. cit. No. 74: 97. 1925.

Stems erect or sometimes decumbent, 1–5 dm. high, usually with several elongated ascending or spreading branches, hispidulous with appressed or ascending hairs. Leaves usually dense at base, sparsely scattered above and on the branches, linear to linear-lanceolate, mostly acutish, rather thinly appressed-hispidulous and usually with a few stouter bristles on margins; spikes solitary at the ends of the branches or in twos or threes, 4–10 cm. long, slender, bractless with 1 or 2 bracts at base; corolla about 1 mm. broad; fruiting calyx ovoid to ovoid-oblong, 2–3 mm. long; mature calyx-lobes linear or narrowly linear-lanceolate, connivent above with the tips spreading, outer ones conspicuously hispid on the thickened midribs, all the lobes densely whitish appressed-hirsutulous; nutlets 1–4, ovate-oblong to broadly lanceolate, smooth and shining, low-rounded on the back, groove closed, broadly forked at base or rarely with a small areola; style about two-thirds to as long as nutlets or slightly surpassing them.

Hillsides and mountain slopes, Upper Sonoran Zone; cismontane southern California from the vicinity of Los Angeles to northern Lower California. Type locality: San Diego, California. April–June.

Cryptantha Clevelandii var. **flordsa** I. M. Johnston, Contr. Gray Herb. No. 74: 95. 1925. (*Cryptantha hispidissima* Greene, Pittonia 1: 118. 1887; *C. Clevelandii* var. *hispidissima* I. M. Johnston in Munz, Man. S. Calif. 427. 1935.) Plants usually stouter, spreading or erect, often conspicuously hispid with spreading hairs; spikes in twos or threes at the ends of leafless or sparingly leafy peduncles, bractless or with a few bracts at base; corolla 2–5 mm. broad. California Coast Ranges from San Luis Obispo to San Diego, but infrequently found as far north as Santa Cruz County. Type locality: Linda Vista, San Diego County.

Cryptantha Clevelandii var. **dissíta** (I. M. Johnston) Jepson & Hoover in Jepson, Fl. Calif. 3: 348. 1943. (*Cryptantha dissita* I. M. Johnston, Journ. Arnold Arb. 20: 383. 1939.) Stems rather stout with ascending branches, villous-hirsute; corolla 4–6 mm. broad; fruiting calyx 5–6 mm. long; nutlets 1–3, ovate-lanceolate; style slightly exceeding the nutlets. Tufaceous and serpentine outcrops in the vicinity of Lakeport, Lake County, California. Type locality: near foot of grade a few miles west of Lakeport on road to Hopland.

39. **Cryptantha Gánderi** I. M. Johnston. Gander's Cryptantha. Fig. 4303.

Cryptantha Ganderi I. M. Johnston, Journ. Arnold Arb. 20: 386. 1939.

Stem 1–4 dm. high, branching from the base and more or less dichotomously above, hirsute-hispid with spreading hairs of different length. Leaves linear, acute or obtuse, rather thinly hispidulous, the hairs, especially those on the lower, pustulate at base; spikes solitary, terminal or from the axils of the upper leaves, bractless, 5–15 cm. long and loosely flowered in age; corolla inconspicuous, 2.5 cm. long, lobes narrow, erect; fruiting calyx subsessile, ascending, accrescent, 6–10 mm. long, lobes narrowly linear, erect, margins very narrow, the costate midrib with conspicuous yellowish, spreading or deflexed bristles; ovules 4, usually 1 fertile and 3 abortive; nutlets lanceolate, acuminate, 2–2.5 mm. long, smooth or faintly rugulose, shiny, grayish brown and rather obscurely mottled, convex on the back, margins rounded, ventral side broadly obtuse; groove closed above, forked at base into a narrow triangular areola.

Desert washes and hills, Lower Sonoran Zone; Colorado Desert, San Diego County, California, and northern Lower California. Type locality: "Borego Valley, Larrea-Franseria association, 500 ft. alt." San Diego County. Feb.–May.

40. **Cryptantha hispídula** Greene. Napa Cryptantha. Fig. 4304.

Cryptantha hispidula Greene ex Baker, West. Amer. Pl. 2: 10. 1903. Nomen nudum.
Cryptantha hispidula Greene ex Brand, Pflanzenreich 4^{252}: 60. 1931.

Stems erect, slender, 1–4 dm. high, widely branched above the base, strigose and spreading-hirsutulous. Leaves linear or the lower narrowly oblanceolate, 0.7–1.5 cm. long, spreading-hispidulous, more or less pustulate; spikes geminate or ternate or occasionally solitary, becoming loosely flowered and often 5-7 cm. long; corolla 2–2.5 mm. broad; fruiting calyx 2–2.5 mm. ascending, connivent with the tips spreading; mature calyx-lobes linear, conspicuously hispid on the midrib, the tips and margins appressed-hispidulous; nutlet 1, smooth and polished, ovate or lanceolate, narrowed above into a slender beak, well-rounded on both sides; groove open, shortly forked at base; style shorter than the nutlet.

Serpentine outcrops, Upper Sonoran Zone; Inner Coast Ranges, Lake and Napa Counties, California. Type locality: Knoxville, Napa County. April–June.

41. **Cryptantha microstàchys** Greene. Tejon Cryptantha. Fig. 4305.

Krynitzkia microstachys Greene ex A. Gray, Proc. Amer. Acad. 20: 269. 1885.
Cryptantha microstachys Greene, Pittonia 1: 116. 1887.

Stems erect, slender-branched from the base or above, 8–30 cm. high, hirsute-hispidulous with spreading or more or less ascending hairs. Leaves spreading, linear to linear-lanceolate, 1–4 cm. long, obtuse, hirsute-hispidulous or rarely strigose, sparsely ciliate-hispid on the margins and the midrib beneath; spikes geminate or ternate, in age loosely flowered and very slender, 2.5–8 cm. long; corolla 0.5–1 mm. broad; fruiting calyx ascending, 1–2 mm. long, oblong or slightly connivent and tips slightly spreading; calyx-lobes narrowly linear-lanceolate, thinly strigose and greenish with a few spreading bristles on the midrib and usually 1 or 2 erect ones at the tip; nutlet 1, lanceolate or ovate-attenuate, 1.5 mm. long, smooth and polished, rounded on the dorsal side, the ventral side rounded or slightly 2-planed; groove closed, simple or shortly forked at very base.

Common in chaparral, Upper Sonoran Zone; Coast Ranges from Glenn County south to San Diego County, also Sierra Nevada in Kern County, California. Type locality: Fort Tejon, Kern County. April–June.

42. **Cryptantha nemáclada** Greene. Colusa Cryptantha. Fig. 4306.

Cryptantha nemaclada Greene, Pittonia 1: 118. 1887.

Stems slender, erect and usually much-branched, 1–3 dm. high, sparsely strigose, and more or less short-hirsute. Leaves narrowly linear, 1–3 cm. long, obtuse, ascending or somewhat appressed, appressed-hirsutulous, minutely pustulate; spikes solitary or geminate, bractless, slender, becoming loosely flowered and 2–9 cm. long; corolla minute, less than 1 mm. broad; fruiting calyx oblong-ovoid, strictly ascending, 2–4 mm. long; mature calyx-lobes linear, connivent above with tips spreading, midrib thickened, conspicuously hispid toward the base, retrorsely setulose toward the apex, margins sparsely strigose; nutlets 1–4, lanceolate to ovoid-lanceolate, 1.7–2 mm. long, smooth, convex on the back, obtuse on the sides, groove opened or closed above, broadly forked below; style reaching to about three-fourths the length of the nutlet.

Hillsides and shaded banks, Upper Sonoran Zone; Inner Coast Ranges and bordering valleys, Colusa County south to San Luis Obispo County and the Tehachapi Mountains, California. Type locality: "Colusa County." April–May.

43. **Cryptantha rostellàta** Greene. Beaked Cryptantha. Fig. 4307.

Krynitzkia rostellata Greene, Bull. Calif. Acad. 1: 203. 1885.
Cryptantha rostellata Greene, Pittonia 1: 116. 1887.
Krynitzkia Suksdorfii Greenm. Bot. Gaz. 40: 146. 1905.
Cryptantha Suksdorfii Piper, Contr. U.S. Nat. Herb. 11: 484. 1906.

Stems stiffly erect, branched below or more often simple below with a few ascending branches toward the top, rather finely strigose and canescent. Leaves rather abundant along main stem, ascending, firm and persistent, usually opposite below the middle, narrowly linear but more often oblanceolate and 2–3 mm. wide; spikes solitary or geminate, rather stiff, naked, 2–4 cm. long; corolla minute, 1 mm. or less broad; fruiting calyx oblong-ovate, 3–4 mm. long, spreading or ascending, fairly persistent; mature calyx-lobes with midrib on all lobes armed with stout, encrusted uncinate or arcuate hairs, margins sparsely ciliate or strigose; only 1 nutlet maturing, smooth, compressed ovate-lanceolate to lanceolate, 2–3 mm. long, convex dorsally, rounded on the sides, truncate at base; groove closed above, forked at base into a distinct areola; gynobase very short and stout; style one-half to one-third height of nutlet.

Foothills, Upper Sonoran Zone; Klickitat County, Washington, south to central California. Type locality: "Lake and Colusa Counties," California. Collected by Mrs. Curran. April–May.

Cryptantha rostellata var. spithamèa (I. M. Johnston) Jepson, Fl. Calif. 3: 354. 1943. (*Cryptantha spithamea* I. M. Johnston, Journ. Arnold Arb. 20: 385. 1939.) The reflexed bristles on the lower part of the calyx are few or wanting. Foothills, Upper Sonoran Zone; Mariposa County, California. Type locality: Coulterville.

44. Cryptantha flăccida (Dougl.) Greene. Flaccid Cryptantha. Fig. 4308.

Myosotis flaccida Dougl. ex Lehm. Stirp. Pug. 2: 22. 1830.
Eritrichium oxycaryum A. Gray, Proc. Amer. Acad. 10: 58. 1874.
Krynitzkia oxycarya A. Gray, op. cit. 20: 269. 1885.
Cryptantha flaccida Greene, Pittonia 1: 115. 1887.
Cryptantha multicaule Howell, Fl. N.W. Amer. 487. 1901. Not A. Nels. 1900.
Cryptantha Howellii A. Nels. Bot. Gaz. 34: 30. 1902.
Cryptantha Lyallii Brand, Rep. Spec. Nov. 24: 57. 1927.

Stem strictly erect, ascendingly branched above, or sometimes from the base, 2–5 dm. high, strigose with encrusted hairs. Leaves very narrowly linear to linear-oblanceolate, 2–6 cm. long, 1–2 or rarely 3 mm. wide, strict or ascending, rather densely and finely strigose; spikes solitary to quinate, naked, usually rather stiff, 4–8 cm. or as much as 16 cm. long; corolla 1–4 mm. broad; fruiting calyx oblong-ovoid, 2–5 mm. long, strictly and closely erect; mature calyx-lobes linear-lanceolate, closely connivent above with the tips spreading, midrib armed with spreading, coarse, encrusted, arcuate or uncinate bristles, margins ciliate or strigose, outer lobe longest and most conspicuously bristly; only 1 nutlet maturing, ovate-lanceolate and rostrate-acuminate, only slightly compressed, smooth; groove closed above, dilated at base to form a very small areola; gynobase very low and scarcely manifest; style one-third to one-half the height of the nutlet.

Hillslopes, Arid Transition and Upper Sonoran Zones; Washington and adjacent Idaho to southern California. Type locality: east of the Cascades in the Columbia River Basin. Collected by Douglas. April–June.

45. Cryptantha sparsiflòra Greene. Slender Cryptantha. Fig. 4309.

Krynitzkia sparsiflora Greene, Bull. Calif. Acad. 1: 203. 1885.
Cryptantha sparsiflora Greene, Pittonia 1: 116. 1887.

Stem very slender, with usually few ascending branches, 1–3 dm. high, sparsely strigose. Leaves narrowly linear, 1–3 cm. long, about 1 mm. wide, strigose, the lower often opposite; spikes solitary or geminate, slender, becoming loosely flowered and 2–6 cm. long, bractless or sometimes with 1 or 2 bracts near the base; corolla minute, less than 1 mm. broad; fruiting calyx 2–3 mm. long, ovate to ovate-oblong, ascending, early deciduous; mature calyx-lobes linear-lanceolate, somewhat connivent, midrib armed with short, stout, uncinate hairs, margins sparsely ciliate; ovules 4, only 1 maturing; nutlet 1, ovate, acute or short-acuminate, decidedly compressed, smooth, 2 mm. long, low-convex dorsally, angled on the margin; groove closed and broadly forked near the base; gynobase low; style one-third to one-half the height of nutlet.

Rocky slopes, Upper Sonoran Zone; Inner Coast Ranges, Stanislaus and San Benito Counties and the foothills of the Sierra Nevada from Mariposa County to Kern County, Califonia. Type locality: possibly in the Tehachapi Mountains. Collected by Mrs. Curran, but collecting data uncertain. April–May.

46. Cryptantha áffinis (A. Gray) Greene. Common Cryptantha. Fig. 4310.

Krynitzkia affinis A. Gray, Proc. Amer. Acad. 20: 270. 1885.
Cryptantha affinis Greene, Pittonia 1: 119. 1887.
Cryptantha geminata Greene, loc. cit.
Cryptantha Eastwoodiae St. John, Fl. S.E. Washington 342. 1937.

Stems usually with few ascending branches mostly above the middle or sometimes more or less profusely branched from the base, 1–4 dm. high, pubescent throughout with short upwardly curved hairs and also with scattered ascending or spreading hirsute-hispid hairs. Leaves narrowly to broadly oblanceolate, mostly 3–6 mm. broad, obtuse or rounded at apex, rather sparsely short-hispid and minutely pustulate; spikes solitary or geminate, 2–8 cm. long or rarely longer, usually with a few foliaceous bracts below, becoming loosely flowered; corolla minute, about 1.5 mm. broad; fruiting calyx 2.5–4 mm. long, and about as broad, compressed; mature calyx-lobes somewhat connivent, midrib little thickened, on the outer lobe especially sparsely hispid, margins appressed-hirsute; nutlets 4, similar, smooth and polished, ovate, obliquely compressed, often mottled, 2–2.5 mm. long, low-convex on the back, rounded on the sides; groove distinctly eccentric, closed, simple or shortly forked at base; style shorter or nearly as high as the nutlets.

Usually in sandy or rocky soils, Arid Transition Zone; eastern Washington south, mainly east of the Cascades to eastern Oregon, the North Coast Ranges, and in the Siskiyou Mountains, and the Sierra Nevada, south to the Cuiamaca Mountains, California, east to Idaho, Nevada, and Wyoming. Type locality: "E. side of the Cascades near lat. 49°." Collected by Lyall. June–Sept.

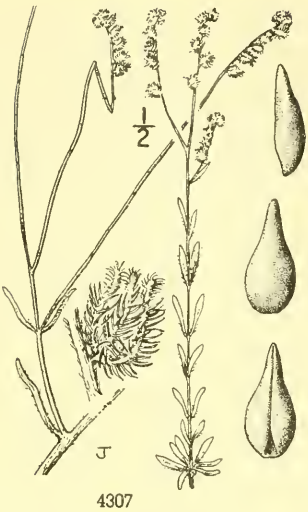
47. Cryptantha glomeriflòra Greene. Truckee Cryptantha. Fig. 4311.

Cryptantha glomeriflora Greene, Pittonia 1: 116. 1887.

Stems erect with a few ascending branches, 3–10 cm. high, or commonly diffusely branched and spreading, whitish strigose. Leaves 5–15 mm. long, linear-oblong to lanceolate-oblong, appressed-hispidulous; flowers in glomerules or 2 or 3 in the axils of the leaves and at the ends of the branchlets; corolla minute, the lobes ascending; mature calyx 1–1.5 mm. long, lobes linear-lanceolate, hispidulous and bristly with stout straight bristles; nutlets solitary, ovate below, more or less abruptly attenuate at apex, smooth, shiny, light gray more or less speckled with brown, 1.5 mm. long, rounded on the back and somewhat keeled on the narrowed apex; ventral groove a little off center, closed, opening at base into the sunken areola.

Mountain meadows and slopes, upper Arid Transition and Canadian Zones; Sierra Nevada from Nevada County to Tulare and Inyo Counties, also White Mountains, California. Type locality: "Borders of a pond two miles below Truckee," Nevada County, California. June–Sept.

4306



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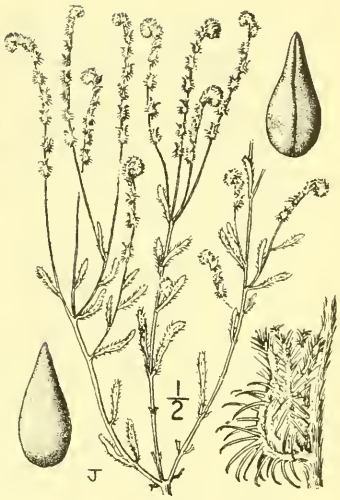

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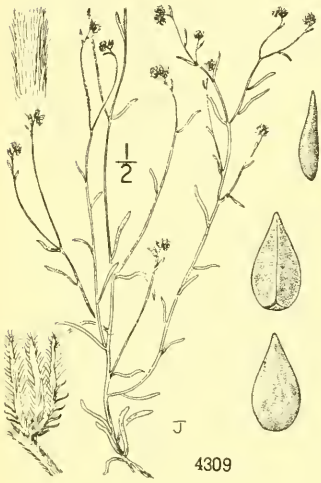

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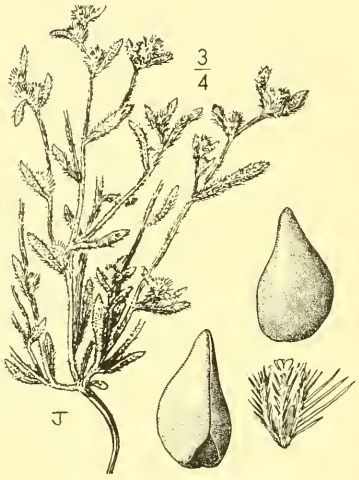
4310



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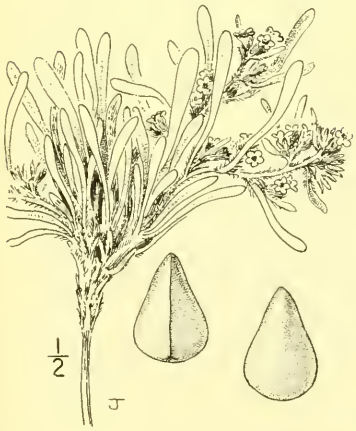

4312

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4314

4306. Cryptantha nemaclada
4307. Cryptantha rostellata
4308. Cryptantha flaccida

4309. Cryptantha sparsiflora
4310. Cryptantha affinis
4311. Cryptantha glomeriflora

4312. Oreocarya abortiva
4313. Oreocarya confertiflora
4314. Oreocarya leucophaea

22. OREOCÀRYA Greene, Pittonia 1: 57. 1887.

Stout perennial herbs, canescent or pilose-hispid with the leaves mostly basal. Inflorescence leafy-bracteate thyrsoid or racemose-paniculate. Flowers in slender pedicels, persistent. Calyx 5-parted to the base, segments lanceolate. Corolla white or cream-colored with prominent often yellow crests. Nutlets smooth and polished or tuberculate or rugose and dull, the margins acute or sometimes very narrowly winged; groove usually closed, divaricate at base. [Name Greek, meaning mountain, because of the habitat, and nutlet.]

A genus of about 45 species inhabiting western North America. Type species, *Cynoglossum glomeratum* Pursh.

Nutlets smooth and shining on the dorsal surface.
- Corolla-tube 3–4 mm. long, barely as long as calyx in anthesis, white. 1. *O. abortiva.*
- Corolla-tube 8–12 mm. long, distinctly longer than calyx in anthesis.
  - Corolla yellow; nutlets broadly ovate in outline, distinctly wing-margined. 2. *O. confertiflora.*
  - Corolla white; nutlets lanceolate in outline, the margins acute not winged. 3. *O. leucophaea.*

Nutlets more or less roughened or wrinkled on the dorsal surface.
- Corolla-tube about equaling or shorter than the calyx in anthesis.
  - Inner surface of nutlets smooth or nearly smooth; margin of scar not elevated.
    - Scar of nutlet narrowly subulate, but open at base.
      - Nutlets with conspicuous transverse rugae on upper surface.
        - Calyx 5–7 mm. long in fruit. 4. *O. subretusa.*
        - Calyx 13–15 mm. long in fruit. 5. *O. crymophila.*
      - Nutlets with distinct tubercles but no conspicuous transverse rugae on upper surface. 6. *O. nubigena.*
    - Scar of nutlet broader and distinctly cuneate at base. 7. *O. Thompsonii.*
  - Inner surface of nutlets conspicuously rugose or tuberculate.
    - Scar of nutlet open and cuneate toward the base, only narrowly so in *O. humilis.*
      - Margin around scar somewhat elevated.
        - Cymules elongated and inflorescence broad.
          - Calyx-lobes 10–12 mm. long in fruit; nutlets 4.5 mm. long, prominently carinate on the dorsal side. 8. *O. virginensis.*
          - Calyx-lobes 5–7 mm. long in fruit; nutlets 2.5–3 mm. long, with only an indistinct central ridge toward the apex. 9. *O. Hoffmannii.*
        - Cymules short and inflorescence narrow; nutlets without or with only an indistinct central ridge on the dorsal side. 10. *O. tumulosa.*
      - Margin around the scar not at all elevated; scar with only narrow opening at base. 11. *O. humilis.*
    - Scar of nutlet closed and linear or nearly so, without conspicuous triangular opening toward the base.
      - Leaves uniformly strigose on the upper surface and without pustules. 12. *O. propria.*
      - Leaves with strigose hairs, also with marginal setae pustulate at base.
        - Nutlets dark brown and glossy, tuberculate, not rugose but with an occasional pair of tubercles connected by a low vein-like ridge. 13. *O. Sheldonii.*
        - Nutlets more or less rugose, the ridges and tubercles pallid. (See also *O. humilis.*)
          - Nutlets 3–4 mm. long; stems slender. 14. *O. spiculifera.*
          - Nutlets 4–5 mm. long; dorsal ridges conspicuously rugose. 15. *O. celosioides.*
- Corolla-tube distinctly longer than the calyx in anthesis; scar of nutlet conspicuously open and its margin distinctly elevated. 16. *O. flavoculata.*

1. Oreocarya abortìva Greene. Prostrate Oreocarya. Fig. 4312.

Oreocarya abortiva Greene, Pittonia 3: 114. 1896.
Krynitzkia multicaulis var. *abortiva* M. E. Jones, Contr. West. Bot. No. 13: 5. 1910.
Oreocarya suffruticosa var. *abortiva* J. F. Macbride, Proc. Amer. Acad. 51: 547. 1916.
Cryptantha Jamesii var. *abortiva* Payson, Ann. Mo. Bot. Gard. 14: 250. 1927.
Hemisphaerocarya abortiva Brand, Rep. Spec. Nov. 24: 61. 1927.

Stems several from the root crown, decumbent or prostrate, 5–15 cm. long, herbage silver-gray throughout with a fine strigulose pubescence and with few hirsute bristles in the inflorescence especially on the margins of the bracts. Leaves mostly tufted near the base, 5–10 cm. long, oblanceolate, densely strigulose and with scattered appressed bristles pustulate at base; raceme short leafy-bracteate, usually in a thyrsoid panicle 1.5–3 cm. long; calyx-lobes ovate-lanceolate, 3–4 mm. long, densely strigose and setose, the tube very short; corolla white, 3–4 mm. long, the limb about 3 mm. broad; nutlets 1–4, narrowly ovoid, 2–2.5 mm. long, curved on the dorsal side, smooth and glossy, ventral side strongly keeled with sloping sides, the keel grooved about two-thirds the way up and forked at base; scar linear, situated in the groove.

Gravelly flats, mountains, mostly Canadian Zone; Mono and Inyo Counties and to the San Bernardino Mountains, California, east to southern Nevada. Type locality: Bear Valley, San Bernardino Mountains, California. May–Aug.

2. Oreocarya confertiflòra Greene. Mojave Oreocarya. Fig. 4313.

Oreocarya confertiflora Greene, Pittonia 3: 112. 1896.
Oreocarya leucophaea var. *confertiflora* Parish, Erythea 7: 95. 1899.
Oreocarya lutea Greene ex Fedde, Rep. Spec. Nov. 19: 72. 1923.
Cryptantha confertiflora Payson, Ann. Mo. Bot. Gard. 14: 256. 1927.

Perennial with a stout woody root and woody cespitose caudex, the flowering stems simple,

1.5–5 dm. high, densely white silky-villous at base, strigose and sparingly setose above, the bristles appressed or ascending. Leaves rather crowded near the base, their clasping bases often persistent, linear-oblanceolate, acute, 3–10 cm. long, densely strigose and at least all but the lowest with appressed bristles with pustulate bases, lower surface uniformly strigose; inflorescence usually less than one-third the length of the stem, the axis, floral bracts and calyces covered with spreading yellowish bristles, cymules short; sepals linear-lanceolate, acute, 7–10 mm. long in flower, 10–12 mm. in fruit; corolla pale yellow or cream-colored, 12–14 mm. long, the limb 7–9 mm. broad; nutlets broadly ovoid, sharply 3-angled, about 3 mm. long, flat or concave dorsally, acute and narrowly wing-margined at the angles, glossy and smooth; scar straight extending from base to about the middle, the margin not elevated.

Usually on gravelly benches or washes, Upper Sonoran and Arid Transition Zones; desert regions from Mono and Inyo Counties to the northern base of the San Bernardino Mountains, San Bernardino County, California, east to southern Nevada, southwestern Utah and northern Arizona. Type locality: Cushenberry Springs, desert slopes of the San Bernardino Mountains, California. May–July.

3. **Oreocarya leucophaèa** (Dougl.) Greene. Gray Oreocarya. Fig. 4314.

Myosotis leucophaea Dougl. ex. Lehm. Stirp. Pug. 2: 22. 1830.
Eritrichium leucophaeum A. DC. Prod. 10: 129. 1846.
Krynitzkia leucophaca A. Gray, Proc. Amer. Acad. 20: 280. 1885.
Oreocarya leucophaea Greene, Pittonia 1: 58. 1887.
Cryptantha leucophaea Payson, Ann. Mo. Bot. Gard. 14: 262. 1927.

Stems arising from a cespitose woody caudex, 2–4 dm. high, densely white-strigose below, bristly-hirsute above. Leaves linear to linear-oblanceolate, acute, 3–6 cm. long or rarely longer, ciliate toward the base and on the winged petioles, strigose on both sides; inflorescence 7–15 cm. long, narrow, congested above, leafy bracted below, densely bristly-hirsute; fruiting calyx 10–15 mm. long, the lobes linear-subulate, white-strigose and densely bristly; corolla white, the tube 8–10 mm. long, limb 8–10 mm. broad; nutlets about 3.5 mm. long, smooth and glossy, the margins acute but not winged; scar as in preceding species.

Usually in sandy soils, associated with sagebrush, Arid Transition Zone; east of the Cascade Mountains from southern British Columbia and eastern Washington at least as far as Walla Walla County, and probably adjacent northern Oregon. Type locality: "arid barrens of the Columbia, and of its northern and southern tributaries." May–July.

4. **Oreocarya subretùsa** (I. M. Johnston) Abrams. Crater Lake Oreocarya. Fig. 4315.

Cryptantha subretusa I. M. Johnston, Journ. Arnold Arb. 20: 393. 1939.
Cryptantha andina I. M. Johnston ex M. E. Peck, Man. Pl. Oregon 601. 1941.

Cespitose perennial, the woody caudex usually compact and densely leafy. Leaves congested at base, spatulate, subretuse, rounded or obtuse at apex, tomentose; stems 7–20 cm. high, densely yellowish hirsute-bristly, flowers mostly congested in a rather narrow thyrsus, bracts densely yellowish-hispid, the lower longer than the cymes, the upper shorter; sepals 3–4 mm. long in anthesis, 5–7 mm. in age; corolla white, tube 3–4 mm. long, limb 3–6 mm. broad; nutlets oblong-lanceolate, 3–4 mm. long, acute on the angles or narrowly wing-margined, dorsal surface convex, inconspicuously tuberculate or with short low rugae; scar linear or subulate with the base slightly open.

Dry talus slopes, especially in pumice, Boreal Zones; Crater Lake, Oregon to Mount Eddy, Siskiyou County, California, east to Wallowa and Harney Counties, Oregon, and Humboldt County, Nevada. Type locality: "Crater Lake, pumice slope on rim, 7,000 ft." May–Aug.

This species has been confused by some authors with *O. nubigena* and *O. humilis*.

5. **Oreocarya crymóphila** (I. M. Johnston) Jepson & Hoover. Alpine Oreocarya. Fig. 4316.

Cryptantha crymophila I. M. Johnston, Journ. Arnold Arb. 21: 65. 1940.
Oreocarya crymophila Jepson & Hoover in Jepson, Fl. Calif. 3: 328. 1943.

Perennial, stems erect, several, 1.5–3 dm. high, simple, hirsute and minutely villous below, hispid above. Leaves grayish villous-tomentose and bearing upwardly appressed setae on both surfaces, the setae on the lower surface pustulate at base; lower leaves spatulate-oblanceolate, 5–10 cm. long; upper cauline leaves oblanceolate or narrowly linear, 4–5 cm. long, 4–5 mm. broad; cymes 3–7-flowered, scattered in the axils of the leaves and glomerate at the apex, fruiting inflorescence 2–3 cm. broad; calyx 5 mm. long in flower, 13–15 mm. in fruit; corolla white, 8 mm. long, limb 5 mm. broad; nutlets 4, ovoid, 4.5–5 mm. long, rounded at base, dorsal side irregularly rugose, the rugae interrupted more or less by transverse rugae, ventral side smooth; scar narrow, subulate at base; gynobase subulate.

Rocky slopes, mainly Hudsonian Zone; alpine ridges between the Clark Fork and Middle Fork of the Stanislaus River, Sierra Nevada, Alpine and Tuolumne Counties, California. Type locality: Red Peak, Alpine County, California. July–Aug.

6. **Oreocarya nubígena** Greene. Sierra Oreocarya. Fig. 4317.

Oreocarya nubigena Greene, Pittonia 3: 112. 1896.
Cryptantha nubigena Payson, Ann. Mo. Bot. Gard. 14: 265, in part. 1927.
Cryptantha Clemensiae Payson, op. cit. 14: 267.

Stems several to many from rather slender roots, slender, 6–15 cm. high, densely leafy at

base, retrorsely pubescent and setose with spreading bristles. Leaves narrowly oblanceolate or spatulate, 2–3 cm. long, rather thinly hirsute-pubescent and setose with mostly ascending bristles, mostly pustulate on both surfaces; inflorescence short-spicate, often with a few scattered cymules below in the axils of leafy bracts; sepals 3–4 mm. long in flower, about 7 mm. in fruit, setose with slender bristles; corolla white, tube barely 3 mm. long, shorter than the sepals in anthesis, limb 4 mm. broad; nutlets narrowly lanceolate, 3 mm. long, narrowly wing-margined, slightly glossy, dorsal side tuberculate, the tubercles sometimes forming short rugae, ventral surface nearly smooth; scar straight, extending from near the base nearly to the apex, narrow but open, the margin not elevated.

Rocky or sandy slopes and moraines, Arctic-Alpine and Hudsonian Zones; high Sierra Nevada from Mount Conness, Mono County to Mount Whitney, Inyo County, California. Type locality: Cloud's Rest, Yosemite National Park. July–Aug.

7. **Oreocarya Thompsònii** (I. M. Johnston) Abrams. Thompson's Oreocarya. Fig. 4318.

Cryptantha Thompsonii I. M. Johnston, Contr. Arnold Arb. No. 3: 88. 1932.

Cespitose perennial, with a stout woody root and stout-branched woody caudex or root crown, stems 1 to several, 15–25 cm. high, densely bristly-hirsute with slender weak bristles. Basal leaves oblanceolate to spatulate, acutish to rounded at apex, 5–7 cm. long, grayish-tomentose and bearing scattered appressed bristles on both sides; cymules crowded at the apex, scattered below in the axils of the much longer linear or linear-lanceolate foliaceous bracts, loosely and irregularly few-flowered, not scorpioid; sepals about as long as corolla-tube in flower, 8–12 mm. long in fruit, densely setose; corolla white, tube 3–4 mm. long, limb 3–7 mm. broad; nutlets ovate or oblong-ovate, short-acuminate, glossy, dorsal side irregularly rugose and tuberculate, inner surface smooth; scar open and cuneate at base.

Rocky ground, especially talus slopes, Canadian and Arid Transition Zones; east side of the Cascade Mountains in Chelan and Kittitas Counties, Washington. Type locality: "rocky open crest of Iron Mts., Mt. Stuart region, Kittitas Co., 7000 ft." June–Aug.

8. **Oreocarya virginénsis** (M. E. Jones) J. F. Macbride. Virgin Valley Oreocarya. Fig. 4319.

Krynitzkia glomerata var. *virginensis* M. E. Jones, Contr. West. Bot. No. 13: 5. 1910.
Oreocarya virginensis J. F. Macbride, Proc. Amer. Acad. 51: 547. 1916.

Biennial or short-lived perennial, from a somewhat woody taproot; stems 1 to many from the root crown, stout, 1.5–4 dm. high, conspicuously hispid with divaricate bristles. Leaves oblanceolate to spatulate, rounded or obtuse at apex, 5–10 cm. long, setose-bristly on the margins and petioles, the bristles few, somewhat appressed and usually conspicuously pustulate especially on the lower surface of the leaves; flowers in a large thyrsus extending well below the middle of the stem; individual cymes elongated; bracts foliaceous and conspicuous; calyx-lobes lanceolate in anthesis, 4 mm. long, becoming 10–12 mm. long and linear in fruit, setose, the bristles often somewhat fulvous; corolla white, tube 3–4 mm. long, about equaling the calyx, limb 6–8 mm. broad; nutlets usually only 1 or 2 maturing, lanceolate-ovate, obtuse, 4.5 mm. long, dorsal surface distinctly carinate, and both it and the ventral surface somewhat rugose and tuberculate; scar narrowly triangular.

Rocky hills, Upper Transition Zone; Mojave Desert region: Panamint Mountains, hills north of Barstow, Kingston Mountains, California; also Charleston Mountains, Nevada, east to south Utah. Type locality: La Verkin, Virgin River Valley, Utah. March–June.

9. **Oreocarya Hoffmannii** (I. M. Johnston) Abrams. Hoffmann's Oreocaryi. Fig. 4320.

Cryptantha Hoffmannii I. M. Johnston, Contr. Arnold Arb. No. 3: 90. 1932.

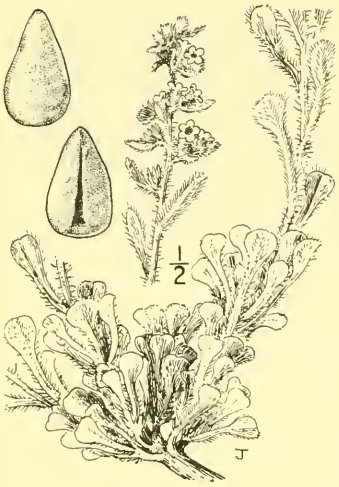
Stems 1 to several from a biennial or short-lived perennial root, erect, 15–30 cm. high, conspicuously hirsute and retrorsely pubescent. Basal leaves spatulate, 2–4 cm. long, the blade 5–10 mm. broad, tapering or abruptly narrowed to a petiole much longer than the blade, retrorsely hirsutulous, also sparsely bristly, bristles pustulate at base, more or less appressed; stem-leaves distant, the lower with winged petioles, the upper reduced, linear and sessile; inflorescence 6–18 cm. long, 3.5–6 cm. broad, more or less interrupted; cymules ascending, 2.5–4 cm. long; calyx-lobes 3–3.5 mm. long, equaling the corolla-tube, in fruit 5–7 mm. long, narrowly lanceolate, hirsutulous and rather densely bristly, the hairs yellowish; corolla white, tube 3 mm. long, limb 5–6 mm. broad; nutlets ovate, 2.5–3 mm. long, acute, dorsal surface tuberculate and slightly rugose; ventral surface with scar open, extending nearly to the apex, the sides rugose.

Mountain slopes, Arid Transition Zone; southern Sierra Nevada and White Mountains, Inyo County, California. Type locality: rocky open slope, Westgard Pass, 7,300 feet altitude, northern Inyo County, California. June–July.

10. **Oreocarya tumulòsa** Payson. Mojave Oreocarya. Fig. 4321.

Oreocarya tumulosa Payson, Univ. Wyo. Pub. Sci. 1: 164. 1926.
Cryptantha tumulosa Payson, Ann. Mo. Bot. Gard. 14: 276. 1927.

Cespitose perennial with a stout woody root; stems few to many from a branched caudex, 7–25 cm. high, short-villous and setose with divaricate bristles. Leaves crowded near the base,



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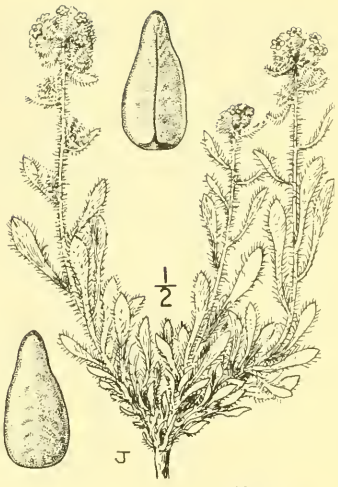

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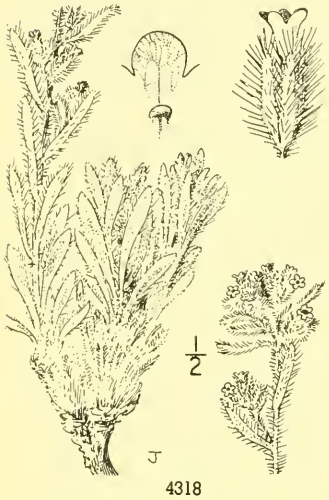

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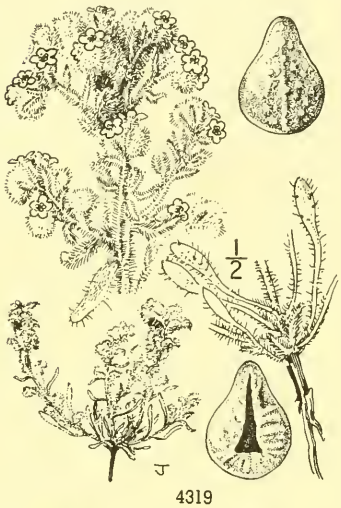

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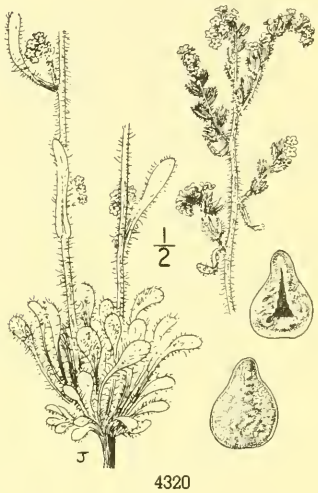

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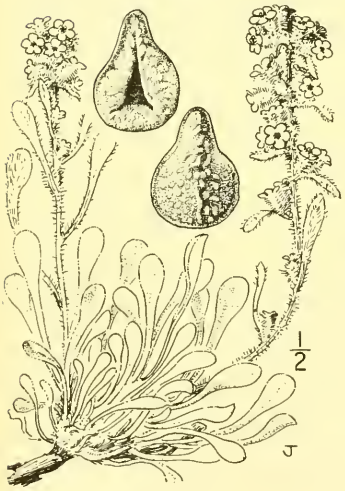

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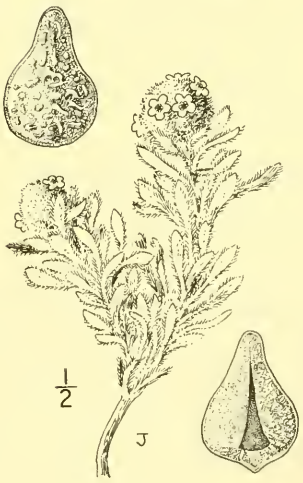

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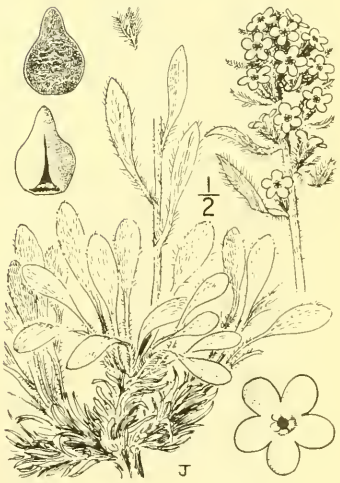


4323

4315. Oreocarya subretusa
4316. Oreocarya crymophila
4317. Oreocarya nubigena
4318. Oreocarya Thompsonii
4319. Oreocarya virginensis
4320. Oreocarya Hoffmannii
4321. Oreocarya tumulosa
4322. Oreocarya humilis
4323. Oreocarya propria

oblanceolate or spatulate, obtuse or rounded at apex, 3–5 cm. long, gradually narrowed to a long petiole, whitish-tomentulose and with few slender more or less appressed bristles; inflorescence rather narrow, interrupted only below, the cymes short; lowest bracts foliaceous, the upper inconspicuous, becoming reflexed, conspicuously setose with spreading or retrorse yellowish bristles; sepals in anthesis linear-lanceolate, about 4 mm. long, 8–10 mm. in fruit, densely setose-spreading with retrorse bristles; corolla white, tube 3.5–4 mm. long, limb 7 mm. broad; nutlets only 1 or 2 maturing, ovate-lanceolate in outline, 4 mm. long, obtuse and light-colored, dull or only slightly glossy, margin acute, dorsal surface with a low medial ridge, tuberculate and distinctly rugose; scar triangular, short, open.

Gravelly slopes, Upper Sonoran Zone; Providence, New York, Panamint and Ivanpah Ranges in the Mojave Desert, California; Charleston Mountains, Nevada. Type locality: Providence Mountains, California. April–June.

11. **Oreocarya hùmilis** (A. Gray) Greene. Low Oreocarya. Fig. 4322.

Eritrichium glomeratum var. *humile* A. Gray, Proc. Amer. Acad. 10: 61, in part. 1874.

Orcocarya humilis Greene, Pittonia 3: 112. 1896.

Cryptantha humilis Payson, Ann. Mo. Bot. Gard. 14: 278. 1927.

Cespitose perennial, stems 1 to several from a compact short-branched, densely leafy, woody caudex, 5–20 cm. high, hirsute with weak spreading bristles. Leaves densely tufted at base, oblanceolate to broadly spatulate, narrowed to a rather slender petiole, 2–4 cm. long, densely silky-tomentose, and with scattering slender bristles; sepals linear or linear-lanceolate, acute, 4–5 mm. long in anthesis, 8–13 mm. in fruit; corolla white, tube 4–5 mm. long, limb 8–10 mm. broad; nutlets commonly 4 maturing, ovate-lanceolate in outline, acute or obtuse, 3–4.5 mm. long, margins acute, dorsal surface somewhat glossy, densely and finely tuberculate, or the tubercles sometimes united to form short rugae, ventral surface rather indistinctly tuberculate, scar triangular, open at the base or nearly closed.

Alpine ridges, Canadian and Hudsonian Zones; Sierra Nevada, from Nevada County to Mono County, California, east to Malheur County, Oregon, and western Nevada. Type locality: Summit Station (Donner Pass), Nevada County, California, as designated by I. M. Johnston, Contr. Arnold Arb. 3: 87. 1932. June–Aug.

12. **Oreocarya pròpria** Nels. & Macbr. Malheur Oreocarya. Fig. 4323.

Krynitzkia fulvocanescens var. *idahoensis* M. E. Jones, Contr. West. Bot. No. 13: 6. 1910.

Oreocarya propria Nels. & Macbr. Bot. Gaz. 62: 145. 1916.

Cryptantha propria Payson, Ann. Mo. Bot. Gard. 14: 317. 1927.

Cespitose perennial with a woody caudex, densely clothed with the old leaf-bases, stems few to many, 15–25 cm. high, rather slender, sparsely setose. Leaves clustered on the crown of the caudex branches, spatulate, obtuse, 4–8 cm. long, finely strigose and appressed-setulose and on the upper side with pustulate bristles, the lower side densely and finely strigose with a few intermingling pustulate hairs; petioles ciliate near the base with long white hairs; inflorescence rather narrow, little or not at all interrupted, extending to the middle of the stem or a little below, densely but weakly setose and hirsute; sepals in fruit 8–10 mm. long; corolla white, the tube 3–5 mm. long, about equaled by the lobes; nutlets lanceolate, 3–4 mm. long, acute on the margins, dull, dorsal side densely rugulose with somewhat minute narrow ridges, conspicuously muricate near the margins; scar narrow, slightly open, extending nearly to the apex, not elevated on the margins.

Dry hillsides, Upper Sonoran Zone; Malheur County, southwestern Oregon to western Idaho. Type locality: near Harper Ranch, Malheur County, Oregon. May–July.

13. **Oreocarya Sheldònii** Brand. Sheldon's Oreocarya. Fig. 4324.

Oreocarya Sheldonii Brand, Rep. Spec. Nov. 19: 73. 1923.

Cryptantha Sheldonii Payson, Ann. Mo. Bot. Gard. 14: 301. 1927.

Perennial with stout root; stems usually several from a branched root crown, stout, 15–25 cm. high, simple, or with 1 or more slender ascending branches from near the base, hirsute-hispid with spreading setae and with a fine somewhat tomentose pubescence of reflexed hairs, densely leafy at base. Leaves, especially the lower, spatulate, 2–3 cm. long, 5–7 mm. broad near the rounded apex, canescent with a more or less appressed pubescence, the upper surface and margins also with scattered ascending slender setae with pustulate bases; upper stem-leaves gradually reduced, oblanceolate to narrowly linear-oblanceolate; cymules several-flowered, in fruit 1–2 cm. long, crowded into a rather dense terminal spike-like inflorescence, 6–10 cm. long, or on some of the slender basal branches sometimes smaller; fruiting calyx-lobes 5–10 mm. long, narrowly linear-lanceolate, bristly with spreading setae; corolla white, 5–6 mm. long, limb 5 mm. broad; nutlets ovate-lanceolate, subacute at apex, 3 mm. long, the margin sharply acute, dorsal side brownish, somewhat glossy, tuberculate, some of the tubercles connected by slender ridges to form a few rather inconspicuous rugae.

Dry rocky slopes and ridges, Arid Transition Zone; Spokane River Valley, eastern Washington to Kootenai and Coeur d'Alene, northern Idaho; also Wallowa County, eastern Oregon. Type locality: Deep Creek, Wallowa County, Oregon. May–July.

14. **Oreocarya spiculífera** Piper. Bristly Oreocarya. Fig. 4325.

Oreocarya spiculifera Piper, Contr. U.S. Nat. Herb. 11: 481. 1906.
Oreocarya cilio-hirsuta Nels. & Macbr. Bot. Gaz. 55: 378. 1913.
Cryptantha spiculifera Payson, Ann. Mo. Bot. Gard. 14: 298. 1927.

Cespitose with a stout woody caudex bearing 1 to several short tufted branches, the herbage pallid. Basal leaves numerous and crowded, spatulate-oblanceolate, mostly acute, the blades 1.5–2 cm. long, about equaling the margined petioles, densely and finely pubescent on both sides with soft reflexed hairs, also with scattered spreading bristles on both sides and the margins; stem-leaves similar but with shorter petioles; flowering stems simple, erect, 2–3 dm. high, pubescent like the leaves; inflorescence of 8–12 ascending racemes, floriferous throughout or nearly so; bracts linear-lanceolate, shorter than the calyx; pedicels short; calyx-lobes erect, narrowly lanceolate, 6–8 mm. long, pubescent like the leaves but more bristly; corolla white, tube 5 mm. long, limb 8 mm. broad, appendages short, triangular-ovate; nutlets ovoid, 3 mm. long, pale brown, dull, smooth on the narrow margin, bluntly tuberculate on the dorsal side, rugose on the ventral, the groove reaching to the apex; gynobase longer than the nutlet.

Dry hillsides or benches, Arid Transition Zone; eastern Washington to southwestern Idaho. Type locality: "Ritzville [1,600 feet altitude], Adams County," Washington. May–June.

15. **Oreocarya celosioìdes** Eastw. Cockscomb Oreocarya. Fig. 4326.

Oreocarya celosioides Eastw. Bull. Torrey Club 30: 240. 1903.
Cryptantha celosioides Payson, Ann. Mo. Bot. Gard. 14: 299. 1927.

Perennial from a stout, woody root; branches of the caudex densely clothed with the broad imbricated petioles of old leaves; stems 1 to several, stout, 2–4 dm. high, densely setose with spreading bristles. Basal leaves crowded, spatulate to oblanceolate, usually obtuse, 2–5 cm. long, densely and finely white-tomentose on both sides, also setose with slender appressed bristles; cauline leaves less tomentose and thickly beset by bristles with more or less prominent pustulate bases; inflorescence usually extending to the middle of the stem or below, often rather narrow and dense, densely setose-bristly; bracts foliaceous, lanceolate-linear, shorter than the mature cymules; sepals densely bristly, 5 mm. long in flower, linear-lanceolate and 10–12 mm. long in fruit; corolla white, tube 4–5 mm. long, and equaling the sepals, limb about 8 mm. broad; nutlets 2–4 maturing, ovate-lanceolate, very acute or narrowly margined on the angles; dorsal surface dull or slightly glossy, conspicuously rugose and toward the edges somewhat muriculate; scar closed, extending from the base to near the apex.

Dry slopes and plains, Upper Sonoran and Arid Transition Zones; Columbia River Basin, from Okanagon and Lincoln Counties, Washington, to Wasco and Baker Counties, Oregon. Type locality: "bank of the Columbia River, eastern Washington." May–July.

16. **Oreocarya flavoculàta** A. Nels. Yellow-eyed Oreocarya. Fig. 4327.

Oreocarya flavoculata A. Nels. Erythea 7: 66. 1899.
Oreocarya Shockleyi Eastw. Bull. Torrey Club 30: 245. 1903.
Cryptantha flavoculata Payson, Ann. Mo. Bot. Gard. 14: 334. 1927.

Perennial with cespitose, woody caudex; stems 1 to many, rather slender, 1–3 dm. high, pubescent with retrorsely appressed hairs and hispid with slender, spreading bristles. Lower leaves linear-oblanceolate to spatulate-obtuse or sometimes acute, 3–8 cm. long, appressed-silky-pubescent on both sides with scattering appressed bristles interspersed, upper stem-leaves less appressed-pubescent, and more bristly, the bristles, especially on the margins, spreading; inflorescence a rather narrow spicate-thyrsus, with the upper cymules crowded, the lower scattered; floral bracts linear-lanceolate, at least the lower longer than the cymules; sepals densely bristly with usually yellowish bristles, linear-lanceolate, 4–5 mm. long in anthesis, 10–12 mm. in fruit; corolla white or pale yellow, crests in the throat yellow, tube slender, 7–10 mm. long, limb 7–8 mm. broad; nutlets ovate to lanceolate in outline, usually obtuse at apex, the margin at the angles acutish, dorsal surface somewhat glossy, tuberculate, muriculate and more or less rugose; scar open and conspicuous, surrounded by a high elevated margin.

Rocky hillsides, often associated with sagebrush or junipers, Upper Sonoran and Arid Transition Zones; a Great Basin species, extending from western Colorado and Wyoming to central and southern Nevada, reaching southeastern California where it is found in the Inyo and Panamint Mountains. Type locality: Piedmont, Wyoming. May–July.

23. **AMSÍNCKIA** Lehm. Del. Sem. Hort. Hamb. 7. 1831.

Hispid or setose annual herbs with erect or spreading, branched stems, alternate linear or lanceolate leaves and yellow flowers in elongated scorpioid spikes. Calyx deeply 5-parted or rarely appearing 4-parted by the union of 2 into 1 broader one. Corolla yellow or orange, funnelform or salverform, the throat open and without crests or processes, sometimes constricted and more or less closed by sac-like processes. Stamens inserted in the throat or in the tube, irregularly or in one plane. Style filiform; stigma capitate, 2-lobed. Nutlets crustaceous, erect or incurved, smooth or rough, triquetrous or ovate-triangular. Cotyledons deeply 2-parted. [Name in honor of William Amsinck, a patron of the Hamburg Botanic Garden.]

A genus of about 20 species natives of western North America and southern South America. Type species, *Amsinckia lycopsoides* Lehm.

The natural limits of the specific entities of *Amsinckia* are not obvious and a satisfactory systematic treat-

ment must await cytogenetic and cultural studies. Suksdorf (Werdenda 1: 47–113. 1931.) described over 200 new species of *Amsinckia*, basing many of them on a single collection, and upon characters of doubtful significance, for they seem too variable and unstable in this genus.

Corolla-tube 20-nerved below attachment of stamens; calyx-lobes unequal in width and reduced in numbers (2, 3 or 4) by fusion.

Nutlets tessellate and dull; scar median, ovate.

Corolla-limb 6–8 mm. broad; calyx densely rusty-pubescent and bristly. 1. *A. Douglasiana.*

Corolla-limb 2–4 mm. broad; calyx thinly whitish-hirsute. 2. *A. tessellata.*

Nutlets smooth and shining.

Scar of nutlet conspicuous, nearly median, ovate-lanceolate. 3. *A. grandiflora.*

Scar of nutlet not developed; ventral angle bearing a closed lineate groove. 4. *A. vernicosa.*

Corolla-tube 10-nerved below insertion of stamens; calyx-lobes 5, distinct, or the two axial united near the base in *spectabilis.*

Leaves mostly erose-dentate; nutlets black or dark brown, small, 1.5–2 mm. long; corolla funnelform, throat open; coastal species.

Corolla 3–5 mm. long. 5. *A. Scouleri.*

Corolla 7–16 mm. long. 6. *A. spectabilis.*

Leaves entire; nutlets brownish or grayish not black, longer, mostly 2.5–3.5 mm. long; species not maritime.

Corolla funnelform, at least narrowly so, with the throat open and glabrous; stamens inserted, usually more or less irregularly, in the corolla-throat.

Corolla orange-yellow, 7–20 mm. long, well-exserted beyond the calyx; plants usually green; stems hirsute-bristly, but with little or no fine-appressed hairs. 7. *A. intermedia.*

Corolla pale yellow, 4–7 mm. long, little or not at all exserted beyond the calyx-lobes.

Corolla-limb 2–3 mm. broad; anthers unevenly placed in the throat; nutlets usually with transverse rugae between the keel and lateral angles; leaves pubescent with appressed or ascending hairs. 8. *A. retrorsa.*

Corolla-limb about 1 mm. broad; nutlets uniformly muricate between the keel and lateral angles but without transverse rugae; leaves and stems rather sparsely clothed with long spreading bristly hairs. 9. *A. micrantha.*

Corolla more or less salverform, the throat constricted and closed or nearly so by intruding hairy saccate processes; stamens inserted evenly in one plane on the tube well below the constriction. 10. *A. lycopsoides.*

1. Amsinckia Douglasiàna A. DC. Douglas' Amsinckia or Fiddle-neck. Fig. 4328.

Amsinckia Douglasiana A. DC. Prod. 10: 118. 1846.

Amsinckia Lemmonii J. F. Macbride, Contr. Gray Herb. No. 48: 50. 1916.

Amsinckia macrantha Suksd. Werdenda 1: 102. 1931.

Amsinckia gloriosa Eastw. ex Suksd. op. cit. 103.

Amsinckia Munzii Suksd. loc. cit.

Stems erect, 3–6 dm. high, simple up to the inflorescence, or sometimes branched below, thinly bristly below with more or less appressed bristles, more abundantly so above and the bristles spreading. Leaves linear-lanceolate or the uppermost lanceolate, lowest narrowed to a winged petiole, the others sessile, appressed-hirsute and somewhat cinereous, pustules of the pubescence inconspicuous or wanting, especially in the upper leaves; spikes dense and subcapitate when young, 10–15 cm. long in age, the bristles and pubescence rusty colored, especially on the calyx; calyx-lobes 3–4, the outer one often 3–4 mm. broad, entire or sometimes notched at apex; corolla orange-yellow, tube 10–12 mm. long, limb 6–10 mm. broad; nutlets broadly ovoid, 4 mm. long, the back rather flat with a low or almost obsolete central keel, more or less rugosely wrinkled and densely tessellate, not scabrous or muricate, sometimes denticulate on the lateral angles; scar ovate, median.

Rolling open hills and valleys, Upper Sonoran Zone; South Coast Ranges, San Benito County, and Salinas Valley, Monterey County, to northern Santa Barbara County and western Kern County. Type locality: California. Collected by Douglas. March–May.

2. Amsinckia tessellàta A. Gray. Tessellate Fiddle-neck. Fig. 4329.

Amsinckia tessellata A. Gray, Proc. Amer. Acad. 10: 54. 1874.

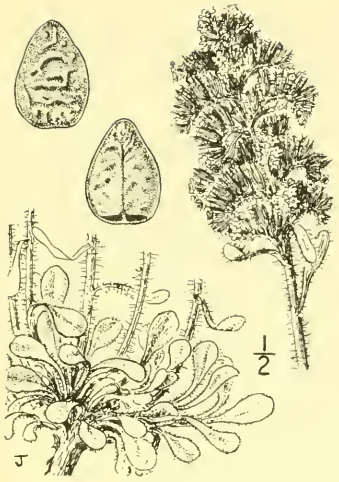
Amsinckia collina Greene, Man. Bay Reg. 263. 1894.

Amsinckia pustulata Heller, Muhlenbergia 2: 243. 1906.

Amsinckia conica Suksd. Werdenda 1: 104. 1931. In the same publication 15 other species referable to *tessellata* were described.

Stems stout, branched throughout or sometimes simple below, 3–6 dm. high, hispid with spreading bristles. Leaves linear-lanceolate to ovate-lanceolate, 2–7 cm. long, rather thinly hispid, the hairs pustulate at base, sessile except the narrowly oblanceolate basal ones; spikes elongating with age, often 5–12 cm. long; calyx-lobes 3 or 4, when 4 one broader and notched or 2-lobed at apex, when 3 two a little broader and notched at apex, hispid and in the margins densely white-hirsute, 8–13 mm. long; corolla orange, tube 5–10 mm. long, limb 2.5–5 mm. broad; nutlets 3–3.5 mm. long, ovoid, the back low, usually with a median line, densely tessellate or papillate, and often transversely rugose.

Dry, usually sandy or rocky soils, Upper and Lower Sonoran Zones; Douglas County, eastern Washington, southeast of the Cascades and the Sierra Nevada to Nevada and Arizona and the desert regions of California, where it also occurs west of the Sierra Nevada in the San Joaquin Valley and the Inner Coast Ranges, from Contra Costa County southward to San Diego County, and northern Lower California. Type locality: near Mount Diablo, California. March–June.



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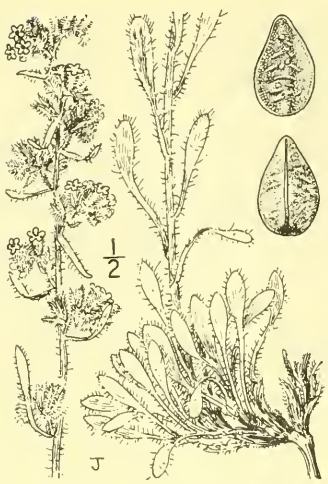

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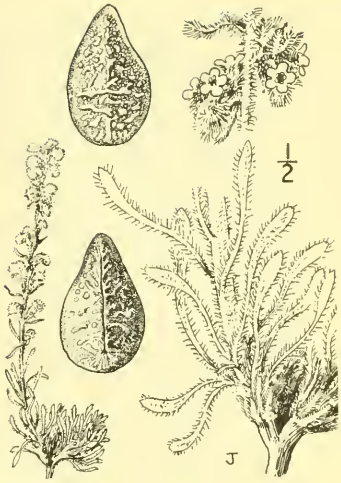

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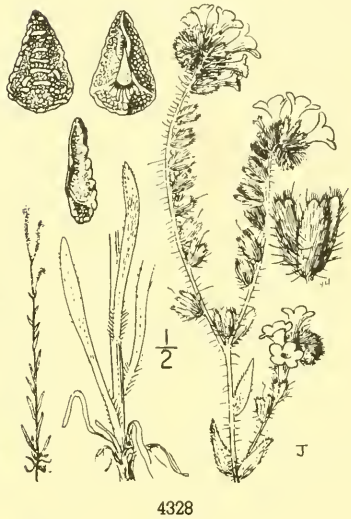

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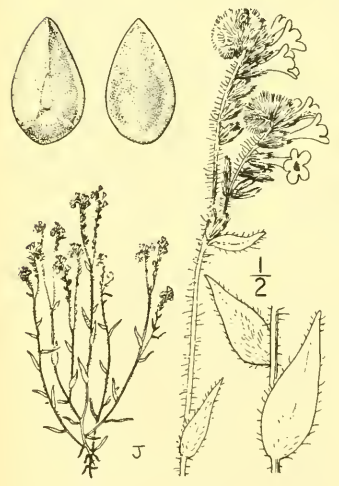

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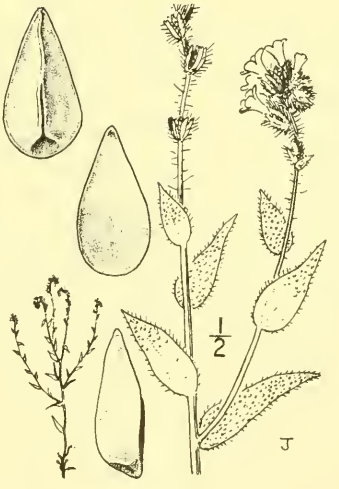

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4324. Oreocarya Sheldonii
4325. Oreocarya spiculifera
4326. Oreocarya celosioides

4327. Oreocarya flavoculata
4328. Amsinckia Douglasiana
4329. Amsinckia tessellata

4330. Amsinckia grandiflora
4331. Amsinckia vernicosa
4332. Amsinckia Scouleri

3. Amsinckia grandiflòra Kleeb. Large-flowered Fiddle-neck. Fig. 4330.

Amsinckia grandiflora Kleeb. ex A. Gray, Bot. Calif. 1: 525, as a synonym. 1876.
Amsinckia vernicosa var. *grandiflora* A. Gray, loc. cit.
Amsinckia grandiflora Kleeb. ex Suksd. Werdenda 1: 113. 1931.

Stems erect, 3–5 dm. high, branching a few inches above the base or often above the middle, sparingly hispid below, thinly pilose above and the hispid hairs weak or represented only by their pustulate bases. Leaves sessile, the lower linear-lanceolate, the upper lanceolate to broadly so, attenuate at apex, rather densely pustulate on both surfaces, but the bristles rather weak or not developed from some pustules; spikes dense at first, becoming 10–15 cm. long in age; calyx-lobes 3–4, covered with rusty-colored bristles, more or less concealing the appressed hairs beneath; corolla orange, tube 12–15 mm. long, the limb 8–10 mm. broad; nutlets ovoid-lanceolate, smooth and shining, plane on the back and sides, lateral angles sharp and carinate; scar ovate-lanceolate, seated a little below the middle.

Open grasslands, Upper Sonoran Zone; Inner Coast Ranges in Contra Costa and Alameda Counties. Type locality: Antioch, Contra Costa County. At the original locality, this species seems to have been exterminated, and the same seems to be true of other localities in Livermore Valley, but in 1938 R. F. Hoover rediscovered this very distinct species in Corral Hollow, western San Joaquin County. March–May.

4. Amsinckia vernicòsa Hook. & Arn. Green or Vernal Fiddle-neck. Fig. 4331.

Amsinckia vernicosa Hook. & Arn. Bot. Beechey 370. 1838.
Amsinckia carnosa M. E. Jones, Contr. West. Bot. No. 8: 35. 1898.
Amsinckia glauca Suksd. Werdenda 1: 113. 1931.

Stem erect, simple or with few branches above, sometimes branched at the base, 2–6 dm. high, glabrous and glaucous, or sometimes with scattering bristles above. Leaves glabrous and glaucous-green, smooth beneath, more or less prominently pustulate above, the pustules sometimes producing a short mucro, especially those near the tip of the leaf, often ciliate bristly on the margins, lower 4–8 cm. long, linear-lanceolate, narrowed below to a winged petiole, the upper ovate-lanceolate and clasping, all acute or acuminate at apex; spikes 3–12 cm. long; calyx-lobes narrowly lanceolate and 1–1.5 cm. long in fruit, sometimes 2 or more partly united, densely appressed-hirsute and with intermingling stiff spreading bristles; corolla 10–12 mm. long, limb 3–6 mm. wide; nutlets gray, smooth and shining, 4–6 mm. long, plane on the back and lateral surfaces, lateral angles sharp and carinate, scar very narrow.

Dry plains and hillsides, Upper and Lower Sonoran Zones; California Coast Ranges, especially the inner range and the east side of the outer, from Monterey and western Fresno Counties, and western slopes of the Sierra Nevada, Greenhorn Mountains, Kern County, south to central Mojave Desert. Type locality: California. Collected by Douglas, probably on his trip from Monterey to Santa Barbara. March–May.

Amsinckia vernicosa var. furcàta (Suksd.) Hoover in Jepson, Fl. Calif. 3: 319. 1943. (*Amsinckia furcata* Suksd. Werdenda 1: 113. 1931.) Herbage much like the species but usually more robust and more frequently bearing scattered bristles; calyx-lobes often 10–12 mm. long; corolla orange, 12–18 mm. long, the limb 8–14 mm. broad. Western edge of the San Joaquin Valley and eastern slopes of the Inner Coast Ranges, western Fresno County to southeastern San Luis Obispo County, California. Type locality: White Hills, Cuyama Valley, San Luis Obispo County.

5. Amsinckia Scoùleri I. M. Johnston. Scouler's Fiddle-neck. Fig. 4332.

Amsinckia lycopsoides of authors, not Lehm. Del. Sem. Hort. Hamb. 1831: 1 and 7. 1831.
Lithospermum lycopsoides Lehm. Stirp. Pug. 2: 28. 1830, and in Hook. Fl. Bor. Amer. 2: 89. 1840.
Amsinckia Scouleri I. M. Johnston, Journ. Arnold Arb. 16: 202. 1935.

Stems 3–6 dm. long, decumbent, sparsely bristly. Leaves ovate to lanceolate, somewhat denticulate, sparsely bristly, the bristles spreading, pustulate at base; spike becoming elongated and the fruiting calyces becoming distant; calyx-lobes oblong or ovate, obtuse, 2 or 3 of them united together and then often notched at apex; corolla yellow-orange, 3–5 mm. long, the throat glabrous; nutlets dark-colored, rugose.

Seashore, in sand or near-by fields, Humid Transition Zone; Alaska south to Tillamook Bay, Oregon. Type locality: "Straits of de Fuca, N.W. America." Collected by Scouler. May–July.

6. Amsinckia spectábilis Fisch. & Mey. Seaside Amsinckia. Fig. 4333.

Amsinckia spectabilis Fisch. & Mey. Ind. Sem. Hort. Petrop. 2: 2 and 26. 1836.
Amsinckia maritima Eastw. Proc. Calif. Acad. III. 1: 110. 1898.
Amsinckia nigricans Brand, Rep. Spec. Nov. 20: 319. 1924.

Stems erect, 3–6 dm. high, often branched at base, the branches spreading or decumbent, sparsely hispid, the hairs spreading from pustulate bases. Leaves linear-lanceolate to broadly lanceolate, bright green, rather sparsely appressed-hispid above, the hispid hairs on the under surfaces pustulate at base; spikes at length loose, 8–10 cm. long; calyx-lobes 5, with 2 or 3 of them usually partly united, narrowly linear-lanceolate, 4–6 mm. long, hispid and pilose with usually fulvous hairs; corolla orange-colored, usually 8–10 mm. long, the throat glabrous; anthers unequally inserted in the throat, rugose, wrinkled and more or less reticulate, dark-colored, barely 2 mm. long; scar ovate, submedian.

Sandy beaches and dunes along the seashore, Upper Sonoran and Humid Transition Zones; Tillamook Bay, Oregon, to San Diego, California. Type locality: Bodega Bay, California. March–July.

Amsinckia spectabilis var. nícolai (Jepson) I. M. Johnston ex Munz, Man. S. Calif. 423. 1935. (*Amsinckia intermedia* var. *nicolai* Jepson, Man. Fl. Pl. Calif. 844. 1925; *A. st.-nicolai* Eastw. Proc. Calif. Acad. III. 1: 109. 1898.) Spikes bracted throughout. San Nicolas, San Miguel and San Clemente Islands, southern California. Type locality: "seashore sands and dry cliffs at 1000 ft. elevation."

Amsinckia spectabilis var. microcárpa (Greene) Jepson & Hoover in Jepson, Fl. Calif. 3: 326. 1943.

(*Amsinckia microcarpa* Greene, Erythea 2: 191. 1894; *Benthamia microcarpa* Druce, Rep. Bot. Exch. Club British Isles 4: 299. 1916; *Amsinckia dentata* Suksd. Werdenda 1: 95. 1931; *A. ochroleuca* Suksd. loc. cit.) Calyx-lobes all distinct to the base or only obscurely united, their bristles brown or blackish; corolla 12–18 mm. long; nutlets densely muricate but without rugae, or dorsal ridges. Sandy soils near the coast from Pismo, San Luis Obispo County, to the Purisima Hills, Santa Barbara County, California. Type locality: "Plant collected long ago by Dr. Coulter, probably in the southern part of California, but possibly in Mexico."

7. Amsinckia intermèdia Fisch. & Mey. Common Fiddle-neck or Ranchers Fireweed. Fig. 4334.

Amsinckia intermedia Fisch. & Mey. Ind. Sem. Hort. Petrop. 2: 2 and 26. 1836.
Amsinckia campestris Greene, Man. Bay Reg. 263. 1894.
Amsinckia valens J. F. Macbride, Contr. Gray Herb. No. 49: 14. 1917.
Amsinckia intactilis J. F. Macbride, op. cit. 13.
Amsinckia arvensis Suksd. Werdenda 1: 32. 1927.

Stems varying from simple or nearly simple and strictly erect to widely branched, 3–9 dm. high, sparsely bristly otherwise usually glabrous except for a tomentose pubescence near the base of the spikes. Basal and lower cauline leaves linear or linear-lanceolate, the upper lanceolate to broadly so, usually clasping at base and acute at apex, thinly hirsute on both sides with spreading, often pustulate hairs; spikes short or usually elongated in fruit, usually leafy-bracted at base; calyx-lobes linear-attenuate, about half as long as the corolla, rufous-hispid on the back, densely white-hirsute on the margins; corolla orange-yellow, 8–10 mm. long, the limb 3–6 mm. wide; nutlets 2.5–3 mm. long, incurved, grayish, narrowly keeled on the back and sharply rugose with the surface between papillate or sometimes muriculate.

Grassy hills and valleys, becoming a common field and roadside weed, Transition and Sonoran Zones; Washington, on both sides of the Cascades, to Idaho, and south to Arizona, southern California and northern Lower California. Type locality: near Bodega Bay, California.

An extremely variable species of wide geographic range. Suksdorf (Werdenda 1: 48–113. 1931) in a study of the genus has proposed many new species, a large number of which belong to this complex, but extensive cytogenetic studies are needed before the biological significance of these variations can be determined. In the desert regions strongly pustulate forms which sometimes have been referred to *Amsinckia echinata* A. Gray suggest hybridization between *Amsinckia intermedia* and *Amsinckia tessellata*.

Amsinckia intermedia var. Eastwoòdiae (J. F. Macbride) Jepson & Hoover in Jepson, Fl. Calif. 3: 323. 1943. (*Amsinckia Eastwoodiae* J. F. Macbride, Contr. Gray Herb. No. 49: 14. 1917; *A. Douglasiana* var. *Eastwoodiae* I. M. Johnston, Bull. S. Calif. Acad. 17: 66. 1918; *A Johnstonii* Suksd. Werdenda 1: 68. 1931.) Vegetative characters similar to the typical species, but corolla 15–20 mm. long and deep orange. Sacramento and San Joaquin Valleys, also cismontane southern California. Type locality: "near Pollasky [Friant], Fresno Co.," California.

8. Amsinckia retrórsa Suksd. Rigid Fiddle-neck or Harvest Fireweed. Fig. 4335.

Amsinckia retrorsa Suksd. Deutsch. Bot. Monatss. 18: 134. 1900.
Amsinckia parviflora Heller, Muhlenbergia 2: 313. 1907. Not Bernh. 1833.
Amsinckia Helleri Brand, Rep. Spec. Nov. 25: 212. 1928.

Stems strictly erect, 3–8 dm. high, usually simple below the inflorescence, bristly-hirsute and often more or less cinereous with fine appressed pubescence. Leaves linear or the upper linear-lanceolate, hirsute on both sides with ascending or appressed hairs; inflorescence of 1 or few, strict, erect or ascending racemes, bractless; calyx-lobes 5, distinct, 7–13 mm. long, linear or linear-lanceolate; corolla light yellow, 5–7 mm. long, the tube included or only slightly exserted beyond the calyx-lobes; style 2.5–3 mm. long; nutlets 2–3 mm. long, broadly ovoid, densely tuberculate all over, with scattering larger tubercles intermixed, the latter on central and lateral ridges when these are present.

Moist slopes and fields, Arid Transition and Upper Sonoran Zones; Washington, mainly east of the Cascades, south to southern California, east to Idaho and Nevada. Type locality: near Bingen, Klickitat County, Washington. April–Aug.

9. Amsinckia micrántha Suksd. Small-flowered Fiddle-neck. Fig. 4336.

Amsinckia micrantha Suksd. Deutsch. Bot. Monatss. 18: 134. 1900.

Stem simple below or sometimes branching from the base, slender and often decumbent, 3–6 dm. long, sparsely bristly-hirsute, with little or no finer pubescence. Leaves broadly linear or oblong, the upper sometimes lanceolate, 4–10 cm. long, thinly hirsute with mostly straight, ascending, but not appressed, pustulate hairs; spikes becoming lax and elongated, bractless or sometimes with 1 or few bracts near the base; calyx 6–8 mm. long in fruit, lobes lanceolate, thinly bristly and with few or no whitish hairs on the margins; corolla pale yellow, 4–5 mm. long, tube included or slightly surpassing the calyx, lobes minute; nutlets triangular, 2.5–3 mm. long, with a narrow, toothed, dorsal ridge and similar lateral ones, the intervals between finely tuberculate.

Grasslands, Upper Sonoran and Transition Zones; mainly east of the Cascades from British Columbia and Idaho south to the Willamette Valley and eastern Oregon. Type locality: near Bingen, Klickitat County, Washington. May–Aug.

10. Amsinckia lycopsoìdes Lehm. Bugloss Fiddle-neck. Fig. 4337.

Amsinckia lycopsoides Lehm. Del. Sem. Hort. Hamb. 7. 1831.
Amsinckia arenaria Suksd. Deutsch. Bot. Monatss. 18: 133. 1900.
Amsinckia simplex Suksd. Werdenda 1: 33. 1927.
Amsinckia Howellii Brand, Rep. Spec. Nov. 25: 213. 1928.
Amsinckia glomerata Suksd. Werdenda 1: 52. 1931.

Stems erect to procumbent with long spreading branches, 3–10 dm. long, bristly-hirsute with

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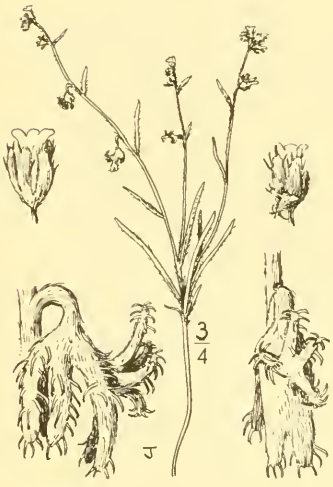

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4333. Amsinckia spectabilis
4334. Amsinckia intermedia
4335. Amsinckia retrorsa

4336. Amsinckia micrantha
4337. Amsinckia lycopsoides
4338. Asperugo procumbens

4339. Harpagonella Palmeri
4340. Verbena bonariensis
4341. Verbena hastata

little or no fine pubescence. Lower leaves linear-oblanceolate, the upper lanceolate to narrowly ovate, bristly-hirsute with spreading or appressed hairs; spikes often bracteate below, becoming loosely flowered but not greatly elongated; fruiting calyx 6–10 mm. long, the lobes linear-lanceolate, bristly-hirsute and the margin densely long-ciliate; corolla deep yellow, usually well-exserted, 7–10 mm. long, the throat nearly closed by hairy, saccate intrusions; stamens inserted below the middle of the corolla-tube; nutlets triangular-ovoid, 2.5–3 mm. long, only obscurely keeled dorsally, closely muricate, but not rugose, or only slightly so.

Usually in moist ground, Upper Sonoran and Transition Zones; Washington and Oregon, on both sides of the Cascades, south to central California and Nevada. Type locality: described from cultivated plants grown from seeds collected by Douglas, probably those listed by him in his Journal (page 116, species 151) ". . . . seeds not yet known; this very interesting species was found on Menzies Island [near Vancouver, Washington] in company with Mr. Scouler; scarce, only three specimens of it were found, two of which are in my possession. I have since found it in abundance near all the Indian lodges above the Rapids of the Columbia. S." The "S" means seeds were collected. April–June.

24. ASPERÙGO [Tourn.] L. Sp. Pl. 138. 1753.

Rough-hispid, procumbent, annual herb, with alternate, entire leaves, and small white or blue flowers borne solitary or 2–3 together in the upper axils. Calyx campanulate, unequally 5-cleft, the toothed lobes enlarged and folded together in fruit. Corolla tubular-campanulate, 5-lobed, lobes imbricated. Stamens 5, inserted on the corolla-tube, included; filaments very short. Ovary 4-divided; style short; stigma capitate. Nutlets 4, ovoid, erect, keeled, granular-tuberculate, attached laterally above the middle to the long-conic receptacle. [Name Latin, meaning rough, referring to the pubescence of the foliage.]

A monotypic genus of Europe and Asia.

1. Asperugo procúmbens L. Catchweed or German Madwort. Fig. 4338.

Asperugo procumbens L. Sp. Pl. 138. 1753.

Stems often diffusely branched, slender and procumbent or ascending, 2–5 dm. long, retrorsely short-hispid. Leaves scabrous, obovate to oblanceolate, 3–6 cm. long, obtuse or acutish at apex, the lower mostly oblanceolate and narrowed to a winged petiole; flowers short-pedicelled, blue, about 2–3 mm. broad; calyx in fruit 8–15 mm. broad, dry and membranous, strongly veined; nutlets obliquely ovoid, about 4 mm. long, granulate-tuberculate.

Locally abundant along roadsides and in fields in eastern Oregon, especially Grant and Umatilla Counties. Adventive from Europe. May–Aug.

25. HARPAGONÉLLA A. Gray, Proc. Amer. Acad. 11: 88. 1876.

Small pubescent annual with the stems branching from the base. Flowers minute, white, racemosely disposed along the bracteate branches. Calyx in flower slightly, but in fruit exceedingly, unequal; 3 of the lobes nearly distinct, the other 2 united to above the middle, closely enwrapping the fruit and armed dorsally with 5–9 soft uncinate spines. Corolla minute, subbracteate. Style entire. Ovary 2-parted. Nutlets 1 or sometimes 2, thin-coriaceous, smooth, obliquely attached by the narrow base to the small depressed gynobase. [Name diminutive of Latin *harpago*, a grappling hook.]

A monotypic genus of southwestern United States and adjacent Mexico.

1. Harpagonella Pálmeri A. Gray. Harpagonella. Fig. 4339.

Harpagonella Palmeri A. Gray, Proc. Amer. Acad. 11: 88. 1876.

Stem usually branched from or near the base, the branches few and ascending, or sometimes diffuse, 2.5–20 cm. long, thinly appressed-pubescent. Leaves narrowly linear to linear-lanceolate, 0.5–3.5 cm. long, 1–3 mm. wide, appressed-pubescent beneath, appressed-hispid above with the hairs pustulate at base; bracts 2–8 mm. long, linear to linear-lanceolate; pedicels short, stout, becoming recurved; corolla white, barely 2 mm. long; calyx-lobes 1–1.5 mm. long in flower, 2–3.5 mm. long in fruit, narrowly linear, armed with several uncinate prickles; nutlets 1 or 2, completely enclosed in the oblong or fusiform somewhat indurate calyx-tube.

Dry barren mesas and hillsides, Lower Sonoran Zone; cismontane southern California, frequent in western San Diego County; rare and local northward, Saugus and Pasadena, Los Angeles County; Murietta, Riverside County; Catalina Island, southward to Lower California. Type locality: Guadalupe Island, Lower California. March–April.

Family 133. VERBENÀCEAE.

Vervain Family

Herbs, shrubs or trees with usually opposite or verticillate, simple or compound leaves. Flowers perfect, usually more or less irregular, in terminal or axillary spikes, racemes or panicles. Calyx generally 4–5-toothed or 4–5-cleft, persistent. Corolla sympetalous, hypogynous, regular or more or less 2-lipped, the tube cylindric, the limb 4–5 lobed. Stamens 4, didynamous, rarely 2 or 5, inserted on the corolla-