

- usually widely divaricate.....27. *C. foliosa*.
 Hairs on calyx slender, not notably coarse;
 stem irregularly branched.
 Calyx-lobes pungent-hirsute; nutlets ob-
 long-ovate, verrucose.....28. *C. intermedia*.
 Calyx-lobes densely hispid; nutlets ovate,
 tuberculate.....36. *C. Hendersoni*.
 Corolla inconspicuous, 0.5-2 mm. broad.
 Ovules 2, nutlet and calyx bent.....12. *C. recurvata*.
 Ovules 4; nutlets and calyx straight.
 Nutlets very small, ca. 1.5 mm. long; spikes
 somewhat bracted.....37. *C. Traskae*.
 Nutlets larger, 2-3 mm. long, spikes very spar-
 ingly if at all bracteate.
 Nutlets usually solitary; gynobase 1/4-1/2
 height of nutlet.
 Nutlet persistent, axial.....21. *C. texana*.
 Nutlet finally deciduous, abaxial.....25. *C. decipiens*.
 Nutlets usually 4.
 Nutlets decidedly ovate.
 Plant closely strigose, pallid, usually 2-3
 dm. tall; spikes commonly geminate
 or ternate.....39. *C. simulans*.
 Plant spreading-hispid, usually 1-1.5
 dm. tall; spikes usually solitary
 or rarely geminate.
 Nutlets with low rounded tubercula-
 tions.....40. *C. ambigua*.
 Nutlets with elongate papillae or
 spicules.....41. *C. echinella*.
 Nutlets more or less lanceolate.
 Stems spreading hirsute.....29. *C. barbiger*.
 Stems strigose.
 Nutlets verrucose or verrucose-muri-
 culate.....30. *C. nevadensis*.
 Nutlets spinular-muricate.....31. *C. scoparia*.

DESCRIPTION AND CLASSIFICATION OF THE SPECIES.

Ser. I. ANGUSTIFOLIAE. Nutlets 4, muricate or tuberculate, dark with pale roughenings, triangular-ovate or triangular-oblong, with sides acute or knife-like or definitely winged, homomorphous or in most species decidedly heteromorphous with odd nutlet abaxial larger and sometimes slightly less roughened than the others; style definitely surpassing the nutlets.

- Pedicels slender, 1-4 mm. long; long-lived annuals.
 Nutlets homomorphous, broadly winged.....1. *C. holoptera*.
 Nutlets heteromorphous, narrowly winged.....2. *C. racemosa*.
 Pedicels stout and very short, less than 1 mm. long.
 Nutlets with a knife-like margin.
 Nutlets heteromorphous.

- Fruiting calyces ca. 2 mm. long; nutlets 0.6-0.7 mm.
 long.....3. *C. angelica*.
 Fruiting calyces 2.5-3 mm. long; nutlets ca. 1.7 mm. long.
 4. *C. inaequata*.
 Nutlets homomorphous.
 Nutlets coarsely tuberculate, bent; gynobase narrowly
 pyramidal.....5. *C. pusilla*.
 Nutlets very obscurely roughened, straight; gynobase
 subulate.....6. *C. costata*.
 Nutlets with merely a sharply angled margin.
 Spikes bracteate throughout; style thick.....7. *C. micrantha*.
 Spikes bractless or practically so; style slender.
 Nutlets heteromorphous.....8. *C. angustifolia*.
 Nutlets homomorphous.....9. *C. Grayi*.
1. ***C. holoptera*** (Gray) Macbr. Coarse erect annual, herbaceous or rarely somewhat suffruticose towards the base, 1-6 dm. tall; branches rather numerous and ascending, hirsute as well as strigose, usually drying brownish; leaves oblanceolate to lance-linear, 3-6 cm. long, 3-8(-12) mm. broad, acute or obtuse, coarsely pustulate and hirsute beneath but less so above; racemes geminate, naked or sparsely bracteate, usually ca. 5 cm. but becoming 10 cm. long; corolla inconspicuous, tube shorter than calyx, the ovate lobes ascending and less than 1 mm. long; fruiting calyx oblong-ovate, 2.5-3.5 mm. long, subsymmetrical, rather persistent; pedicels ascending or decurved, 0.7-1.5 mm. long; mature calyx-lobes lanceolate, somewhat connivent, midrib thickened and hirsute, margins strigose; nutlets 4, homomorphous, 1.5-2.5 mm. long, body oblong-ovate or triangular-ovate, dark with pale tuberculations, margin narrowly to quite broadly winged, groove open or closed above but dilated into an areola below; gynobase slender, about equalling the nutlets; style clearly surpassing the nutlets but shorter than calyx-lobes.—Contr. Gray Herb. n. s. xlviii. 44 (1916). *Eritrichium holopterum* Gray, Proc. Am. Acad. xii. 81 (1876). *Krynitzkia holoptera* Gray, l. c. xx. 276 (1885). *Oreocarya holoptera* Greene, Pittonia i. 58 (1887).
 Deserts of California and western Arizona. Not common.

ARIZONA: Ehrenberg, 1876. *Palmer* (G, TYPE); near Peach Springs, Grand Canyon, 1884. *Lemmon* (UC). CALIFORNIA: sandy places near Palm Springs, 120 m. alt., *Spencer 2066b* and *2070* (G); Marshall Canyon, 16 km. west of Coachella, 90 m. alt., *Hall 5786* and *5788* (UC); Calexico, *Davy 8007* (UC); rocky talus slopes at foot of The Needles, *Grinnell* (UC); "The Caves," sink of the Mohave River, *Parish 9855* (UC).

This species was founded by Gray on two collections cited thus: "S. Utah, Capt. F. M. Bishop; Ehrenberg, Arizona, Palmer." The material collected by Bishop is an immature scrappy specimen of *C. pterocarya*. Palmer's Ehrenberg collection consists of two mounted

sheets with fruit. As would be suspected almost the whole of Gray's original description is based upon the Arizonian plant. Subsequently Gray excluded Bishop's collection and cited only the Ehrenberg material as representative of his species. For these reasons Palmer's Ehrenberg collection is taken as the type of *C. holoptera*.

2. *C. racemosa* (Wats.) Greene. Long-lived annual often decidedly suffruticose towards the base, 1-10 dm. tall; stems single with numerous ascending branches or many and diffusely branched, younger parts green, inconspicuously strigose and commonly hirsute, older parts woody and becoming brown from the falling away of the pale bark; leaves oblanceolate, acute, hirsute, pustulate, the early ones 3-6 cm. long and 6-12 mm. broad, the later and more abundant 1.5-4 cm. long and 2.5 mm. broad; racemes apparently forked and paniculately disposed, inconspicuously and irregularly bracted, 3-15 cm. long; corolla very inconspicuous, limb ca. 1 mm. broad; fruiting calyces oblong-ovate, ascending, 2-4 mm. long, slightly asymmetrical, tardily deciduous, inconspicuously biserial; pedicels usually well developed, 1-4 mm. long, slender, frequently nodding; mature calyx-lobes lance-linear, somewhat strigose, hirsute along the thickened midrib; nutlets 4, heteromorphous, triangular-ovate, the acute tips slightly out-curved, groove open or closed above but below broadening out into a shallow broadly triangular areola; odd nutlet next the abaxial calyx-lobe, 1-2 mm. long, subpersistent, finely muricate or tuberculate or both, light or dark; consimilar nutlets 0.8-1.5 mm. long, acute, tending to be very narrowly winged, dark with pallid tuberculations; gynobase subulate, $\frac{3}{4}$ length of odd nutlet and about equalling consimilar nutlets; style much surpassing the nutlets, almost as long as the mature calyx-lobes.—*Pittonia* i. 115 (1887); Johnston, Proc. Calif. Acad. Sci. ser. 4, xii. 1147 (1924). *Eritrichium racemosum* Wats in Gray, Proc. Am. Acad. xvii. 226 (1882). *Krynitzkia racemosa* Greene, Bull. Calif. Acad. Sci. i. 208 (1885). *Johnstonella racemosa* Brand, Fedde Repert. in press. *K. ramosissima* Gray, l. c. xx. 277 (1885). *C. suffruticosa* Piper, Proc. Biol. Soc. Wash. xxxii. 42 (1919). *C. racemosa*, var. *lignosa* Johnston, Univ. Calif. Pub. Bot. vii. 445 (1922). *J. racemosa*, var. *lignosa* Brand, Fedde Repert. in press.

Southern Nevada and western Arizona, and southwestward to middle Lower California and Carmen Island; usually growing in rocky places.

NEVADA: semishaded places, Las Vegas Mts., *Gooding* 2381 (G, UC); Petrified Forest Canyon west of Logan, 540 m. alt., *Heller* 10446 (G) and 10447

(G, UC); rocks, Ash Meadows, *Purpus* 6024 (UC). ARIZONA: Grand Canyon, 1885, *Gray* (G); Diamond Creek Canyon, *Wilson* 170 (UC). CALIFORNIA: on and about rocks, Silver Canyon, White Mts. east of Laws, *Heller* 8209 (G); Panamint Canyon, *Hall & Chandler* 7034 (UC, TYPE of *C. racemosa*, var. *lignosa*); Surprise Canyon, *Parish* 10125 (UC); Morongo Wash, 900 m. alt., *Parish* 3337 (UC); among rocks on canyon-side, Palm Canyon, 300 m. alt., *Johnston* 1002 (G); sandy places near Palm Springs, 120 m. alt., *Spencer* 2079 (G); among rocks, Cathedral Canyon near Palm Springs, 150 m. alt., *Spencer* 2078 (G); Borregos Springs, 1894, *Brandegee* (UC); San Felipe Creek, *Eastwood* 2704 (G); Split Mt., 1905, *Brandegee* (UC); canyon near Mesquite Station, *Parish* 775 (G, TYPE of *E. racemosum*; UC, ISOTYPE); desert sand, Colorado Desert, San Diego Co., *Spencer* 254 (G). LOWER CALIFORNIA: Cantillas Mts., 1883, *Orcutt* (G); Cantillas Mts., 1884, *Orcutt* (G, UC); San Julio Canyon, 1889, *Brandegee* (UC); San Sebastian, 1884, *Brandegee* (UC); San Reguis, 1889, *Brandegee* (UC); Santa Maria, 1889, *Brandegee* (UC); Cajon de Santa Maria, 1889, *Brandegee* (UC); talus, Puerto Refugio, Angel de la Guarda Island, *Johnston* 3374 (G); shaley slope, San Estaban Island, *Johnston* 3175 (G); cobble-stone beach, South San Lorenzo Island, *Johnston* 4192 (G); foot of cliff, Las Animas Bay, *Johnston* 3505 (G); Santa Rosalia, *Palmer* 188 (G); foot of gypsum cliff, San Marcos Island, *Johnston* 3621 (G); Carmen Island, *Palmer* 846 (G, UC).

A very distinctive plant to be confused only with *C. holoptera*, which has homomorphous, more broadly winged nutlets. The very diffusely branched form of *C. racemosa*, which is most common in the Mohave Desert, has been described as *C. racemosa*, var. *lignosa*. It may be worthy of recognition.

3. *C. angelica* Johnston. Much branched finely strigose herb 15-25 cm. high; stems spreading, rebranched, brown and glabrous below, strigose and canescent above; leaves linear, 8-24 mm. long, 1-2 mm. broad, loosely strigose, densely and minutely pustulate, ascending; spikes solitary, crowded, slender, naked, 4-9 cm. long, very floriferous; corolla minute, ca. 1 mm. long, ca. 0.5 mm. broad; fruiting calyces oblong-ovate, 1.5-2 mm. long, ascending, sessile, somewhat asymmetrical; mature calyx-lobes linear, erect, ribbed, sparsely hispid, abaxial one slightly the longest and most hispid; nutlets 4, heteromorphous, triangular-ovate, dark with small pale tuberculations, margins sharp and with a very narrow knife-edge, back convex, groove closed above but dilated below into a shallowly triangular areola; odd nutlet next the abaxial calyx-lobe, ca. 0.7 mm. long, somewhat persistent; consimilar nutlets ca. 0.6 mm. long; gynobase narrow, almost as long as the consimilar nutlets; style very much surpassing the nutlets.—Proc. Calif. Acad. Sci. ser. 4, xii. 1143 (1924).

Known only from Angel de la Guarda Island in the Gulf of California.

LOWER CALIFORNIA: on silty flats, Angel de la Guarda Island opposite Pond Island, *Johnston* 4221 (G, UC, ISOTYPES).