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A REVISION OF ERIOGONUM SECTION PEDUNCULATA

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A REVISION OF ERIOGONUM SECTION PEDUNCULATA

INTRODUCTION

The name Ganysma (Greek, brightness, sheen, charm, delight) was first applied by Sereno Watson in his revision of the genus Eriogonum (Pro. Am. Acad. Sci. 12. 1877). This subgenus is not clearly distinct from the other subgenera as one natural group, but many species show relationship to species treated in the other subgenera. Ganysma has been made to include, with their nearer relatives, the slender annuals with small, pedunculate, three- to five-toothed, turbinate or campanulate involucres which include one to several small, astipitate flowers. The subgenus Ganysma may be divided further into the foliose and the acaulescent sections, Foliosa and Pedunculata, respectively (Bentham in DC, Prodr. 14: 21-23. 1857). The section Foliosa, with approximately 13 species, is segregated from the Pedunculata and from other foliose Eriogona by the development of opposite or whorled leaves on the stem and frequently floccose-sericeous pubescence.

The scope of this study is the taxonomy of the section Pedunculata only. All species in which involucres are awned are not considered here and may be better considered in a separate section, Oxytheca. The E. angulosum series and E. abertianum, examples of section Foliosa, have been treated thoroughly and in essential agreement in separate papers by John Thomas Howell and by P. A. Munz (E. angulosum series) and by F. Raymond Fosberg (E. abertianum). E. pharnaceoides and E. darrovii, with cauline leaves, as well as E. intricatum are omitted, the two former as best treated under Foliosa, the latter as showing better relation to the E. ciliatum series, and as presenting at present no taxonomic problem.

SECTION PEDUNCULATA

Section Pedunculata (43 spp.). Mostly low annuals, the plants scapose, scapes generally first trichotomous then once or more times dichotomous, glabrous or glandular above the first internode; leaves basal, petiolate, rounded, ovate, lanceolate or elliptic, tomentose below or on both surfaces, frequently crenulate, veins palmate, ciliate; petioles clasping; inflorescence cymose or paniculate; bracts paired or ternate, reduced to membranous or scarious scales or ligulate, never over 1 cm long; inflorescence frequently tending toward a monochasium; involucres pedunculate, turbinate to broadly campanulate, three- to five-toothed, glabrous, glandular, or viscid, less than 2 mm long, not ribbed nor angled, not lobed by reflexed, linear lobes, teeth three to five, usually four or five; flower astipitate, 3 mm or less long, calyx lobes never plicate-flabellate; fruit two- or three-ridged, beaked or mucronate, fusiform, spheric, or lentic.

Although the whole plant may be pilulose or viscid-glandular, in this section tomentum never occurs except on the leaves and basal portion of the plant and rarely sparingly on the first internode of the scape. Several characters of the involucre are also worthy of note. Involucres are very small in this section; in only a few species do involucres approach 3 mm in length. The texture of the epidermis of the involucre in this section is glabrous, glabrous-pruinose, pustulate, or glandular. The form of involucre is variously trumpet-shaped, funnel-shaped, campanulate, or hemispheric, but never cylindric. Nerves are present on some involucres, but the involucres are never distinctly ribbed or angled or with veins of a different color or texture from the rest of the tube. The teeth of the involucres never appear to be excurrent veins, but are always broader.

In E. sessile and in E. hirtiflorum some but not all of the involucres are sessile. In E. inerme, E. Hoffmanni, and E. cernuum var. viminale the involucres are all or mostly sessile or sub-sessile. In E. Hookeri the peduncles of the involucres are very short. These six taxa are, however, included in Section Pedunculata on the basis of apparent immediate relationship to other members of the various series.

E. pedunculatum, with terete involucres more than three times as long as broad, and E. ampullaceum, with green-ribbed involucres and white areas between the ribs, are omitted from this study on the strength of the characters mentioned, which place them in series within the subgenus Oregonium.

Further division of the Section Pedunculata into four subsections is based primarily on apparent interrelationship of the species series as indicated from the external morphology. Subsection Trichopoda is ordinarily a most readily distinguished group of two series. All members of this subsection have hirsute or pilulose calyx lobes; stramineous, three-ridged, beaked fruits; and narrow turbinate involucres. All but E. Ordii and E. tenuissimum have yellow, lanceolate calyx lobes. Except for E. inflatum all species are very diffusely branched, frequently by very fine verticillate branches. Subsection Inerma is characterized by low stature, slender divisions of the inflorescence, frequent subglobose form, minute and short-pedunculate involucres, and a tendency for fine, curved or uncinate hairs on the calyx. This subsection, with the exception that involucral awns are lacking, merges with Subgenus Oxytheca. Subsection Reniformes is distinguished by a usually low and

open inflorescence of comparatively few involucres on slender peduncles. Usually lenticular fruits and reniform or round leaves and spatulate or elliptic calyx lobes are associated with this small subsection. The larger subsection is Cernua, with three complex and interrelated species series. In general this subsection is characterized by heavy and much branched inflorescences, comparatively large, campanulate involucres, and relatively rigid divisions of the scape.

The distribution of the whole of the section is approximately duplicated in the distribution of the two larger subsections, the Trichopoda and the Cernua; but the two smaller subsections, the Inerma and the Reniformes, are distributed over a more limited range within that of the section. The Cernua occur from the western high plains across the Rocky Mountains as far north as southern Wyoming to southeastern Oregon and south of a line from southeastern Oregon to the south peninsula of the San Francisco Bay into the northern states of Mexico. Species in the subsection Trichopoda do not occur east of the Rocky Mountains nor so far west as the outer south coastal range of California, being largely confined to the Great Basin, Sierra Nevada south of the Sacramento Valley, and the Sonoran and Colorado

Deserts. The Inerma are collected in the mountains of California almost exclusively. The Reniformes are collected over the southern desert areas and the dry hills of Arizona and western Nevada.

SUBSECTION CERNUA

E. cernuum Series

Description of the series. Involucres short- or long-pedunculate, deflexed or erect, campanulate or turbinate, five-toothed; calyx lobes lanceolate and crispate, panduriform and crispate, or flabellate and plane; fruit beaked, beak frequently narrow and slightly exserted.

1. E. cernuum Nutt. Journ. Acad. Philad. ser. 2. 1: 163. 1847.

Leaves round, basal or sheathing the scape for as much as 10 cm, tomentose; scape erect, glaucous, branching to form an irregular dense or open panicle; bracts scale-like; peduncles of the involucres deflexed; involucres campanulate, five-toothed, teeth short with white margins; flowers several, more numerous than common in section Pedunculata; outer calyx lobes panduriform, crispate, inner lobes obovate, fruit three-angled, beaked, nearly conic.

Of the five species in the E. cernuum series, E. cernuum has the greatest distribution. E. cernuum occurs

from the mountains of New Mexico to northern Colorado, westward across southern Wyoming to Idaho, through the Great Basin, and southward to the deserts of southern California. The species is reported from northern Arizona, but I have not seen specimens from that area.

1a. E. cernuum var. cernuum
E. cernuum ssp. typicum Stokes, Gen. Eriog. 40. 1936.

Inflorescence globose or subglobose, dense; internodes comparatively short and stout; involucres campanulate, floribund; calyx lobes white-membranous, distinctly panduriform, crispate, frequently suffused with a dark red pigment; beak of fruit hardly exserted.

Range. Rocky Mountains of eastern New Mexico, Colorado except on the western slope, southern Wyoming, and southern Idaho. E. cernuum was referred to in the original publication as collected "on the plains of the Oregon and in the Rocky Mountains, (Nuttall)." Nuttall's collections were, therefore, from the northern limits of the range of the species, Wyoming and Idaho. Variation from these northern specimens to the plants of the eastern borders of the range is relatively continuous and slight.

1b. E. cernuum var. tenue T. & G. Proc. Am. Acad. Sci. 8: 182. 1870. E. cernuum ssp. tenue (T. & G.) Stokes, l.c.

Inflorescence elongate, taller than broad, open, internodes elongate and axillae at angles less than 30°; involucres campanulate, few flowered; calyx lobes white-membranous, panduriform, crispate, red pigments usually restricted to midrib or distal portions of the lobe; beak of fruit exserted; base of scape frequently leafy for several centimeters.

Range. The great basin from northern Nevada and Utah southward to New Mexico.

E. cernuum var. tenue f. tenue.
E. cernuum var. umbraticum Eastwood, Proc. Cal. Acad. Sci. ser. 2.6: 319. 1896. E. cernuum ssp. glaucescens Stokes, Gen. Eriog. 41. 1936.

Involucres pedunculate, deflexed.

E. cernuum var. tenue f. viminale (Stokes) comb. nov.
E. cernuum ssp. viminale Stokes, Gen. Eriog. 41. 1936.

Differs from the type of the variety in having erect, sessile or subsessile involucres.

The appearance is striking, but the difference seems to be minor. These specimens are not uncommonly collected in Nevada.

E. cernuum var. tenue T. & G. was described from Watson's collections on King's Expedition. These collections

were made from the Wasatch to the Humbolt Mountains across northern Utah and Nevada. In this area the variety approaches the typical. Eastwood's type of E. cernuum var. umbraticum is a southeastern Utah collection. Although this type is an extreme condition of the variation found in the western range of the species and rather broadly distributed from New Mexico in the western counties northward through Nevada, it probably should not be segregated from the type of E. cernuum var. tenue, since the two represent extremes of this taxon. In the type for E. cernuum var. umbraticum Eastwood the base is leafy for several centimeters and the plant somewhat taller and more open. All degrees of variation between the two are common. E. cernuum ssp. glaucescens Stokes is also considered a synonym of E. cernuum var. tenue. The specimen upon which Stokes' E. cernuum ssp. glaucescens is based is to a large degree intermediate between the types for E. cernuum var. tenue and E. cernuum var. umbraticum.

1c. E. cernuum var. gracilius var. nov.

E. cernuo var. tenue simile sed gracilius caule, cinereum; pedunculis involucrorum tenuoribus; involucris minoribus, infundibulariformis; flores minores, albae; segmentis quadratis, crispatis, prope basin sinuatis; rostro

frugis exserte.

Typus: M. E. Jones, Colorado Desert. Range: Deserts of California.

The Colorado Desert specimens, varying in a different manner from the variety tenue, are much more slender, elongate, cinereous, and with much smaller flowers with quadrate segments crispate, sinuate near the insertion, and with a more clearly exserted beak of the fruit, frequently minutely hispidulous.

ld. E. cernuum var. acutangulum Gdgr. Bull. Roy. Bot. Soc. Belg. 42: 198. 1906. E. cernuum ssp. acutangulum (Gdgr.) Stokes, Gen. Eriog. 41. 1936.

The description of the specimen given by Gandoger is of little value. That of Stokes implies that the specimens are to be related more to E. Thurberi than to E. cernuum. The specimens on which the taxon is based were collected by Hillman near Reno, Nevada. There have been no known collections of E. Thurberi within a long distance of this. Plants which may be duplicates of the type are apparently E. cernuum var. tenue. I have not seen the original type, since it is in Belgium at the Louvain. Although the plant seems more likely to be one of the many slight variations of E. cernuum var. tenue, final disposition should depend perhaps on

further investigations of the plants of that area.

2. E. rotundifolium Benth. in DC, Prodr. 14: 21. 1856. E. cernuum ssp. rotundifolium (Benth.) Stokes, Gen. Eriog. 41. 1936.

Leaves round, in some sheathing the scape for as much as 3 cm, tomentose; scape low, broad, ascending or spreading, somewhat corymbiform with secondary branches erect, diminishing distally, glabrous; bracts scale-like, peduncles of the involucres erect, short and thick; involucres short-companulate, five-toothed, teeth short; flowers few; outer calyx lobes flabellate, smooth and plane along the margins, inner narrower; fruit three-angled, beaked, the beak long and narrow in proportion to the swollen portion.

E. rotundifolium has the most southeastern distribution of the seri. , having been collected in the Mexican state of Chihuahua, in the southwestern counties of Texas, in New Mexico, and in Arizona. Two subspecific taxa are recognized to occur in E. rotundifolium.

2b. E. rotundifolium var. rotundifolium
E. rotundifolium var. typicum Goodman, Leafl. W. Bot. 6: 71. 1950.

Distal margin of the outer calyx lobe very long, often twice as long as the length of the calyx lobe, strongly

flabellate.

The type for Bentham's species was Wright 625 collected in west Texas.

On specimens in the Missouri Botanical Garden Dr. Gray has noted that this taxon may be a variety of E. cernuum. These particular specimens are referred to by Stokes as "of an intermediate character" to E. cernuum. Perhaps what is referred to here is the heavy foliate base with leaves several centimeters along the first internode. These are also found on specimens of E. cernuum in the northwestern part of New Mexico. Here as in other cases, the name "var. typicum" is relegated to synonymy by the requirement of tautonymy in the international code.

2b. E. rotundifolium var. angustius Goodman, l. c.

Calyx lobe of the outer cycle about as broad distally as long, flabellate.

The type of Goodman's variety is Warnock 46979 from the eastern extremity of the range of E. rotundifolium. The site is 20 miles south of Marfa, Presidio County, Texas. A paratype of Goodman's variety is Warnock 46988 from 20 miles northwest of Fort Stockton, Pecos County, Texas.

3. E. Thurberi Torr. in Emory, Bot. Mex. Bound. 176-177. 1859. E. panduratum Wats. Bot. Cal. 2: 480. 1880. E. Thurberi var. Parishii Gdgr. Bull. Bot. Soc. Belg. 42: 198. 1906. fide Stokes, Gen. Eriog. 42. 1936.

Leaves ovate or lanceolate, crenulate, lanate; scape branching from the base, strict, very slender, bracts scale-like, large for the section; peduncles of the involucres filiform, erect; involucres campanulate, five-toothed; flowers slightly exserted, tubes campanulate, sparsely pilulose; outer calyx lobes flabellate, smooth and plane on the margins, inner narrower; fruit three-angled, beaked.

E. Thurberi has a southwestern distribution, being collected in the southern part of Nevada, in Arizona, in the Colorado Desert of California, and in the Mexican states of Sonora and Baja California.

3a. E. Thurberi var. Thurberi
E. cernuum ssp. Thurberi (Torr.) Stokes, Gen. Eriog. 42. 1936.

Plants glabrous except on calyx tube and leaf.

The type of the species was collected at San Pasqual, San Diego County, California. San Pasqual is in the northwestern part of San Diego County.

3b. E. Thurberi var. viscosum (Stokes) comb. nov.
E. cernuum ssp. viscosum Stokes, Gen. Eriog. 42. 1936.

Plant viscid.

The type for the Stokes variety was collected by Stokes, no. 3102, in extreme southern San Diego County, California, east of San Diego.

4. E. Watsonii T. & G. Proc. Am. Acad. 8: 182. 1876.

Leaves round, or subcordate, crenate, white tomentose; scape glaucous or pruinose, erect, frequently fistulous, heavily but regularly dichotomous beyond the first trichotomous node; bracts scale-like; peduncles of the involucres deflexed, elongate, diminishing distally along the branches; involucres narrowly turbinate, five-toothed; flowers few, white; calyx lobes lanceolate, crispate, enclosing the three-angled, beaked fruit.

4a. E. Watsonii var. Watsonii
E. baratum Elmer, Bot. Gaz. 39: 52. 1905. E. deflexum ssp. Watsonii (T. & G.) Stokes, Gen. Eriog. 44. 1936.

Plants upright, open; internodes elongate, rays spreading.

The type of E. Watsonii was collected by Watson in the Humbolt Mountains of Nevada on King's expedition. A paratype is listed as Torrey, Humbolt Mountains. The species ranges from the Humbolt Mountains south to Los Angeles

County, California. It is most typically found in more grassy areas at the margins of the deserts or in the mountains.

4b. E. Watsonii var. multipedunculatum (Stokes) comb. nov. E. cernuum ssp. tenue var. multipedunculatum Stokes, Leafl. W. Bot. 2: 48. 1937.

Inflorescence densely branched, divisions short.

The type is Howell 7988 Lander Co., Nevada.

Although Miss Stokes placed this taxon under E. cernuum ssp. tenue, it is in all characters but the short internodes and the proliferation of branching a good E. Watsonii.

5. E. collinum Stokes in Jones, Contr. W. Bot. 11: 15. 1903. E. praebens Gdgr. Bull. Soc. Bot. Belg. 42: 196. 1906. fide Stokes, Gen. Eriog. 43. 1936.

Leaves round, cordate, or reniform, plane or crenulate, sparsely hirsute or subglabrous; scape single from the base two or three times dichotomous, angles less than 45°; first internode frequently floccose; bracts subulate, scale-like; peduncles to involucres greater than 1 cm long, not conspicuously slender; involucre turbinate or narrowly campanulate with five small, triangular, erect teeth; flowers few; tube turbinate, papillate; lobes of calyx ovate to lanceolate, white or yellow with pink or red vein, vein in

some sparsely hirsutulous, margins crispate, becoming minutely revolute; fruit fusiform with a small, three-ridged beak slightly but distinctly exserted.

Type, Stokes, s.n. 19 June 1900. Dry hills northeast of Reno, Nevada. In the Herbarium of the University of California. E. collinum has been collected from Lassen County, California, and on sandhills near Reno, Nevada. The stature of the plant is rather like that of the varieties of E. reniforme, being not so flat-topped and corymbose as many of the variety comosum, but not so elongate and rounded an inflorescence as frequent in variety pusillum. E. collinum is quite readily separated from E. reniforme in that the involucres of E. collinum are narrow campanulate; in E. reniforme they are always broadly campanulate to salverform. The calyx lobes of E. collinum are never broad at the tip as in all varieties of E. reniforme, and the fruit of E. collinum is fusiform and three-angled; the fruit of E. reniforme is lenticular.

E. collinum is also confused in herbaria with E. cernuum var. tenue. Although both are somewhat similar in the crispate calyx lobes and exserted beaks of the fruits, the calyx lobe in E. collinum is never panduriform as it always is in E. cernuum in all its varieties. The peduncles

to the involucres in E. collinum are never deflexed, but always ascending.

E. deflexum Series

Description of the series. Involucres pedunculate or subsessile, frequently deflexed, turbinate to hemispheric, glabrous or glandular, green or dark brown; outer calyx lobes ovate to orbicular, glabrous, auriculate or cordate at the base, rounded on distal margin of lobe.

6. E. deflexum Torr. in Ives, Rep. Colorado R. Bot. 1860.

Leaves all basal, orbicular, tomentose, petiolate, petioles floccose, clasping; scape, one to several from the base, glabrous, glaucous in some, trichotomous at the first node, the three rays branching once dichotomously or in some the secondary rays suppressed, thereafter forming elongate rays with alternate branching, some ultimate branches being as much as 1 dm long, the rays ascending or spreading or by a greater degree of branching and suppression of the elongate whiplike rays forming low, thyrsoid panicles or dense, globose panicles; peduncles to the involucres diminishing distally or of the same length, usually short, deflexed, frequently secund in disposition along the rays or on the

alternate branches from them; involucres turbinate, five-toothed, glabrous; flowers mostly white, some red, outer calyx lobes broad ovate or some spatulate, gently reflected, cordate at the insertion to the tube, retuse and truncate or broadly rounded distally, inner lobes more slender, frequently shorter; fruit three-angled, strongly beaked.

The range of the species is Nevada, Utah, Arizona, and southern California on the deserts.

6a. E. deflexum var. deflexum
E. deflexum ssp. typicum Stokes, Gen. Eriog. 44. 1936.

Branching of the inflorescence is spreading, and the internodes vary greatly in proportions from rather slender to stout; involucral peduncles deflexed, varying in length to over 1 cm, ranged alternately or secund along alternate branches from the elongate, whiplike rays.

The type was collected by Torrey on the Colorado River exploring expedition. The typical form ranges through the desert areas of southern California and western Arizona into the Great Basin area.

6b. E. deflexum var. insigne (Wats.) Jones, Contr. W. Bot. 11: 15. 1905. E. deflexum ssp. insigne (Wats.) Stokes, Gen. Eriog. 45. 1936. E. insigne Wats. Proc. Am. Acad. 14: 295f. 1879. E. turbinatum Small, Bull. Torr. Bot. Club 25: 52f. 1898. E. deflexum f. stenopetale Gross, Fedde's Rep. Spec. Nov. Regn. Veg. 12: 217. 1913.

Branching of the inflorescence ascending, internodes regularly slender, basally occasionally fistulous; involucral peduncles erect or spreading, all approximately 1 to 2 cm long, not deflexed; axillary or terminal on the open, extended rays or their branches.

The type was collected by Palmer near Red Creek, southern Utah, no. 431, in 1877. The sepals are narrower and somewhat smaller than in the typical variety and the range is somewhat more northeastern.

6c. E. deflexum var. exaltatum (Jones) comb. nov. E. deflexum ssp. exaltatum (Jones) Stokes, Gen. Eriog. 44. 1936. E. exaltatum Jones, Contr. W. Bot. 15: 61. 1929.

Branching of the inflorescence ascending, internodes regularly moderately stout, relatively few branching from the principal rays; involucral peduncles all near the same length and short; calyx lobes rounded. Differs from E. deflexum var. insigne largely in being somewhat more robust, having broader calyx lobes, and occupying a range to the west of the latter and north of the typical variety.

The type of E. exaltatum was collected by M. E. Jones below Bunkerville, Nevada, at the bridge over the Virgin River and is deposited in the Pomona College Herbarium.

Variation in the series is sufficient to cause confusion in determining specimens, since there is a tendency in both E. deflexum and in E. brachypodum for variation of the one to duplicate that of the other. In general, E. deflexum is a more nearly upright plant, more nearly ascending and fewer branched, with larger involucres and flowers. E. brachypodum is more nearly elongate horizontally along the rays and a more densely branched plant with small involucres and narrower calyx lobes.

7. E. brachypodum T. & G. Proc. Am. Acad. Sci. 7: 180. 1870. E. deflexum ssp. brachypodum (T. & G.) Stokes, Gen. Eriog. 44. 1936.

Leaves basal, tomentose, petiolate; scape stout, one from the base, glabrous or glandular, glaucous or becoming dark reddish-brown; three rays from the first node, the rays spreading or ascending, branching dichotomously or forming long, whip-like, alternately branched axes; internodes short and comparatively stout, frequently diminishing both in diameter and length; peduncles to the involucres very short, spreading or deflexed, frequently glandular but often glabrous and pruinose; involucres small, narrow, turbinate, short-toothed; flowers red or yellow or in some cases white, minutely hastate or auriculate at the base, narrowly ovate

or spatulate, glabrous; fruit three-angled, beaked.

The plant is frequently quite broad and low, the principal rays deflexed below the horizontal. Although the original description refers to E. brachypodum as glandular on the peduncles of the involucres only, the entire inflorescence except the flowers may be very heavily glandular viscid or all parts may be glabrous-pruinose. The peduncles of the involucres are very short and deflexed, frequently slender for the series. Variation in the species is principally in form of the inflorescence panicle, which changes with age and is modified by temperature, and in the size and color of flowers, which may also have mostly ecological significance. Miss Stokes recognized in herbaria certain specimens as being a variation of apparently more than ecological effect in their unusually small flowers and gave them herbarium names referring to this "flosculose" character.

The type of E. brachypodum was collected by Remy in southeastern California, and is deposited in the Herbarium of the Museum of Paris. The original publication lists the plant as collected at the "western borders of California, in alkaline sands around Kingston Spring." The type locality is, in all probability, in western San Bernardino County, California.

8. E. austrinum (Stokes) comb. nov.
E. deflexum ssp. austrinum Stokes, Gen. Eriog. 44. 1936.

Leaves basal, tomentose, petiolate; scape usually one from the base, glabrous, stout, rigid, heavily branched, internodes short; plant globose, low; peduncles to the involucres as much as 3-4 mm, stout; involucres turbinate, heavy in texture; calyx lobes usually red, similar to those of E. brachypodum but broader; fruit three-angled, beaked.

The type of E. austrinum is T. S. Brandegee, Calamajuet, Baja California. It is deposited in the type collections of the Herbarium of the University of California at Berkeley. Miss Stokes also listed a paratype "also from the southern Sierras by Dr. Purpus."

E. austrinum is a very stout, rounded tumble-weed form of plant probably most closely related to E. brachypodum but from a more southern range and with the habit of the whole plant more heavy and rounded and with more distinctly short, heavy internodes and larger flowers.

9. E. Hookeri Wats. Proc. Am. Acad. 14: 295 f. 1879. E. deflexum ssp. Hookeri (Wats.) Stokes, Gen. Eriog. 45. 1936. E. deflexum ssp. Hookeri var. gilvum Stokes, l.c. E. deflexum ssp. ultrum Stokes, l.c.

Leaves basal, round-cordate, tomentose, petiolate; scape glabrous upright, three-rayed, branches very few;

involucres subsessile, deflexed, hemispheric, teeth broad and blunt; flowers yellow or red or both; outer calyx lobes hastate or auriculate at the base, round, about isodiametric; inner calyx lobes not exceeding outer; lobes accrescent to fruit; fruit three-angled, beaked.

The type of E. Hookeri is "Watson 1033, Wasatch Mountains, American Fork Canon, at least in part" from northern Utah. Paratype referred to in the original publication is Hooker & Grey 1977. W. Nevada.

Collections of E. Hookeri are made in western Colorado, northern Arizona, and in Nevada and Utah. E. Hookeri is notable for its very large, rounded outer calyx lobes and broad involucres. The variation noted under the names "gilvum" and "ultrum" is considered here as falling well within the range of normal variation of the species. An isotype of Stokes' E. deflexum ssp. ultrum at California Academy of Science apparently differs only in the narrower and therefore campanulate involucre from other specimens of E. Hookeri. The yellow color noted in E. deflexum var. gilvum is not, apparently, unusual.

10. E. Parryi Gray, Proc. Am. Acad. Sci. 10: 77. 1874. E. deflexum ssp. Parryi (Gray) Stokes, Gen. Eriog. 45. 1936.

Leaves basal, petiolate, tomentose; round-cordate; scape one from the base, erect, branching to three rays with few small branches on the main rays; pubescence frequently glandular over the whole plant except the flowers and leaves; branching open, branches slender; peduncles to the involucres varying in length from 2 mm to more than a centimeter, deflexed; involucres turbinate to campanulate-turbinate; calyx lobes long, narrow, auriculate or hastate basally, distal margins frequently revolute; fruit three-angled, beaked.

E. Parryi was collected by C. C. Parry, M.D., no. 239, in 1874. The range is deserts of southeastern California, southern Nevada, southern Utah, and northwestern Arizona.

E. Parryi differs remarkably in habit from other species of the series in its rather slender, open, upright habit with manifestly pedunculate narrow involucres. Although younger specimens of E. deflexum are often similar, E. Parryi is of softer texture and the calyx lobes are more elongate. E. Hookeri is also a slender species, but the involucres are very distinctly broader and subsessile.

11. E. Hoffmanni Stokes, Leafl. W. Bot. 1: 29. 1932.

Leaves all petiolate, basal, broadly cordate-obtuse, conereous-tomentose below, veins prominent, sparsely floccose-tomentose above; scape one to several from the base, glabrous, first intermode elongate to about 15 cm, three-rayed with smaller adventive branches at the nodes, inflorescence ascending; involucres all sessile in minute, paired bracts, angled; flowers red, glabrous, calyx lobes spatulate; fruit three-angled, shortly exserted.

The type was collected one-fourth mile north of Wild Rose Spring, Panamint Mountains, Inyo County, California, by Ralph Hoffmann, no. 627, September 30, 1931. It is deposited at the Santa Barbara Museum. An isotype is deposited in the Herbarium of the California Academy of Sciences.

11a. E. Hoffmanni var. Hoffmanni

Calyx lobes slender; plants slender, under 6 dm high.

11b. E. Hoffmanni var. robustius Stokes, Leafl. W. Bot. 3: 16. 1941.

Similar to the typical variety but in all parts more robust, the first internode being often beyond 2 dm tall and nearly 1 cm in diameter; calyx lobes ovate.

The type is M. French Gilman s.n., February, 1938,

Ryan Wash, Funeral Mountains, Death Valley Region. Deposited at California Academy of Sciences.

E. Hoffmanni is included in the section Pedunculata because of its seeming near relation to other members of the section, especially in the E. deflexum series, in spite of the sessile involucres.

12. E. Rixfordii Stokes, Leafl. W. Bot. 1: 29. 1932. E. deflexum ssp. rixfordii (Stokes) Munz, Aliso 4: 89. 1958.

Leaves basal, petiolate, round-cordate, cinereous tomentose, blades crisp; scape several from the base, glabrous, arachnoid at nodes; bracts arachnoid within, minutely pustulate; inflorescence globose, branches dichotomous with angles above the second node greater than 90°, internodes very short and stout; peduncles to the involucres very short but not stout, frequently appearing sessile or subsessile, the longer deflexed; involucre campanulate, nerved, four- or five-toothed, about 1 mm long; flowers reddish, several in an involucre; calyx lobes auriculate, narrow, nervate, rounded at apex; fruit lenticular with long, narrow, two-ribbed beak.

The type was collected by G. P. Rixford in Inyo County, California, and is deposited in the Herbarium of the

University of California.

E. Gordoni Series

Description of the series. Scapes erect, glabrous, branching strict and slender; involucres pedunculate, narrow-campanulate or turbinate, glabrous or glandular; calyx lobes spatulate, oblong, or round, frequently emarginate, pustulate or minutely and sparsely hirsute or glabrous, usually white or white with pink.

13. E. pustulosum sp. nov.

Foliis radicalibus, cordata-ovatis, subtus tomentosis, supra strigosis; scapo recto, ramis bifurcis, glabris, angulis acutis, involucris campanulatis, quinqudentatis; tubam calycis pustulosam laciniis oblongis minute tridentatis; fruge rostrato.

The range of this formerly overlooked species is in the hilly parts of northern and western Nevada. Collections occur in the herbaria under the names of several other superficially similar species; some being determined as E. cernuum var. tenue, some as E. nutans var. brevipedicellatum, E. Gordoni, or E. collinum. It is similar to all of these in its form of inflorescence and shape of involucre and coloring

of flowers; however, the characters of leaves and calyx segregate it from the others on inspection. The range falls within that of E. cernuum var. tenue and nearly coincides with that of E. nutans, but E. collinum is found to the west of E. pustulosum and E. Gordoni to the east of it.

14. E. Gordoni Benth. in DC, Prodr. 14: 20f. 1857. E. trinervata Small, Bull. Torr. Bot. Club 25: 52. 1898.

Leaves basal, sparsely ciliate or hirsute, petiolate, reniform-entire or round-crenate; scape single from the base, the first internode elongate, frequently fistulous, glabrous or glabrescent, erect, the rays ascending and branched, frequently fascicled at the axils; bracts ternate or paired, very small scales; peduncles to the involucres often more than 1 cm long, involucres 1 mm or more long, campanulate, five-lobed or five-toothed, the lobes or teeth erect or slightly turned inward; flowers several shortly exserted, calyx lobes white with green or red midrib, often becoming pale red, elliptic or spatulate, varying in length, fruit beaked-fusiform, the base spheric, beak ridged, color changing from yellow to black or very dark brown.

The type was collected on the upper Platte River of the Rocky Mountains by Gordon. E. Gordoni is variable over

its range and includes several minor habit variations that tend to merge with E. capillare. Small described E. trinervata from specimens in southwestern Colorado. Although specimens from the south of the range of E. Gordoni seem easily confused with E. capillare, E. capillare always has more distinctly elliptic calyx lobes, a broader habit (except for specimens of northwestern Arizona, where the base of the plant is heavily developed and foliar) and leaves smaller and with smooth margins.

15. E. capillare Small, Bull. Torr. Bot. 25: 51f. 1898.

Leaves round, basal or sheathing the scape for several centimeters, round, cordate at the base, usually sparingly tomentose; caudex frequently heavily developed and apparently perrenial; scape erect, single, usually slender and wiry, angle of branching greater than 45° at the first node, usually forming a regular globose, open panicle; round, peduncles to the involucres erect, elongate, slender; involucres turbinate, glabrous, five-toothed, flowers white or pink, glabrous; outer calyx lobes slightly larger than the inner, erect or spreading, margins plain or slightly revolute about the middle or at the apex; fruit dark brown, ovary

spheric, distinctly beaked and three-angled on the beak.

E. capillare has been confused with E. arizonicum Stokes because of great similarity of the scape and flowers. E. arizonicum is different in having heavily tomentose leaves with undulate (not sinuate) margins; the leaves of E. capillare are strigose and plane. The habit of the scape is also different, that of E. arizonicum being stricter than that of E. capillare.

Jones referred E. capillare to synonymy under E. Gordoni. The habit of E. Gordoni is more irregular than that of E. capillare, which forms an open subglobose panicle. The leaves of E. Gordoni are less pubescent, and the fruit is more elongate and less rounded basally than those of E. capillare.

The species to which E. capillare is most closely comparable in habit is E. Wetherillii, but the fruits of E. Wetherillii are lenticular and lack the beak and the whole plant of E. Wetherillii is generally smaller than that of E. capillare.

16. E. arizonicum Stokes (non Gdgr.), Contr. W. Bot. 11: 16. 1906.

Base leafy for as much as 1.25 dm or more; leaves

petiolate, heavily blue-gray tomentose, blades thick, round or reniform, crispate; scape one or more from the base, erect and irregularly dichotomous to form an open panicle, internodes elongate, glabrous; peduncles to the involucres about 1 cm long, erect or ascending; involucres turbinate, 2 mm long, five-toothed; flowers on hispid pedicels, urceolate, glabrous, white or tinged with pink or yellowish, calyx lobes broad, oblong or subpanduriform, not crispate but in some slightly revolute at the narrow part of the calyx lobe; fruit black, spheric with long, brown beak.

The type is deposited in the University of California Herbarium and was collected by C. R. Orcutt no. 186 in 1896 in Arizona. This specimen is immature, but it matches subsequent collections so well in vegetative characters that there is no doubt as to the identity of the species. Certain specimens of E. capillare are of so nearly intermediate character to E. arizonicum as to have been the occasion of doubt concerning the validity of the species, E. arizonicum. The latter is distinct in vegetative characters as well as in flowering and fruiting parts. The flowers are the most readily distinguishing portions of the two species; fruits are very similar in the two. E. arizonicum may grow to over 6 dm high and does not become a broad plant in the

inflorescence as does E. capillare, and the leaves of E. capillare are never so heavily tomentose and so thick as those of E. arizonicum. So far as is known E. arizonicum occurs only in Arizona. A mature specimen distributed in several herbaria is Goodman and Hitchcock no. 1276 collected 10 miles north of Winkleman, June 22, 1930.

17. E. tenellum Torr. (non Nutt.), Ann. Lyc. Nat. Hist. N. Y. 2: 241. 1828.

Caudex one or branched at or below the surface, leafy and branching; leaves basal and caespitose or distributed above the base for 1 dm or more, petiolate, heavily gray-tomentose on both surfaces or more heavily beneath, elliptic to semicircular with the base truncate or circular with acute apex; scape glabrous, dichotomous once or twice; bracts ternate, heavily gray-arachnoid within, subulate or triangular, becoming blunt; peduncles to the involucres elongate, frequently over 2 cm long, erect, axillary and terminal, single; involucre glabrous without, 2 or 3 cm long, turbinate, five-toothed, floribund and filled with an exserted, gray, arachnoid pubescence; flowers large for the subgenus, often more than 2 mm long, glabrous on exserted, glabrous pedicels, outer calyx lobes becoming ovate,

frequently retuse, some crenulate or revolute around the margins, gibbous basolaterally and reflexed beyond the middle; inner calyx lobes narrower and shorter, accrescent, narrowed beyond the basal, accrescent portion and distally emarginate; fruit three-angled and long-beaked.

The type was collected by James at the bases of the Rocky Mountains. The three varieties are segregated most readily on characters of the foliar base.

17a. E. tenellum var. tenellum
E. tenellum var. leptocladon Benth. in DC, Prodr. 14: 20. 1857.

Leaves elliptic or round, acute at the apex, inflorescence little branched; base simple and subcaespitose.

17b. E. tenellum var. ramosissimum Benth. in DC, l.c. E. tenellum var. caulescens T. & G. Proc. Am. Acad. 8: 186. 1870.

Leaves elliptic, acute at the apex, inflorescence open with few branches; leafy base elongate, basally prostrate or subterranean, caudex branched.

17c. E. tenellum var. platyphyllum (Torr. ex Benth. in DC) Torr. in Emory, Rep. 176. 1859. E. tenellum ssp. platyphyllum (Torr. ex Benth. in DC) Stokes, Gen. Eriog. 69. 1936. E. platyphyllum Torr. ex Benth. in DC, Prodr. 14: 20. 1857.

Base simple, erect, leafy for a decimeter or more; leaves semicircular, obtuse at the base, petiolate, heavily tomentose.

The type for E. platyphyllum was Wright no. 618, west Texas.

The species E. tenellum occurs in northern Mexico, in west Texas, New Mexico, Oklahoma, and Colorado.

Although Gandoger named several subspecific taxa in E. tenellum, these have been referred to E. microthecum subsequently.

E. tenellum is somewhat unusual in its characters, but aside from the development of a branched caudex (also found in E. inflatum) and the development of leaves above the basal roseate (also found in E. arizonicum and E. capillare) the characters place E. tenellum in the subgenus Ganysma and in the Section Pedunculata, where it was placed by Bentham as the first listed species of Section Pedunculata. The relationships are not entirely clear, the base being reminiscent of E. ovalifolium and the inflorescence of E. capillare. Especially in E. tenellum var. platyphyllum is the tomentum and leaf reminiscent of E. arizonicum. The tube of the calyx has the form of that of E. cernuum, and the calyx lobes are the only ones outside of E. cernuum which

truly approach the smaller panduriform calyx lobe of E. cernuum.

18. E. rubricaule Tidestr. Proc. Biol. Soc. Wash. 36: 181. 1923. E. laetum Stokes, Gen. Eriog. 23. 1936. E. trichopes var. rubricaule (Tidestr.) Stokes, Gen. Eriog. 25, 1936.

Leaves basal and sheathing the scape up to 2 cm, long petiolate, reniform, mucronate or retuse, hirstulous, ciliate; scape single from the base, erect, trichotomous with small accessory branches at the first node; bracts elongate scale-like or subfoliar, ciliate, to plumose, yellow-margined; peduncles to the involucres elongate, erect; involucres broad campanulate, pruinose, five-toothed or more flowers yellow; calyx lobes nervate, minutely astipitate-glandular, ovate-lanceolate, acute; beak of fruit shortly exserted, ridged.

Type in the U. S. National Herbarium, collected by F. B. Headley near Lahontan, Churchill County, Nevada, May 21, 1916.

The type of E. laetum Stokes is at the California Academy; it was collected by Mrs. L. E. George no. 9, near Humboldt, Nevada, May 24, 1901. A paratype of E. laetum in the University of California is Purpus, collected in Clayton

Valley. All collections have been in Nevada in the Toiyabe area.

19. E. nutans T. & G. Proc. Am. Acad. 8: 181. 1870. E. rubiflorum Jones, Zoe 4: 281. 1895.

Leaves basal, round or broad reniform or the smaller ones round and mucronate, heavily tomentose below, floccose above; scape one or several from the base, fistulous in some, glabrous and pruinose except on the involucral peduncles; branching open; bracts scale-like, two to four at a node, small, arachnoid within; peduncles to the involucres usually deflexed, slender but not filiform, stipitate glandular, hirsute, or glabrescent; involucre shallow campanulate, five-toothed, the teeth rounded and deeply inscised, white margined; flowers large (2 mm or more long), yellow; calyx lobes notched at the broad apex, narrower about the middle; fruit three-angled, beaked.

Type collected by Lieut. Beckwith, canyon at base of Sierra Nevada, Nevada. The species is collected in southwestern Oregon, in Nevada, and in central Utah.

E. nutans var. nutans

Involucral peduncles elongate, deflexed, sparsely glandular.

E. nutans var. brevipedicillatum Stokes, Gen. Eriog. 43. 1936. E. Lemmoni Wats. Proc. Am. Acad. 12: 266. 1877.

Involucral peduncles short, many erect, heavily glandular.

Type in California Academy of Sciences J. T. Howell 7974, from 30 miles west of Eureka, Nevada.

The type of E. Lemmoni was collected by Lemmon on Sand hills near Reno, Nevada. The number of collections of plants of this description is small, and it may be that a greater number of specimens will reveal a distinction between the two. I have examined only a fragment of the type of E. Lemmoni, but the fragment and the description by Watson indicate the synonymy employed here.

20. E. apiculatum Wats. Proc. Am. Acad. 17: 378. 1882.

Leaves basal, oblong, ciliate; scape glabrous or glandular especially toward the base and on the peduncles, dichotomous, open, slender; peduncles to the involucres elongate, deflexed, spreading, or ascending, subsecund and shorter especially near the ends of elongate rays; involucre small, turbinate-campanulate, toothed, the teeth inscised about one-third the distance to the base of the involucre,

teeth nervate, in some the nerves excurrent, occasional minute pubescence on the nerve; calyx lobes oblong, the outer apiculate in a minute distal sinus, the inner simply emarginate, smaller; fruit rounded with a short, thick beak.

The type was collected by the Parish brothers on the San Jacinto Mountains, July, 1881. All collections are southern California.

E. apiculatum var. apiculatum

As described.

E. apiculatum var. subvirgatum Stokes, Leafl. W. Bot. 2: 48. 1937.

Calyx lobes not sinuate apically; involucres subvirgate; flowers with appressed pubescence.

Type at California Academy of Science; Ralph Hoffman, September 8, 1929. Mt. San Jacinto, Riverside County, California.

21. E. esmeraldense Wats. Proc. Am. Acad. 24: 85. 1889.

Leaves all basal, petiolate, the blade tapering to the petiole, ciliate and sparsely strigose or glabrescent; scapes cinereous-glaucous, slender, unequally trichotomous,

upright; bracts three or four at a node, scale-like and joined very briefly at the base; involucral peduncles slender, mostly strongly reflexed; involucre minute, turbinate or trumpet-shaped; flowers glabrous, white or pinkish, changing with age from lanceolate and relatively smooth to oblong and transversely corrugated.

Found by W. H. Shockley, at Candelaria, Esmeralda County, Nevada. Deposited in the Dudley Herbarium of Stanford University. Nevada and southwestern California north of the Colorado Desert.

E. esmeraldense var. esmeraldense

Involucres distinctly pedunculate, leaves glabrescent or sparsely strigose with hairs with pustulate bases.

E. esmeraldense var. toiyabense J. T. Howell, Leafl. W. Bot. 6: 176. 1952.

Leaves glandular, involucres subsessile.

Type at California Academy of Science; J. M. and M. A. Linsdale 550, June 30, 1931. Mahogany Canyon, Toiyabe Mountains, Lander County, Nevada.

SUBSECTION RENIFORMES

E. reniforme Series

Description of the series. Leaves round, tomentose below, petiolate; scape slender, erect or ascending, glabrous, viscid, or pruinose; inflorescence broadly umbellate or open paniculate; calyx lobes spatulate or elliptic, auricled or saccate at base or simple; fruit lentic, spheric, or short beaked.

22. E. reniforme Torr. ex Frem. Report. 317. 1845.

Occasional cauline leaves at the first or second node of the inflorescence similar to but smaller than the very heavily tomentose, whitish or bluish radical leaves; scape one to several from the base, frequently branching from very near the base, villous on the lower portion of the first internode in some, more frequently glabrous and glaucous, forming frequently a regularly rounded or nearly flat-topped inflorescence, but in southeastern specimens the

inflorescence frequently flat-topped unbellate; bracts short, pointed, ternate and barely joined at the base around the node, slightly membranous, araneous or silky villous within and rarely slightly hirsutulous or floccose on the back; involucre broad turbinate or hemispheric or salverform, five broad, short, rounded lobes yellowish-membranous on margins, glaucous on the firmer portion; flowers yellow, frequently with red rib or tip; calyx lobes spatulate or obovate, always rounded at the apex, the inner somewhat smaller, tube very broad and shallow; fruit lenticular with a small mucro representing the beak, yellowish brown to black.

Three varieties differ principally in distribution of glandular pubescence in the inflorescence.

22a. E. reniforme var. reniforme
E. reniforme ssp. typicum Stokes, Gen. Eriog. 35. 1936.

Pubescence lacking from the inflorescence.

22b. E. reniforme var. comosum Jones, Contr. W. Bot. 7: 719. 1895. E. comosum Jones, Contr. W. Bot. 11: 16. 1903. E. reniforme var. asarifolium Gdgr. Bull. Soc. Belg. 42: 196. 1906. E. reniforme var. playanum Jones, Contr. W. Bot. 11: 16. 1903.

Pubescence limited to the flowers.

22c. E. reniforme var. pusillum (T. & G.) comb. nov. E. pusillum T. & G. Proc. Am. Acad. 8: 184. 1870. E. reniforme ssp. pusillum (T. & G.) Stokes, Gen. Eriog. 36. 1936.

Minute glandular pubescence on distal peduncles, involucres, and flowers.

The type for the typical variety was collected by Fremont on the exploring expedition to the Rocky Mountains and to Oregon and North California. The locality was reported to be on the Sacramento River, March. This is a highly improbable locality and date. Later in the same year Fremont passed through the Tehachapi area into what is now Arizona and southern Utah toward the east. This was spring and early summer, a time when the collection of E. reniforme is most probable in this area. Jones collected the type for E. comosum at Hole in the Rock, Nevada, April 12, 1894. He collected the type for E. reniforme var. playanum at Mica Springs, southeastern Nevada. The type for E. pusillum was collected by Watson on King's expedition in the foothills of the Trinity Mountains, borders of the Truckee Desert, Nevada. The species ranges from arid regions of eastern and southeastern California and in adjacent Nevada southward to the Mohave and northern Arizona-southeastern Nevada region. E. reniforme var. pusillum is the more northern in distribution

and E. reniforme var. comosum the more southern and southeastern. Where the ranges of E. reniforme var. reniforme and E. reniforme var. pusillum meet the two approximate each other in all characters but the pubescence.

23. E. subreniforme Wats. Proc. Am. Acad. 12: 260. 1877.

Leaves basal, round or reniform, cordate at the base, long petiolate, tomentose below, pilulose or strigose above, up to 3 cm in diameter; scapes very slender, usually several from the base, once or twice dichotomous, pilulose or glabrescent, broader than tall; bracts scale-like, membranous, peduncles filiform and at most little over 1 cm long; involucre minute, turbinate-campanulate to salverform, five-toothed, teeth rounded, about one-third the length of the tube; flowers few, exserted, dark red or pink, glabrous, long-ovate or spatulate, the inner slightly longer; fruit becoming dark brown, nearly spheric.

In the herbaria the species E. subreniforme is usually not distinguished from E. filicaule; the two species are very similar in their exceedingly low, slender, dichotomous inflorescences and their lightly tomentose to puberulent leaves. However, the two are distinct in their fruits,

flowers, involucres, and in the angle of the dichotomy. The fruit of E. subreniforme is spheric rather than fusiform; the flowers are quite red rather than streaked with red; the involucres are broad rather than minutely and narrowly trumpet-shaped. In inflorescence branching E. subreniforme is broader and lower than E. filicaule, the branching in E. filicaule being at angles of 30° or less and strikingly dichotomous.

In Watson's description of E. subreniforme no mention is made of any particular specimen as type. A lectotype is, therefore, necessary, but none has yet been selected.

E. subreniforme is collected rarely in California in desert regions, in Arizona, and in Nevada and Utah.

24. E. viscidulum J. T. Howell, Leafl. W. Bot. 3: 138. 1942.

Leaves basal, tomentose below, glabrous above, elliptic to ovate-round, crenulate-crispate, petiolate; scape tall, slender, one or two from the base, viscid throughout, verticillate at the first node, simply paniculate above by repeated dichotomy; bracts elongate, tomentose, diminishing distally; peduncles to the involucres filiform, about 1 cm; involucres four-toothed, minute, trumpet-shaped;

flowers exserted in minute glabrous pedicel, one or two in each involucre, yellow, ligulate, distally minutely emarginate or apiculate as if by an excurrent midrib; fruit lentic, red-brown.

The type is Eastwood and Howell 9031, collected May 8, 1941 at the Virgin River crossing below Bunkerville, Clark County, Nevada. The type and an immature specimen from the same locality are deposited in the Herbarium of the California Academy of Science. No other collections have been observed. Although the plant is, as described, viscid throughout, glands are not visible with a lens.

25. E. filicaule Stokes, Gen. Eriog. 32. 1936.

Leaves basal, smoothly reniform, sparsely hirsutulous above, short tomentose below except on the glabrous, palmate veins; scape tall, one to several from the base, dichotomous regularly, strict, internodes elongate and slender; bracts subulate, puberulent; peduncles to the involucres filamentous; involucres minute, trumpet-shaped; flowers pubescent, yellow; calyx lobes elliptic, some revolute on the margins proximal to the middle; fruit broad fusiform, short-beaked, beak slightly exserted.

The type is Eastwood and Howell no. 1171, collected

from talus near the roadsize near Zion Canyon, Utah, in 1933.

As noted under E. subreniforme, this species and that are frequently not distinguished. The very narrow involucres of E. filicaule and the taller than broad inflorescences with narrow angles distinguish E. filicaule from E. subreniforme. The range for the two is the desert basin area of southern Utah, southern Nevada, and Arizona and California in the Colorado Desert area.

26. E. Thomasii Torr. Pacific Rail. Rep. 5: 364. 1857. E. minutiflorum Wats. Proc. Am. Acad. 26: 125. 1891.

Plants usually filmy, erect, becoming dense and rounded in some; leaves round, reniform, elliptic, or sagittate at the base and ovate; pubescence of the leaves white or cinereous, floccose-tomentose on both surfaces; scapes slender and one to several from the base, brown or reddish; branching at the nodes usually dichotomous at the first node, then irregularly dichotomous with scattered small branches at the nodes, the major branches tend to elongate with a secund distribution of involucral peduncles; bracts minute, dry scales; the involucral peduncles very slender and diminishing in length along the branch; involucres minute; triangular, five-toothed, erect; flowers several in the

involucre, slightly to distinctly exserted; calyx tube campanulate, minute, pilulose, darker than the limbs; calyx lobes variably white, yellow, or purple or rose, glabrous and hyaline; bases of the outer calyx lobes minutely to saccately auriculate, beyond the auricles spatulate inner calyx lobes narrow, spatulate; fruit brown, fusiform when immature, at maturity small, spheric, with a subulate beak, obscurely three-angled.

The type was collected from the railway survey near Fort Yuma by Major Thomas. E. minutiflorum is based on an Orcutt collection from the desert near San Diego. In this area it is frequent to find specimens which match this description of E. minutiflorum. They are the immature form of the flower in which the auricles have not made readily noticeable development. These plants are sometimes confused with E. reniforme. The underdeveloped calyx is very similar to that of E. reniforme though rather smaller, but in E. Thomasii the outer calyx lobes will be found to have at least some rudiment of the auricles, the involucre is much smaller and narrower than that of E. reniforme, and the inflorescence is of much more slender branches in E. Thomasii than in E. reniforme. Except for the flower parts just described and the variation in leaves, the greater amount of variation in

E. Thomasii is limited to size. The branching habit varies in density or in filminess largely dependent on situation and age of the plant.

E. Wetherillii Series

Description of the series. Inflorescences low, rounded, divaricate and short branched, becoming denser in age; involucres shallow campanulate, five-toothed; calyx lobes glabrous, elliptic, spreading, equal or subequal; fruit lenticular.

27. E. Wetherillii Eastwood, Proc. Calif. Acad. Sci. ser. 2. 6: 319, f. 1896.

Leaves basal, subglabrous or sparsely hirsutulous (rarely white-tomentose); scape single from the base, glabrous or very sparsely silky villous, short and slender; inflorescence once trichotomous, subsequently monochasial; bracts minute, elongate, submembranous; involucres minute (less than 0.5 mm long), broad turbinate, four-toothed, teeth rounded; flowers well exserted, glabrous, yellow to membranous with a red stripe along the center; calyx tube broad, minute, dark; calyx lobes broadly open, elliptic, broader beyond the middle; fruit dark, lenticular, minutely mucronate at maturity, fusiform at anthesis.

Miss Eastwood has deposited three sheets in the type collection of the California Academy of Sciences Herbarium which are marked E. Wetherillii Eastw. Two of these sheets are Eastwood 124, "San Juan River, near Cliffs. 12/vii/1895. SE Utah." According to her publication of the species, these sheets are to be considered the type. The third sheet is Eastwood s.n. "Courthouse Wash, near Moab, SE Utah. May 1892." These may be the other collections referred to in the same publication.

E. Wetherillii is a low plant of slight habit, and when young it tends to form a flat-topped monochasial system in the inflorescence. Early branching produces minor branches or peduncles erect from a continuing branch with slightly curved internodes. With further growth, however, the plant may assume a rounded or globose form and may become a tumble-weed. The leaves are never large, being on the type and co-type collections round and seldom over a centimeter in diameter. On the type collection there are several branches from the base, but this is not the usual case. The opposite bracts are very small, and rather short in the type collection. Angles of the axillae are broad, approaching 90°. The peduncles of the involucres are short, up to 5 mm long; slender but not filiform. The involucres are very

small, shallow four-toothed, not deeply incised nor long lobed nor pointed. Flowers become long exserted, flowering one at a time; but one involucre may bring forth four or five flowers. The pedicels are quite glabrous. Bracteoles are never exserted, and are hirsutulous. Anthers are not exserted noticeably.

28. E. sessile Stokes, Contr. W. Bot. 11: 16. 1903. E. filiforme L. Williams, Bull. Torr. Bot. Club 59: 428. 1932.

Leaves basal, oblong, tomentose below and glabrescent above, petiolate; scapes one to several from base, usually several, glabrous, diminishing distally both in length of internodes and in diameter to finely filiform divisions; bracts squamate, elongate or very short toward the ends of branches; involucres pedunculate on slender peduncles under 0.5 mm long or sessile in axils of the bracts, campanulate, from 0.5 mm to 1 mm long, deeply toothed, glabrous; calyx lobes obovate or elliptic with blunt distal margin, only slightly spreading; fruit nearly lentic but slightly thicker at the apex.

The type for E. sessile was collected by M. E. Jones at Moab, Utah, in August of 1891. The type for E. filiforme was collected by Garrett, no. 5975, in Wayne County, Utah,

July 23, 1931.

E. sessile is intermediate in habit between E. Wetherillii and E. Parishii, being in its young form more like E. Wetherillii but becoming denser in the same manner as the much more frequently collected E. Parishii. The near lentic fruits and campanulate involucres make discrimination between E. sessile and E. Parishii apparent, the fruits of E. Parishii being beaked and exserted beyond the narrow calyx lobes. The distinction between E. Wetherillii and E. sessile is in the sessile or short pedunculate involucres of E. sessile.

SUBSECTION INERMA

E. inerme Series

Description of the series. Low plants, under 3 dm tall; leaves basal, small glandular; scape usually one, in some several from the caudex, glandular or rarely eglandular, dichotomous, becoming dense, green or reddish; involucres minute, turbinate, four-toothed; flowers white or pink, calyx lobes lanceolate, distally emarginate, sparingly hirsutulous; fruit beaked, exserted.

29. E. Parishii Wats. Proc. Am. Acad. 17: 379. 1882.

Leaves basal, petiolate, glandular; scape one or more from the base, green or reddish-brown, dichotomous, becoming dense; peduncles to the involucres secund, short filamentous; involucres turbinate, four-toothed, few-flowered; calyx lobes lanceolate, emarginate distally; fruit three-angled, beaked.

The type was collected in the San Bernardino Mountains by the Parish brothers, August, 1881. E. Parishii is collected in desert mountains of southern California, western Arizona, and Baja California.

Flowers and involucres in E. Parishii are minute, usually 0.5 mm or less in length. The habit is frequently similar to E. sessile or to E. tenuissimum, being either dense and globose or erect and diffuse. By pubescence and flower this as well as the next two are related closely to Subgenus Oxytheca.

30. E. inerme (Wats.) Jeps. Flora California 406. 1913. Oxytheca inermis Wats. Proc. Am. Acad. 12: 273. 1877. E. vagans Wats. Proc. Am. Acad. 20: 370. 1885. E. inerme var. typicum Goodman, Am. Midl. Nat. 39: 502. 1948. E. inerme var. hispidulum Goodman, l.c.

Leaves basal, obovate, blade spinulose-ciliate, continuous with winged petiole; scape low, open dichotomous, minutely glandular, branching about equally; bracts lanceoloate-ovate, subfoliar; involucres minute, subsessile, turbinate; flowers 1 mm or very slightly longer. calyx lobes sparsely hispid, white; fruit three-angled, exserted.

The type of Oxytheca inermis was collected in the south coastal range area, "probably Mount Diablo" by Bancroft. The range of E. inerme is in the south coastal

range, adjacent interior, and in the mountains of southern California. E. inerme and E. hirtiflorum, the next species, have both been classified both as Oxytheca and as Eriogonum. These two species in particular are responsible for the invalidation of the genus Oxytheca. Although the characters of these two and the next two, E. spergulinum and E. pratense, as well as the previous, E. Parishii, can well be used to place them into the Subgenus Oxytheca; that subgenus is here considered to exclude "unarmed" species, those lacking awns to the involucre. This being the case, the most logical place to consider them is in the Subgenus Ganysma, Section Pedunculata. Distinction between E. inerme and E. hirtiflorum is sometimes difficult; since they are so very similar in all characters. E. inerme, however, is somewhat more coarsely pubescent and the bracts slightly narrower in general than the other species. More thorough study of these two may, at a later date, indicate conspecific relationship between this, the southern, and E. hirtiflorum, the northern representative of these low, coarse, glandular Eriogona.

31. E. hirtiflorum Gray ex S. Wats. Proc. Am. Acad. 17: 259. 1877. Oxytheca hirtiflora (Gray) Greene, Flora Fran. 153. 1891.

Leaves obovate, oblanceolate, or spatulate, joining the winged petioles, very softly and minutely glandular or hirsutulous; scape low, open, dichotomous irregularly, minutely glandular and hirsutulous, forming a more or less rounded corymb; bracts round or ovate, subfoliar, hirsutulous; peduncles short, heavily glandular, 1 to 4 mm long; involucres turbinate, hirsutulous, about 1 mm long, five-toothed; flowers hirsutulous, pink, hairs white, uncinate; calyx lobes equal, elliptic, rounded distally; fruit exserted, three-angled, length of flower and exserted beak about 1 mm.

The type of E. hirtiflorum was collected by Dr. Gray in 1872, "probably in the mountains of California." The range of E. hirtiflorum is northern California in the coastal ranges. The difficulty of discriminating this species from the former is largely a matter of great similarity of the inflorescence. These seem to be, however, constant characters in which sufficient discontinuity is observed to maintain the species.

E. spergulinum Series

Description of the series. Leaves basal and at first node of scape, linear, 4 mm or shorter, hirsutulous; scape erect to spreading, broadened, glandular, slender and

irregularly branching; bracts ligulate, subfoliar; sparsely hirsutulous; peduncles to the involucres slender; involucres turbinate, minute, long-toothed, teeth four; flowers one at a time or few, white or pink, arachnoid pubescent; calyx lobes oblong or becoming round-obtuse, frequently emarginate at the distal midpoint; calyx tube narrow, hirsutulous; fruit plano-convex.

32. E. spergulinum Gray, Proc. Am. Acad. 7: 389. 1868. E. spergulinum var. typicum J. T. Howell, Leafl. W. Bot. 6: 79. 1950. E. spergulinum var. Reddingianum (Jones) J. T. Howell, l.c., Oxytheca Reddingiana Jones, Bull. Torr. Bot. Club 9: 32. 1882.

Leaves basal and at lower nodes, sparsely hirsutulous, 4 mm or shorter; first internode erect, branching to two or three rays, spreading by narrow angles, rays becoming spreading and diffuse, internodes slender and elongate, heavily stipitate-glandular, glands becoming black; peduncles to the involucres 1 cm or more long, slender or filiform, glandular, rarely eglandular; involucres narrow turbinate, approaching the trumpet-shape, four-toothed, teeth long, one-half the length of the tube; flowers few or only one at a time; calyx tube narrow, hirsutulous; calyx lobes obovate or oblong, rather sparsely hirsutulous, some apiculate in a minute sinus; fruit lenticular, plano-convex.

The type for E. spergulinum was collected by Bolander in dry sandy soil on the banks of Big Creek below the Mariposa Big-Tree Grove in southern California. Jones' type for O. Reddingiana was collected at Soda Springs near Summit, California, July, 1882, in Nevada County. The species as delimited here occurs in Idaho, Oregon, Nevada, and in California in the Sierra Nevada. The typical specimens are of more limited range, occurring only in the Sierra Nevada of California, whereas the atypical, intermediates to the next species or resembling Jones' type, are collected over the broader range.

33. E. pratense Stokes, Leafl. W. Bot. 3: 201f. 1943. E. spergulinum var. pratense (Stokes) J. T. Howell, Leafl. W. Bot. 6: 80. 1950.

Leaves basal and on the lower portion of the inflorescence, ligulate; scape branching from the caudex, eglandular, finely and sparsely puberulent or hirsutulous, spreading, internodes very short; bracts ligulate, subfoliar, peduncles to the involucres short, axillary, floribund, small, conspicuously hairy, broad; fruit lentic, plano-convex, broadest distally.

E. pratense is based on a type collected by Alexander and Kellogg on Cottonwood Creek in Inyo County, California.

All collections of this and of specimens of intermediate character to E. spergulinum are from Inyo and Tulare Counties, California, in the Sierra Nevada.

Although the interpretation that this is a variety of E. spergulinum is readily defended, the numerous characters in which variation from that species occurs regularly make it a more distinct thing from E. spergulinum than is O. Reddingiana. The dintinction between the "Reddingianum" forms and the "spergulinum" forms is decidedly of lesser nature, and may be recognized as no more than a variety, and the frequent intermediates collected indicate that there is a little discontinuity between the populations.

SUBSECTION TRICHOPODA

E. Ordii Series

Description of the series. Leaves basal and at higher nodes, elliptic, floccose-tomentose; scape one or several from the base, one usually more strongly developed; inflorescence very diffuse and many branched, the divisions being capillary; involucres distinctly pedunculate, minute, trumpet-shaped, few-flowered; flowers white with pink tips, arachnoid; fruit beaked, frequently exserted.

34. E. Ordii Wats. Proc. Am. Acad. 21: 468. 1886.

Leaves basal, green, obtuse or elliptical, attenuate to the petiole, thinly floccose; scape branching from the base, basally thinly floccose-tomentose, diffuse 3 to 6 dm high; peduncles to the involucres spreading, filiform and elongate; involucres narrowly turbinate, glabrous, minute flowers white or tipped with pink, pubescent, sepals narrow. The type was collected, according to the publication of the species, on sand dunes near Fort Mohave in western Arizona

by J. G. Lemmon, April, 1884. E. Ordii has not been collected since in Arizona. It is possible that this was collected out of usual range and that E. tenuissimum, according to the description very similar to E. Ordii, is a synonym. However, certain parts of the description do not conform to E. tenuissimum, and further disposition must await further knowledge concerning the type and concerning variation in this series.

35. E. tenuissimum Eastwood, Proc. Cal. Acad. Sci. ser. 4. 20: 139. 1931.

Leaves basal, 7 cm or less long, spatulate or obovate, tapering to the petiole, floccose on both surfaces; scape erect; first internode floccose, erect; first internode in the inflorescence diffusely branched with a verticil of branches, leafy; panicle very diffuse and glabrous, filmy and stramineous; bracts broad, membranous, light brown, wedge-shaped, arachnoid or floccose; peduncles finely filiform; involucres trumpet-shaped, minute, pale green, yellow nerved, four-toothed, teeth mucronate and membranous-margined; flowers large and only slightly exserted, white tips red and irregularly tapering, blunt, major portion of calyx hirsute by short curved brown hairs, fruit three-angled, beaked,

yellow.

The type for E. tenuissimum is Eastwood 13897 in the Herbarium of the California Academy of Science. It was collected at Cholame, San Luis Obispo County, California, on May 5, 1926. Specimens are collected in the coast range south of the Bay area.

E. trichopes Series

Description of the series. Involucral peduncles filiform; involucres turbinate, four- or five-toothed, or in series of 3; flowers yellow, white hirsute; fruit three-angled, beaked; plants frequently perenniel.

36. E. inflatum Torr. ex Frem. in Emory, Report. 317. 1848.

Leaves basal, petiolate, round, reniform, or oblong, cordate at the base or obtuse, hispid or hirsute, prominently veined; scape one or several from the caudex, the caudex frequently branching and producing inflorescences in subsequent seasons, erect, three rayed, whorls of smaller branches in E. inflatum var. minus, glabrous or glabrous-glaucous, in E. inflatum var. minus sometimes glandular; bracts whorled, squamate; peduncles elongate, spreading or ascending, filiform, usually yellow; involucres narrowly

campanulate-turbinate, four- or five-toothed; flowers several from the involucre, exserted, yellow; calyx lobes lanceolate to elliptic, some minutely crispate, frequently crassulous at least at the midvein, coarsely white-pubescent by usually curved hairs at least on the midvein; fruit three-angled, beaked.

36a. E. inflatum var. inflatum
E. inflatum ssp. typicum Stokes, Gen. Eriog. 22. 1936. E. trichopes ssp. cordatum (Torr.) Stokes, 1.c. E. cordatum Torr. ex frem. in Emory, Report 317. 1848. fide Torr. 1.c.

First internode fistulous; inflorescence rather regularly dichotomous.

36b. E. inflatum var. deflatum Johnston, Proc. Cal. Acad. Sci. ser. 4. 12: 1013. 1924. E. inflatum ssp. lagunense (Jones) Stokes, 1.c. E. lagunense Jones, Contr. W. Bot. 18: 34. 1933.

First internode not fistulous; several scapes from the caudex; dichotomy lacking, lateral branches few or lacking except for short, peduncle-bearing, alternate branches; peduncles stout, elongate beyond 2 cm; few-flowered.

36c. E. inflatum var. minus (Benth.) comb. nov.
E. trichopodum var. minor Benth. in DC, Prodr. 14: 21. 1857. E. trichopes ssp. minus (Benth.) Stokes, 1.c. E. fusiforme Small, Bull. Torr. Bot. Club 33: 56. 1906. E. clavatum Small, Bull. Torr. Bot. Club 25: 50. 1898. E. glaucum Small, 1.c. p. 51.

First internode fistulous or not; two- or three-rayed at first node or fascicled; inflorescence open, fewer branches on the rays, some glandular.

The range of the species is from the western slopes of the Colorado Rockies westward across the Great Basin in New Mexico and Arizona, Utah and Nevada to the south inner Coast Ranges of California, through the Colorado and Sonoran Deserts to northern Mexico in Sonora and in Baja California.

The type for the species was collected by Torrey on the exploring expedition in southeastern California. The type for E. inflatum var. minus was collected by Wright in New Mexico. The type for E. inflatum var. deflatum was collected by Johnston in the Colorado Desert.

E. inflatum var. minus occurs in the southern part of the range from New Mexico and Colorado westward to the Colorado Desert. It is this type that simulates E. trichopes in being more slender in many specimens and more openly branched. The glandular members of this variety that occur in the western part of the range are often confused with E. glandulosum. E. inflatum var. deflatum, better represented by Jones' collection of the type for the name E. lagunense as an extreme, is a much lower plant than the typical variety in the west. In the southeastern part of the range,

however, E. inflatum var. minus is frequently larger than nearby collections of E. inflatum var. inflatum in the eastern part of the range.

The difficulty of distinguishing E. inflatum from E. trichopes is due to the great similarity which relates the two species closely. The most readily observed characters for distinction are the frequently deflexed peduncles of E. trichopes and the elongation of the principal rays of the inflorescence and whorled nature of secondary branches from them.

37. E. flexum Jones, Zoe 2: 15. 1891.

Leaves basal, sparsely and minutely strigose, orbicular-rhombic; scape one from the base, dichotomous, diffuse, subglobose, broader than tall, internodes up to 5 cm long; bracts linear, ternate, some over 1 cm long; involucral peduncles dark-colored, divergent, filiform, elongate, flexed to an acute angle about three-fourths of the distance, 2 cm or more long; involucre yellow, cleft to the base, of several series, three in each series; flowers 2 mm or more long, fusiform, yellow, hispid by curved hairs; calyx lobes acute, bases of some reddish; fruit brown, beaked, three-angled and ridged, very shortly exserted.

The type of E. flexum is Jones from Moencoppa, Arizona, June 10, 1890. E. flexum occurs in southwestern Colorado, around the "Four Corners" area, in Arizona and in Utah.

37a. E. flexum var. flexum

As described in the species.

37b. E. flexum var. ferronis Jones, Contr. W. Bot. 11: 15. 1903.

Smaller than E. flexum var. flexum; leaves cordate-hastate, orbicular or rhombic, petiolate, small, stigose beneath; scape open and low, few branches, more distinctly glandular than the typical variety, internodes shorter, involucral peduncles short, not flexed.

Type collected by Jones 2 miles south of Ferron, Utah, June 18, 1894.

E. flexum is glandular, but the glands are frequently not visible without a lens. The involucre is atypical, being divided to or near to the base in many. Some involucres occur sessile in axils of bracts. Exinvolucrate flowers may be found. These peculiarities are also found in E. salsuginosum, frequently segregated under the name Stenogonum

salsuginosum. Whether a strong relationship or a case of parallel evolution is indicated must depend on further evidence.

38. E. glandulosum (Nutt.) Nutt. ex Benth. in DC, Prodr. 14: 21. 1857. Oxytheca glandulosa Nutt. Journ. Acad. Nat. Sci. Philadelphia ser. 2. 1: 170. 1848. E. trichopes ssp. glandulosum (Nutt.) Stokes, Gen. Eriog. 25. 1936 excl. var. rubricaule (Tidestr.) Stokes, l.c.

Leaves basal, petiolate, orbicular to spatulate, 2.5 to 9 cm long; scape one from the caudex, trichotomous at the first node, small accessory branches at first node, the rays open and few branching; bracts very small, broad, rounded; entire inflorescence glandular; peduncles slender, straight or curved, less than 1 cm long; involucres minute, campanulate-spheric, five-toothed, teeth blunt, about half as long as tube; flowers yellow, segments ovate-acuminate, puberulent by yellow or white pilose hairs.

38a. E. glandulosum var. glandulosum

Perianth yellow, becoming reddish-tinged in age; anthers yellow.

Type collected by Gambel in the Rocky Mountains. The range is Nevada and Utah according to Howell in his Synopsis of Eriogonum glandulosum in Leafl. W. Bot. 8: 38. 1956.

38b. E. glandulosum var. carneum J. T. Howell, l.c.

Perianths red or whitish, ribs reddish, anthers red, leaves and bracts slightly glandular.

The type of E. glandulosum var. carneum is J. C. and A. R. Roos 6527, collected at the west base of Last Chance Mountains, east of Eureka Valley sand dunes, Inyo County, California, August 23, 1955.

39. E. trichopes Torr. in Emory, Notes of a Mil. Reconn. 150. 1848. E. trichopes ssp. typicum Stokes, Gen. Eriog. 24. 1936.

Leaves basal, petiolate, softly pilose or strigose, reniform, ovate, or round, crenulate; scape one from the base, first internode about 1 cm long, three-rayed beyond, the rays elongate and ascending; nodes slightly swollen, verticillate by secondary branches 1 dm or less long, some longer, pilulose; bracts scale-like or subulate, frequently ciliate; peduncles to the involucre filiform, yellow, deflexed, 1 cm or more long; involucres minute, less than 1 mm long, narrow, four-toothed, teeth as long as the tube; flowers yellow, white hirsute, lobes lanceolate; fruit three-angled, beaked.

The type of E. trichopes was collected in southern

California in the eastern slopes of the mountains. E. trichopes is frequent over wide areas of the desert part of southern California and northern Sonora and Baja California. It occurs often in clumps or small stands of as many as twenty or thirty plants, the filmy yellow-green of the inflorescence appearing as a mist or haze from a little distance; this is also true of the more diffuse specimens of E. inflatum. More slender specimens of E. inflatum are often determined erroneously as E. trichopes. The variation in size of flowers and of involucres has also misled botanists as to the identity of plants of this series. Size of involucre is apparently related to ecological conditions in connection with genetic differences in E. inflatum, the smaller being no larger than those of E. trichopes. Size of flower is related to age and, apparently in some cases at least, to female-sterile flowers, the male-fertile flowers being smaller, the fruit-producing flowers being larger. E. trichopes is also very difficult to distinguish from the next species, E. repens, in the southern part of the range. The presence of longer secondary branches from the principal rays is the most easily observed of the characters of E. trichopes.

Although Torrey altered the name E. trichopes to E.

trichopodum (Proc. Am. Acad. Sci. 8: 145-200. 1870) the earliest acceptable specific epithet is E. trichopes.

40. E. repens (Stokes) comb. nov.
E. trichopes ssp. repens Stokes, Gen. Eriog. 24. 1936.

Similar to E. trichopes but basal leaves longer than broad, leaves and entire inflorescence covered by fine greenish-brown pilulose pubescence; primary rays lax and humifuse or horizontal; secondary branches from the rays shorter, all nearly the same length, strongly verticillate; involucres campanulate, minute; and flowers pilose instead of hirsute, green.

The type of E. repens, in the Herbarium of the University of California, was collected in Lower California at San Juanico, by T. S. Brandegee, April 7, 1889. All collections from Mexico.

41. E. pilosum Stokes, Gen. Eriog. 22. 1936.

Leaves basal on a perenniel caudex, linear-lanceolate, slightly broader beyond the middle; pubescence tawny, short-hirsute, occurring on leaves and entire inflorescence; two or more elongate inflorescence rays from the caudex or from a very short first, erect internode; inflorescence

conspicuously and heavily verticillate with very short branches and peduncles at the nodes; bracts scale-like, inconspicuous; peduncles filiform; involucres minute, four-toothed, narrow turbinate; flowers minute, pilulose, tawny to brown.

The type collection is in the Herbarium of the University of California. On one sheet are two collections of the same material, both collected by T. S. Brandegee in Baja California in 1889; one is from Cardon Grande, April 23, 1889, the other is Camp 17, April 25, 1889. By misprint the Camp 17 collection is cited as 1899 in Stokes' Genus Eriogonum.

42. E. irretitum Brandegee Proc. Cal. Acad. Sci. ser. 2, 2: 202. 1889.

Leaves petiolate, the broad bases of petioles clothing the crown of a branched, perennial caudex, elliptic, ciliate and sparsely hirsute; scape several from the base, dichotomous once, then verticillate by stout divisions; lower bracts subfoliose, ternate, distally diminishing to scales, brown; peduncles to the involucres 1 cm long, axillary, involucres turbinate, four-toothed; flowers red, glabrescent, the inner dilated, the outer round.

The type collection of E. irretitum was made by T. S. Brandegee at Agua Dulce, Baja California, in 1889. E. irretitum is very similar to E. scalare, the next species, but occupies a more easterly range on the peninsula of Baja California. The flowers of E. irretitum are broader, more glabrous, and the habit of E. scalare is somewhat heavier and more coarse.

43. E. scalare Wats. Proc. Am. Acad. Sci. 12: 261. 1877.

Leaves ovate, crowning a perennial, branched caudex, ciliate by coarse, tawny hairs, sparsely villous; one or several scapes from the caudex, irregularly dichotomous, verticillate, sparsely villous; bracts subfoliar at least below, elongate beyond; internodes short and thick, tending to fragment when dry; involucral peduncles to 0.5 cm; involucres turbinate, four-toothed, teeth as long as the tube; flowers small, hirsutulous, red and yellow, lobes lanceolate or spatulate.

The type was collected at Canvas Point on the west coast of Baja California by Dr. Streets of the U. S. Navy. Differences between this and the preceding are slight, and Mrs. Brandegee distinguished them only as variants based on

different distribution and on slight habit difference. Miss Stokes, however, noted the differences of the flowers. The two species are closely related and could also be interpreted as subspecies or varieties of one species.

Nomina dubia

E. Visheri Nels. Bot. Gaz. 56: 64. 1913.
Visher no. 536. Perkins County, South Dakota. (E. pusillum or E. Gordoni?).

E. Clutei Rydb. Am. Bot. 27: 61. 1921.
Clute no. 71a. Cameron near Tubo, July 15 and 31, 1920. (E. trichopes?).

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