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A REVISION OF THE SOUTH AMERICAN BORAGINOIDEAE.

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# A REVISION OF THE SOUTH AMERICAN BORAGINOIDEAE.

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IN the present paper an attempt has been made to give a critical descriptive account of the American species of the subfamily *Boraginoideae* now known from south of Panama. The species of this group were last brought together in the general account of the whole subfamily published in 1846 in the 10th volume of DeCandolle's *Prodromus*. Since the appearance of this scholarly treatment great changes have come about, the generic classification has been well nigh remade and the great abundance of the group in the Chilean flora has become known, the recognized species being much more than doubled. The subfamily having the South American distributional center in Chile, the recent work dealing most extensively with these plants is Reiche's account of the family published serially in the *Anales de la Universidad de Chile* (vol. cxxi) in 1907 and 1908 and as part of his *Flora de Chile* (vol. v) in 1910. This treatment is very disappointing, for through the author's careless and often manifestly inaccurate interpretations of the Philippian species, the types of which he might have studied, he has only added to that confusion in the literature on the Chilean flora that first arose from R. A. Philippi's over zealous multiplication of species.

The classification here presented has developed from a fairly detailed account of the Chilean species which I prepared in 1926 while studying in the Philippi herbarium at the Museo Nacional in Santiago. After my return from Chile I was loaned the South American material of the group from the collections of the United States National Herbarium, the New York Botanical Garden and the Field Museum of Chicago. With this extensive material to supplement the rich collections of the Gray Herbarium the extra-Chilean species were also studied, the account of the Chilean species thoroughly revised and the present paper written. Though as thorough and critical as the materials and facilities available permitted, the following treatment makes no pretense at finality, but is believed to afford a consistent and logical summary of our present knowledge, thus providing a sound foundation for the work still to be done in further elucidation of the complexities of this interesting group.

Without opportunity to study the extensive and fundamental collections of Philippi in the Museo Nacional at Santiago the subjoined account of the South American *Boraginoideae* could never have been written. I am, therefore, under particular obligation to the Committee on Sheldon Fellowships at Harvard University for the privilege

A very distinct species apparently most related to *C. haplostachya* of the Caldera-Copiapó region but widely differing from it in habit. In the Philippi collections it was found determined as *E. capituliflorum*. Reiche reported that species from Frai Jorge apparently upon the basis of this misdetermination. The plant described and named above is most certainly not closely related to the high Andean *C. capituliflora*.

III. Section *GEOCARYA*.—This section is characterized by being amphicarpous, producing ordinary spikes of chasmogamic flowers and at the very base of the stem in the lowermost leaf-axils highly specialized cleistogamic flowers. The latter are commonly developed just below the surface of the ground. They are always biovulate, strongly compressed and at maturity become acutely ovate in outline and closely invested by the tough, much accrescent highly modified calyx. The calyx, commonly, is indehiscent, and has the throat conspicuously smaller than the broadly expanded proper tube which tightly invests the fruit. Frequently the mature calyx is strengthened by prominent ribs, these either simple and vertical, or irregularly anastomosing and loosely reticulate. These peculiar cleistogamic flowers at maturity become 3–9 mm. long, 2–5 mm. broad and 1–3 mm. thick. In order to distinguish them from the much simpler cleistogamic flowers developed in the section *Eucryptantha* I have restricted to them, in the present treatment, the term "Cleistogene." Little is known concerning the early growth of these highly specialized structures. In this paper I have described only their mature fruiting condition.

The section is a very natural one and apparently contains some of the most highly evolved members of the genus. With the exception of one high Andean species which occurs just over the Argentine border, the section is entirely Chilean with its center of distribution in the north-central part of the country. It seems to lend itself readily to classification, in fact the principal difficulties in its classification are those concerned with the proper delimitation of *C. linearis*.

#### KEY TO SPECIES.

- Plant a strong-rooted coarse perennial. *Alyssoides*.....31. *C. alyssoides*.  
 Plant definitely annual.  
 Root fleshy and spindleform. *Dimorphae*.  
 Spikes bracted; calyx-lobes linear.  
 Corolla 5–8 mm. broad; chasmogamic flowers 4-ovulate. 32. *C. involucrata*.  
 Corolla 2–5 mm. broad; chasmogamic flowers 2-ovulate. 33. *C. Volckmanni*.  
 Spikes bractless; calyx-lobes oblong.  
 Corolla 2–3 mm. broad; hairs on calyx straw-colored;  
 pubescence on stems loose.....34. *C. dimorpha*.

Corolla 4-5 mm. broad; hairs on calyx bright yellow; pubescence on stems closely appressed. . . . 35. *C. cynoglossoides*.

Root firm and woody, attenuate.

Chasmogamic flowers 2-ovulate. *Lineares*.

Mature calyx 2-2.5(-3) mm. long; nutlets ca. 2 mm. long; cleistogenes rather evidently reticulate-ribbed. . . . 36. *C. linearis*.

Mature calyx 3-4.5 mm. long; nutlets 2-3 mm. long; cleistogenes weakly ribbed. . . . 37. *C. aprica*.

Chasmogamic flowers 4-ovulate.

Corolla conspicuous, 4-8 mm. broad; nutlets 2.5-3 mm. long, homomorphous or practically so, back obtuse.

*Dolichophyllae*.

Corolla 6-8 mm. broad; leaves narrowly linear, 4-9(-11) cm. long, 1.5-3 mm. broad. . . . 38. *C. dolichophylla*.

Corolla 4-5 mm. broad; linear or narrowly lanceolate, 2-3.5(-4.5) cm. long, 2-3(-5) mm. broad. . . . 39. *C. Gayi*.

Corolla inconspicuous, 1-3 mm. broad; nutlets 1.5-2 mm long, definitely heteromorphous, back convex

*Virentes*. . . . 40 *C. Kingi*.

31. ***C. alyssoides*** (DC.) Reiche. Perennial; stems usually several and widely branched, 1-4.5 dm. tall, strigose with fine short silky closely appressed hairs; leaves finely strigose, rarely minutely pustulate, oblanceolate or linear-oblanceolate, obtusish, very much reduced up the stem, lower ones 4-8 cm. long and 3-5 mm. broad; cleistogenes apparently rare, 4-9 mm. long, angulate, irregularly rib-thickened, ovate, finely appressed-pubescent, with ovate-lanceolate brown obscurely and minutely granulate nutlets 4-5 mm. long; spikes minutely and inconspicuously linear-bracted, geminate or solitary, 1-1.5 cm. long, on elongate commonly inconspicuously bracted peduncles; fruiting calyx globose-ovoid, 2-2.5 mm. long, subsessile, subpersistent; mature calyx-lobes oblong-linear or linear-spathulate, obtuse, spreading or appressed short-hispid, rarely with a few short coarse bristles, thickish but without a conspicuous midrib; corolla 3-5 mm. broad, white with a yellowish throat; fruit 2-ovulate; nutlets 1 or 2, the axial one always developing, 2.5-3 mm. long, 1-1.3 mm. broad, dull, densely and minutely granulate-tuberculate and with scattered coarser murications or tuberculations, usually slightly protruding from the calyx, base rounded, apex acute, sides acute, back obtuse with a medial ridge, groove gradually dilated towards the broad open forking; style barely reaching tip of nutlets or just surpassing them; gynobase about  $\frac{2}{3}$  height of nutlets.—Anal. Univ. Chile cxxi. 824 (1908) and Fl. Chile v. 229 (1910). *Eritrichium alyssoides* DC. Prodr. x. 131 (1846); Clos in Gay, Fl. Chile iv. 467 (1849); Wedd. Chlor. Andina ii. 88 (1859). *Krynitzkia alyssoides* Gray, Proc. Am. Acad. xx. 280 (1885). *E. Gilliesii* Ph. Anal. Univ. Chile xliii. 517 (1873). *C. Gilliesii* Reiche, l. c. 824 and l. c. 229. *E. talquinum* Ph. Anal. Univ. Chile xc. 517 (1895).

CHILE. SANTIAGO: Maipo, 2700 m. alt., Jan. 1924, *Claude-Joseph* 2930 (US); Valle del Yeso, Jan. 1866, *no collector given* (MS, TYPE of *E. Gilliesi*; G, photo.); Mina Cristo, Valle Maipo, 1869-70, *Reed* (G); Paso Cruz, 2200-2300 m. alt., Jan. 1892, *Kuntze* (NY, US). COLCHAGUA: Talcaregua, 1833, *Gay* (G, photo of TYPE of *E. alyssoides*); Agua de la Vida, March, 1875, *no collector given* (MS). TALCA: Cordillera de Talca, Feb. 1879, *F. Philippi* (MS, TYPE of *E. talquinum*; G, photo.).

Cleistogenes do not seem to be abundantly developed by this species. They are probably not produced every year and perhaps only the first season. Among the specimens studied they were found only on the collections made in the Cordillera de Talca by Philippi and at Paso Cruz by Kuntze. I suspect that they have been brushed off in the other collections, for in some of them scars seem to indicate that they were formerly present. In its section the outstanding character of the species is its strong perennial root. Besides its cleistogenes its short broad calyx and general habit further suggest its affinities in the section. The species is very well marked and distinct.

32. **C. involucrata** (Ph.) Reiche. Annual with a fleshy narrowly spindleform root 2-5 mm. thick; stems 1-2 dm. tall, loosely branched, finely short-hispid; leaves oblong-linear to linear or oblong-lanceolate, usually recurving below the obtuse apex, little reduced up the stem, 2-4 cm. long, 2-4 mm. broad, short-hispid, minutely pustulate beneath; cleistogenes in a crowded whorl at the collar of the plant and a few in the lower leaf-axils, calyx not thickened nor reticulate, with usually two bent and unequal smooth or tuberculate nutlets 4-5 mm. long; spikes geminate, bracted, ca. 1 cm. long, glomerate becoming somewhat loosened at maturity; fruiting calyx ovate-oblong, 3-4 mm. long, subsessile; mature calyx-lobes linear, obtuse, erect, short villous-hispid especially above the middle, midrib weak; corollas 5-8 mm. broad, white, usually with brightly orange-colored throat and appendages; fruit 4-ovulate; nutlets 2-4, with the axillary (?) one most persistent, homomorphous, ovate to oblong-ovate, 2-3 mm. long, dull, very minutely and densely tuberculate-granulate and commonly coarsely tuberculate as well, apex acute, base obtuse, back usually obtuse with a weak mid-ridge, edges sharp or merely acute, groove opened or closed and widely forked at base; gynobase subulate,  $\frac{1}{2}$ - $\frac{2}{3}$  height of nutlets; style almost reaching tip of nutlets or barely surpassing them.—Anal. Univ. Chile cxxi. 830 (1908) and Fl. Chile v. 235 (1910). *Eritrichium involucratum* Ph. Anal. Univ. Chile xliii. 517 (1873).

CHILE. COQUIMBO: Baños del Toro, 1860-61, *Volckmann* (MS, TYPE; G, photo.); Baños del Toro, Jan. 1904, *Reiche* (MS); Baños del Toro, 3500 m. alt., Dec. 1923, *Werdermann* 193 (G, US, FM, IP). ATACAMA: Rio Sancar-

ron near Corrales, 3600 m. alt., Jan. 1926, *Johnston 6227* (G); Rio Sancarron below Rucas, 3200 m. alt., Jan. 1926, *Johnston 6226* (G).

33. **C. Volckmanni** (Ph.), comb. nov. Annual 1–1.5 dm. tall, with a fleshy narrowly spindleform root 2–4 mm. thick; stems loosely branched, finely short-hispid; leaves linear, obtuse, little reduced up the stem, 2–3 cm. long, 2–3 mm. broad, short-hispid, minutely pustulate beneath; cleistogenes in a whorl at the collar of plant, a few in the axils above, calyx not thickened nor reticulate, with usually 2 unequal granulate and coarsely tuberculate nutlets ca. 2 mm. long; spikes geminate, bracted, ca. 1 cm. long, glomerate becoming somewhat loosened at maturity; fruiting calyx ovate-oblong, 3–4 mm. long, subsessile; mature calyx-lobes spathulate-linear or linear, obtuse, densely villous-hispid above the middle, with a definite midrib; corolla 2–5 mm. broad, white with orange-colored throat and appendages; fruit 2-ovulate; nutlets 1–2 with the axillary one always developing, ovate, 2–2.5 mm. long, finely and densely tuberculate-granulate and commonly also tuberculate or rugose-tuberculate, apex acute, base rounded, back rounded or somewhat obtuse, edges obtusish, groove gradually dilated towards the broad basal forking; gynobase subulate, ca.  $\frac{2}{3}$  height of nutlets; style equalling or somewhat surpassing the nutlets.—*Eritrichum Volckmanni* Ph. Anal. Univ. Chile xviii. 54 (1861) and *Linnaea* xxxiii. 188 (1864). *E. chrysanthum* Ph. *Linnaea* xxxiii. 191 (1864). *C. chrysantha* Reiche, Anal. Univ. Chile cxxi. 815 (1908) and *Fl. Chile* v. 220 (1910).

CHILE. COQUIMBO: Huanta, 4000 m. alt., 1860, *Volckmann* (MS, TYPE of *E. Volckmanni*; G, photo.); Cordilleras de Illapel, 1860–61, *Volckmann* (MS, TYPE of *E. chrysanthum*; G, photo.); Cordilleras de Illapel, 2500 m. alt., Jan. 1906, *Reiche* (MS); El Peñon, Andes of Illapel, Jan. 1888, *Philippi* (MS).

Although the type of *C. Volckmanni* is a small immature specimen in flower only, I believe it to be the same as *E. chrysanthum*. The types of both species unquestionably have bracted spikes and biovulate chasmogamic flowers. *Eritrichium chrysanthum* was described as having the corollas "pulchre aurantiaca." The species of the series *Dimorphae* all have white corollas in which the throat and appendages are orange-colored. In drying, the corollas become more or less completely orange-colored or brownish. Hence Philippi's specific name, *chrysanthum*, is misleading.

34. **C. dimorpha** (Ph.) Greene. Annual, 0.5–1.5 dm. tall, irregular and usually laxly branched; root fleshy, spindleform, 2–5 mm. thick; stems usually decumbent, simple or much branched from the base, appressed short-hispid and frequently spreading-hispid as well;

leaves linear-oblongate or lanceolate, obtuse or acute, 2–4 cm. long, 2–4(–6) mm. broad, appressed-hispid, rather finely pustulate beneath; cleistogene in crowded whorls at collar of plant and a few in the lower axils, the unribbed calyx densely hispid-villous, the 2 nutlets tuberculate or rugose; spikes geminate or solitary, bractless, capitate-congested, 6–10 mm. long; fruiting calyx globose, 3–4 mm. tall, sessile, pubescence straw-colored; mature calyx-lobes spatulate-oblong, obtuse, spreading, appressed short-hispid, with midrib; corollas 2–3 mm. broad, white with a small yellow eye; fruit 2-ovulate; nutlets 2 or rarely only the axillary one developing, ovate, 2–3 mm. long, densely and minutely tuberculate-granulate and coarsely tuberculate or tuberculate-rugose as well, apex acute, base obtuse, sides acute, back obtuse with a medial ridge; gynobase  $\frac{2}{3}$ – $\frac{3}{4}$  height of nutlets; style just surpassed by nutlets or equalling them.—*Pittonia* i. 112 (1887); Reiche, Anal. Univ. Chile cxxi. 815 (1908) and Fl. Chile v. 220 (1910). *Eritrichum dimorphum* Ph. Linnaea xxix. 16 (1857). *E. himorddo* Ph. Anal. Univ. Chile xviii. 55 (1861), a printer's slip for *E. dimorphum*.

CHILE. SANTIAGO: Las Condes, Jan. 1880, *Navarro* (MS; G, photo.); Arañas, Jan. 1861, *Philippi* (MS; G, photo.); Cordillera de Santiago, Feb. 1857, *Philippi* (MS, TYPE; G, photo.); Las Arañas, Cordillera de Santiago, Nov. 1861, *Philippi* (MS; G, photo.). ACONCAGUA: San Felipe, Dec. 1925, *Claude-Joseph* 3857 (US).

Closely related to *C. cynoglossoides*, but a more southern species with a much less trim or erect habit, much paler more spreading pubescence, and smaller corollas.

35. ***C. cynoglossoides*** (Ph.), comb. nov. Annual, 1–1.5 dm. tall, with a fleshy spindleform root 2–5 mm. thick; stems erect, solitary or tufted, simple or with short (1–3 cm. long) ascending floriferous branches above, finely appressed short villous-hispid; leaves lanceolate to linear-oblong or oblong-lanceolate, 2–4 cm. long, 2.5–5 mm. broad, usually recurved just below the obtuse or rounded apex, appressed-hispid, little reduced up the stem; cleistogenes in crowded whorls at crown of plant, a few in the lower axils, with the membranous unribbed calyx surpassed by the nutlets, the two densely tuberculate nutlets ca. 5 mm. long; spikes solitary or geminate, bractless, very densely capitate-congested, ca. 1 cm. long; fruiting calyx globose, 3–4 mm. long, the hairs bright yellow or darkly tawny; mature calyx-lobes oblong, obtuse, ascending, densely short-hispid, midrib not prominent; corolla 4–5 mm. broad, white with orange-colored tube and appendages; flowers 2-ovulate; nutlets 2 or rarely with only the axillary one developing, 2.5–3 mm. long, finely and densely tuber-

culate-granulate and also commonly tuberculate or tuberculate-rugose as well, apex acute, base obtuse, back obtuse with a weak medial ridge, edges angled, groove usually closed with a small areola at the broad forking; gynobase about  $\frac{2}{3}$  height of nutlets; style surpassing the nutlets.—*Eritrichum cynoglossoides* Ph. Linnaea xxix. 16 (1857). *E. uspallatense* Ph. Anal. Univ. Chile xc. 521 (1895).

ARGENTINA. MENDOZA: Baños del Inca, Jan. 1886, *Borchers* (MS, TYPE of *E. uspallatense*; G, photo.). SAN JUAN: Arroyo Tambillo below Paso de Valeriano, 4000 m. alt., Jan. 1926, *Johnston 6099* (G).

(?) CHILE: "Arqueros, Oct. 1836, *Gay*" (MS, TYPE of *E. cynoglossoides*; G, photo.).

The source of the type specimens of *E. cynoglossoides* is uncertain. It was found by Philippi mixed with specimens of *C. capituliflora* on a sheet in the Museo Nacional at Santiago. The accompanying label bears Gay's number 1620 and gives the collection-locality as Arqueros, a small mining district at relatively low altitudes in the hills back from the coast in the northwestern part of the Province of Coquimbo, Chile. The flora of this region is very different from that in which both *C. cynoglossoides* and *C. capituliflora* are with certainty known. I suspect that the specimens in question really came from the cordilleras east of Coquimbo and were attributed to Arqueros through mislabeling. Perhaps pertinent in this connection is the fact that the type of *C. capituliflora* at Paris presents a mixture similar to that described. A photograph of Clos's type of *C. capituliflora* shows that a single plant of *C. cynoglossoides*, or at least of some closely related species, is associated with the plants of *C. capituliflora*. It is significant that the single plant is remarkably similar in size, habit and degree of maturity to the type of *C. cynoglossoides* at Santiago, in short they might be part of the same collection. The sheet at Paris bears Gay's number 533 and is labeled as from Los Patos, a high Andean valley just within Argentina (Prov. San Juan) and southeasterly from Coquimbo. I am inclined to believe that the type of *C. cynoglossoides* really came from Los Patos and I should not be surprised if future collecting shows that species to be strictly Argentinian.

36. **C. linearis** (Colla) Greene. Annual, 1–3 dm. tall, stiffly erect, with a firm slender root 1–2.5 mm. thick; stems solitary or few, slender, producing short ascending branches above, strigose or loosely appressed short hispid-villous; leaves spathulate-linear or narrowly lance-linear, acutish, 2–5(–7) cm. long, 2–3(–4) mm. broad, scarcely reduced up the stem, somewhat hispid, silky-strigose; cleistogenes few, borne at collar of plant or occasionally in lower axils, with an apparently indehiscent calyx that is pubescent and rather evidently reticulate-



ribbed, the 1-2 ovate-oblong nutlets smooth or obscurely tuberculate; spikes geminate or ternate, bractless, 2-6 cm. long, usually becoming loosely flowered at maturity; fruiting calyx oblong, 2-2.5(-3) mm. long, base conical and usually tapered off into a short pedicel, rarely subsessile; mature calyx-lobes linear, erect, usually rather densely short villous-hispid, midrib short-hirsute; corolla white, 2-5 mm. broad; fruit 2-ovulate; nutlets usually solitary, axillary, inflexed, densely tuberculate or verrucose, ashy or brown, ovate, 1.5-2 mm. long, 1-1.3 mm. broad, apex acute, base rounded, back obtuse, sides usually acute, groove open; gynobase  $\frac{1}{4}$ - $\frac{2}{3}$  height of nutlet; style much surpassing or at least equalling the nutlet.—*Pittonia* i. 111 (1887); Reiche, Anal. Univ. Chile cxxi. 814 (1908) and Fl. Chile v. 219 (1910). *Myosotis linearis* Colla, Mem. Acad. Torino xxxviii. 129, t. 42, fig. 2 (1835). *Eritrichium lineare* DC. Prodr. x. 131 (1846); Clos in Gay, Fl. Chile iv. 469 (1849). *Krynitzkia linearis* Gray, Proc. Am. Acad. xx. 280 (1885). *E. lineare*, var. *sericeum* A. DC. l. c. *C. linearis*, var. *sericea* Reiche, l. c. *E. minutiflorum* Ph. Linnaea xxxiii. 190 (1864). (?) *C. minutiflora* Brand in Fedde, Repert. xx. 319 (1924). *E. fallax* Ph. Anal. Univ. Chile xc. 518 (1895). *C. fallax* Reiche, l. c. 817 and 222; not *C. fallax* Greene (1902). *E. gracile* Ph. Anal. Univ. Chile xc. 519 (1895). *C. gracilis* Reiche, l. c. 816 and l. c. 221. *E. affine* Ph. Anal. Univ. Chile xc. 523 (1895).

CHILE. TALCA: Talca, Corinto, 1913, *Espinosa* (IP); Peumo, Sept. 1921, *Claude-Joseph 1433* (US); Talca, Oct. 1921, *Claude-Joseph 1650* (US); Mondaca, Cord. Talca, 1861-62, *Volckmann* (MS). COLCHAGUA: San Fernando, Sept. 1864, *Philippi* (MS); Colchagua, Nov. 1860, *Landbeck* (MS, TYPE of *E. minutiflorum*; G, photo.); hills, Prov. Colchagua, *Gay 1626* (MS). OHIGGINS: Cocalan, 1913, *Baeza* (IP); Rancagua, Oct. 1878, *Bertero 444* (G, NY; ISOTYPES of *M. linearis* ?). SANTIAGO: Renca, Oct. 1877, *Philippi* (MS); fields, San Cristobal, Santiago, Aug. 1830, *Gay 1629* (MS); Nuñoa, Nov. 1922, *Claude-Joseph 2107* in pt. (US); Cajon del Arragua, Oct. 1859, *Philippi* (MS). VALPARAISO: rocky hills, Quillota, 1829, *Bertero 1158* (NY). COQUIMBO: vicinity of Illapel, Oct. 1914, *Rose 19269* (NY, US); Coquimbo, 1856, *Harvey* (G); Coquimbo, Nov. 1864, *Philippi* (MS); Coquimbo, Sept. 1885, *Philippi* (MS, TYPE of *E. affinis*; G, photo.). INDEFINITE: Chile, *Reed* (G); Chile, *Gillies* (NY, G); central Chile, *Reid* (NY); collection without data (MS, a fragment of TYPE of *E. affine* ?).

The type of *E. fallax* is lost. However a study of the original descriptions leaves little doubt that it is a synonym of the present species. The only material I could find at Santiago of *E. affine* is a small fragment determined by Philippi. This material is certainly referable to *C. linearis*.

37. **C. aprica** (Ph.) Reiche. Annual 1-4(-5.5) dm. tall, with a firm root 2-4 mm. thick; stems solitary or rarely several, usually erect and loosely branched, sparsely strigose and hispid; leaves linear-lan-

ceolate to linear, acute, 2-5(-10) cm. long, 1.5-3(-4) mm. broad, strigose and hispid; cleistogenes few, produced at the collar of the plant, the pubescent weakly ribbed calyx apparently indehiscent, the 1 or 2 nutlets smooth or obscurely tuberculate; spikes geminate or ternate, bractless, 2-5 cm. long, elongating and loosening at maturity; fruiting calyx ovate to obliquely ovate-oblong, 3-5 mm. long, pedicellate or sessile; pedicels short or evident, slender, 1-2 mm. long; mature calyx-lobes lance-linear, connivent, somewhat villous-hispid, the midrib sparsely hirsute; corolla white, 3-4 mm. broad; fruit biovulate; nutlets commonly 1, axillary, ovate or oblong-ovate, incurved, verrucose or muricate, 2-2.5(-3) mm. long, back obtuse, apex acute, base obtuse, sides acute, groove gradually dilated towards the broad open forking; gynobase about  $\frac{2}{3}$  length of nutlets; style much surpassing the nutlets or at least equalling them.—Anal. Univ. Chile cxxi. 814 (1908) and Fl. Chile v. 219 (1910). *Eritrichum apricum* Ph. Linnaea xxxiii. 190 (1864). *E. Bridgesii* Ph. Anal. Univ. Chile xc. 515 (1895). *E. lignosum* Ph. Anal. Univ. Chile xc. 524 (1895). *E. denudatum* Ph. Anal. Univ. Chile xc. 527 (1895). *E. Closii* Ph. Anal. Univ. Chile xc. 528 (1895). *E. Rengifoanum* Ph. Anal. Univ. Chile xc. 529 (1895). *Plagiobothrys rufescens*, var. *Renjifoanus* Reiche, l. c. 812 and l. c. 217. *C. candelabrum* Brand in Fedde, Repert. xx. 47 (1924). *C. congesta* of Reiche, l. c. 816 and l. c. 221; not DC.

CHILE. SANTIAGO: Lampa, Nov. 1, 1864, *Philippi* (MS, TYPE of *E. Bridgesii*; G, photo.); Lampa, Nov. 1, 1864, *Philippi* (MS, TYPE of *E. lignosum*; G, photo.); Lampa, *Philippi* (MS, TYPE of *E. Closii*; G, photo.); collection without data [from Lampa?], (MS, TYPE of *E. denudatum*; G, photo.); Salto de Agua, Valle Ramon, Nov. 1860, *Philippi* (MS, TYPE of *E. Rengifoanum*; G, photo.); Santiago, *Philippi* (G, frag. of TYPE of *C. candelabrum*). ACONCAGUA: Cajon del Boldo, Catemu, Sept. 1860, *Philippi* (MS, TYPE of *E. apertum*; G, photo.). COQUIMBO: vicinity of Choapa, Oct. 6, 1914, *Rose 19217* (NY, US). ATACAMA: (?) Quebrada de Serna, 1885, *San Roman* (MS; G, photo.).

A very close relative of *C. linearis*, with which it appears to intergrade and of which it may possibly be only a large coarse phase. The proper status of *C. aprica* can not be ascertained from herbarium studies alone. Until reliable field observations are made the species must remain one of dubious status.

The collection made by San Roman in Quebrada de Serna, which I have cited above, is incomplete and fragmentary and is very doubtfully referred to the present species. Although in many ways suggesting *C. Gayi* rather than *C. aprica* it has biovulate chasmogamic flowers which make it fit best, for the time being, in the latter species. It is a stiff coarse plant 1.5-2 dm. tall which has dried very dark, the

pubescence is denser, the calyx is coarser and the nutlets seem less densely and finely roughened than in *C. aprica*. The plant is a peculiar one and more collections are much needed. I suspect that it will be found to be worthy of specific recognition.

38. **C. dolichophylla** (Ph.) Reiche. Annual, 1.5–2.5 dm. tall, with a firm root 2–4 mm. thick; stems erect, usually loosely and ascendingly branched, leafy, strigose and hispid; leaves linear, ascending, 4–9(–11) cm. long, 1.5–3 mm. broad, acute; cleistogenes few, borne at collar of plant, the calyx pubescent with thickened ribs, the two unequal nutlets smooth or tuberculate; spikes geminate or ternate, bractless, becoming 1–2 cm. long or perhaps longer; fruiting calyx ovate-oblong, 4–5 mm. long, subsessile; mature calyx-lobes lance-linear, erect, appressed hispid-villous, sparsely hirsute on the weakly thickened midrib; corolla very conspicuous, 6–8 mm. broad, white; flowers 4-ovulate; nutlets 4, homomorphous, oblong-ovate, 2.5–3 mm long, transversely rugose or somewhat verrucose-rugose especially towards base, sides acute, apex acute, back obtusish; gynobase ca.  $\frac{2}{3}$  height of nutlets; style very much surpassing nutlets, about half again as long as the gynobase.—Anal. Univ. Chile cxxi. 830 (1908) and Fl. Chile v. 235 (1910). *Eritrichium dolichophyllum* Ph. Anal. Univ. Chile xc. 520 and 522 (1895).

CHILE. COQUIMBO: Paihuano, Dept. Elqui, 1884, *Peralto* (MS, TYPE; G, photo.); Frai Jorge Estancia, Dept. Ovalle, Aug. 13, 1917, *Skottsberg* (G).

39. **C. Gayi**, sp. nov. Annua erecta 1.5–3.5 dm. alta e radice firma 3–4 mm. crassa oriens; caulibus solitariis breviter ascendentisque ramosis sparse breviterque hispidis; foliis linearibus vel anguste lanceolatis 2–3.5(–4.5) cm. longis 2–3(–5) mm. latis late sessilibus acutiusculis adpresse hispidis subtus minute pustulatis; cleistogeneis (fide tab. Gayi) ad collum plantae congestis ovatis 5–6 mm. longis, calycibus costatis, nuculis 2; apicis geminatis vel ternatis 1–3(–4) cm. longis ebracteatis; calycibus fructiferis ovatis 3–4 mm. longis brevissime pedicellatis vel sessilibus; lobis calycis maturitate lanceolatis vel oblongis erectis dense hispidis costa paullo encrassatis; corolla alba 4–5 mm. lata; fructu 4-ovulato; nuculis (1–)4 (axillare paullo differentiata) 2.5–3 mm. longis dense minuteque granulatis sparse tuberculatis pallidis ovato-oblongis apice acutis dorso obtusis medio longitudinaliter costatis marginibus acutis ventre  $\frac{2}{3}$  longitudinis ad gynobasem affixis; stylo nuculas evidenter superanti gynobasi aequilongis.

CHILE. COQUIMBO: Arqueros, Dept. La Serena, Oct. 1836, *Gay 1921* (MS, TYPE; G, photo. and frag.).

In gross habit and in details the plant described above agrees so very closely with that illustrated under the name *Eritrichium phaceloides* by Gay, Fl. Chile. t. 52 bis (1854), that I believe them to represent the same species if not parts of the same collection. The specimens which I studied unfortunately lacked the base of the stem. Hence I can not say positively that it produced cleistogenes, although I feel confident that it did so. In the above description the cleistogenes are described from Gay's plate. In the illustration the corollas are shown as light blue in color, but this is no doubt a mistake. True *C. phaceloides*, with which this species has been somehow confused, is a valid species of the section *Krynitzkia*.

40. **C. Kingi** (Ph.) Reiche. Annual, 1-3 dm. tall, with a firm slender root 2-3 mm. thick; stems short-hispid, usually solitary, ascendingly branched; leaves lance-linear or lanceolate, 1-3(-5.5) cm. long, 2-4(-6) mm. broad, base rounded, apex acute, finely pustulate beneath; cleistogenes not numerous, borne at collar of plant and a few in the lower axils, 6-8 mm. long, the conspicuously ribbed calyx finely appressed-hispid, the 2 unequal nutlets smooth or obscurely roughened and 5-7 mm. long; spikes geminate or ternate or solitary, bractless, congested or even glomerate but loosening somewhat in age, 1-2 cm. long; fruiting calyx ovate-oblong, 4-5 mm. long, usually definitely pedicellate; pedicels almost 1 mm. long; mature calyx-lobes lance-linear, erect, short villous-hispid, hirsute along the thickened midrib; corolla small or inconspicuous, white, 1-3 mm. broad, subtubular or with an evident limb; fruit 4-ovulate; nutlets 4, definitely heteromorphous, narrowly ovate, minutely tuberculate, apex acute, sides sharp, base truncate, back convex, groove narrow or closed and widely forking at base; odd nutlet axial, largest and most persistent, 1.8-2 mm. long; consimilar nutlets 1.5-1.8 mm. long; gynobase ca.  $\frac{2}{5}$  height of odd nutlet; style surpassing odd nutlet, about  $\frac{2}{3}$  length of gynobase.—Anal. Univ. Chile cxxi. 815 (1908) and Fl. Chile v. 220 (1910). *Eritrichium Kingi* Ph. Anal. Univ. Chile xc. 516 (1895); not *E. Kingii* Wats. (1871). *E. virens* Ph. l. c. 519. *C. virens* Reiche, l. c. 826 and l. c. 231. *E. macrocalyx* Ph. l. c. 536. *C. macrocalyx* Reiche, l. c. 825 and l. c. 230. *C. campylotricha* Brand in Fedde, Repert. xx. 47 (1924).

CHILE. ATACAMA: Bandurrias, 1885, *Geisse* (MS; G, photo.); Bandurrias, 1887, *Geisse* (MS, TYPE of *E. virens*; G, photo.); Desert of Atacama [? Bandurrias], *Geisse* 25 (NY); Quebrada de Chancoquin near Copiapó, Oct. 1885, *Gigoux* (G); Caldera, Oct. 1894, *Gigoux* (G); Caldera, Aug. 1876, *Stübel* 30 (G, frag. TYPE of *C. campylotricha*); Caldera, Nov. 1925, *Johnston* 5060 (G); Caldera, Sept. 1885, no collector given (MS, TYPE of *E. macrocalyx*; G, photo.); Desert of Atacama [Caldera region], *Morong* 1250 and 1343 (NY).

This species is readily recognized in its section by its heteromorphous nutlets. It varies considerably in gross habit. Perhaps worthy of some recognition is the subsimple, strictly erect, rather coarse form from Caldera represented by *Morong 1343*, *Johnston 5060* and the type of *E. macrocalyx*. I believe, however, that it is ecological, being probably a xerophytic dune-form. It is evidently not geographically separated from the slender more branched phase, for a collection made at Caldera by Gigoux is very similar to the plant from Bandurrias.

*Cryptantha campylotricha* I refer to the present species. Through the kindness of Dr. Brand I have had a bit of the type of *C. campylotricha* for study. Dr. Brand makes much of certain apically reflexed hairs found on the calyx of the cleistogenes. I have found some uncinata or contorted hairs on the cleistogenes of such collections as *Geisse 25* and Gigoux's material from Caldera. Though very regular I believe this bending of the hairs to have resulted from drying and pressing of the specimens.

I have not seen the type of *C. Kingi* unless a certain specimen in the Philippi herbarium lacking data may be it. The original description of the species however seems to leave little doubt as to its identity. It is to be hoped that, although the type is lost or unrecognizable at Santiago, authentic material of the species may be found in some other herbarium.

#### DOUBTFUL OR EXCLUDED SPECIES.

CRYPTANTHA HOSSEI Brand in Fedde, Repert. xx. 49 (1924)—This species, based upon *Hosseus 1531* from the vicinity of Vegas del Descubrimiento Nuevo in La Rioja, Argentina, apparently belongs to the section *Eucryptantha*. It is described as a very hispid erect annual, much branched from the base, and only ca. 6 cm. tall. I have received fragments of the type from Dr. Brand and find that the fruiting and flowering parts much suggest *C. glomerulifera*. The nutlets, however, seem to be less broad and more tuberculate than in that species and the low annual habit quite different. The species may be worthy of recognition.

CYNOGLOSSUM PAUCIFLORUM R. & P. Fl. Peruv. ii. 6 (1799); Lehm. Asperif. i. 139 (1818); Reiche, Anal. Univ. Chile cxxi. 250 (1907) and Fl. Chile v. 208 (1910).—The type of this unrecognized species is said to have come from Concepcion, Chile. Recent writers have seemed to think it is a *Cryptantha* although no species of that genus is known to grow within the area about Concepcion from which it is reported that Ruiz & Pavon obtained material. Possibly it is a *Plagiobothrys*.