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A REVISION OF THE SOUTH AMERICAN BORAGINOIDEAE.

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# A REVISION OF THE SOUTH AMERICAN BORAGINOIDEAE.

BY IVAN M. JOHNSTON.

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

of visiting Chile as a Sheldon Traveling Fellow. I am also extremely indebted for the very courteous treatment which I received from the staff of the Museo Nacional de Chile at Santiago. Prof. Carlos Porter, Prof. Marcial R. Espinoza, Sr. Luis Moreira, Sr. Gualterio Looser and Sr. Gilberto Montero were very friendly and helpful and did much to make my work in the museum both pleasant and profitable. I am particularly indebted, however, to Prof. Francisco Fuentes, Curator of the Phanerogamic Herbarium, through whose friendliness and courtesy I was afforded every facility for studying the famous collection which is in his charge. While at Santiago I also received very courteous treatment from Prof. Victor M. Baeza, of the Instituto Pedagógico de Chile, being through his kindness permitted to study the fine herbarium of recent collections brought together by his efforts and those of Prof. Federico Johow and their students.

Various persons have assisted me in important details. Dr. H. M. Hall of the Carnegie Institution and Mr. E. P. Killip of the United States National Museum generously procured for me photographs of various essential types in the European herbaria. Prof. H. Lecomte of the Muséum d'Histoire Naturelle, Paris, most kindly sent for my examination, fragments of certain obscure species of Clos and Weddell. Dr. A. Brand, the well known monographer of the family, in generous coöperation has provided me with fragments of and notes concerning his recently published South American species. I have also been much aided by notes and specimens received from Dr. A. W. Hill, Director of the Royal Gardens at Kew, Prof. Carl Skottsberg of the Göteborgs Botaniska Trädgård, Prof. C. C. Hosseus, of the Universidad Nacional de Córdoba, Prof. Lucien Hauman, formerly of the Universidad de Buenos Aires, Dr. Alberto Castellanos of the Museo Nacional of Buenos Aires, Prof. L. R. Parodi of the Universidad de Buenos Aires, and the late Carlos Spegazzini of La Plate. Of great aid in the present work, have been the large loans received from the United States National Herbarium through Dr. W. R. Maxon, from the New York Botanical Garden through Dr. N. L. Britton and from the Field Museum of Natural History of Chicago through Mr. D. C. Davies and Mr. J. F. Macbride. In preparation of this paper, as well as in the previous ones of the series, I have profited much from the suggestions and the able editorial assistance of Prof. B. L. Robinson as well as from the help in bibliographic matters received from the librarian of the Gray Herbarium, Miss Ruth D. Sanderson. Greatly appreciating the aid of all these persons, who have so courteously responded to my needs, I would here express my hearty thanks for their generous assistance.

In the systematic account, which follows, I have cited all the material which I have examined. I have tried to arrange the collections listed in geographical sequence grouping them under the countries and the major subdivisions (Provinces or Departments) of the countries. Following the citation of each collection, I have appended in parenthesis initials indicating the herbarium in which I have seen material of the particular collection. The initials used and the herbaria they indicate are as follows—"G" for Gray Herbarium, "NY" for New York Botanical Garden, "US" for United States National Herbarium, "FM" for Field Museum of Chicago, "MS" for the Museo Nacional of Santiago and "IP" for the Instituto Pedagógico of Santiago.

## ARTIFICIAL KEY TO SOUTH AMERICAN GENERA.

- Nutlet wing-margined or appendaged dorsally.
- Nutlets with appendages or teeth of the margin tipped with stout unciniate bristles, the body usually with unciniate pubescence; slender herbs with the lowermost leaves opposite. . . . . 17. *Pectocarya*.
- Nutlets with glochidiate appendages; leaves all alternate.
- Nutlets equalling the subulate gynobase to which they are affixed for nearly their whole length along the ventral keel. . . . . 13. *Lappula*.
- Nutlets much longer than the pyramidal gynobase to which they are affixed by a broad areola.
- Nutlets spreading or divergent, not keeled ventrally; areola apical or lateral and extending down from the apex of the nutlet. . . . . 16. *Cynoglossum*.
- Nutlets ascending, keeled ventrally above the medial areola.
- Pedicels recurving in fruit; inflorescence paniculate, sparsely bracted or naked; herbs. . . . . 14. *Hackelia*.
- Pedicels erect in fruit; inflorescence corymbose, bractless; shrub. . . . . 15. *Selkirkia*.
- Nutlets neither wing-margined nor appendaged dorsally.
- Attachment-surface of nutlet plug-shaped, strophiolate, surrounded by a tumid rim.
- Corolla subrotate, suggesting that of a *Solanum*; stamens conspicuously exserted, appendaged dorsally. . . . . 7. *Borago*.
- Corolla salverform; stamens included, unappendaged. . . . . 6. *Anchusa*.
- Attachment-surface of nutlets flat, convex or annulate, simple or carunculate, not surrounded by a tumid rim.
- Stamens very unequal, some exserted; corolla irregular. . . . . 5. *Echium*.
- Stamens equal, usually included; corolla regular.
- Corolla-lobes contorted in the bud. . . . . 8. *Myosotis*.
- Corolla-lobes imbricated in the bud.
- Calyx or bracts with unciniate hairs.
- Inflorescence bracted; nutlets stipitate. . . . . 3. *Thaumatocaryon*.
- Inflorescence bractless; nutlets sessile. . . . . 4. *Moritzia*.
- Calyx or bracts completely lacking unciniate hairs.
- Nutlets with a broad basal attachment; leaves all alternate. . . . . 1. *Lithospermum*.

- Nutlets attached laterally; at least lower leaves opposite.
- Corolla blue; stigmas geminate.....2. *Antiphytum*.
- Corolla not blue; stigmas solitary and simple.
- Corolla yellow or orange, throat unappendaged. 12. *Amsinckia*.
- Corolla white, throat appendaged.
- Nutlets with pericarpial wall fused above middle to form a definite medial ventral keel. 11. *Plagiobothrys*.
- Nutlets with a medial ventral groove formed by the non-fusion of the pericarpial wall.
- Calyx cut to base, distinct from the bracts. 9. *Cryptantha*.
- Calyx cylindrical, merely toothed, with floral bracts decurrent on its lower part.....10. *Nesocaryum*.

### I. TRIBE LITHOSFERMEAE.

Nutlets erect, straight or rarely bent, smooth or rough, unmargined; areola basal or occasionally suprabaasal, near tip of cotyledon, unmargined, flat or nearly so, not at all strophiolate, usually sessile but occasionally stipitate; gynobase flat or low-pyramidal, not excavated; style cleft or entire; stigmas 2 or exceptionally 4, distinct or proximate or rarely fused, capitate or obscurely thickened; corolla yellow or orange or occasionally white or somewhat purplish.—Johnston, Contr. Gray Herb. lxxiii. 43 (1924).

#### KEY TO GENERA.

- Corolla with conspicuously oblique limb and unequal stamens...5. *Echium*.
- Corolla with horizontal limb and equal stamens.
- Mature calyx cut to near base, the elongate lobes erect or spreading; nutlets usually 4, falling individually; calyx and bracts lacking uncinata hairs.
- Nutlet-areola basal, sessile; leaves all alternate.....1. *Lithospermum*.
- Nutlet-areola suprabaasal, sessile or stipitate, at least the lower leaves opposite.....2. *Antiphytum*.
- Mature calyx cylindrical or ellipsoid, merely toothed with the teeth connivent over the fruit; nutlets solitary, falling away tightly invested by the calyx; calyx or bracts with uncinata pubescence.
- Inflorescence bracted; calyx lacking uncinata hairs; corolla-throat pubescent along obscure horizontal plaits; nutlet with stipitate areola.....3. *Thaumatocaryon*.
- Inflorescence bractless; calyx with uncinata hairs; corolla-throat with circular villous spots or intruded appendages; nutlet with sessile basal areola.....4. *Moritzia*.

#### 1. *Lithospermum* L.

Calyx usually divided. Corolla tubular or salverform; tube cylindrical; lobes spreading, imbricate; throat with intruded appendages or

6. **M. laxa** Lehm. Annual or soboliferous perennial; roots fasciculate and fibrous; stems slender, erect or decumbent, solitary, loosely branched commonly from the base, terete, sparsely strigose; leaves sparsely strigose, the lower ones oblanceolate or spatulate, 3-6(-8) cm. long, 6-10(-12) mm. wide, the upper ones gradually reduced, narrowly linear-lanceolate or linear-oblong; racemes geminate or solitary, with the principal one leafy-bracted just above the base; calyx sparsely strigose, lacking uncinata hairs, usually with narrowly ovate-triangular or almost cuneate lobes about equalling the tube in length; pedicels slender, longer than the mature calyx; corolla light-blue with yellow appendages, limb slightly concave, 3-6 mm. broad; style usually shorter than the nutlets and reaching much below the level of the calyx-sinuses.—Asperif. i. 83 (1818); Johnston, Contr. Gray Herb. lxx. 41 (1924) where further synonymy.

ARGENTINA. BUENOS AIRES: vicinity of Buenos Aires, 1913, *Rodriguez 167* (G).

CHILE. VALDIVIA: Valdivia, 1899, *Buchtien* (US).

A native of Europe and North America, but probably introduced in South America.

#### DOUBTFUL OR EXCLUDED SPECIES.

**M. FOLIOSA** Lehm. Asperif. i. 99 (1818).—"America meridionalis"—Probably a species of *Lithospermum* and perhaps the same as the next.

**M. grandiflora** HBK. Nov. Gen. et Sp. iii. 90, t. 199 (1818).—Although given as from Ecuador this appears to be *LITHOSPERMUM DISTICHUM* Ort. and to have come, in fact, from Mexico, cf. Johnston, Contr. Gray Herb. lxxv. 40 (1925).

#### 9. **Cryptantha** Lehm.

Calyx usually cut to the base, the lobes erect or connivent, linear or oblong. Corolla with usually a short cylindrical tube, with or without scales at the base inside; lobes imbricate, rounded, spreading; throat with intruded appendages. Style slender, short or long, included; stigma capitate. Ovules 2-4. Nutlets 1-4, erect, ovate to triangular, roughened or smooth, margined or marginless, affixed laterally through a medial ventral and commonly basally forked groove to a usually columnar subulate or pyramidal gynobase.—Annual or perennial herbaceous or fruticulous plants, usually with coarse stiff pubescence. Leaves opposite at base, firm, veinless. Flowers white or very rarely yellow, in bractless or bracted spikes or racemes. Mature calyx in-

vesting the nutlets and falling away as a bur or persistent with the nutlets falling away individually.—Del. Sem. Hort. Hamburg iv. (1833); Don. Gen. Syst. iv. 373 (1837). *Krynitzkia* F. & M. Ind. Sem. Hort. Petrop. vii. 52 (1841). *Piptocalyx* Torr. in Wats. Bot. King Exped. 240 (1871). *Oreocarya* Greene, Pittonia i. 57 (1887). *Eremocarya* Greene, Pittonia i. 58 (1887). *Greeneocharis* Gürke & Harms in E. & P. Nat. Pflanzenf., Gesamtreg. 462 (1899). *Wheelerella* Grant, Bull. So. Calif. Acad. v. 28 (1906). *Johnstonella* Brand in Fedde, Repert. xxi. 249 (1925).

One of the largest and most perplexing genera of the *Boraginaceae*. It is exclusively American. About two-thirds of the approximately 150 species occur in western United States. In South America the genus is most abundant in Chile with outlying species in Peru, Bolivia and Argentina.

As here defined, the genus includes the North American group of coarse perennials current as *Oreocarya*. My study of the South American species of *Cryptantha* has convinced me that the recognition of *Oreocarya* has been most arbitrary. That group appears to consist merely of the more or less coarse persistent members of *Cryptantha* § *Krynitzkia*. I am convinced that the characters of the sections of *Cryptantha* defined below are much more fundamental than are such "generic" characters as coarseness of habit and persistence of root which must be stressed in justifying the continued maintenance of *Oreocarya*. I do not believe that *Oreocarya* should be recognized unless the primitive, coarse, persistent species and the more evolved, slender, annual ones in the three sections of *Cryptantha* each be given generic recognition. Personally I do not approve of, and certainly will not be responsible for the segregation of 5 weak genera from the currently accepted *Cryptantha* simply to give logical justification for the maintenance of any mere habit-genus as indefinite as *Oreocarya*.

#### KEY TO SECTIONS.

- Plants not producing cleistogamic flowers; North and South America. . . . . I. § *Krynitzkia* (spp. 1-22).
- Plants producing cleistogamic flowers; South America.
- Cleistogamic flowers simple, borne in the middle and upper or frequently in all the leaf-axils, occasionally replacing the chasmogamic flowers in the inflorescence proper. . . . . II. § *Eucryptantha* (spp. 23-30).
- Cleistogamic flowers highly specialized, appearing as persistent ovoid or lenticular structures (cleistogenes) borne at the base of the plant below or just above the surface of the ground. . . . . III. § *Geocarya* (spp. 31-40).

I. Section **KRYNITZKIA**.—This is the largest and most difficult section of *Cryptantha* and is distinguished from the other two sections



of the genus by the complete lack of cleistogamic flowers. It reaches its maximum development in North America, where it is represented by about 100 species. There can be little doubt that in the section are found the most primitive members of the genus. One species, *C. albida*, occurs in both North and South America. The only other approach to this condition is the case of *C. parviflora*. This species, while evidently separable, is very closely related to the North American *C. Grayi* and *C. angustifolia*. The species assembled in the series *Barbigerae* are as a group clearly related to those North American species I have collected under that heading, cf. Contr. Gray Herb. lxxiv. 60-69 (1925). It is interesting to note that whereas the short style overwhelmingly predominates among the North American species of the section, the long style is somewhat more common among the southern members. In North America there are numerous species with smooth polished nutlets; in South America there are only four, all closely related and quite different from the northern forms. *Cryptantha gnaphalioides* is a peculiar shrubby perennial, which would be referred to the genus *Oreocarya* if it grew in North America. In other than its habit, however, it is much like *C. dichita*, *C. hispida* and *C. phaceloides*, species which in some regards are reminiscent of the Californian *C. mohavensis*.

## KEY TO SPECIES.

- Nutlets perfectly smooth and shiny, large, 2.8-3.3 mm. long.  
Chile.  
Plant perennial, shrubby at base. *Gnaphalioides*....1. *C. gnaphalioides*.  
Plant an annual herb. *Phaceloides*.  
Corolla 7-10 mm. broad; leaves 7-13 mm. broad.....2. *C. dichita*.  
Corolla 4-7 mm. broad; leaves 2-3 mm. broad.  
Nutlets 2.....3. *C. hispida*.  
Nutlets 4.....4. *C. phaceloides*.
- Nutlets more or less roughened and dull.  
Nutlets thick with deep plane sides, not crowded, only impinging on one another close to the gynobase and hence separated by open re-entrant sinuses, anterior face occupied by a large triangular (apparently) excavated areola; gynobase narrowly pyramidal; northern Argentina.  
*Albidae*.....5. *C. albida*.
- Nutlets strongly compressed with angulate or rounded edges, crowded and closely juxtaposed, not separated by open broad sinuses, anterior face with a very small shallow areola; gynobase subulate.  
Edges of nutlets sharp, with a definite thin margin; abaxial nutlet more or less emphasized, usually largest and most persistent. *Angustifoliae*.  
Nutlet homomorphous, 1-1.5 mm. long; spikes bracted throughout; Argentina.....6. *C. diplotricha*.  
Nutlets heteromorphous, 0.6-1 mm. long; spikes bractless or bracted at base only; Chile and Peru..7. *C. parviflora*.

Edges of nutlets merely angled or rounded, not sharp, mostly marginless but more or less thickly margined in a few species; axial nutlet more or less emphasized, usually the largest or most persistent. *Barbigerae*.

Corolla evident or conspicuous, 2-7 mm. broad.

Spikes bractless; Chilean.

Plant persistent, a perennial or long-lived annual; stems becoming prostrate or trailing.

Plant loosely branched, forming a loose broad open mat, pubescence canescent; corolla 5-6 mm. broad.....8. *C. subamplexicaulis*.

Plant densely branched, forming a dense cushion, pubescence silvery; corolla 2-4 mm. broad.9. *C. argentea*.

Plant a short-lived annual; branches short, erect or ascending.

Nutlets homomorphous, obscurely roughened  
10. *C. chaetocalyx*.

Nutlets heteromorphous, definitely tuberculate or papillate.....11. *C. filiformis*.

Spikes bracted.

Corolla 2-4 mm. broad; nutlets homomorphous or heteromorphous, 1.3-1.8 mm. long.

Style much surpassing the 4 nutlets; Peru....12. *C. granulosa*.

Style shortly surpassing the 2-4 nutlets; Chile.  
13. *C. taltalensis*.

Corolla 5-6 mm. broad; nutlets homomorphous, ca. 2 mm. long; Chile.....14. *C. Romani*.

Corolla inconspicuous or minute, 0.5-1.5(-2) mm. broad.

Spikes bracted; style noticeably surpassing the nutlets.

Fruiting calyx 3-4 mm. long, with narrow erect or slightly spreading lobe-tips; Chile and southern Peru.....15. *C. filaginea*.

Fruiting calyx 5-6 mm. long, with broad decidedly spreading lobe-tips; Peru.....16. *C. limensis*.

Spikes bractless; style equalling the nutlet or just surpassing them.

Nutlets obscurely tuberculate or almost smooth.

Fruiting calyx 8-11 mm. long; nutlets lanceolate, 2.8-3.2 mm. long; plant coarse shaggy-hirsute; Andes of northern Chile.....17. *C. calycina*.

Fruiting calyx 2-3 mm. long; nutlets lance-ovate, ca. 2 mm. long; plant finely strigose or appressed short-hispid; Patagonia.....18. *C. patagonica*.

Nutlets definitely tuberculate or wrinkled.

Back of nutlets tuberculate, coarsely if at all transversely grooved.

Fruiting calyx 2.5-3 mm. long, lobes lance-linear or narrowly lanceolate; Peru.....19. *C. peruviana*.

Fruiting calyx 3-4 mm. long, lobes linear or lance-linear; Chile and Argentina....20. *C. globulifera*.

Back of nutlets with transverse lineate grooves.

Spikes very tawny; fruiting calyx 3-4 mm. long; plant stiff; Chile and Argentina....21. *C. diffusa*.

Spikes green; fruiting calyx 2-2.5 mm. long; plant weak; Bolivia.....22. *C. debilis*.

1. ***Cryptantha gnaphalioides*** (A. DC.) Reiche. Perennial, 2-4 dm. tall, becoming much branched and shrubby, commonly decidedly

woody towards the base; stems erect, closely white-strigose and frequently sparsely hirsute also, cottony-strigose towards base, older parts with exfoliating bark; leaves linear to lance-linear, broadly attached, 1-4(-6) cm. long, 1.5-2.5(-3) mm. broad, obtusish or acutish, more or less strigose and frequently somewhat hirsute, usually canescent, spreading, abruptly reduced above, with leaf-buds or fasciculate leaves in the axils, bases more or less persistent; racemes unbracted, geminate, 1-4 cm. long, not loose, pedunculate; fruiting calyx tardily deciduous, oblong-ovate, 4.5-6 mm. long; mature calyx-lobes oblong-linear, obtusish, densely strigose or abundantly short-hirsute; pedicels 1-2 mm. long; corolla white, 5-9 mm. broad; ovules 4; nutlets 1-4, apparently with the axillary one always developing, ovate-oblong, smooth and shiny, light colored, frequently somewhat mottled with brown, 2.8-3.3 mm. long, 1.2-1.5 mm. broad, apex acute and slightly outcurved, base rounded, edges acute particularly above the middle; back of nutlet flattish or low convex, occasionally above the middle somewhat obtuse with a rather definite medial ridge; inner face of nutlet right-angled with the groove closed throughout; gynobase about  $\frac{2}{3}$  height of nutlets; style usually very conspicuously surpassing the nutlets, more than twice the length of the gynobase.—Anal. Univ. Chile cxxi. 822 (1908) and Fl. Chile v. 227 (1910). *Eritrichium gnaphalioides* A. DC. Prodr. x. 131 (1846); Clos in Gay, Fl. Chile iv. 466 (1849); Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 213 (1860); Ph. Cat. Pl. Itin. Tarapaca 56 (1891). *E. fruticosum* Ph. Linnaea xxix. 15 (1857).

CHILE. COQUIMBO: Baños del Toro, *no collector given* (MS); Pachuana, Oct. 1878, *Philippi* (MS); rocky place, Prov. Coquimbo, Sept. 1836, *Gay 1077* (MS, TYPE of *E. fruticosum*; G, photo.); Prov. Coquimbo, 1839, *Gay* (G, photo. of TYPE of *E. gnaphalioides*). ATACAMA: Rio Laguna Grande, 2300 m. alt., Jan. 1924, *Werdermann 238* (G, US, FM, IP); Potrero de Toledo, Rio Laguna Grande, 2660 m. alt., Jan. 1926, *Johnston 5895* (G); Yerba buena near Carrizal, Sept. 1885, *King* (MS); Yerba buena, Oct. 1871, *Reed* (G); Bandurrias, 1885, *Geisse* (MS); Desert of Atacama [Bandurrias] *Geisse 24* (NY); Copiapó, June 1841, *Gay 1074* (MS); Aguada del Tabaco, Sierra San Miguel, 3000 m. alt., Nov. 1925, *Johnston 4892* (G); Quebrada San Miguel above Los Marayes, Sierra San Miguel, Nov. 1925, *Johnston 4919* (G); Quebrada de Paipote, Jan. 1885, *F. Philippi* (MS); Potrerillos, 1920, *Harding 22848* (US, NY); vicinity of Potrerillos, 2500 m. alt., Oct. 1925, *Johnston 3696* (G); Quebrada de Doña Ines Chica, Jan. 1886, *Gigoux* (G). INDEFINITE: no locality given, *Gay* (G, NY).

A common and very characteristic undershrub of gravelly slopes and plains between 2000 and 3000 m. alt. in the arid mountains of the Province of Atacama. Frequently the dominant perennial over large areas. The greatest abundance of the plant noted was on the barren llano near the highest point on the railroad between Copiapó

and Pueblo Hundido, where at about 2000 m. alt. the plants of this species were extremely common and apparently the only kind of vegetation over many square kilometers. The plant is well known to the natives frequenting the mountains as "Té burro," "Té del campo" or "Té blanco." An infusion of the leaves is used as a beverage. Generally, however, this *Cryptantha* is used in tea-making only when the more generally favored "Té colorado" or *Vivania rosea* is unobtainable.

2. **C. dichita** (Ph.), comb. nov. Very coarse annual, 1-3 dm. tall; stems erect or ascending, one to several, subsimple or with a few short ascending branches, short-hispid and (especially above) coarsely pungent tawny-hirsute, 2-4 mm. thick; leaves broad and coarse, obtuse, hirsute and short-hispid, at least the under surface conspicuously pustulate, the lower leaves 7-11 mm. broad and 5-7 cm. long; middle and upper cauline leaves oblong or lanceolate, 3-5 cm. long, 8-13 mm. broad; spikes coarse, dense, 1-2 cm. long, bractless or with a leafy bract at base; fruiting calyx ovate-oblong, coarse, ca. 5 mm. long, short pedicellate; fruiting calyx-lobes linear or spatulate-linear, erect, hirsute and hispid, midrib not prominent; corolla large, 7-10 mm. broad, white with a yellow throat; fruit 4-ovulate; nutlets 2, oblong-lanceolate, 3-3.3 mm. long, smooth and shiny, apex acute, back flat or low convex, sides angled, groove very narrow; gynobase  $\frac{1}{2}$ - $\frac{2}{3}$  height of nutlets; style very much surpassing nutlets, about twice length of gynobase.—*Eritrichium dichita* Ph. in Villanueva, Anal. Univ. Chile liii. 444 (1878), nomen; Ph. Anal. Univ. Chile xc. 516 (1895); Reiche, Anal. Univ. Chile cxxi. 831 (1908) and Fl. Chile v. 236 (1910).

CHILE. ATACAMA: "Desierto de Atacama," 1877, Villanueva (MS, TYPE; G, photo.); Potrerillos, 1920, Harding 22849 (US); near Los Alamos, Quebrada de Potrerillos, 2400 m. alt., Johnston 3695 (G).

The two collections with precise locality-data both come from about Potrerillos in the Department of Chañaral. Since Villanueva, who collected the type, mentions visiting the Quebrada Salado and such other localities in the Potrerillos region as Pedernales Lake, Doña Ines Chica, etc., it is not improbable that the type of the species actually came from that general region. According to him the plant was called "dichita" and was eaten by animals.

3. **C. hispida** (Ph.) Reiche. Annual, 1-2 dm. tall, coarsely hirsute, stiffly erect with a few short strictly ascending floriferous branches above; leaves linear, strictly ascending, 1-4 cm. long, 2-3 mm. broad, coarsely hirsute; spikes dense, bractless, ca. 1 cm. long;

fruiting calyx ovate-oblong, 4–5 mm. long, short-pedicellate; mature calyx-lobes linear, erect, commonly hirsute, midrib not very prominent; corolla 5–7 mm. broad, white; fruit 4-ovulate; nutlets 1–2, smooth and shiny, pale, oblong-lanceolate, 3–3.3 mm. long, ca. 1.4 mm. broad, apex acute, base rounded, edges angled, back flat or broadly obtuse with a weak but definite medial ridge, ventrally right-angled, groove closed to base and unforked; gynobase  $\frac{1}{2}$ – $\frac{2}{3}$  height of nutlets; style very long, much surpassing the nutlets, about twice the length of gynobase.—Anal. Univ. Chile cxxi. 831 (1908) and Fl. Chile v. 236 (1910). *Eritrichum hispidum* Fl. Atac. 38 (1860) and Viage Des. Atac. 44 and 212 (1860).

CHILE. ATACAMA: Quebrada de Doña Ines Chica, Dept. Chañaral, Jan. 1886, *Gigoux* (G). ANTOFAGASTA: Alto de Varas, Dept. Taltal, 3700 m. alt., 1854, *Philippi* (MS, TYPE; G, photo.).

After *C. phaceloides*, from which species it is scarcely separable, the closest relative of this species is *C. dichita*. It differs from that species in its very much more slender habit and smaller flowers and leaves. Although all the material I have seen falls readily and definitely into one or the other of these two species, I should not be surprised if future collecting gave reason for treating *C. dichita* and *C. hispida* as subordinate to *C. phaceloides*.

4. ***C. phaceloides*** (Clos) Reiche. Annual, 1.5–3 dm. tall, hirsute, stiffly erect, loosely branched; leaves linear, rather few, 1–2 cm. long, 2–3 mm. broad, ascending, hirsute and pustulate; spikes geminate or ternate, spreading, 6–12 mm. long, bractless, densely flowered; fruiting calyx ovate, ca. 4 mm. long, with a short coarse pedicel; mature calyx-lobes lanceolate to linear, erect, appressed hispid and hirsute along the weakly prominent midrib; corolla 4–5 mm. broad, white; fruit 4-ovulate; nutlets 4, slightly heteromorphous with the axial one a trifle the largest, brown and somewhat mottled, oblong-lanceolate, 3.5–3.8 mm. long, ca. 1.5 mm. broad, apex acute, base obtuse, edges acute, back low-convex, groove closed with a small areola at the acute basal forking; gynobase  $\frac{2}{3}$ – $\frac{3}{4}$  height of nutlets; style shortly surpassing the odd nutlet.—Anal. Univ. Chile cxxi. 813 (1908) and Fl. Chile v. 218 (1910). *Eritrichium phaceloides* Clos in Gay, Fl. Chile iv. 468 (1849), not tab. 52 bis! *Krynitzkia phacelioides* F. & M. acc. F. Ph. Cat. Pl. Chile 211 (1881); Gray, Proc. Am. Acad. xx. 280 (1885).

CHILE: no locality given, *Gay* (G, frag. of the TYPE).

I know this species only from the original description and from some fragments (a leaf and a spike with mature fruit and flowers),

apparently from the type, sent me through the courtesy of Professor H. Lecomte. The material is without precise locality-data. When the species was published, however, it was said to grow "en Copiapó." The region immediately about Copiapó and especially that just to the south and west has been quite well explored botanically, yet the species does not appear to have been rediscovered. It is not improbable that Gay got the specimens on his journey through the cordilleras southeast of Copiapó. The species is extremely close to *C. hispida* which grows in the cordilleras in the northern part of the Province of Atacama. The plant described above is not that illustrated by Gay. A comparison of the original description of *C. phaceloides* with the plant subsequently illustrated as that species is sufficient to demonstrate that two species are concerned. The plant illustrated as *E. phaceloides* is obviously a member of the section *Geocarya* and is apparently that which I have described as *C. Gayi*.

5. ***C. albida*** (HBK.) Johnston. Annual, 1–3 dm. tall; stems erect or loosely ascending, solitary or several, subsimple or paniculately branched above, very leafy, finely ashy-hispid; pubescence usually appressed below and spreading above; leaves narrowly oblanceolate or spatulate to linear, obtuse, appressed-hispid and somewhat pustulate, reduced up the stem but extending through the inflorescence as linear bracts; lower and middle cauline leaves 2–7 cm. long, 1.5–4 mm. broad; spikes solitary, numerous, loosely bracted, 1–7 cm. long, becoming remotely flowered; fruiting calyx ovate, 2–3 mm. long, sessile, tardily deciduous; mature calyx-lobes ovate-oblong to narrowly lanceolate, acute, loosely connivent, margins appressed-hispid, midrib somewhat prominent and short-hirsute; corolla white, inconspicuous, ca. 2.5 mm. broad; fruit 4-ovulate; nutlets usually 4, homomorphous with the abaxial one subpersistent, triangular-ovate, 1–1.5 mm. long, broadly tuberculate and usually somewhat granulate, rather thick, not crowded, touching one another only close to the gynobase and hence individually separated by an obvious sinus, apex acute, base truncate or obtuse, back convex, sides straight and deep, ventrally with a large open triangular areola which appears to be excavated at maturity through the breaking away of the attachment-surface from the nutlet-walls; gynobase narrowly pyramidal, a little shorter than the nutlets; style much surpassing the nutlets.—Contr. Gray Herb. lxxviii. 53 (1923); Johnston, Contr. Gray Herb. lxxiv. 42 (1925). *Myosotis albida* HBK. Nov. Gen. et Sp. iii. 91 (1818). *Lithospermum ramosum* Lehm. Asperif. ii. 328 (1818). *Eritrichium ramosum* A. DC. Prodr. x. 132 (1846). *Krynitzkia ramosa* Gray, Proc. Am. Acad. xx. 274 (1885). *C. ramosa* Greene, Pittonia i. 115

(1887). *E. hispidum* Buckley, Proc. Acad. Philad. 1861, pg. 462  
 (1861). *E. falcatum* Hieron. [Sertum Sanjuan.] Bol. Acad. Nac. Cient. Cordoba iv. 64 (1882). *C. falcata* Johnston, Contr. Gray Herb. lxxviii. 54 (1923). *K. mexicana* Brandg. Zoe v. 182 (1904). *C. argentinica* Brand in Fedde, Repert. xx. 318 (1924).

ARGENTINA. CATAMARCA: sand, El Suncho, Dec. 26, 1916, *Jørgensen 1810* (G). LA RIOJA: Cuesta de la Puerta de Piedra, Sierra Velasco, Jan. 8-11, 1879, *Hieronymus & Niederlein 16* (G, fragment of TYPES of *E. falcatum* and *C. argentinica*). JUJUY: La Guaiaca, Feb. 1916, *Hauman* (G).

I have been quite unable to separate the Argentine plant from the better known one of Mexico. The matter of leaf-breadth which Brand gives as separating them is hopelessly inadequate. The habit, flowers and the fruiting structures agree surprisingly and I doubt if there are characters that will separate the Mexican from the Argentine material.

It seems that *C. argentinica* Brand and *E. falcatum* Hieron. are clearly synonymous. The first collection cited by Brand and apparently that which he considers the type of his *C. argentinica* is *Hieronymus & Niederlein 16* from the Sierra Velasco in La Rioja. The type is in the Berlin herbarium. The specimen of this same collection in the herbarium of the University of Cordoba, Argentina, must be considered the type of *E. falcatum*, for as Dr. C. C. Hosseus, *in lit.*, has emphasized to me Hieronymus definitely stated in publishing his species that he had used the material from the Sierra Velasco in drawing up his description since the other collection (that made by Echegaray at Leoncito in San Juan), which he referred to the species, was imperfect. Brand used the name *C. falcata*, apparently for a different species, but for which one I do not know.

6. **C. diplotricha** (Ph.) Reiche. Annual, 1-1.5 dm. tall; stems several, erect, frequently somewhat decumbent at base, appressed-hispid and sparsely hirsute with short pallid hairs; leaves linear or spatulate-linear, 1-2 cm. long, 1.5-3 mm. broad, appressed short-hispid, somewhat pustulate, reduced up the stem but extending through the inflorescence as bracts; spikes solitary or rarely geminate, bracted, 1-4 cm. long, very numerous, congested; fruiting calyx ovate, ca. 2.5 mm. long, very hispid, subsessile; mature calyx-lobes lanceolate, erect or loosely connivent; corolla white, inconspicuous, tubular, ca. 0.8 mm. broad; fruit 4-ovulate; nutlets usually 4, homomorphous with apparently a slight emphasis on the abaxial one, lucid, triangular, dark with light-colored tuberculations or wrinkles, 1-1.5 mm. long, readily deciduous, crowded and closely juxtaposed with no open sinus between the individual nutlets, apex acute and slightly recurving, base trun-

cate, sides sharply margined, back usually convex; groove open or closed above but below expanded broadly into a shallow open triangular areola; gynobase subulate, about equalling length of nutlets; style clearly surpassing the nutlets.—Anal. Univ. Chile cxxi. 821 (1908) and Fl. Chile v. 226 (1910). *Eritrichium diplotrichum* Pl. Cat. Pl. Itin. Tarapaca 57 (1891). *E. diplotrichum*, var. *humilis* Ph. l. c. *C. diplotricha*, var. *humilis* Reiche, l. c. *E. axillare* Ph. l. c. *C. axillaris* Reiche, l. c. *C. modesta* Brand in Fedde, Repert. xx. 48 (1924).

ARGENTINA. LOS ANDES: between Antofagasta and Calalaste, 3600 m. alt., Jan. 1885, *F. Philippi* (MS, TYPE of *E. diplotrichum*; G, photo); Breas, Jan. 1885, *F. Philippi* (MS, TYPE of *E. diplotrichum*, var. *humilis*; G, photo.); between Breas and Salar, Jan. 1885, *F. Philippi* (MS, TYPE of *E. axillare*; G, photo.). LA RIOJA: Tambillos, 1600 m. alt., *Hosseus 1711* (G, part of TYPE of *C. modesta*).

Most related to *C. albida* but clearly different, particularly as to fruit. Both Brand and Reiche have placed the species in the section *Eucryptantha*, accrediting it with cleistogamic flowers. I have searched for closed-flowers but have been quite unable to find any. The corollas are small and tubular, however, and perhaps might be mistaken for cleistogamic ones if not examined under high magnification.

7. ***C. parviflora*** (Ph.) Reiche. Slender annual, 3–20 cm. tall; stems commonly one, usually loosely branched from near base, very leafy, more or less abundantly appressed chalky-hispid and frequently also somewhat spreading short-hirsute; leaves linear, 5–40(–50) mm. long, 1–2 mm. broad, appressed-hispid or spreading short-hirsute, somewhat pustulate beneath, weakly reduced up the stem and in plants beginning to fruit somewhat obscuring the spikes; spikes solitary or geminate, 1–5(–7) cm. long, numerous, bractless except for a leafy bract at base; fruiting calyx ovate or oblong-ovate, 1.5–2 mm. long, sessile, readily deciduous; mature calyx-lobes lanceolate or lance-oblong, connivent, densely short-hirsute; corolla minute, subtubular, 0.3–0.5 mm. broad, white; fruit 4-ovulate; nutlets usually 4, heteromorphous, ovate or triangular-ovate, dark with pale tuberculations or broad murications, apex acute, base rounded, back convex, edges sharply margined, groove usually closed above but below dilated into a shallow triangular areola; odd-nutlet abaxial, largest and most persistent, ca. 1 mm. long; consimilar nutlets 0.6–0.8 mm. long, readily deciduous; gynobase ca.  $\frac{2}{3}$  height of odd-nutlet; style much surpassing odd nutlet, a little shorter than the gynobase.—Anal. Univ. Chile cxxi. 821 (1908) and Fl. Chile v. 226 (1910). *Eritrichum parviflorum* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 10 and 213 (1860). *E. microphyllum* Ph. Cat. Pl. Itin. Tarapaca 57 (1891). *C. micro-*



*phylla* Reiche, l. c. 828 and l. c. 233. *C. piscoensis* Brand in Fedde, Repert. xx. 49 (1924). *C. umbelliformis* Brand, l. c. 317. *C. Seleri* Brand, l. c. 317.

CHILE. ATACAMA: Chañarcillo, Sept. 1876, *no collector given* (MS; G, photo.); Bandurrias, *Geisse* (MS); Desert of Atacama [*? Bandurrias*], *Geisse 58B* (NY); Atacama Desert, 1884, *San Roman* (MS; G, photo.); gravel, hills north of Copiapó, 800 m. alt., *Johnston 5026* (G); Caldera, Dec. 1853, *Philippi* (MS, TYPE of *E. parviflorum*; G, photo.); coastal dunes, Caldera, *Johnston 5059* (G); gravelly bench near Caleta Pan de Azucar, *Johnston 5837* (G). ANTOFAGASTA: dry slope, Sierra Esmeralda, *Johnston 5681* (G). TARAPACÁ: Chismisia, March, 1885, *Rahmer* (MS, TYPE of *E. microphyllum*; G, photo.).

PERU. MOQUEGUA: hills southeast of Moquegua, 1500–1600 m. alt., *Weberbauer 7398A* (G, FM). AREQUIPA: open sandy and rocky slopes, Tingo, 2100–2300 m. alt., *Pennell 13112* (G, FM); open gravelly slope above Arequipa, 2500 m. alt., *Pennell 13177* (G, FM); Yura, 1884, *Borm* (G). ICA: slopes above Pisco, 1200–1300 m. alt., *Weberbauer 5375* (G, part of TYPE of *C. piscoensis*). LIMA: open rocky slope, Quive, 800–1000 m. alt., *Pennell 14300* (G); mountains near Chosica, 1500 m. alt., *Weberbauer 5337* (FM, ISOTYPE of *C. umbelliformis*).

This species, while evidently distinct, is very closely related to the North American *C. angustifolia* (Torr.) Greene and *C. Grayi* (V. & R.) Macbr., cf. Contr. Gray Herb. lxxiv. 31 and 38–40 (1925). All the material cited above has heteromorphous nutlets with the abaxial one evidently the largest and most persistent. In this fact as well as in general form and appearance of the nutlets, the present species agrees closely with *C. angustifolia*, though in size of parts and general aspect it is much nearer *C. Grayi*.

I have been quite unable to separate specifically the Chilean and Peruvian plants. In a very general way it can be said that the Peruvian specimens are somewhat more strictly branched and more leafy particularly above. These, however, are but vague differences and, perhaps, hardly more than an impression. The type and only known collection of *E. microphyllum* unquestionably belongs here. The specimen is a poor one, with numerous simple flagellate branches and linear leaves ca. 6 mm. long. In habit it very much suggests *C. pusilla* (T. & G.) Greene, of North America. The nutlets are clearly heteromorphous. I have seen no authentic material of *C. Seleri* but assume it to be the hispid plant collected by Pennell and Borm in the vicinity of Arequipa. *Cryptantha umbelliformis* I believe to be merely a young state of the same form. *Cryptantha piscoensis* has an appressed pubescence and is a somewhat coarser form. It has been collected at Quiva by Pennell.

Possibly representing a distinct species in my own collection, no. 6281, from a dryish bench just below the fertile belt in the hills back

of Mollendo, Peru. This plant definitely has homomorphous nutlets. Though the nutlets are all consimilar, the abaxial one is more firmly attached to the gynobase than are the others. In other than the homomorphy of its nutlets the plant is quite like the Peruvian forms of *C. parviflora*. It has the appressed pubescence and the slightly coarse habit of the type of *C. piscoensis*.

8. **C. subamplexicaulis** (Ph.) Reiche. Perennial or persistent annual with a firm branching root, erect and subsimple at first but later with several or many trailing branches from a loose fruticulose caudex and forming a loose prostrate mat 3–12 dm. broad and 1–2 dm. tall, hispid or hispid-villous and usually appressedly so and canescent; leaves linear to linear-lanceolate or oblong-lanceolate, 1–4 (–5) cm. long, 2–4(–5) mm. broad, acutish, sessile by a broad usually cordulate or rounded base, more or less pustulate; spikes solitary or geminate, bractless, 3–12 cm. long, becoming remotely flowered; fruiting calyx ovate or ovate-oblong, 3–5 mm. long, contracted below into a short stout and angled pedicellate base; mature calyx-lobes lanceolate or linear, erect with tips more or less spreading, densely or at times sparsely appressed hispid-villous, the midrib prominent below middle and more or less hirsute; corolla evident, 5–6 mm. broad, white; fruit 4-ovulate; nutlets 4, homomorphous or somewhat heteromorphous with the axial nutlet (always the most persistent) slightly the largest and dullest, 1.5–1.9 mm. long, tuberculate or papillate, obscurely granulate, sometimes sparsely stipitate-glandular, apex acute, base truncate or obtuse, sides angled, back convex or obscurely obtuse; groove narrow or closed, usually with a small areola at the broad basal fork; gynobase  $\frac{2}{3}$ – $\frac{3}{4}$  height of nutlets; style very much surpassing the nutlets and about twice length of gynobase.—Anal. Univ. Chile cxxi. 826 (1908) and Fl. Chile v. 231 (1910). *Eri-trichum subamplexicaule* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 25 and 213 (1860).

CHILE. ANTOFAGASTA: dry shrubby hillside, Cerro Perales near Taltal, *Johnston 5633* (G); Paposo, Dec. 1853, *Philippi* (MS, TYPE; G, photo.); fertile belt on west slope of Cerro Yumbes, Paposo, *Johnston 5562* (G); slopes in fertile belt, El Rincon just north of Paposo, *Johnston 5543* (G); grassy slope in fertile belt above Aguada Panulcito, *Johnston 5475* (G); sheltered places, Aguada Panul, *Johnston 5448* (G); moist bench in quebrada, Aguada de Miguel Diaz, *Johnston 5416* (G); dune slope just southwest of Aguada de Miguel Diaz, *Johnston 5412* (G); dune slope just back of Punta Reyes below Aguada de Miguel Diaz, *Johnston 5411* (G).

A well marked species in its typical form, characterized by its very remarkable habit. The plant grows on the fog-bathed middle slopes of the hills fronting the sea. The long branches trail through the

grass or even clamber somewhat in the low bushes forming a loose mat commonly about 8 dm. broad. Although appearing to flower the first year, it seems to persist ordinarily at least for several seasons, forming a loosely branched depressed fruticulose caudex.

The three collections from the vicinity of Miguel Diaz are not typical, having longer more hirsute calyces and non-canescens herbage. The two collections from the dunes are further atypical, being more or less ascendingly branched and not certainly persistent. It is not improbable that future collecting will show the plants from Miguel Diaz to be worthy of special nomenclatorial recognition. As now known *C. subamplexicaulis* reaches its northern limit at Miguel Diaz. The species is reported from Iquique and Tocopilla by Reiche, but through misdeterminations of *C. filiformis*.

9. **C. argentea**, sp. nov. Perennis prostrata dense argenteo-strigosa; ramis numerosissimis ramosis e caudice prostrato dense ramoso fruticoso orientibus in pulvinum 2-5 cm. altum 1-4 dm. latum densum congestis; foliis firmis 5-15 mm. longis 1-2 mm. latis dense argenteo-strigosis numerosis acutis basi rotundis vel cordulatis, superioribus paullo reductis, inferioribus conspicue marcescentibus; spicis geminatis vel solitariis 3-12 cm. longis ebracteatis; calycibus fructiferis ovatis 2-3 mm. longis deciduis basem versus crasse angulatumque attenuatis; lobis calycis oblongi-linearibus obtusis strigosis vel dense velutinis, supra medium plus minusve herbaceis et saepe recurvatis vel ascendentibus, infra medium erectis cum setis flavescenscentibus paucis perbrevibus horridis; corolla conspicua alba 2-4 mm. lata; fructu 4-ovulato; nuculis 4 homomorphis cum nucula axillari subpersistenti 1.5-2 mm. longis tuberculatis vel papillatis minute granulatis apice acutis basi rotundatis dorso convexis ventre  $\frac{2}{3}$ - $\frac{3}{4}$  longitudinis ad gynobasem adfixis, sulcis clausis vel anguste apertis in areolam deltoideam dilatatis; stylo nuculam longe superante quam gynobasis duplo longiori.

CHILE. ANTOFAGASTA: crevices about head of high fog-bathed sea-cliffs near Aguada Cachina, *Johnston 5734* (G); about head of high fog-bathed sea-cliffs near Aguada Grande, *Johnston 5814* (G, TYPE).

This species is known only from the crevices about the head of the high line of huge fog-bathed sea-cliffs which stretch for about 25 km. northward from the Atacama-Antofagasta provincial boundary between Caleta de Pan de Azucar and Caleta Esmeralda. The plant is notable for its silvery, very dense strigose pubescence and particularly because of its very densely pulvinate habit. The root is strong, branched and indubitably perennial. The species is evidently most related to *C. subamplexicaulis* of the fertile fog-bathed hillsides north

of Taltal, but is clearly different in its pulvinate habit, silvery pubescence, smaller corollas and inconspicuously hirsute calyces.

10. **C. chaetocalyx** (Ph.), comb. nov. Annual; stems several, 4–10 cm. long, spreading, loosely branched, with a very short mostly appressed slender hispid pubescence; leaves linear or oblong to lanceolate, obtusish, 1–1.5 cm. long, 1–3(–4) mm. broad, scabrous, short-hirsute, evidently and abundantly pustulate; spikes 1–3 cm. long, bractless, solitary or geminate, becoming loose in age; fruiting calyx ovate, 2–4 mm. long, contracted into a short stout angulate pedicellate base; mature calyx-lobes linear, above middle sparsely hirsute and green and spreading, midrib very prominent and pungent short-hirsute below middle; corolla white, 2.5–5 mm. broad; ovules 4; nutlets usually 4, homomorphous with the axial one most persistent, 1.5–2 mm. long, oblong-ovate, very finely granulate, more or less obscurely rugulose or tuberculate, apex acute, sides sharp, base rounded, back convex without a medial ridge; gynobase ca.  $\frac{3}{4}$  height of nutlets; style definitely surpassing the nutlets.—*Eritrichum chaetocalyx* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 10 and 213 (1860). *E. divaricatum* Ph. Anal. Univ. Chile xc. 534 (1895). *C. divaricata* Reiche, Anal. Univ. Chile cxxi. 827 (1908) and Fl. Chile v. 232 (1910). *E. pustulosum* Ph. Anal. Univ. Chile xc. 537 (1895).

CHILE. ATACAMA: Bandurrias, *Geisse*, (MS); Desert of Atacama [? Bandurrias], *Geisse 154* (NY); Atacama Desert [Caldera region], *Morong 1235* (G, NY, US, FM); "Caldera ? Copiapó," *no collector given* (MS); Caldera, Dec. 1853, *Philippi* (MS, TYPE of *E. chaetocalyx*; G, photo.); Caldera, Sept. 1879, *no collector given* (MS, TYPE of *E. pustulosum*; G, photo.); Caldera, Sept. 1885, *F. Philippi* (MS, TYPE of *E. divaricatum*; G, photo.); Caldera, 1906, *Gigoux* (G).

Although in the original account of *E. chaetocalyx* the type is given as coming from near Pan de Azucar, lat.  $26^{\circ} 10'$ , I feel certain that in fact it came from Caldera, lat.  $27^{\circ} 5'$ . There are no specimens in the Philippi herbarium from north of Caldera. I searched for the plant about Caleta de Pan de Azucar and did not find it. In the Philippi herbarium there is but a single collection labeled *E. chaetocalyx* which was collected by Philippi during his travels in the Atacama Desert in 1853–4. This is from Caldera and checks perfectly with the original description. It is notable that in the text of the narrative of his explorations, Philippi does not mention the species in connection with Pan de Azucar although he does so with Caldera. Hence I feel confident that the locality given with the original description is an error and probably a slip of the pen. The type almost certainly came from Caldera. The species is a very distinct one with characteristic coarse spreading stems and more or less obscurely roughened nutlets. Its

relations are with *C. granulosa* and *C. filiformis* though it is quite distinct from both.

11. **C. filiformis** (Ph.) Reiche. Annual, 5–30 cm. tall, usually loosely and ascendingly branched from the base, finely hispid and frequently appressedly so; leaves not numerous, lanceolate to lance-linear or oblanceolate, 1–3 cm. long, 1–5(–9) mm. broad, obtuse or acutish, sessile, pustulate and hirsute; spikes solitary or geminate, 1–10 cm. long, bractless, becoming loosely flowered; fruiting calyces ovate or oblong-ovate, 3–5 mm. long, subsessile; mature calyx-lobes linear or lance-linear, obtusish, hirsute below the middle, above the middle usually herbaceous sparsely appressed short-hispid and spreading; corolla conspicuous, 4–7 mm. broad, white; fruit 4-ovulate; nutlets usually 4, heteromorphous, ovate or ovate-oblong, back obscurely obtuse, base truncate, sides angled, groove opened or closed and broadly forked near base; odd nutlet axial, evidently the largest, 1.5–2 mm. long, most firmly affixed, palest, tuberculate or muricate or papillate, more or less stipitate-glandular; homomorphous nutlets 1.3–1.5(–1.7) mm. long, tuberculate, brownish; gynobase about  $\frac{2}{3}$  length of nutlets; style much surpassing nutlets, about twice length of gynobase.—Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichum filiforme* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 213 (1860). *E. mite* Ph. Anal. Univ. Chile xc. 539 (1895). *C. mitis* Reiche, l. c.

CHILE. ANTOFAGASTA: Hueso Parado, Taltal, 1853, *Philippi* (MS, TYPE of *E. filiforme*; G, photo.); coastal hills, Tocopilla, Sept. 1889, *Vidal* (MS, TYPE of *E. mite*; G, photo.); Tocopilla, no collector given, no. 13 (MS); gravelly fog-bathed slope, Tocopilla, Oct. 1925, *Johnston* 3578 (G). TARAPACÁ: Quebrada Huantaca, Iquique, Sept. 1904, *Martens* (MS); Quebrada Huantajaya, Iquique, 700 m. alt., Sept. 1925, *Werdermann* 764 (G).

The type of *C. filiformis* is a very small slender plant given as from Hueso Parado at Taltal. Although with a different gross aspect, it has the fruit-characters, the calyx and pubescence of the Tocopilla and Iquique plants. I made very many collections of *Cryptanthas* in the region about Taltal but did not discover any plants there that could be mistaken for *C. filiformis*. If the plant actually came from the Taltal region it must be rare or very local. The known range of the species is very disrupted. The material at hand shows variation in size and shape of the calyx-lobes and to some extent in the outline of the nutlets also. However, these variations are unimportant since they are all present among the large suite of specimens I collected on a single hillside at Tocopilla.

12. **C. granulosa** (R. & P.) Johnston. Annual, 5–30 cm. tall; stems erect, becoming loosely and ascendingly branched, finely hispid

with the hairs appressed or somewhat spreading; leaves linear, 2–3.5 cm. long, 2–4 mm. broad (rarely, in *C. latifolia*, somewhat oblong and 5–10 mm. broad), obtuse, rounded to a sessile base, sparsely pustulose-setose; spikes solitary or geminate, bracted, 3–12 cm. long, becoming loosely flowered; bracts few to many, linear or oblong, 3–5(–10) mm. long; fruiting calyx ovate, 2–4 mm. long, subsessile; mature calyxlobes linear or lance-linear, obtuse, sparsely appressed-hispid, below middle sparsely short-hirsute on the weakly prominent midrib, above middle more or less herbaceous and spreading; corolla evident, white, 2–4 mm. broad; ovules 4; nutlets 4, homomorphous or heteromorphous with the axial one (always subpersistent) slightly the largest, ovate-oblong, 1.3–1.8 mm. long, tuberculate or papillate and somewhat glandular, apex acute, base rounded or obtuse, edges angled, back convex, groove closed or gradually dilated towards the base; gynobase  $\frac{2}{3}$ – $\frac{3}{4}$  height of nutlets; style surpassing the nutlets, about equalling the gynobase.—Contr. Gray Herb. lxxviii. 54 (1923). *Myosotis granulosa* R. & P. Fl. Peruv. ii. 5 (1799). *C. latifolia* Johnston, Contr. Gray Herb. lxxiii. 73 (1924).

PERU. LIMA: mountains near Chosica, 1400 m. alt., *Weberbauer 5340* (FM); Mount San Augustin near Lima, 250 m. alt., *Weberbauer 5695* (FM); loose stony upper slopes of seaside hills, Chorrillos near Lima, 150 m. alt., *Macbride 5861* (FM, TYPE of *C. latifolia*; G, ISOTYPE). AREQUIPA: sandy hills, Mollendo, *Hitchcock 22357* (US, G); lower edge of fertile belt in hills back of Mollendo, *Johnston 3532* (G).

I have concluded that *C. latifolia* is merely the luxuriant phase of *C. granulosa*. Mounted on the sheet with the type is a small plant, which is apparently typical of Ruiz & Pavon's species. The plant from Mollendo seems to belong to the present species, but appears to be very much more abundantly bracted than is the typical form about Lima.

13. ***C. taltalensis***, sp. nov. Annua 1–3 dm. alta laxe lasaliter ramosa; ramis saepe gracilibus minute strigosis et plus minusve breviter hispidis; foliis linearibus vel rariter anguste lanceolatis paucis 1–2 cm. longis 1–2(–3) mm. latis pustulatis breviter hispidis, superioribus paullo reductis; spicis solitariis vel geminatis 3–5 cm. longis bracteatis; bracteis linearibus caducis 3–5 mm. longis; calycibus fructiferis congestis ascendentibus oblongis 3–4.5 mm. longis asymmetricis sessilibus faciliter deciduis basi conicis; lobis calycis linearibus erectis ascendenter hispidis cum costa prominenti; corolla evidenti 3–4 mm. lata alba; fructu 4-ovulato; nuculis 1–3 saepissime plures abortis heteromorphis ovatis apice acutis dorsi convexis margine angulatis, sulcis clausis vel anguste apertis basi in areolam deltoideam dilatatis; nucula axillari ca. 1.8 mm. longa subpersistenti semper maturanti

papillata plus minusve glandulari opaca ventre  $\frac{3}{4}$  longitudinis ad gynobasem affixa; nuculis consimilibus tuberculatis deciduis ca. 1.5 mm. longis; stylo nuculam axillarem brevissime vel breviter superanti.

CHILE. ANTOFAGASTA: gravelly slopes near crest of hills southeast of Taltal, *Johnston 5121* (G, TYPE); rocky bottom of dry quebrada in hills southeast of Taltal, *Johnston 5120* (G); rocky talus-slope in Quebrada de San Ramon, near Taltal, *Johnston 5156* (G); dryish gravelly open places on summit ridge of Cerro Perales near Taltal, 1000 m. alt., *Johnston 5634* and *5635* (G).

This species is most closely related to *C. flaginea*, from which it differs in its larger corollas and few, strongly heteromorphous nutlets. It was found at various points in the region about the port of Taltal, always associated with *C. flaginea*, though less common and less generally distributed than that widely ranging species. Although it appeared to be a very definite and recognizable entity in the field, subsequent study of the collected material shows it so closely related to *C. flaginea* that I have been tempted to propose it merely as a variety of that species.

14. **C. Romanii**, sp. nov. Annua laxa ramosa 8–15 cm. alta sparse strigosa hirsuta; foliis linearibus 1–3 cm. longis 1–2.5 mm. latis pustulatis breviter hirsutis acutis, superioribus paullo reductis; spicis solitariis vel geminatis 2–3 cm. longis bracteatis; bracteis linearibus 4–6 mm. longis; calycibus fructiferis congestis ascendentibus oblongis 3–4.5 mm. longis asymmetricis subsessilibus deciduis basi conicis; lobis calycis linearibus erectis costatis ascendenter hirsutis; corolla conspicua 5–6 mm. lata alba; fructu 4-ovulato; nuculis 4 homomorphis cum nucula axillari subpersistenti 2 mm. longis oblongo-ovatis tuberculatis obscure granulatis apice acutis dorse convexis margine angulatis et incrassatis ventre  $\frac{4}{5}$  longitudinis ad gynobasem affixis; sulcis clausis vel anguste apertis basem versus breviter furcatis; stylo nuculas valde superanti.

CHILE. ANTOFAGASTA: Sierra Esmeralda, Dept. Taltal, 1884, *San Roman* (MS, TYPE; G, photo. and frag.).

In gross habit this species much suggests *C. hispida* and in fact was so determined by Philippi. Its relations, however, are with *C. flaginea* and *C. taltalensis*, particularly the latter. It differs from both in its very large corollas. From *C. taltalensis* it also differs in its 4 homomorphous nutlets. It differs from *C. flaginea*, which I collected in the Sierra Esmeralda, in its slightly coarser habit, very large corollas and slightly larger nutlets.

15. **C. flaginea** (Ph.) Reiche. Annual, 1–2 dm. tall, erect and shortly branched above or loosely branched from the base; stems

slender, finely strigose and hispid; leaves linear or lanceolate, 1–2.5 (–3) cm. long, 1–2 mm. broad, spreading, obtuse, pustulate, finely short-hispid, weakly reduced up the stem; spikes solitary or geminate 2–5 (–8) cm. long, bracteate; bracts linear, 3–6 mm. long, caducous; fruiting calyx oblong, 3–4 mm. long, usually congested, readily deciduous, sessile, ascending; mature calyx-lobes linear, below the middle appressed short hispid and along the prominent midrib hirsute, above somewhat herbaceous and sparsely hairy and slightly spreading; corolla inconspicuous, white, subtubular or with a very narrow limb, 0.5–1.5 (–2) mm. broad; fruit 4-ovulate; nutlets 4 or rarely fewer, subhomomorphous with the axial one slightly emphasized and most persistent, tuberculate, usually obscurely granulate, 1.2–1.5 (–1.8) mm. long, ovate or oblong-ovate, apex acute, edges angled and frequently margined, base obtuse, back convex; groove narrow or closed, forked at base; gynobase  $\frac{2}{3}$ – $\frac{3}{4}$  as high as the nutlets; style much surpassing the nutlets.—Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichium filagineum* Ph. Anal. Univ. Chile xc. 536 (1895).

CHILE. ATACAMA: Monte amargo, Sept. 1885, *F. Philippi* (MS, TYPE; G. photo.); Desert of Atacama [Caldera Region], *Morong* 1238 (G, NY, US, FM), 1263 (G, NY, US), 1249 (NY); sand, Caldera, *Johnston* 5064 (G); Caldera, 1922, *Gigoux* (G); gravelly benches and slopes, Chañaral, *Johnston* 4808 (G); vicinity of Caleta Pan de Azucar, *Johnston* 5831 and 5844 (G); quebrada below Aguada Grande, *Johnston* 5812 (G). ANTOFAGASTA: crest of high fog-bathed sea-cliffs near Aguada Grande, *Johnston* 5813 (G); wash on plain between Ag. Grande and Ag. Cachina, *Johnston* 5745 (G); Cerro de la Cachina on dry gravelly crest, *Johnston* 5744 (G); sandy soil, Aguada Cachina, *Johnston* 5736 (G); north of Portezuelo de Mina Carola, Sierra Esmeralda, *Johnston* 5682 (G); gravel, Quebrada de Taltal, *Johnston* 5123 (G); gravelly slopes near crests of hills southeast of Taltal, *Johnston* 5122 (G); Taltal, 100 m. alt., *Werdermann* 809 (G); summit ridge of Cerro Perales near Taltal, *Johnston* 5636 (G); gravelly floor of Quebrada San Ramon near Taltal, *Johnston* 5157 and 5158 (G); Paso Malo north of Taltal, *Johnston* 5179 (G); gravelly bench, Estancia Vieja, *Johnston* 5204 (G); summit of Cerro Yumbes, Paposo, *Johnston* 5547 (G); Posada, Quebrada Guanillo, Paposo, *Johnston* 5601 (G); El Rincon, Paposo, *Johnston* 6285 and 5546 (G); hillside, Aguada Panulcito, *Johnston* 5479 (G); between Ag. Panul and Ag. Panulcito, *Johnston* 5244 (G); rocky slope, Aguada Cardon, *Johnston* 5295 (G); Aguada de Miguel Diaz, *Johnston* 5417 and 5418 (G); quebrada just north of Antofagasta, *Johnston* 3659 (G).

PERU. AREQUIPA: lower part of fertile belt in hills back of Mollendo, *Johnston* 6280 (G); hills, Mollendo, *Hitchcock* 22384 (G, US).

In the Museo Nacional at Santiago the original collection of this species is represented by six plants, two in the small herbarium of Federico Philippi and four in the main herbarium of the museum. It seems certain that the older Philippi described his species from the latter four plants. These are associated with a label giving the



locality as "Monte amargo," a station on the railroad about half-way between Caldera and Copiapó. This collection of four plants is a mixture, three representing *C. filaginea* as here defined and one being a plant of *C. parviflora* just coming into fruit. I suspect that the plant of *C. parviflora* is the one mentioned by Philippi as having been collected by Borchers near Caldera. It seems very probable, also, that the specific name, *filaginea*, was suggested by this same odd plant.

The species seems to reach its southern limit in the Caldera-Copiapó region. It is very generally distributed in the coastal region further north, in fact is the predominating and common species of the genus in the coastal portion of the Department of Taltal. It is related on one hand to *C. taltalensis* and on the other to *C. limensis*. The latter is a coarser plant and less branched and has broader firmer leaves and larger fruiting calyces.

16. **C. limensis** (A. DC.) Johnston. Annual, 5–15 cm. tall; stems usually loosely branched from the base, finely appressed-hispid; leaves oblanceolate to linear, 1–3 cm. long, 2–4 mm. broad, obtusish, finely appressed-hispid, more or less pustulate; spikes solitary or geminate, evidently bracted, 3–5 cm. long; fruiting calyx 5–6 mm. long, ovate-oblong, subsessile; mature calyx-lobes linear to linear-ob lanceolate, below the middle with a prominent very hirsute midrib, above broadened herbaceous spreading and merely appressed-hispid; corolla inconspicuous, subtubular, white, ca. 1 mm. broad; fruit 4-ovulate; nutlets 4, homomorphous or sometimes slightly heteromorphous, ovate-oblong, 1.5–1.7 mm. long, tuberculate, apex acute, base truncate, back convex, edges angled, groove closed or narrow but below gradually dilated into a suprabaasal triangular areola, axial nutlet always most firmly affixed and occasionally a trifle the largest; gynobase about  $\frac{3}{5}$  height of nutlet; style surpassing the nutlets.—*Contr. Gray Herb.* lxx. 46 (1924). *Eritrichium limense* A. DC. *Prodr.* x. 133 (1846). *C. Macbridei* Johnston, *Contr. Gray Herb.* lxxiii. 74 (1924). *C. Woitschachii* Brand in Fedde, *Repert.* xx. 317 (1924).

PERU. LIMA: loose stony upper slopes of sea-side hills, Chorrillos near Lima, ca. 150 m. alt., *Macbride* 5869 (FM, TYPE of *C. Macbridei*; G, ISOTYPE); Lima, 1833, *Abadia* (G, photo. of TYPE of *E. limense*). AREQUIPA: open places in and just below fertile belt in hills back of Mollendo, *Johnston* 3531 (G). INDEFINITE: "Peru," *Woitschach* (G, fragment of TYPE of *C. Woitschachii*).

Very closely related to *C. filaginea* but a coarser plant with larger fruiting calyces. *Cryptantha Macbridei* and *C. Woitschachii* are clearly synonyms of this species.

17. **C. calycina** (Ph.) Reiche. Annual, 1–3.5 dm. tall; stems commonly solitary with short ascending laterals above or with nu-

merous long erect branches from towards the base, shaggy coarse-hirsute; leaves linear or lance-linear, 1-4 cm. long, 1.5-3 mm. broad, obtusish, hispid, somewhat pustulate; spikes geminate or ternate, bractless, glomerate or elongating and becoming very loosely flowered, 1.5-6(-10) cm. long; fruiting calyx strongly accrescent, 8-11 mm. long, 2-2.5 mm. broad, short-pedicellate; mature calyx-lobes lance-linear or linear, proximate and erect above the fruit which they greatly surpass, midrib thick and very prominent and armed with coarse slightly tawny hirsute bristles, margins villous-hispid; corolla inconspicuous, subtubular, white, 1-2 mm. broad, lobes erect; fruit 4-ovulate; nutlets usually 4, homomorphous with the axial one slightly the most persistent, lanceolate, 2.8-3.2 mm. long, 0.9-1.2 mm. broad, smooth or obscurely tuberculate particularly towards the apex, apex acuminate, back flat or broadly obtuse with, at most, an obscure low medial ridge, groove closed or very narrow but usually open at the broad forking; gynobase subulate, ca.  $\frac{3}{5}$  height of nutlets; style equalling the nutlets or shortly surpassing them.—Anal. Univ. Chile. cxxi. 825 (1908) and Fl. Chile v. 230 (1910). *Eritrichum calycinum* Ph. Fl. Atac. 38 (1860) and Viage Des. Atac. 80 and 212 (1860).

CHILE. ATACAMA: talus, Rio Sancarron below Rucas, 3200 m. alt., *Johnston 6225* (G); dry rocky floor of quebrada, Rio de Valeriano above Juntas del Encierro, 3250 m. alt., *Johnston 6025* (G); Quebrada Alfalfa, 3200 m. alt., *Johnston 6004* (G); rocky hillside, Laguna Chica, 3200 m. alt., *Johnston 5961* (G); gravelly bench in quebrada east of Laguna Grande, 3400 m. alt., *Johnston 5923* (G); sunny gravelly slope, Quebrada Tolar, Sierra San Miguel, 3400 m. alt., *Johnston 4950* (G); Encantada, Jan. 1901, *Reiche* (MS). ANTOFAGASTA: Sandon, 2700 m. alt., Feb. 1854, *Philippi* (MS, TYPE; G, photo.).

An extremely well marked and very distinct species, which appears to be without any close, obvious relatives. The unusually large fruiting calyces and its very elongate nutlets make it readily recognizable. I found it usually associated with *C. diffusa*, commonly in the upper parts of the range of that species, though always much less common.

18. **C. patagonica** (Speg.) Johnston. Annual, 1-1.5(-3) dm. tall, drying dark; stems slender, erect or decumbent, usually several, commonly with short spreading branches, finely strigose or appressed short-hispid; leaves linear, obtuse, 1-3.5 cm. long, 1-2(-3) mm. broad, spreading, finely short appressed-hispid, finely pustulate beneath; spikes solitary or geminate, bractless, 1-3 cm. long, glomerate or elongating but not particularly loose-flowered; fruiting calyx ovate, 2-3 mm. long, 1.5-3 mm. broad, short-pedicellate; mature calyx-lobes narrowly lanceolate, connivent above, shortly surpassing the nutlets,

midrib prominent and hirsute, margin appressed villous-hispid; corolla inconspicuous, white, ca. 1.5 mm. broad; fruit 4-ovulate; nutlets 4, homomorphous with the axial one most persistent, lance-ovate, ca. 2 mm. long, ca. 0.8 mm. broad, smooth or more often obscurely tuberculate particularly above the middle, apex acute, base truncate, sides angled, back usually convex below the middle and flat above; groove closed or very narrow, usually with a small areola at the fork; gynobase subulate,  $\frac{2}{3}$ – $\frac{4}{5}$  height of nutlets; style equalling or shortly surpassing the nutlets.—Contr. Gray Herb. lxxviii. 54 (1923). *Am-sinckia patagonica* Speg. Anal. Soc. Cient. Argentina liii. 137 (1902).

ARGENTINA. SANTA CRUZ: very arid desert between Rio Santa Cruz and Rio Gallego, Feb. 26, 1882, *Spegazzini* (G); arid plains along Rio Santa Cruz, Feb. 7, 1882, *Spegazzini* (G, part of TYPE); desert along Rio Chico, Feb. 21, 1882, *Spegazzini* (G); Patagonia, lat. 50°–53°, 1882, *Moreno & Tonini* (NY).

This species, which sets the southern limit of the genus at about lat. 52° S., is probably most related to the very distinct *C. calycina* of the desert Andes of northern Chile. It has been much misunderstood and has passed under many names. The collection by *Moreno & Tonini*, above cited, is that reported as *Cynoglossospermum humile* by *Kuntze*, Rev. Gen. iii. pt. 2, 204 (1898). *Spegazzini*, Pl. Patag. Aust. 551–552 (1897), and *Macloskie*, Fl. Patag. 678–679 (1905), treated it as *E. diffusum* and *E. parvulum*.

19. ***C. peruviana*** Johnston. Annual, slender, 1–2 dm. tall; stem simple or with several long ascending branches, finely short-hispid and frequently appressedly so; leaves narrowly linear, 1–3(–6) cm. long, 1–2 mm. broad, numerous, finely hispid, inconspicuously pustulate, little reduced up the stem; spikes solitary or geminate, 1–5 cm. long, bractless, glomerate then elongating; fruiting calyx ovate, 2.5–3 mm. long, subsessile; mature calyx-lobes lance-linear or narrowly lanceolate, erect, appressed hispid-villous, somewhat hirsute along the weakly prominent midrib; corolla white, inconspicuous, subtubular with a very narrow limb 0.8–1.4 mm. broad; fruit 4-ovulate; nutlets 4 or rarely fewer, homomorphous with the axial one subpersistent and always developing, 1.5–1.8 mm. long, lance-ovate, very coarsely muricate or muricate-rugose, finely granulate, pale, apex acute, edges acute, back convex, groove closed or gradually dilated towards the base; gynobase about  $\frac{3}{5}$  length of nutlets; style just surpassing the nutlets.—Contr. Gray Herb. lxxiii. 74 (1924). *C. Weberbaueri* Brand in Fedde, Repert. xx. 318 (1924). *C. cajabambensis* Brand, l. c. 319.

PERU. ANCASH: Hacienda Cajabamba between Samanco and Caraz, *Weberbauer 3041* (G, frag. of TYPE of *C. cajabambensis*); rocky places, Ocos,

3200–3400 m. alt., *Weberbauer 2658* (G, frag. of TYPE of *C. Weberbaueri*). LIMA: loose rocks on dry slope above river, Rio Blanco, 3600 m. alt., *Macbride & Featherstone 674* (FM, TYPE of *C. peruviana*; G, ISOTYPE). AREQUIPA: gravelly soil along stream-courses, Arequipa near base of El Misti, 3000–3200 m. alt., *Pennell 13235* (G, FM); ravines and hillsides on southern slopes of El Chachani north of Arequipa, 3350 m. alt., *Hinkley 77* (G, US). MOQUEGUA: open mixed formation, Torata, 2200–2300 m. alt., *Weberbauer 7398* (G, FM).

A Peruvian plant which is very closely related to *C. globulifera* and perhaps is only a phase of it differing in its northern range, slender habit and slightly smaller flower-parts. It sets the northern limit for the distribution of *Cryptantha* in South America, in the Department of Ancash occurring north almost to lat. 9° S.

20. **C. globulifera** (Clos) Reiche. Annual, 1–3(–4) dm. tall; stems few or solitary, usually loosely branched, hispidulous; leaves linear, 1–4 cm. long, 1–2 mm. broad, obtusish, short appressed-hispid, little reduced up the stem; spikes solitary or geminate, bractless, 1–6(–10) cm. long, becoming loosely flowered in age; fruiting calyx ovate-oblong, 3–4 mm. long, ascending, base rounded and very shortly pedicellate; mature calyx-lobes linear or lance-linear, connivent above with the tips somewhat spreading, margins villous, hirsute along the prominent midrib, the hairs all clean and white or only slightly tawny; corolla inconspicuous, white, subtubular, ca. 1 mm. broad; fruit 4-ovulate; nutlets 1–4, homomorphous, ovate-oblong, 1.5–2 mm. long, finely granulate, pale, weakly but densely tuberculate with the tuberculations in more or less broken transverse rows, apex acute, back convex, edges acute below middle and rounded above, groove narrowed or closed but usually with an open fork; gynobase  $\frac{3}{4}$ – $\frac{4}{5}$  height of nutlets; style just surpassing or a little surpassed by the nutlets.—Anal. Univ. Chile cxxi. 827 (1908) and Fl. Chile v. 232 (1910). *Eritrichium globuliferum* Clos in Gay, Fl. Chile iv. 464 (1849). *E. glareosum* Ph. Linnaea xxxiii. 189 (1864). *C. glareosa* Greene, Pittonia i. 111 (1887); Reiche, l. c. 820 and l. c. 225. *E. carrizalense* Ph. Anal. Univ. Chile xc. 526 (1895). *C. carrizalensis* Reiche, l. c. 819 and l. c. 224. *E. floribundum* Ph. Anal. Univ. Chile xc. 532 (1895). *C. floribunda* Reiche, l. c. 825 and l. c. 230. *E. parvulum* Ph. Anal. Univ. Chile xc. 535 (1895). *E. oliganthum* Ph. Anal. Univ. Chile xc. 535 (1895). *C. oligantha* Reiche, l. c. 819 and l. c. 224. *E. sphaerophorum* Ph. Anal. Univ. Chile xc. 539 (1895). *E. longisetum* Ph. Linnaea xxxiii. 189 (1864) in part; only as to plant from San Felipe which became type of *E. floribundum*, cf. Anal. Univ. Chile xc. 538 (1895).

ARGENTINA. CHABUT: gravelly places along Rio Carren-leofú, March 5, 1900, *Spegazzini* (G). RIO NEGRO: vicinity of General Roca, 250–360 m.

alt., *Fischer 131* (G, US, FM). MENDOZA: vicinity of Mendoza, Nov. 1913, *Hauman 260* (G).

CHILE. SANTIAGO: Las Arañas, Sept. 1861, *no collector given* (MS). ACONCAGUA: San Felipe, Sept. 1861, *Philippi* (MS, TYPE of *E. floribundum*; G, photo.); bed of Rio Aconcagua near San Felipe, Sept. 1860, *Philippi* (MS, TYPE of *E. glareosum*; G, photo.); San Felipe, Aug. 20, 1921, *Claude-Joseph 1408* (US); Rio Blanco, Aug. 25, 1921, *Claude-Joseph 1346* (US). COQUIMBO: common on coastal dunes, La Serena, Sept. 1836, *Gay 47* (G, frag. and photo. of TYPE of *E. globuliferum*); gravelly talus, Los Llanos, Estero de Guanta, ca. 1400 m. alt., *Johnston 6246* and *6247* (G); Paihuano, Sept. 1878, *no collector given* (MS). ATACAMA: Bandurrias, *Geisse* (MS); Desert of Atacama [? Bandurrias], *Geisse 58a* (NY); Chañarcillo, Sept. 1885, *no collector given* (MS; G, photo.); Yerba Buena, 1885, *Godoi de Collao* (MS, TYPE of *E. carrizalense*; G, photo.); Caldera, Sept. 1885, *no collector given* (MS, TYPE of *E. parvulum*; G, photo.); Caldera, Sept. 1879, *no collector given* (MS, TYPE of *E. sphaerophorum*; G, photo.); between Caldera and Copiapó?, *no collector given* (MS, TYPE of *E. oliganthum*; G, photo.); Piedra colgada, Sept. 1885, *no collector given* (MS; G, photo.); Vizcachitas, Oct. 14, 1914, *Rose 19336* (US, NY).

A somewhat variable but a natural and readily recognized species. It is not improbable that with the accumulation of study-material the species as here defined may be broken up into several minor species of restricted distribution. The material from Coquimbo is more tawny, coarser and more spreading than other forms. As here interpreted the species is notable since it is the only member of its genus generally ranging at low altitudes which occurs both in Argentina and Chile. Possibly the axial nutlet is slightly emphasized. However, in a number of cases, I found it aborted and the abaxial one developing.

21. **C. diffusa** (Ph.), comb. nov. Annual, 8–20 cm. tall; stems commonly several to many, ascending, strictly branched, hispid; leaves linear or lance-linear, 1–3.5 cm. long, 1–2.5 mm. broad, obtuse, numerous, weakly reduced up the stem, finely appressed-hispid, very obscurely if at all pustulate; spikes solitary or geminate, bractless, 1–5(–8) cm. long, glomerate but in age becoming rather loosely flowered, tawny; fruiting calyx ovate or oblong-ovate, 3–4 mm. long, ascending, base rounded and very shortly pedicellate; mature calyxlobes lanceolate to linear-lanceolate, connivent above, at times with tips spreading, margins villous, the prominent midrib hirsute, the hairs usually very conspicuously tawny; corolla inconspicuous, sub-tubular, white, ca. 1 mm. broad; fruit 4-ovulate; nutlets 1–4, homomorphous, ovate-oblong, 1.5–2.2 mm. long, pale, finely granulate, obscurely tuberculate, marked by 6–12 more or less sinuous deep lineate transverse grooves and hence broadly wrinkled, apex acute, back flattish or obscurely obtuse or convex, edges angled, groove narrow or closed; gynobase  $\frac{3}{4}$ – $\frac{4}{5}$  height of nutlets; style just surpassed by or just surpassing the nutlets.—*Eritrichum diffusum* Ph.

Linnaea xxxiii. 191 (1864) and Anal. Univ. Chile xc. 523 (1895). *E. diffusum* Ph. in Villanueva, Anal. Univ. Chile liii. 444 (1878), nomen. *E. micranthum* Ph. Fl. Atac. 38 (1860) and Viage Des. Atac. 80 and 212 (1860); not *E. micranthum* Torr. (1854) nor *C. micrantha* Johnston (1925). *E. Borchersii* Ph. Anal. Univ. Chile xc. 531 (1895). *C. Borchersii* Hauman, Anal. Soc. Cient. Argentina lxxxvi. 302 (1918). *E. globuliferum*, var. Ph. Anal. Univ. Chile xc. 524 (1895). (?) *C. famatinae* Brand in Fedde, Repert. xx. 318 (1924).

ARGENTINA. MENDOZA: Baños del Inca, Jan. 15, 1886, *Borchers* (MS, TYPE of *E. Borchersii*; G, photo.); Rio Tupungato, 2300 m. alt., *Hauman* 271 (G); Mendoza, Jan.-Feb., *Goldsack* (MS).

CHILE. COQUIMBO: Cordilleras de Illapel, 2500 m. alt., Jan. 1906, *Reiche* (MS); in andiis Hurtado, Feb. 1837, *Gay* 1622 (MS, badly diseased); "Huanta, Baños del Toro, etc.," 1860-61, *Volckmann* (MS, TYPE of *E. diffusum*; G, photo.); Doña Ana, *Peralto* (MS); Baños del Toro, 3500 m. alt., *Werdermann* 220 (G, FM); Cordilleras de Coquimbo, Jan. 1904, *Reiche* (MS). ATACAMA: rocky burnt-over place, Rio Sancarron below Rucas, 3200 m. alt., *Johnston* 6224 (G); loose earth in quebrada, Laguna Grande, 3450 m. alt., *Johnston* 5924 (G); Quebrada de Serna, 1885, *San Roman* (MS); gravelly slope below Portezuelo Tolar, Sierra San Miguel, 3800 m. alt., *Johnston* 4949 (G); stony benches, Quebrada Tolar, Sierra San Miguel, 3500 m. alt., *Johnston* 4951 (G); upper part of Quebrada San Miguel, 2500-2800 m. alt., *Johnston* 4932 and 4933 (G); near Los Marayes, Sierra San Miguel, 1100-1500 m. alt., *Johnston* 4918 and 6282 (G); rocky draw, Potrerillos, 2800 m. alt., *Johnston* 4728 (G); abandoned field, Los Alamos, Quebrada de Potrerillos, 2400 m. alt., *Johnston* 3697 (G); Agua de Acerillo, Oct. 1877, *Villanueva* (MS). ANTOFAGASTA: Sandon, 2700 m. alt., Feb. 1854, *Philippi* (MS, TYPE of *E. micranthum*; G, photo).

Clearly related to *C. globulifera* but differing in its lineately transverse-grooved nutlets, usually conspicuously tawny spikes and high montane distribution. Though there is some intergradation between the two species it is rare. Commonly they are distinguished at a mere glance. In *C. diffusa* no particular nutlet seems to be emphasized nor always developing.

22. ***C. debilis*** (Ph.) Reiche. A weak slender annual, 1-1.5 dm. tall, with a few very loose well developed branches, sparsely hispidulous; leaves linear or oblanceolate, spreading, distant, 2-3 cm. long, 2-4 mm. broad, quite herbaceous, sparsely hispidulous, obtuse, upper ones scarcely if at all reduced; spikes geminate or solitary, spreading, 2-3 cm. long, bractless, becoming very loosely flowered; fruiting calyx broadly ovate, 2-2.5 mm. long, 1.5-2 mm. broad, base broad and very shortly pedicellate; mature calyx-lobes lanceolate, herbaceous, sparsely appressed-villous, weakly hirsute along the non-prominent midrib; corolla inconspicuous, white, subtubular, ca. 1 mm. broad, fruit 4-ovulate; nutlets 4, homomorphous, ovate-oblong, 1.5-1.8 mm. long, pale, very finely granulate, tuberculate or becoming

papillate towards apex, marked by 6–12 deep more or less sinuous lineate grooves and hence broadly transverse-wrinkled, apex acute, back convex, edges acute, groove closed or narrow; gynobase reaching to about  $\frac{4}{5}$  height of nutlets; style just surpassed by nutlets.—Anal. Univ. Chile cxxi. 830 (1908) and Fl. Chile v. 235 (1910). *Eri-trichium debile* Ph. Cat. Pl. Itin. Tarapaca 57 (1891).

BOLIVIA. POTOSI: Paroma, ca. 3800 m. alt., Feb. 25, 1885, *F. Philippi* (MS, TYPE; G, photo.); Chiguana, 3700 m. alt., March 22, 1921, *Asplund 5898* (US).

Obviously a close relative of *C. diffusa* and perhaps only an extreme form of it. The two collections cited agree uncommonly well in gross aspect and technical characters. They come from about 450 km. north of the northernmost known station of *C. diffusa* and differ from that species in the weak widely branched habit and smaller broader non-tawny fruiting calyces. No particular nutlet seems to be emphasized in this species.

II. Section EUCRYPTANTHA.—This section seems to be a very natural one. It is apparently derived from the section *Krynitzkia* and in turn seems to have given rise to the section *Geocarya*. With the exception of *C. glomerulifera* and *C. capituliflora*, two high Andean species that extend into western Argentina, it is restricted to Chile. It is characterized by the presence of very numerous simple cleistogamic flowers. These are specialized only in having closed corollas. At maturity the fruiting calyx is quite similar to that characteristic of the chasmogamic flowers of the particular species. Frequently these cleistogamic flowers are slightly smaller than the chasmogamic ones. They appear to be invariably biovulate whereas the chasmogamic flowers, commonly biovulate, are sporadically 4-ovulate. They are always developed in the leaf-axils along the middle and upper parts of the stem, and frequently also down to the lowermost pair of leaves and even into the spikes where they sometimes develop to the exclusion of all chasmogamic flowers. In the leaf-axils, while occasionally solitary, they commonly form small few-flowered glomerules. Occasionally these glomerules elongate but then are readily distinguished from the true spikes by their laxness and abundant bracting. The chief classificatory difficulty in this section is associated with the species, *C. glomerata*. Here the relative abundance of the cleistogamic and chasmogamic flowers varies enormously and makes profound changes in the general aspect.

#### KEY TO SPECIES.

Plant definitely perennial.

Fruiting calyx small, 2–2.5 mm. long; nutlets ca. 2 mm. long.

*Glomeruliferae*.....23. *C. glomerulifera*.

Fruiting calyx large and coarse, 4–6 mm. long; nutlets 2–3 mm. long. *Capituliflorae*.

Plant low, with short prostrate or widely spreading densely appressed white villous-hispid stems; mature inflorescence more or less capitate.....24. *C. capituliflora*.

Plant erect or ascending, loosely branched; stems appressed-hispid; inflorescence becoming loose and open.

Plant canescent, abundantly appressed short-hispid on stems and leaves; style very much surpassing the nutlets.....25. *C. longifolia*.

Plant green, very sparsely hirsute, evidently pustulate; style equalling or shortly surpassing the nutlets.

26. *C. spathulata*.

Plant definitely annual.

Fruiting calyces armed with stiff hairs, hispid or hirsute.

*Glomeratae*.

Nutlets 1.3–2 mm. long; plant green; common, widely dispersed species.....27. *C. glomerata*.

Nutlets 2.5–3 mm. long; plant canescent; rare local species.

28. *C. alfalfalis*.

Fruiting calyces long-villous, lacking stiff hairs. *Haplostachyae*.

Plant slender; cauline leaves 1–1.7 cm. long, 2–3 mm. wide; nutlets verrucose.....29. *C. haplostachya*.

Plant coarse; cauline leaves 1–2 cm. long, 5–10 mm. wide;

nutlets tuberculate.....30. *C. calycotricha*.

23. ***C. glomerulifera*** (Ph.), comb. nov. Perennial, 3–5 dm. tall; stems tufted, erect or strictly ascending, subsimple or producing slender ascending branches above the middle, more or less abundantly appressed short-hispid; leaves very scabrous, short-hispid, pustulate at least beneath; the lower oblanceolate, crowded, acutish, 3–7 cm. long, 3–5 mm. broad, contracted to a petiole; the middle cauline linear to oblance-linear or lance-oblong, obtusish, broad at the sessile base, ca. 1–3 cm. long, 3–4 mm. broad; cleistogamic flowers solitary or glomerate in the leaf-axils all along the stem, the fruiting structures similar to those of the chasmogamic flowers; chasmogamic flowers with corolla 1.5–2 mm. broad, small, white; spikes geminate, bractless, densely flowered, ca. 1 cm. long; fruiting calyx ovate, 2–2.5 mm. long, sessile; mature calyx-lobes lance-linear to lance-oblong, short-hispid, midrib not greatly thickened; ovules 2; nutlets 2, ovate or oblong-ovate, ca. 2 mm. long, granulate, often sparsely tuberculate especially below the middle, apex acute, base truncate or obtuse, back convex or more commonly obtuse with a medial ridge, groove narrow, axial nutlet always present, abaxial one twisted around beside the axial; style equalling or surpassing nutlets, about length of gynobase; gynobase ca.  $\frac{2}{3}$  height of nutlets.—*Eritrichium glomeruliferum* Ph. Anal. Univ. Chile xc. 521 (1895).

CHILE. ACONCAGUA: Juncal, 2400 m. alt., Feb. 25, 1903, *Buchtien 144* (G, US, MS). COQUIMBO: Las Mollacas, Cordillera de Illapel, Jan. 1888, *no*



collector given (MS, TYPE; G, photo.). INDEFINITE: Cordilleras, *Cummings 236* (G).

ARGENTINA. SAN JUAN: talus in gorge above Baños San Crispin, 3500 m. alt., Jan. 1926, *Johnston 6106* (G).

A very distinct species readily distinguished from other perennial species by the small size of its flowering parts.

24. **C. capituliflora** (Clos) Reiche. Perennial, much depressed; stems few or numerous, decumbent to prostrate, 5–15 cm. long, densely and canescently villous-hispid; leaves oblanceolate, obtuse, thickish, weakly reduced up the stem, densely appressed villous-hispid, abundantly and minutely pustulate beneath; lower leaves rather crowded, 3–5 cm. long, 2–4 mm. broad; cleistogamic flowers in leaf-axils, solitary or glomerate, not numerous; chasmogamic flowers in bractless congested geminate racemes, ca. 1 cm. long, crowded into dense capitate thyrsoid terminal clusters 1–2 cm. thick; fruiting calyx oblong, 4.5–6 mm. long, short-pedicellate; mature calyx-lobes oblong to linear, obtuse, erect, velvety with a very dense villous-hispid pubescence, midrib not prominent; corolla not conspicuous, 1.5–2 mm. broad, subtubular, white drying brown; ovules usually 2 but occasionally 3 or even 4; nutlets 1–2(–4), when 2 with the abaxial one bent around beside the axial one, 2.5–3 mm. long, ca. 1.3–1.5 mm. broad, triangular-ovate, light-colored, granulate, with scattered murications, apex acute, base rounded, back obtuse with a definite medial ridge, sides angles, inner face right-angled bearing an open or closed groove; gynobase ca.  $\frac{2}{3}$  height of nutlets; style surpassing the nutlets.—Anal. Univ. Chile cxxi. 822 (1908) and Fl. Chile v. 227 (1910); Hauman, Anal. Soc. Cient. Argentina lxxxvi. 303 (1918). *Eritrichium capituliflorum* Clos in Gay, Fl. Chile iv. 467 (1849). *Cynoglossospermum capituliflorum* Kuntze, Rev. Gen. iii. pt. 2, 204 (1898). *E. cephalanthum* Ph. Anal. Univ. Chile xc. 520 (1895).

ARGENTINA. MENDOZA: Rio Blanco, 2500–3200 m. alt., Jan. 1908, *Hauman 270* (G). SAN JUAN: Los Patos, 3000 m. alt., *Gay 533* (G, photo. of TYPE of *E. capituliflorum*).

CHILE. COQUIMBO: Cordilleras de Doña Ana, *F. Philippi* (MS); (?) hills, Arqueros, Aug. 1836, *Gay 1620* (MS). ACONCAGUA: Juncal, 2400 m. alt., Feb. 1903, *Buchtien 145* (G, US, MS). SANTIAGO: Las Condes, Jan. 1880, *Navarro* (MS, mixed with *C. dimorpha*).

The type of *E. cephalanthum* seems to be lost. Reiche could not find it nor could I locate it at Santiago. However, from the description, it seems to belong clearly to the present species. It was based upon specimens lacking data. The collection from Arqueros, cited above, I suspect to have been mislabeled. The low hills near the coast are scarcely a likely situation for the present high Andean

species. For further notes on this collection see discussion under *C. cynoglossoides*.

25. **C. longifolia** (Ph.) Reiche. Perennial, 1–3 dm. tall; stems several, rather slender, strict, leafy, appressed short-hirsute; leaves oblanceolate, obtuse, gradually reduced up the stem; basal leaves long-petiolate, 7–9 cm. long, 6–8 mm. broad, appressed short-hispid, minutely pustulate; cleistogamic flowers solitary or glomerulate in the leaf-axils particularly below the middle of the stem, inconspicuous; chasmogamic flowers with corollas ca. 3 mm. broad, white, drying brown; spikes bractless, geminate, dense, 1–3 cm. long, in a somewhat thyrsoid arrangement; fruiting calyx oblong, subpersistent, 4–5 mm. long; mature calyx-lobes oblong-linear, erect, densely hispid-villous, midrib not prominent; fruit biovulate; nutlets 1–2, when 2 with the abaxial one bent around beside the axial one, 2–2.2 mm. long, 1–1.2 mm. broad, cuneate-oblong, dark or pale, sometimes mottled, granulate, sparsely tuberculate, apex acute, base obtuse, sides angled, and with thickened edges, back obtuse with a definite medial ridge, inner face right-angled, groove nearly closed though opened at the broad basal forking; gynobase ca.  $\frac{3}{4}$  height of nutlets; style much surpassing the nutlets.—Anal. Univ. Chile cxxi. 823 (1908) and Fl. Chile v. 228 (1910). *Eritrichium longifolium* Ph. Anal. Univ. Chile xc. 522 (1895).

CHILE. COQUIMBO: La Polcura, Cordillera de Illapel, Jan. 1888, collector not given (MS, TYPE; G, photo.).

Evidently related to *C. capituliflora*, but certainly distinct, differing in its habit and in the abundance of pubescence. Much more closely related to *C. spathulata* but a less stiff, more erect plant with more abundant, less rough pubescence on herbage and calyces and having slightly smaller nutlets and a longer style. The known stations for *C. longifolia* and *C. spathulata* are very distant. Both are known, however, only from the type-collection.

26. **C. spathulata** (Ph.) Reiche. Perennial from a strong taproot; stems several, loosely ascending, 1–3 dm. tall, very scabrous, leafy, sparsely appressed short-hirsute; leaves oblanceolate, obtuse or rounded at apex, 2–3.5 cm. long, 6–9 mm. broad, conspicuously pustulate, scabrous, sparsely appressed short-hirsute, lower ones petiolate; cleistogamic flowers solitary or glomerulate in the leaf-axils along the middle part of the stems; chasmogamic flowers with corollas 3–3.5 mm. broad, white, drying brownish; spikes bractless, geminate, numerous, 2–5 cm. long, becoming loose; fruiting calyx oblong, 4–5 mm. long, sessile, subpersistent; mature calyx-lobes oblong-linear, erect, obtuse, hispid, midrib weakly prominent; fruit biovulate; nutlets 2

with the abaxial one bent around besides the axial one, 2.5–3 mm. long (the axial one usually the best developed and slightly the darker), ovate-oblong, finely granulate, sparsely tuberculate, apex acute with the very tip blunted, base obtusish, back obtuse with a well developed medial ridge, sides angled with thickened edges, angled ventrally, groove closed except at the broad forking; gynobase ca.  $\frac{2}{3}$  height of nutlets; style equalling height of nutlets or definitely surpassing them.—Anal. Univ. Chile cxxi. 823 (1908) and Fl. Chile v. 228 (1910). *Eritrichium spathulatum* Ph. Anal. Univ. Chile xc. 517 (1895); not *E. spathulatum* Clarke (1883).

CHILE. COLCHAGUA: Cordilleras de Popeta, 1881, *F. Philippi* (MS, TYPE; G, photo.).

This species is readily separated from the other coarse perennials by its very sparsely pubescent and quite scabrid herbage. It is known only from the type-collection.

27. **C. glomerata** Lehm. Annual; plant usually erect, 1–5 dm. tall, more or less hispid or hirsute and frequently finely pubescent as well; stems one or several, shortly branched above or occasionally loosely branched from the base; leaves lanceolate to lance-linear or lance-ovate, 1–4(–5) cm. long, 2–8 mm. broad, from a broad rounded sessile base usually tapered to an acute apex, reduced up the stem and extending into the inflorescence; cleistogamic flowers biovulate, solitary or in glomerules or in short bracted spikes produced in the leaf-axils, always present in the upper axils and commonly in all the axils down to the base of the plant, commonly much more abundant than the chasmogamic flowers, corolla very poorly developed and inconspicuous, fruiting structures as in chasmogamic flowers though averaging slightly smaller; chasmogamic flowers usually not abundant and occasionally absent, restricted to and dominating the normal true terminal spikes which are 1–3(–5) cm. long, solitary or geminate or even ternate and are bracted only at base; corolla 3–4 mm. broad; fruiting calyx oblong-ovate to oblong, 1.5–3(–4) mm. long; mature calyx-lobes linear to linear-lanceolate, notably unequal, hispid or hirsute; fruit biovulate or rarely quadriovulate; nutlets 2 or rarely 4, 1.3–2 mm. long, tuberculate and coarsely granulate, ovate or oblong-ovate, more or less triquetrous, apex acute, base obtuse, edges decidedly angled and usually somewhat thickened, back convex; groove usually open, dilated towards the base where divaricately forked; style from slightly shorter to definitely surpassing the nutlets; gynobase about  $\frac{2}{3}$  height of nutlets.—Lehm. ex F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1836); Don, Gen. Syst. iv. 373 (1838); Greene, Pittonia

i. 110 (1887); Reiche, Anal. Univ. Chile cxxi. 817 (1908) and Fl. Chile v. 222 (1910). *Cryptantha microcarpa* F. & M. l. c.; Don, l. c.; Greene, l. c. 111; Reiche, l. c. 818 and l. c. 223. *Eritrichium cryptanthum* A. DC. Prodr. x. 129 (1846); Clos in Gay, Fl. Chile iv. 463 (1849). *E. clandestinum* A. DC. l. c.; Clos, l. c. *Krynitzkia clandestina* Gray, Proc. Am. Acad. xx. 274 and 280 (1885). *E. clandestinum*, var. *angustifolium* A. DC. l. c. 130; Clos, l. c. *E. clandestinum*, var. *decumbens* A. DC. l. c. 130; Clos, l. c. *E. congestum* A. DC. l. c. 132; Clos, l. c. 465. *Cynoglossum congestum* Poepp. in herb. fide A. DC. l. c. 132. *Cryptantha congesta* Greene, l. c. 111; Reiche, l. c. 816 and l. c. 221. *E. asperum* Ph. Linnaea xxix. 16 (1857). *E. strictum* Ph. Fl. Atac. 39 (1860) and Viage Des. Atac. 213 (1860); not *E. strictum* Decne. (1844). *Cryptantha microcarpa*, var. *stricta* Reiche, l. c. 818 and l. c. 223. *E. longisetum* Ph. Linnaea xxxiii. 189 (1864) and Anal. Univ. Chile xc. 538 (1895). *Cryptantha glareosa*, var. *longiseta* Reiche, l. c. 820 and l. c. 225. *E. Vidali* Ph. Anal. Univ. Chile xc. 525 (1895). *Cryptantha Vidali* Reiche, l. c. 817 and l. c. 222. (?) *E. diplasianthum* Ph. Anal. Univ. Chile xc. 530 (1895). *E. foliosum* Ph. Anal. Univ. Chile xc. 533 (1895). *C. foliosa* Reiche, l. c. 827 and l. c. 232. *Cryptantha Candolleana* Brand in Fedde, Repert. xx. 48 (1924). *Cryptantha Philippiana* Brand, l. c. 319.

CHILE. MAULE: Constitucion, Azocart (MS, TYPE of *E. foliosum*; G, photo.). COLCHAGUA: Colchagua, Gay (G, photo. of TYPE of *E. clandestinum*, var. *angustifolium*). OHIGGINS: Peumo, Sept. 1921, Claude-Joseph 1434 (US). SANTIAGO: San Cristobal, Nov. 4, 1877, no collector given (MS); Cerro San Cristobal, Sept. 1917, Skottsberg 976 (G); Santiago, 1840, Gay 1619 (MS); Santiago, no collector given (MS); Santiago, Claude-Joseph 1377, 2234 and 2881 (US); Nuñoa, Nov. 1922, Claude-Joseph 2107 (US); Renca, Oct. 1883, no collector given (MS); Cerro de Renca, 1877, no collector given (MS); Cerro de Renca, Nov. 1906, Reiche (MS); San Bernardo, Oct. 1877, no collector given (MS); San Miguel, Oct. 1879, no collector given (MS); Santa Rita, Oct. 12, 1879, no collector given (MS); San Antonio, Claude-Joseph 1734 and 2869 (US); Lo Prado, Oct. 1924, Claude-Joseph 2806 (US). VALPARAISO: near Viña del Mar, Oct. 19, 1894, Buchtien 145 (MS); sands, near Viña del Mar, Sept. 1, 1895, Buchtien (US); along roads, Valparaiso, Oct. 19, 1895, Buchtien (US); Valparaiso, Oct. 1925, Claude-Joseph 3638 and 3639 (US); Valparaiso, 1879, no collector given (MS); Valparaiso, Cumings 513 (G); Valparaiso, 1836, Gaudichaud 122 (G, photo. of COTYPE of *E. clandestinum*, var. *decumbens*); Quintero, ca. 20 m. alt., Sept. 1923, Werdermann 40 (G, US, FM); La Calera, 1865, no collector given (MS); Curuma, 1883, Philippi (MS, ISOTYPE of *C. Philippiana*; G, photo.); near Rio Quillota, Oct. 1828 Bertero 1157 (G, NY, US); Limache, [? Bertero] (NY). ACONCAGUA: Catema, Sept. 1860, no collector given (MS, TYPE of *E. longisetum*; G, photo.); Islota Huevos, Los Vilos, Nov. 20, 1889, Vidal (MS, TYPE of *E. Vidali*; G, photo.); Zapallar, 1908, Johow (IP). COQUIMBO: vicinity of Choapa, Oct. 6, 1914, Rose 19218 (US, NY); Talahuen, 1889-90, Geisse (G, MS); Frai Jorge Estancia, Aug. 13, 1917, Skottsberg 748 (G); Coquimbo, Nov. 1893, no collector given (MS, TYPE of *E. asperum*; G, photo.); Coquimbo, Sept. 1885, no collector given (MS, G, photo.). ANTOFAGASTA: open slope above Aguada Lora,

Cerro Perales, Taltal, Dec. 1925, *Johnston 5630* (G); thickets at lower edge of fertile belt, El Rincon near Paposo, Dec. 1925, *Johnston 5542* (G); gravelly talus, Aguada Panul, Dec. 1925, *Johnston 5447* (G); Miguel Diaz, 1853, *Philippi* (MS, TYPE of *E. strictum*; G, photo.); steep hillside, Tocopilla, Oct. 1925, *Johnston 3577* (G). INDEFINITE: Cerro de Bravos, Oct. 23, 1881, *no collector given* (MS); San Juan de Pirque, 1914, *Baeza* (IP); costa, Nov. 4, 1920, *Claude-Joseph 1222* (US); Chile, 1828, *Poeppig 193* (G, photo of TYPE of *E. congestum*).

As here taken *C. glomerata* is extremely variable. While it is possible that future studies will show it as breaking up into several varieties or even close species, the material I have had for study is not sufficiently extended to form a satisfactory basis for the segregation, at this time, of this polymorphous though certainly very natural assemblage of forms. Thus interpreted the species is readily recognized in its section by its annual habit, its usually very numerous cleistogamic flowers and its more or less lanceolate leaves, which from a broad rounded sessile base are usually contracted to an acute apex. In habit of growth, leaf-proportions, pubescence and even in nutlets there is considerable variation. This variation seems to be quite erratic, for I have been unable to detect concomitant variation in unrelated characters. The great variation in gross habit is due partly to environment and partly to the varying abundance of cleistogamic flowers. The cleistogamic flowers are always present in considerable numbers, at times to the complete exclusion of the chasmogamic flowers. The extreme latter condition is apparently that represented by the type of *C. glomerata*. This form has simple bracted spikes and is usually more densely and abundantly branched than the more common form in which the stem is terminated by 2-3 bractless spikes of conspicuous chasmogamic flowers.

*Eritrichium Vidali*, from a coastal islet off the Department of Petorca, is a peculiar form with broad leaves, the uppermost of which are lance-ovate. *Eritrichium foliosum*, from Constitucion, is a low coastal form with coarse stems and leaves. The type-collection sets a point on the southern limit of the genus in Chile. *Eritrichium asperum* from Coquimbo is notable for its slightly smallish calyces which seem somewhat more villous than in the plant from further south. *Eritrichium longisetum* is a small slender plant with few chasmogamic flowers. *Cryptantha Philippiana* is similarly small and slender, but has the chasmogamic flowers well developed and dominating. The type of *E. diplasianthum* is apparently lost, though judging from descriptions it seems to belong clearly to *C. glomerata*. A very striking form is that plant of the coastal hills of the Province of Antofagasta described as *E. strictum*. Though widely detached geographically, *E. strictum* forms part of the spring-flora of the fog-

bathed lomas which has a very strong affinity with the flora of central Chile in which the main range of *C. glomerata* falls. Reiche treated *E. strictum* as a variety of *C. microcarpa*, but the characters he enumerates for it do not hold in light of the new material recently collected. While the plant has a fairly characteristic coarse gross habit and a very detached range it does not seem to be decisively separated from *C. glomerata*.

28. **C. alfalfalis** (Ph.), comb. nov. Annual, 3–4 dm. tall; stems stiff, subsimple or loosely and ascendingly long-branched, somewhat cinerescens, finely appressed or spreading villous-hispid; basal leaves linear, becoming 6 cm. long; stem-leaves linear or lanceolate, obtusish, firm, 2–3 cm. long, 2–3.5 mm. broad, finely pustulate; cleistogamic flowers very numerous, solitary or glomerate in the leaf-axils or in small-bracted spikes terminating the stems and branches, calyx and fruit similar to those of the chasmogamic flowers; chasmogamic flowers very few, mixed with the cleistogamic flowers in the terminal solitary or geminate spikes; corolla not conspicuous, ca. 2 mm. broad; fruiting calyx ovate or oblong-ovate, 2–3 mm. long, subsessile; mature calyx-lobes narrowly lanceolate, connivent above, hirsute especially on the thickened midrib; flowers biovulate; nutlets 1–2, axial one always present and most persistent, ovate-oblong, somewhat compressed, 2.5–3 mm. long, 1.3–1.5 mm. broad, densely verrucose, apex acute, base truncate, sides acute, back obtuse, groove closed or open and broadly forked below; gynobase  $\frac{2}{3}$ – $\frac{3}{5}$  height of nutlets; style shortly but definitely surpassing the nutlets.—*Eritrichium alfalfalis* Ph. Anal. Univ. Chile xc. 525 (1895); Reiche, Anal. Univ. Chile cxxi. 831 (1908) and Fl. Chile v. 236 (1910). *E. rigidum* Ph. l. c. 529. *C. rigida* Reiche, l. c. 819 and l. c. 224.

CHILE. SANTIAGO: Rio Colorado, Jan. 1888, *Philippi* (MS, TYPE of *E. alfalfalis*; G, photo.); Rio Colorado, Jan. 1888, *Philippi* (MS, TYPE of *E. rigidum*; G, photo.).

The specific name suggests that the type of this species came from El Alfalfal, a locality on the Rio Colorado in the mountains about 40 km. east of Santiago. The two collections cited probably came from the same locality and represent merely ecological phases of one species. It is quite possible that the plants concerned represent merely very coarse forms of *C. glomerata*. The description given above is incomplete from lack of well developed spikes of chasmogamic flowers, both the cited collections being almost wholly cleistogamic.

29. **C. haplostachya** (Ph.), comb. nov. Erect slender annual ca. 1.2 dm. tall, with several well developed ascending branches, ap-

pressed short-hispid; leaves narrowly lanceolate, 1–1.7 cm. long, 2–3 mm. broad, sessile by a broad rounded base, scabrous, minutely pustulate, apex acute or acuminate; cleistogamic flowers solitary or glomerulate in all the leaf-axils; chasmogamic flowers in a dense short solitary terminal spike 1–1.5 cm. long; corolla ca. 2 mm. broad; fruiting calyx ovate, ca. 1.5 mm. long, subsessile; mature calyx-lobes linear or oblong-linear, densely villous, midrib scarcely developed; flowers biovulate; nutlets 2, opposite one another, firmly affixed, ovate, thick, ca. 1.7 mm. long, 1.5 mm. broad, minutely granulate and coarsely tuberculate, pale, apex acute, base obtuse, back convex or obtuse, sides acute, groove very narrow and broadly forking below; gynobase poorly developed, ca.  $\frac{2}{3}$  length of nutlets; style just surpassing the nutlets, short.—*Eritrichium haplostachyum* Ph. Anal. Univ. Chile xc. 537 (1895).

CHILE. ATACAMA: Piedra colgada, Sept. 1885, no collector given (MS, TYPE; G, photo.).

More material of this very distinct species is a decided desideratum. It is known only from the type, which is a small, very slender plant in full fruit. Its nearest relation is found in *C. calycotricha* of the Coquimbo region.

30. **C. calycotricha**, sp. nov. Annua ca. 1.5 dm alta basaliter laxaque pauciramosa; ramis ascendentibus delicate adpresseque brevi-hispidis; foliis adpresse hispidis minute pustulatis obtusis, inferioribus linearibus vel anguste oblanceolatis 3–3.5 cm. longis 3–5 mm. latis, mediis oblongis vel ovato-oblongis late affixis 1–2 cm. longis 5–10 mm. latis, superioribus paullo reductis; floribus cleistogamis in axillis foliorum glomeratis et in parte inferiori spicae productis; floribus chasmogamis albis 2.5–3 mm. latis in spicis geminatis 1–2.5 cm. longis congestis ebracteatis dispositis; calycibus fructiferis ovatis 4–5 mm. longis subsessilibus; lobis calycis linearibus vel oblongo-linearibus vel late lanceolatis obtusis dense molliter villosis fulvescentibus ascendentibus cum costa paullo prominenti; fructu biovulato; nuculis 2 anguste ovatis crassis 1.8–2.1 mm. longis brunneis dense tuberculato-granulatis sparse crasseque tuberculatis vel papillatis apice plus minusve acutis basi obtusis margine angulatis dorso obtusis saepe crasse carinatis, sulcis apicem versus clausis infra mediam in areolam triangularem profundam grandem abrupte ampliatis; gynobasi quam nuculae  $\frac{2}{3}$  longiori basim versus crassa medium et apicem versus abrupte contracta; stylo quam nuculae conspicue longiori.

CHILE. COQUIMBO: Frai Jorge, Dept. Ovalle, Sept. 21, 1893, *F. Philippi* (MS, TYPE; G, photo. and frag.).

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 phacelooides* 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. phacelooides*, 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*.