

Mediterranean element in the flora. Certainly its occurrence as a native in California and Chile is no more surprising than the presence of *Fagonia chilensis* H. & A., a species doubtfully separable from the Mediterranean *F. cretica* L.

2. THE FLORA OF THE NITRATE COAST

The coast of northern Chile, with the possible exception of that of northern Peru, is the driest in America. This paper is concerned with the flora of the most arid section of this very dry region, comprising about 400 odd kilometers of Chilean littoral between lat. 20° and 24° S. On this section of coast are situated the principal nitrate ports, Antofagasta, Tocopilla and Iquique.

Viewed from the passing steamer the region consists of a wall of grayish-brown hills rising abruptly from the narrow coastal plain to about 1000, or here and there to 1500 m. alt., and extending in a line almost north and south. Only near Antofagasta is the regularity of the coast-line broken by a prominent headland. Almost at the crest of the coastal hills begins the great desert tract of flat or rolling country that stretches eastward for nearly 100 km. It is on this elevated, quite barren desert that the nitrates are obtained. The slopes of the hills facing the sea appear to be also quite barren of vegetation, an impression indeed, which is not at once dispelled even when one lands and in the port gazes at them from a much closer range. In ordinary years the slopes nearby are quite bare and utterly devoid even of lichens. The vegetation of the region is confined to certain higher slopes where the moisture from fog-clouds, which frequently drift against them, is sufficient for the development of a meager flora in this otherwise completely desert region.

Within the area the most complete meteorological observations have been made at Iquique. Twenty-five years of observation there, *Anuario Estadístico* i. 4 (1927), show the average temperature for the year to be 18.5° C., the average for January (midsummer) being 21.4° C., and that for July (midwinter) being 11.4° C. The lowest temperature recorded is 10° C. and the highest is 30.9° C. Franze, *Peterm. Mitt., Erg. Heft no. 193: 68* (1927), reports that the latest figures, covering a period of twenty-four years, show that the average annual rainfall at Iquique is only 2 mm. Writing nine years ago Jefferson, *Am. Geogr. Soc. Research Ser. vii. 1* (1921), described the precipitation at Iquique as follows, "Of the last twenty years fourteen have had no drop of water from the sky. The whole catch of the twenty years has been 28 millimeters (a little over an inch)." The tables given below are adapted from the *Anuario Estadístico* for

1920-1926 (all available) and show the distribution and character of the rainfall at Iquique and Antofagasta for the seven years through 1925. The years given seem to represent a wet cycle (!) and include among them the phenomenally rainy one of 1925. Nevertheless, the meagerness of precipitation is remarkable. It is to be noticed that most of the total rainfall each year results from one relatively large shower.

ANNUAL RECORDS OF PRECIPITATION

IQUIQUE (alt. 9 m.)

Year	Total mm.	Maximum in one day mm.	Date of maximum	Number of days with 0.1 mm. or more	Number of days with 1.0 mm. or more
1925	7.8	2.3	{ 8-21 viii 27 ix 1 viii	4	4
1924	0.5	0.3	14 iv	2	0
1923	1.6	1.6	25 v	1	1
1922	1.5	1.5	6 viii	1	1
1921	2.8	2.6	—	2	1
1920	3.0	2.8	2 x	2	1
1919	0	0	—	0	0

ANTOFAGASTA (alt. 94 m.)

Year	Total mm.	Maximum in one day mm.	Date of maximum	Number of days with 0.1 mm. or more	Number of days with 1.0 mm. or more
1925	28.8	16.3	3 vii	7	3
1924	7.3	6.8	11 ix	2	1
1923	0.7	0.5	28 xi	2	0
1922	1.5	0.3	—	5	0
1921	0.5	0.5	11 ix	1	0
1920	6.2	6.2	1 x	1	1
1919	0	0	—	0	0

Along most of the coast of Peru and much of northern Chile there is a conspicuous relation between sea-fogs and vegetation. Drifting in from the ocean, particularly during the winter, these wet fogs mantle certain slopes and by their condensation there as mists supplement the scanty rainfall sufficiently to develop a vegetation. This, because of its relative luxuriance, stands out from that on the less favored slopes and forms a distinct green belt. Weberbauer, Engler & Drude, *Veg. Erde* xii. 134-149 (1911), has described this type of vegetation as found in Peru and has indicated it as constituting a Loma Zone or Loma Formation. The Loma Formation is well developed in southern Peru and just south of our area, in Chile, between Miguel Diaz and Paposo. Along the Nitrate Coast, however, the formation is not luxuriant though it is of particular interest because of the simplicity of the factors directly permitting its develop-

ment. The relation of fog to the presence of vegetation is here most obvious.

In our area there is no continuous band of fertile slopes. These vary in size and in the moisture they receive and are scattered in occurrence. Only here and there along the coast are meteorological and topographical conditions right for the formation and the banking of fog and so consequently for the development of some vegetation. Because of the meagerness of the flora, its disrupted occurrence, and the difficulties and danger (from lack of water) of traveling along the coast, no one has ever attempted to make a thorough general collection or study the detailed distribution of the plants in the area. Consequently we know the flora only as it is represented on the slopes about the ports of Antofagasta, Cobija (now deserted), Tocopilla and Iquique. Fortunately, however, there is a means of estimating the general extent and development of the vegetation along the coast. Growing on and confined to the fog-moistened slopes on the Nitrate Coast is the large columnar cactus, *Cereus iquiquensis*. This plant grows 2-3 m. tall and is sometimes used as a source of fuel. Its size and economic importance do not permit it to be overlooked even in the dry months when the herbs, associated with it in the more favorable seasons, are absent. It becomes evident, therefore, that this conspicuous cactus serves as a ready index to the extent and distribution of the fog-bathed fertile slopes. From the mention of the occurrence of the plant by travelers and from observations of it made with field-glasses from the steamer one may say with fair confidence that the fertile areas are most abundant and best developed on the stretch of coast from the vicinity of Tocopilla south near Antofagasta. South of the hills near La Chimba, just north of Antofagasta, the coast is particularly barren. Only as Botija is approached, nearly 100 km. to the south, does an evident vegetation reappear, cf. Philippi, *Viage Des. Atacama* 28-30 (1860). A little south of this point and just beyond our area, however, are the very moist and very fertile slopes which stretch between Miguel Diaz and Paposo. North of Tocopilla the fertile areas are small and scattered and probably best developed on the slopes just above Iquique. I understand that there is a weak development of the flora as far north as Caleta Buena. Beyond that point, however, and practically to Arica, the coast is essentially barren.

Of the 117 species reported from the area practically all occur in the coastal hills farther south in the departments of Chañaral and Taltal, the only exceptions being 23 endemic species and 5 Peruvian species that reach their southern limit in the area. Although geo-

graphically nearer Peru the region is floristically closer to Atacama, a fact which may be due to the edaphic effects resulting from the change in coastal topography that occurs just south of Arica. At that place the hills abruptly rising from the sea, so characteristic of most of the Chilean littoral, give way to the broad gently ascending coastal terraces that are so well developed about Arica, Mollendo and farther north. In any case the flora of Arica is very different as to species from that of the most northern of the major nitrate ports, Iquique, although to be sure both are of the Loma type and have many characteristic genera in common. The flora of the Nitrate Coast seems to be scarcely more than an impoverished northern extension of the Paposo flora.

Much of the early collecting in the region was done at Cobija which is situated between Antofagasta and Tocopilla and is now practically deserted. During most of the first half of the last century it was one of the principal ports-of-call between Coquimbo and Arica. It was under the Bolivian flag and from it started one of the main routes to the Bolivian plateau. Hugh Cuming visited and collected at Cobija in September, 1828. Unfortunately his plants were distributed under a general printed label reading "Cobija, Iquique et Arica" and consequently the precise source of his specimens is unknown. The plants of this series bear his numbers 912-959 inclusive! The elder Hooker has made further confusion by labeling them in his herbarium as from Peru and even as from Lima! The most of this range of numbers came, I believe, from Arica. A. d'Orbigny collected about Cobija in April, 1830. A large collection was also made there by M. Gaudichaud who was in the port July 1-3, 1836. Thomas Bridges, Hook. Jour. Bot. iv. 572-3 (1845), did a little collecting at Cobija in September, 1844. His plants were distributed with those he collected on the plateau and in the Amazonian forests, and like them merely labeled as from Bolivia.

About Antofagasta little collecting has been done. Herzog collected there in September, 1911 and Rose in October, 1914. Recently a small collection was made there by Pennell in April, 1925. The only collections I know of from Tocopilla are those I saw at Santiago, These were by Vidal in September, 1889, and Gülland in 1918 and by Mozer and by Reiche at unnoted dates. At Santiago I also saw collections from Iquique made by Salinas in December, 1913 and at Quebrada de Huantaca near Iquique by Martens in September, 1904. Recently Werdermann has collected in Quebrada Huantajaya near Iquique and distributed his exsiccatae widely. Rose also collected at Iquique in 1914.

My own collections which form the basis of the subjoined catalogue were made in 1925, a phenomenally rainy year for the region. Plants during this year appeared on slopes very much lower than normal. Having a day ashore at Tocopilla on October 18th I hired an automobile and drove north from the town to below a steep quebrada which is just beyond the switch-backs on the railroad and about opposite Caleta Duendas. Here plants grew almost to the base of the hills. I climbed well up the slope and into the *Cereus*-belt and eventually returned to the steamer with a bulging vasculum. The following day I had another opportunity to go ashore at Antofagasta. Hiring another automobile I drove north towards Quebrada de la Chimba but could not reach it because of washed out roads. Leaving the car several kilometers short of this abandoned objective I walked eastward across a sandy plain to the foot of the hills where in and about the mouth of a small quebrada I filled my vasculum without the necessity of climbing the slopes. I obtained 86 numbers during these two short excursions, 52 at Tocopilla and 34 at Antofagasta.

There is very little literature bearing directly upon the flora of the Nitrate Coast. The most important source of information is found in a few pages of Reiche's *Grundzüge der Pflanzenverbreitung in Chile* [Engler & Drude, *Veg. Erde* viii.] 164-166 (1907). In this work Reiche gives an incomplete list of the plants known from about Iquique and Tocopilla. The only other attempts at listing the flora in any part of the area are much less satisfactory and even less complete. Herzog, Engler & Drude, *Veg. Erde* xv. 229 (1923), gives a short list of plants collected near Antofagasta, and Philippi, *Viage Des. Atacama* 33-34 (1860), mentions the few he was able to find about the Morro de Mejillones. Most naturalists who have visited the region have dismissed it as absolutely barren of all plants. Ball, *Notes of a Naturalist in So. Amer.* 128-129 (1887), likens the coast to the waterless landscape of the moon.

The following catalogue is primarily based upon my own collections. I have incorporated in it, however, all the published records that I could locate and have cited all the specimens from the region which I have been able to study here in Cambridge. My own collections were determined in the herbarium of the Museo Nacional at Santiago where I was able to compare them with critical material in the Philippi Herbarium. While studying at Santiago I had no intention of publishing upon the flora of the Nitrate Coast and, consequently, did not take special note of the material from the region which I saw there. In the course of critical comparisons of my collections of this region and of those from Chañaral and Taltal, however, I did make note

of a goodly number of the specimens from the Nitrate Coast found in the collections at Santiago. Consequently I have been able to cite a good proportion of the interesting collections from the region found there.

CATALOGUE OF SPECIES

POLYPODIACEAE

Adiantum chilense Kaulf., var. **hirsutum** Hook. in Hook. & Grev. Icon. Fil. ii. t. 173 (1829).

Growing under rocks on a hillside near Tocopilla (*J.* 3580).

Notholaena mollis Kunze, Linnaea ix. 54 (1834).

Growing under rocks on a hillside near Tocopilla (*J.* 3581). Also collected near Iquique by Rose (no. 19451).

GNETACEAE

Ephedra breana Ph. Anal. Univ. Chile xci. 519 (1895).

I doubtfully refer here a staminate plant with pale sheaths which formed subprostrate masses on a rocky ledge on a hill near Tocopilla (*J.* 3613). The sheaths are better developed than in more southern forms. Perhaps the plant may be only a form of *E. americana* H. & B.

Ephedra

Specimens from what appears to be a loosely branched bush were collected near Antofagasta by Rose (no. 19414). The plant is staminate and has brown sheaths. An infertile specimen, but more compactly branched, collected near Antofagasta by Pennell (no. 13036) is apparently conspecific. Lacking fruit an attempt at determination seems unwise.

GRAMINEAE

Stipa tortuosa Desv. in Gay, Fl. Chile vi. 281 (1853).

Collected near Antofagasta by Rose (no. 19415).

Stipa plumosa Trin. Mem. Acad. St. Petersb. ser. 6, ii. 37 (1836).

Growing about rocks in hills near Antofagasta (*J.* 3657) and Tocopilla (*J.* 3582).

Stipa annua Mez in Fedde, Repert. xvii. 204 (1921). ✓

On a gravelly hillside near Tocopilla (*J.* 3579).

BROMELIACEAE

Puya boliviensis Baker, Handb. Brom. 126 (1889).

Known only from the type collected at Cobija by Gaudichaud.

LILIACEAE

Scilla triflora Ph. Fl. Atac. 51 and Viage Des. Atac. 225 (1860).

Infrequent on a gravelly hillside near Tocopilla (*J.* 3610). A very mature specimen from Antofagasta (*Pennell* 13037) is probably the same.

Pasithea caerulea (R. & P.) Don, var. **grandiflora**, var. nov., speciosa; lobis perianthii 2 cm. longis.—CHILE: growing about rocks on a hillside near Tocopilla, Oct. 18, 1925, *Johnston* 3608 (TYPE, Gray Herb.).

This was a common and very conspicuous plant on a hillside near Tocopilla. The corolla, though very large and of an attractive purple color, has a disagreeable odor. Reiche, Grundz. Pfl. Chile 166 (1907), reported *P. caerulea* from Tocopilla apparently upon a specimen of this variety, past flowering, which I examined in the museum at Santiago.

Leucocoryne narcissoides Ph. Fl. Atac. 52 and Viage Des. Atac. 226 (1860).

I refer to this species collections from slopes near Tocopilla (*J.* 3609) and from Queb. Huantajaya near Iquique (*Werdermann* 759). The plant seems to be very variable. The plant from Iquique reported as *L. ixioides* by Reiche, Grundz. Pfl. Chile 166 (1907), is the same.

AMARYLLIDACEAE

Cummingia campanulata (Lindl.) Don ex Sweet, Brit. Fl. Garden iii. t. 257 (1828).

A collection from Tocopilla, apparently of a large-flowered form, is in the museum at Santiago. Reiche, Grundz. Pfl. Chile 166 (1907), reported the species from Tocopilla apparently upon the basis of this collection.

Zephyra elegans Don, Edinb. New Philos. Journ. xiii. 236 (1832). *Z. amoena* Miers, Trans. Linn. Soc., Bot. xxiv. 503, t. 53 (1864).

The types of *Z. elegans* and *Z. amoena* both came from Iquique. Baker, Jour. Linn. Soc. xvii. 495 (1879), considers them synonymous. Miers's plate, however, shows a plant quite different in corolla-proportions from any collection seen by me; the lobes of the corolla being illustrated as scarcely if at all surpassing the narrow tube. I have a collection from the hills near Tocopilla (*J.* 3611) and have seen material from Iquique quite similar to typical *Dicolus caerulescens* Ph., a species considered indistinguishable from *Z. elegans*.

Alstroemeria violacea Ph. Fl. Atac. 51 and Viage Des. Atac. 225 (1860). *A. paupercula* Ph. l. c.

This beautiful species was collected in the hills near Antofagasta (*J.* 3634) and Tocopilla (*J.* 3612). Reiche, *Grundz. Pfl. Chile* 166 (1907), also reports it from Tocopilla. The type and only known collection of *A. paupercula* was collected on the Morro de Mejillones and appears to be merely a starved and over-mature specimen of *A. violacea*.

DIOSCOREACEAE

Dioscorea cylindrostachya Johnston, *supra* pg. 25.

Common on dunes at the base of the hills near Antofagasta (*J.* 3645, type).

IRIDACEAE

Tigridia Philippiana Johnston, *supra* pg. 26.

Collected in 1904 at Tocopilla by Mozer.

URTICACEAE

Parietaria debilis Forst. *Prodr.* 73 (1786).

Collected on a gravelly bench in a quebrada near Antofagasta (*J.* 3644) and in Queb. Huantajaya near Iquique (*Werdermann* 755).

SANTALACEAE

Quinchamalium

A collection by Gaudichaud from Cobija is cited as *Q. chilense* Lam. by DeCandolle, *Prodr.* xiv. 625 (1857). I suspect that the material is referable to *Q. carnosus* Ph.

CHENOPODIACEAE

Chenopodium hastatum Ph. *Fl. Atac.* 47 and *Viage Des. Atac.* 221 (1860).

Collected in Queb. Huantajaya near Iquique by Werdermann (no. 756). Reiche, *Grundz. Pfl. Chile* 165 (1907), reported the plant from Iquique as *C. sparsiflorum* Ph. and later, *Fl. Chile* vi. 158 (1911), as *C. paniculatum* Hook.

Atriplex taltalensis Johnston, *supra* pg. 30.

Collected on the rocky floor of a quebrada near Antofagasta (*J.* 3635). This material is not quite typical, having reddish stems that are somewhat more slender and foliage that is slightly less scurfy than in the type.

Suaeda foliosa Moq. in DC. *Prodr.* xiii. pt. 2, 156 (1849).

Collected near Iquique by Rose (no. 19450). The plant reported

as *S. divaricata*, also from Iquique, is probably the same, Reiche, Grundz. Pfl. Chile 165 (1907).

NYCTAGINACEAE

Oxybaphus elegans Choisy in DC. Prodr. xiii. pt. 2, 431 (1849).
Growing on a hillside near Tocopilla (*J.* 3593).

AIZOACEAE

Tetragonia maritima Barn. in Gay, Fl. Chile ii. 469 (1846).

A shrub 5–10 dm. tall collected near Antofagasta by Pennell (no. 13029) and by Rose (no. 19420 in pt.).

Tetragonia ovata Ph. Anal. Univ. Chile lxxxv. 168 (1893).

Known from near Antofagasta (*Pennell* 13024; *J.* 3643) and Tocopilla (*Reiche*, *Mozer*, *J.* 3598). The report of *T. crystallina* from Antofagasta by Herzog, Meded. Rijks Herb. no 40, 12 (1921), is probably based upon a misdetermination of this species.

PORTULACACEAE

Calandrinia capitata H. & A. Bot. Misc. iii. 334 (1833).

Growing on a gravelly hillside near Tocopilla (*J.* 3592).

Calandrinia calycina Ph. Fl. Atac. 21 and Viage Des. Atac. 195 (1860).

In sandy places near Antofagasta (*J.* 3652) and on a gravelly hillside near Tocopilla (*J.* 3590).

Calandrinia cephalophora Johnston, supra pg. 35.

Collected in a quebrada near Antofagasta (*Pennell* 13032) and on a gravelly hillside near Tocopilla (*J.* 3591, type).

Calandrinia chrysantha, sp. nov., annua herbacea glaberrima; radice palari; caulibus simplicibus vel saepe fere a basi in ramos laxo ascendentes plures 3–5 cm. longos ca. 2 mm. crassos decompositis ad apicem versus foliatis et inde a pedunculo gracili aphylo 4–6 cm. longo terminatis; foliis obovatis carnosius inferioribus laxo rosulatis 4–6 cm. longis 2–3 cm. latis obtusis infra medium in petiolum 1–2 cm. longum contractis, caulinis paucis ovato-lanceolatis, supremis non rariter suboppositis; corymbo 2–3 cm. crasso laxiflori; bracteis corymbi lanceolatis vel subulatis 2–4 mm. longis; pedicellis gracilibus ascendentibus vel vetustate deflexis 8–12 mm. longis; sepalis ca. 5 mm. longis late orbicularibus conspicue nigro-venosis equitantibus exteriori imam ad basem subamplexicauli; petalis aureis orbicularibus 4–5 mm. longis apice rotundis sepala vix superantibus; staminibus ca.

11-13; capsula globoso-ovoidea sepalis subaequali ca. 5 mm. longa; seminibus numerosis ca. 0.9 mm. longis minute tuberculatis.—CHILE: on a gravelly steep hillside near Caleta Duendes near Tocopilla, Oct. 18, 1925, *Johnston 3589* (TYPE, Gray Herb.).

This species belongs to Reiche's section *Rosulatae* and is apparently most closely related to *C. cymosa* Ph. from which it differs in having larger and broader petals and sepals, narrow bracts, broader and larger capsules and bright green herbage. It was noted in the field that the calyxes of *C. chrysantha* were clammy and slightly glutinous.

Calandrinia cachinalensis Ph. Fl. Atac. 20 and Viage Des. Atac. 194 (1860).

I refer here doubtfully a very mature and incomplete specimen from Antofagasta (*Pennell 13025*). Although denuded of most of the inflorescence and lacking the root the specimens seem very similar to authenticated material of *C. cachinalensis*. The seeds are covered with short brownish hairs.

Calandrinia grandiflora Lindl. Bot. Reg. xiv. t. 1194 (1828).

Reiche, Grundz. Pfl. Chile 165 (1907), reports this species from Iquique. I feel confident, however, that study will show that this species does not occur in our area and that Reiche has misdetermined his plant. He probably had one of the large coarse species of the genus but which one I do not care to guess.

Silvaea amarantoides Ph. Fl. Atac. 22 and Viage Des. Atac. 196 (1860).

Growing on dunes at the foot of the hills near Antofagasta (*J. 3653*).

CARYOPHYLLACEAE

Drymaria cordata (L.) Willd. ex R. & S. Syst. v. 406 (1819).

Collected on a gravelly hillside near Tocopilla (*J. 3620*).

Spergularia aberrans, sp. nov., perennis; caulibus numerosis gracilibus e caudice fruticoso prostrato laxo ramoso decumbentibus numerosis 1.5-3 dm. longis sparse breviterque villosis glandulosis internodiis 1.5-4 cm. longis; foliis linearibus subteretibus 1.5-2.5 cm. longis 0.6-1 mm. latis cuspidulatis glabratis rariter glandulosis quam internodiis brevioribus; stipulis 5-7 mm. longis hyalinis lanceolatis attenuatis apicem versus non rariter laciniatis basi connatis; floribus paucis cymosis; bracteis linearibus 3-5 mm. longis; pedicellis glanduloso-puberulentis 5-20 mm. longis ascendentibus; sepalis anguste lanceolatis 6-7 mm. longis 1-1.2 mm. latis acutis glandulosis puberulentis margine anguste scariosis; petalis albis oblongo-ovatis ca. 2 mm. latis sepalis aequilongis apice acutis; staminibus 5 ca. 3 mm.

longis ovario ellipsoideo breviter stipitato sesquilingioribus; stylo 1–1.3 mm. longo in media parte trilobato; capsula trivalva ca. 6 mm. longa ad 2.5 mm. crassa cylindrico-lanceolata sepalis maturis paullo breviori; seminibus ignotis.—CHILE: sprawling from rock crevices in a quebrada near Antofagasta, Oct. 19, 1925, *Johnston 3631* (TYPE, Gray Herb.).

This species is most closely related to *S. stenocarpa* (Ph.) Johnston and *S. fasciculata* Ph. It is, however, readily distinguished by its habit and few (only 5) stamens. In its reduced androecium and united styles the species is atypical of its genus. Mature seeds indubitably of this species I have not seen. There are, however, a few seeds of apparently a *Spergularia* which were adhering to the plant and probably were produced by it. These are dull black, ca. 0.8 mm. long, narrowly wing-margined and sparsely tuberculate on the sides.

CAPPARIDACEAE

Cleome chilensis DC., var. **pubescens** DC. Prodr. i. 239 (1824).

Growing on a gravelly slope near Tocopilla (*J. 3601*) and in Queb. Huantajaya near Iquique (*Werdermann 765*). Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

CRUCIFERAE

Menonvillea parviflora Ph. Fl. Atac. 8 and Viage Des. Atac. 182 (1860).

What is apparently a form of this species was collected at Tocopilla by Reiche. It is probably this collection that is reported from Tocopilla by Reiche, Grundz. Pfl. Chile 166 (1907), as *M. Gayi*.

Descurainia minutiflora (Ph.) Reiche, Anal. Univ. Chile xc. 148 (1895) and Fl. Chile i. 118 (1896).

I refer here a collection from a gravelly hillside near Tocopilla (*J. 3600*). Although the type of *D. minutiflora* came from the puna in Los Andes, Argentina, it agrees with the collection from Tocopilla in the flowers, size and shape of fruit, inflorescence and cut and size of leaves.

Sisymbrium sagittatum H. & A. Bot. Misc. iii. 139 (1833).

Collected near Tocopilla (*Reiche*) and on the gravelly floor of a quebrada near Antofagasta (*J. 3641*).

Mathewsia collina, sp. nov., fruticosa decumbens 3–5 dm. alta; ramis ascendentibus vel erectis albidis leviter stellatis; foliis confertis pinnatifidis vel pinnatipartitis 4–6 cm. longis 1.5–3 cm. latis pallide viridibus cum pilis minutis stellatis vestitis subsessilibus basi semi-

amplexicaulibus et saepe subauriculatis ambitu oblongo-ob lanceolatis, lobis pluribus 3-7-jugatis oblongis obtusis; pedunculis 3-6 cm. longis; pedicellis ascendentibus 8-14 mm. longis; sepalis ca. 7 mm. longis 2-2.5 mm. latis oblongis obtusis leviter stellatis; petalis ochroleucis spathulatis ca. 11 mm. longis ca. 2.5 mm. latis obtusis longe angustaeque unguiculatis; filamentis 5 et 6 mm. longis glabris linearibus; antheris erectis 2.5-3 mm. longis; pistilo 6-7 mm. longo sessile; stylo ca. 0.5 mm. longo; stigmatibus capitatis; ovario dense minuteque stellato-canescenti ca. 40-ovulato; siliquis 2.5-3 cm. longis 4-5(-6) mm. latis dense canescenter stellato-tomentosis; seminibus brunneis ruguloso-tuberculatis.—CHILE: a small erectly branched bush on a hillside near Caleta Duendas near Tocopilla, Oct. 18, 1925, *Johnston 3599* (TYPE, Gray Herb.).

This plant is obviously related to *M. laciniata* Ph. and to *M. foliosa* H. & A. From the former, with which it is probably most closely related, it agrees in having broad auriculate leaf-bases, pubescent fruit, etc., but differs from it in its rather smaller flowers, very conspicuously less dense pubescence and green rather than canescent more lobed leaves. From *M. foliosa*, which ranges south of Coquimbo, it differs in its pubescent usually narrower fruit, and less deeply lobed and more densely pubescent leaves.

LEGUMINOSAE

Cassia Brongniartii Gaud. Voy. Bonite, Bot. Atlas t. 10 (1840-42). *C. conjugata* R. & P. ex Benth. Trans. Linn. Soc. xxvii. 50 (1871).

The material used as the basis of the beautiful plate of *C. Brongniartii* probably came from Cobija, for material cited by Benth, l. c., as representative of the synonymous species *C. conjugata*, includes a collection made at Cobija by Gaudichaud.

Hoffmanseggia gracilis (R. & P.) H. & A. Bot. Misl. iii. 209 (1833).

Growing on a gravelly hillside near Tocopilla (*J. 3622*).

Astragalus viciiformis Ulbr. Bot. Jahrb. xxxvii. 550 (1906).

Collected on a hillside near Tocopilla (*J. 3621*) and in Queb. Huan-tajaya near Iquique (*Werdermann 754*). Previously this species has been known only from Mollendo.

Astragalus melanogonatus Johnston, supra pg. 52.

Growing in sandy places at the foot of the hills near Antofagasta (*J. 3632*).

Adesmia tenella H. & A. Bot. Beechey Voy. 19 (1830).

A colony of this species was found on a gravelly hillside near Tocopilla (*J.* 3623).

OXALIDACEAE

Oxalis ornithopus Ph. Fl. Atac. 13 and Viage Des. Atac. 187 (1860).

Growing on a rocky slope in the hills near Tocopilla (*J.* 3595).

Oxalis micrantha Bertero ex Colla, Mem. Accad. Torino xxxvii. 50 (1831).

Collected on a gravelly slope near Tocopilla (*J.* 3596).

Oxalis bulbocastanum Ph. Anal. Univ. Chile lxxxii. 1095 (1893).

Collected in Queb. Huantajaya near Iquique by Werdermann (no. 762). Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

Oxalis gageiflora Knuth, Meded. Rijks Herb. Leiden no. 27, 65 (1915).

This species was based upon material collected at ca. 300 m. alt. in the hills near Antofagasta by Herzog. I know it and the following species only from description.

Oxalis occidentalis Knuth, Meded. Rijks Herb. Leiden no. 27, 66 (1915).

Described from material collected at ca. 300 m. alt. near Antofagasta by Herzog.

TROPAEOLACEAE

Tropaeolum leptoceras, sp. nov., scandens glaberrimum; caulibus tenuibus; foliis peltatis fere ad basem in lacinas 5–6 stellatim distantes spatulatas vel oblanceolatas rotundas vel obtusiusculas 8–15 mm. longas 4–8 mm. latas dissectis 1.5–3 cm. diametro; petiolis 1–2 cm. longis contortis exstipulatis; floribus in axillis foliorum solitariis 2.5–5 cm. longe pedunculatis 2–2.5 mm. longis; calcare ab insertione pedunculi usque ad apicem 8–10 mm. longo recto subulato flavo vel paullo brunnescenti apertura 1–2 mm. diametro; sepalis ovatis vel ellipticis flavis 4–5 (maturitate ad 6) mm. latis subimbricatis basi 2–4 mm. longe connatis apice rotundis; petalis subhomomorphis luteis calycem conspicue superantibus obovatis integerrimis sed apice breviter emarginatis 7–8 mm. latis unguiculatis, lamina (ungue incluso) ca. 11 mm. longa; fructibus ignotis.—CHILE: growing in shelter of rocks on a hillside near Caleta Duendas near Tocopilla, Oct. 18, 1925, *Johnston 3597* (TYPE, Gray Herb.).

In Reiche's treatment of the Chilean species, Fl. Chile i. 297 (1896), this species keys out with *T. brachyceras* H. & A., from which it differs in its elongate very slender spur and very much larger petals. It

seems, however, to be most closely related to *T. Kingii* Ph. of Atacama. From that species it differs in its larger flowers, straight more slender subulate spur, larger more richly colored emarginate petals and much larger leaves. The root-structures are not known. Its obvious relatives, however, are all said to have small tubers.

MALPIGHIACEAE

Dinemandra ericoides Juss. Ann. Sci. Nat. ser. 2, xiii. 255 (1840).

The type of this species was collected at Cobija by Gaudichaud. Material has also been collected near Antofagasta (*Rose 19412*; *J. 3647*). In my collection from Antofagasta the third stamen exhibits all degrees of development in the size of anther and in length of filament.

EUPHORBIACEAE

Chiropetalum canescens Ph. Fl. Atac. 49 and Viage Des. Atac. 223 (1860). *Argyrothamnia Sponiella* Müll. Arg. Linnaea xxxiv. 148 (1865).

An erect tufted perennial growing in rock-crevices in the hills near Antofagasta (*J. 3646*). The type of *A. Sponiella* was collected by Gaudichaud near Cobija.

MALVACEAE

Palaua inconspicua, sp. nov., annua herbacea; caulibus erectis vel plus minusve decumbentibus solitariis vel pluribus 1-2 dm. longis gracilibus simplicibus vel rarius breviter sparseque ramosis subangulatis vel teretibus pilis stellatis minutis numerosis vestitis internodiis 1-6 cm. longis; foliis vix rosulatis homomorphis supremis reductis; lamina orbiculari-cordata vel reniformi-cordata obtusa 1-3.5 cm. longa et lata plus minusve obscure 3-5-lobata basi cordata supra pilis stellatis minutis sparse vestita, subtus pallidiori pilis stellatis minutis numerosis et nerviis 5 palmatis prominentibus ornata; petiolis gracilibus medio-caulinis laminae subaequilongis pilis stellatis numerosis vestitis; stipulis subulatis persistentibus 2-5 mm. longis ciliatis; pedunculis gracilibus 1-3 cm. longis pilis stellatis vestitis axillaribus 1-5-floris; pedicellis gracillimis 1-4 mm. longis; calyce ad anthesim campanulato 2-3 mm. longo pilis stellatis vestito 5-lobato, fructifero depresso globoso 3-4 mm. longo, lobis ovatis; petalis albis 2-3 mm. longis calycem vix superantibus; fructu per calycem occulto depresso 3-4 mm. diametro; carpidiis 20-25 monospermis ca. 0.9 mm. longis glabris rugosis fuscis compresso-ovoideis; seminibus ca. 0.7

mm. longis.—CHILE: infrequent on a gravelly hillside near Tocopilla, Oct. 18, 1925, *Johnston 3617* (TYPE, Gray Herb.). PERU: infrequent in sandy soil at the lower edge of the fertile belt in hills back of Molendo, Dept. Arequipa, Oct. 16, 1925, *Johnston 3565*.

A species closely related to *P. modesta* (Ph.) Reiche of the Paposo region, but differing in being distinctly annual, in having shorter less conspicuously spreading hairs and smaller corollas. My collections of the new species have dried a pale green but those of *P. modesta* have dried very dark.

Malvastrum peruvianum (L.) Gray, Bot. U. S. Explor. Exped. 146 (1854).

Growing on a gravelly hillside near Tocopilla (*J. 3618*).

Cristaria diversifolia Ph., f. **parvula** (Ph.) Johnston, supra pg. 76.

Local on a gravelly bench in a quebrada near Antofagasta (*J. 3630*). I doubtfully also place here collections from a hillside near Tocopilla (*J. 3619, 6298*). This latter material although having simple basal leaves has those of the stems deeply lobed. The collection from Antofagasta has all the leaves simple and with straight entire margins.

Cristaria formosula Johnston, supra pg. 74.

Growing in sandy soil in and just below a quebrada in the hills near Antofagasta (*J. 3629*). An excessively mature plant collected by Pennell (no. 13020) near Antofagasta is probably the same.

FRANKENIACEAE

Frankenia chilensis Presl, var. **aspera** (Ph.) Johnston, supra pg. 77. *F. farinosa* Remy, Ann. Sci. Nat., Bot. ser. 3, viii. 236 (1847).

I refer here material collected near Antofagasta by Rose (*sine num.*). The type of Remy's species was collected near Cobija by Gaudichaud.

VIOLACEAE

Viola polypoda Turcz. Bull. Soc. Nat. Moscou xxxvi. pt. 1, 555 (1863). *V. Werdermannii*, f. *glaberrima* Becker in Fedde, Repert. xxiii. 223 (1926).

Known from rocky quebradas near Antofagasta (*Rose 19424, Pennell 13034, J. 3642*) and from ca. 700 m. alt. in the hills near Iquique (*Werdermann 760*). The collection from Iquique is the basis of *V. Werdermannii*, f. *glaberrima*. My collection from Antofagasta was determined as *V. Werdermannii* Becker by the author of the species. The petals are yellow.

MALESHERBIACEAE

Malesherbia humilis Poepp. in Froriep, Notizen xxiii. 291 (1829).

Collected on a hillside near Tocopilla (*J.* 3614) and in the hills near Antofagasta (*Pennell* 13033, *J.* 3627). I also have material from Blanco Encalada a locality ca. 15 km. inland from Antofagasta. Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

LOASACEAE

Mentzelia ignea (Ph.) Urb. & Gilg. in E. & P. Nat Pflanzenf. iii. Abt. 6a, 110 (1894).

Reported from Cobija where it is said to have been collected by Gaudichaud, cf. Urban & Gilg, Monog. Loasac. 59 (1900). Reiche, Grundz. Pfl. Chile 166 (1907), reports it from Tocopilla.

Loasa urens Jacq. Obs. ii. 15, t. 38 (1767).

Frequent on a gravelly hillside near Tocopilla (*J.* 3616). Urban & Gilg, Monog. Loasac. 235 (1900), doubtfully refer to the species a collection made by Gaudichaud at Cobija.

Loasa sessiliflora Ph. Anal. Univ. Chile lxxxv. 12 (1893).

I refer to this very distinct species a battered collection from a bare rocky quebrada near Antofagasta (*Pennell* 13026). The material although very mature agrees well with authenticated collections from the type-region.

Loasa tricolor Ker, Bot. Reg. viii. t. 667 (1822).

Material referable to a variety of this species or to a closely related undescribed species was collected on gravelly slopes near Tocopilla (*J.* 3615) and in a quebrada near Antofagasta (*J.* 3628). The same form has been collected as far south as Taltal.

Loasa longiseta Ph. Anal. Univ. Chile xxvii. 347 (1865).

Reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

CACTACEAE

Opuntia sphaerica Först. Hamb. Gartenz. xvii. 167 (1861).

Collected near Antofagasta by Rose (no. 19523) and by Pennell (no. 13038). Pennell describes the petals as "Eugenia-red."

Opuntia

A low yellow-flowered species of this genus is reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

Cereus iquiquensis K. Schum. Monatsschr. Kakteenk. xiv. 99 (1904).

The type of this species was collected at Iquique by Reiche. Britton & Rose, Cact. ii. 83 (1920), report the species from Iquique and

Antofagasta. The large columnar cactus I observed in the hills near Tocopilla and Antofagasta obviously belongs here. The plant from Mejillones reported as *Eulychnia breviflora* by Philippi, Viage Des. Atac. 34 (1860), is no doubt the same.

Echinocactus marginatus Salm-Dyck, Allg. Gartenzeit. xiii. 386 (1845).

Collected by Pennell (no. 13039) and by Rose (no. 19410) near Antofagasta whence it is also reported by Britton & Rose, Cact. iii. 86 (1922). The types of this species and its several synonyms were probably obtained at Cobija as that was a frequented port-of-call during the first half of the last century when the plants were collected. The material from Cuming and from Bridges mentioned by Schumann, Kakteen 311 (1898), almost certainly came from Cobija.

ONAGRACEAE

Oenothera verrucosa Johnston, Contr. Gray Herb. lxx. 77 (1924).
Oe. arequipensis Munz & Johnston, Contr. Gray Herb. lxxv. 20 (1925).

I refer here a plant which was frequent on a gravelly hillside near Tocopilla (*J.* 3602). The yellow petals are ca. 8 mm. long and the hypanthium is 1–1.5 cm. long. It seems necessary to admit in the present species considerable variation in size of flower. It is separated from *Oe. laciniata* Hill by having a shorter and stouter straight capsule noticeably contracted at the base and apex. From *Oe. coquimbensis* Gay it differs in having ovoid rather than decidedly fusiform seeds.

Oenothera coquimbensis Gay, var. **grandidentata** (Ph.) Reiche, Anal. Univ. Chile xcvi. 476 (1897) and Fl. Chile ii. 258 (1898).

Frequent in sandy places near Antofagasta (*J.* 3640). This is the large-flowered form. The mature bud is 12–15 mm. and the hypanthium 1–1.6 cm. in length.

UMBELLIFERAE

Apium laciniatum (DC.) Urban in Mart. Fl. Bras. xi. pt. 1, 343 (1879).

Reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

APOCYNACEAE

Skytanthus acutus Meyen, Reise i. 376 (1834).

A shrub half buried in the dunes at the foot of the hills near Antofagasta (*J.* 3649).

ASCLEPIADACEAE

Cynanchum viride (Ph.) Reiche, Anal. Univ. Chile cxviii. 159 (1906) and Fl. Chile v. 113 (1910).

Scrambling over rocks on the floor of a quebrada near Antofagasta (*J.* 3650).

POLEMONIACEAE

Gilia glutinosa Ph. Linnaea xxx. 196 (1859). *G. cobijanensis* Brand, Pflanzenr. [Heft. 27] iv. Fam. 250, 98 (1907).

Material referable to this species is given by Brand, l. c., as collected at Cobija by Gaudichaud and at Iquique by Reiche.

BORAGINACEAE

Coldenia litoralis Ph. Fl. Atac. 37 and Viage Des. Atac. 211 (1860).

Scattered on a sandy coastal plain at the foot of the hills near Antofagasta (*J.* 3658). The nutlets are slightly more prominently roughened than in material from further south. The corolla is bluish.

Coldenia grandiflora Ph. Cat. Pl. Itin. Tarapacá 55 (1891).

On dunes near Antofagasta (*J.* 3660). The corollas are large and bright blue in color.

Heliotropium

An apparently unnamed species, belonging to the immediate group of *H. floridum* Clos, has been collected near Antofagasta (*Pennell* 13022) and near Iquique (*Salinas*). The material available is inadequate for a thorough study of the plant, cf. Johnston, Contr. Gray Herb. lxxxix. 38 (1928):

Cryptantha filiformis (Ph.) Reiche, Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichium mite* Ph. Anal. Univ. Chile xc. 539 (1895). *C. mitis* Reiche, l. c.

Collected near Tocopilla (*Vidal*, type of *E. mite*; *J.* 3578), in Queb. Huantaca near Iquique (*Martens*), in Queb. Huantajaya near Iquique (*Werdermann* 764) and near Caleta Buena (*Paessler*). The plant was incorrectly reported from Tocopilla and Iquique under the name *C. subamplexicaulis* by Reiche, Fl. Chile v. 231 (1910).

Cryptantha filaginea (Ph.) Reiche, Anal. Univ. cxxi. 829 (1908) and Fl. Chile v. 234 (1910).

Growing in a quebrada near Antofagasta (*J.* 3659).

Cryptantha glomerata Lehm. ex F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1836).

Growing on a steep hillside near Tocopilla (*J.* 3577). This is the coarse northern form described as *Eritrichium strictum* Ph.

Amsinckia hispida (R. & P.) Johnston, Contr. Gray Herb. lxxiii. 75 (1924).

Growing on hillsides near Tocopilla (*Gülland, J. 3576*) and in Queb. Huantajaya near Iquique (*Werdermann 761*).

LABIATAE

Salvia paposana Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860). Infrequent on gravelly slopes near Tocopilla (*J. 3624*).

Stachys grandidentata Lindl. Bot. Reg. xiii. t. 1080 (1827).

This species is reported from Tocopilla by Reiche, Grundz. Pfl. Chile 166 (1907). The correctness of the determination is most questionable and I suspect that the plant is probably referable to *S. pannosa* Ph., a species which occurs in the Paposo region.

NOLANACEAE

Nolana Gayana (Gaud.), comb. nov. *Alibrexia Gayana* Gaud. Voy. Bonite, Bot. Atlas tab. 105 (1842-46).

I refer here material collected by Martens at Iquique in 1904. Gaudichaud's plate seems to represent the plant found about Lima which was treated by Lindley, Bot. Reg. xxx. sub t. 46 (1844), as *Alona revoluta* and by Miers, Illust. So. Pl. i. 61 (1850), as *Alibrexia revoluta*. This plant may perhaps be *Nolana revoluta* R. & P., Fl. Peruv. ii. 8, t. 113 (1799), a species based only upon a drawing of a plant from near Camaná in southern Peru. The illustration given, however, shows a glabrous plant with a "ventricose" calyx rather different in shape from the Lima plant. The specimens from Iquique differ from those from Lima in having a longer, rather shaggy pubescence on the stems leaves and calyx, and perhaps a less densely villous corolla-tube. Otherwise, however, it seems quite similar.

Periloba longifolia (Lindl.) Johnston, supra pg. 104. *Nolana grandiflora* Herzog, Meded. Rijks Herb. no. 29, 21 (1916).

Collected near Antofagasta (*Pennell 13019, J. 3638*), Tocopilla (*J. 3604*) and Iquique (*Werdermann 757, Rose 19448*). All this material is slightly smaller throughout than are the common forms of this polymorphous species from further south. The type *N. grandiflora* was collected by Herzog near Antofagasta.

Bargemontia linearifolia (Ph.) Johnston, supra pg. 109. *Nolana linearifolia* Ph. Anal. Univ. Chile xci. 28 (1895). *N. decemloba* Herzog, Meded. Rijks Herb. no. 29, 20 (1916).

The type of *N. decemloba* was collected by Herzog near Antofagasta. It seems to be distinguishable from *N. linearifolia* only by its slightly

smaller corollas. I have seen collections from near Antofagasta (*Pennell 13021, 13027; J. 3637*). The species varies much in the abundance of the glandular puberulence on the herbage, some plants being almost glabrous, others densely glandular puberulent.

Bargemontia aplocaryoides (Gaud.) Johnston, supra pg. 110. *Leloutrea aplocaryoides* Gaud. Voy. Bonite, Bot. Atlas tab. 110 (1842-46). *Alona pusilla* Ph. Fl. Atac. 45 (1860).

Collected on the dry gravelly plain at the base of the hills near Antofagasta (*J. 3639*). The specimens upon which the original plate of *L. aplocaryoides* was based were almost certainly collected by Gaudichaud at Cobija.

Bargemontia sedifolia (Poepp.) Johnston, supra pg. 110 *Dolia vermiculata* Lindl. Bot. Reg. xxx. sub t. 46 (1844).

Growing in a bare rocky quebrada near Antofagasta (*Pennell 13035*).

Bargemontia clivicola, sp. nov., fruticosa ramosissima erecta pilis minutis erectis abundantibus simplicibus glanduliferis inconspicue oblecta; ramulis gracilibus cortice subpallida vestitis usque ad 2 mm. crassis ca. 5 cm. longis, internodiis 2-10 mm. longis; foliis in nodis solitariis vel rariter subfasciculatis anguste spathulatis 7-10 mm. longis 1-1.5 mm. latis compressis paullo carnosulis apice rotundis ad basem versus evidenter contractis; floribus in axillis foliorum solitariis; pedicellis gracilibus 4-9 mm. longis erectis vel ascendentibus maturitate paullo accrescentibus vix deflexis; calyce 10-12 mm. longo, tubo poculiformi 2-3 mm. longo, lobis linearibus ca. 8 mm. longis ca. 1 mm. latis inaequalibus erectis vel leviter ascendentibus apice rotundis; corolla caerulea subtubulosa lobos calycis paullo vel vix superanti 12-14 mm. longa intus glaberrima extus supra medium sparse adpresse villosa, tubo 3-4 mm. longo ca. 1 mm. crasso, faucibus ca. 8 mm. longis ca. 2.5 mm. crassis subcylindricis, lobis ad 2 mm. longis ovatis obtusis ascendentibus; filamentis glaberrimis ca. 4 mm. supra basem corollae affixis 3 et 4.5 mm. longis e faucibus vix exsertis; stylo ca. 1 cm. longo; nuculis saepe ca. 5 ovoideis nigris basi affixis maturitate calycem distendentibus uniseriatis.—CHILE: a bush growing in rocky places in the *Cereus*-belt on the hills near Tocopilla, Oct. 18, 1925, *Johnston 6307* (TYPE, Gray Herb.).

Probably most closely related to *B. foliosa* (Ph.) Johnston of the interior northeast of Tocopilla. It differs from that species, however, in having the more nearly cylindrical corolla scarcely if at all surpassing the calyx-lobes and in being not at all villulose. The stems, leaves, pedicels and calyces in *B. clivicola* are all covered with a short erect simple glandular puberulence which though copious is rather inconspicuous.

Bargemontia inconspicua, sp. nov., fruticosa ut videtur depressa ramosissima pilis villosis erectis sordidis simplicibus glanduliferis dense evidenterque oblecta; ramulis 4–8 cm. longis usque ad 2 mm. crassis, internodiis 3–10 mm. longis; foliis in nodis solitariis vel subfasciculatis linearibus 8–10 mm. longis 1–1.5 mm. latis carnosulis compressis submarcescentibus apice rotundis ad basem versus vix contractis; floribus in axillis foliorum solitariis; pedicellis ad anthesim 1–2 mm. longis erectis deinde saepe crescentibus, fructiferis robustioribus 3–4 mm. longis prope basem deflexis; calyce ad anthesim ca. 12 mm. longo, tubo subcylindrico ad basem versus crassissimo 3–3.5 mm. crasso 7–8 mm. longo, lobis linearibus vel lanceolato-linearibus ca. 5 mm. longis inaequalibus erectis obtusis; calyce fructifero 12–14 mm. longo, tubo subgloboso 4–5 mm. crasso; corolla caerulea ca. 12 mm. longa lobos calycis paullo vel vix superanti intus glaberrima extus supra medium sparse adpresseque villosa, tubo 3–4 mm. longo ca. 1 mm. crasso, faucibus 8–9 mm. longis apicem versus paullo ampliatis ca. 2.5 mm. crassis, lobis 1.5–2 mm. longis late ovatis ascendentibus; filamentis glaberrimis 5–5.5 mm. supra basem corollae affixis 2 et 3 mm. longis e faucibus vix exsertis; stylo ad 1 cm. longo; nuculis saepe ca. 5 ovoideis 1.7–2.2 mm. longis nigris basi affixis maturitate calycem distendentibus et mox eum lateraliter horizontaliterque rumpentibus.—CHILE: vicinity of Antofagasta, Oct. 31, 1914, *Rose 19416* (TYPE, U. S. Nat. Herb.).

This plant is very closely related to *B. clivicola* and perhaps may be only a pronounced variety of it. It differs, however, in having recurved fruiting pedicels, much distended fruiting calyces, a conspicuous glandular-villous indument and linear or strap-shaped leaves. It also appears to be a lower and a coarser plant than *B. clivicola*.

Bargemontia mollis (Ph.) Johnston, supra pg. 109.

Herzog, Meded. Rijks Herb. no. 29, 22 (1916), reports the synonymous *Dolia macrocalyx* Ph. from Antofagasta. The determination is almost certainly incorrect.

Bargemontia tocopillensis, sp. nov., fruticosa laxa decumbens glandulosa inconspicue sparseque tomentosa ramosa; ramulis 3–10 cm. longis ca. 1 cm. crassis ascendentibus cum pilis simplicibus mollibus flexuosis vix abundantibus laxa tomentosis et glanduloso-puberulentibus cortice pallido oblectis, internodiis 1–12 mm. longis; foliis fasciculatis 2–6 mm. longis crassiusculis compressis ligulatis ad basem versus latioribus 0.7–1.5 mm. latis ad apicem versus paullo attenuatis obtusis inconspicue glanduliferis cum pilis villosis flexuosis sparse laxaque tomentosis margine leviter revolutis; floribus e fasci-

culis foliorum erumpentibus solitariis; pedicellis gracilibus 2–4 mm. longis ascendentibus sparse tomentosis; calycibus 5–6 mm. longis laxè sparseque tomentosis, tubo poculiformi ad 2.5 mm. longo 2 mm. crasso, lobis linearibus erectis inaequalibus ca. 3 mm. longis herbaceis; corolla caerulea 15–16 mm. longa anguste infundibuliformi extus glabrata intus ad basem versus sparse villosa, tubo ca. 1 mm. crasso ca. 4 mm. longo lobos calycis paullo vel vix superanti, faucibus 9 mm. longis sursum gradatim ampliatis ad summam partem ca. 8 mm. diametro, lobis ca. 3 mm. longis suborbicularibus ascendentibus vel subpatentibus; antheris 4–5 mm. supra basem corollae affixis 2.5 et 4.5 mm. longis ad basem versus sparse villosis; stylo ca. 1 cm. longo glaberrimo; nuculis maturitate ignotis.—CHILE: rocky place on slope in *Cereus*-belt on hillside near Tocopilla, Oct. 18, 1925, Johnston 3603 (TYPE, Gray Herb.).

A very distinct species characterized by its elongate corollas which are merely sparsely villous within, its ligulate fasciculate leaves, its depressed spreading habit and its very sparse tomentose indument and intermixed copious inconspicuous glandular puberulence. The species has also been collected at Tocopilla by Mozer and by Reiche. It is probably most closely related to **B. leptophylla** (*Dolia leptophylla* Miers), the type of which was collected by Cuming (no. 956) at Cobija, Iquique or Arica! In that species, however, the corolla, which is about as long as in *B. tocopillensis*, has an abruptly dilated campanulate throat, the calyx-lobes are triangular and the leaves are covered with a dense gray tomentum. Whether or not Miers's species has the corolla villous within I do not know. Probably also a relative of the new species is **B. alibrexoides** (*Velpeaulia alibrexoides* Gaud.). The source of the latter is not given although it is rather probable that it came from Cobija. Its leaves are spatulate, the indument is not at all tomentose and the more tubular corolla is quite glabrous inside.

Bargemontia peruviana Gaud. Voy. Bonite, Bot. Atlas tab. 8 (1839–42).

Collected near Antofagasta by Rose (19420 in pt.) and Pennell (13017). Benthams & Hooker, Gen. Pl. ii. 880 (1876), report a collection made by Pearce at Cobija. The specimens forming the basis of the admirably detailed plate of *B. peruviana* were almost certainly collected by Gaudichaud at Cobija.

SOLANACEAE

Lycium chañar Ph. Cat. Pl. Itin. Tarapacá 68 (1891).

Reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

In his *Flora of Chile*, v. 317 (1910), however, he does not report the species from so far north.

Solanum phyllanthum Cav. *Icones* iv. 35, t. 359 (1797).

A single plant was collected on a hillside near Tocopilla (*J.* 3607).

Solanum brachyantherum Ph. Anal. Univ. Chile xliii. 522 (1873).

I have seen collections from Antofagasta (*Rose* 19419, *Pennell* 13031, *J.* 3636) and Tocopilla (*J.* 3605). Reiche, *Fl. Chile* v. 339 (1910), reports it from Tocopilla and Iquique. Under the name *S. flexuosum* it was reported from Mejillones by Philippi, *Fl. Atac.* 42 and *Viage Des. Atac.* 34, 216 (1860), and from Iquique by Reiche, *Grundz. Pfl. Chile* 165 (1907).

Solanum chilense (Dunal) Reiche, *Anal. Univ. Chile* cxxiv. 742 (1909) and *Fl. Chile* v. 358 (1910).

The type of this species was collected at Cobija by Gaudichaud. I collected it on a rocky slope near Tocopilla (*J.* 3606).

Cacabus

Reported from Iquique by Reiche, *Grundz. Pfl. Chile* 165 (1907). Later, however, Reiche, *Fl. Chile* v. 322 (1910), makes no mention of the plant as occurring near the coast. The determination might have resulted from a misidentification of some species of *Nolanaceae*.

Schizanthus lacteus Ph. *Fl. Atac.* 45 and *Viage Des. Atac.* 219 (1860).

Frequent on the gravelly floor of a quebrada near Antofagasta (*J.* 3633). This is the typical white-flowered form. A very mature collection made by Pennell (no. 13028) near Antofagasta is probably the same.

Schizanthus fallax, sp. nov., annuus herbaceus erectus 2–5 dm. altus laxe ascendenterque longi-ramosus; caulibus inconspicue hispidulis plus minusve glanduliferis; foliis pinnatisectis 4–9 cm. longis 12–30 mm. latis sparse hispidulis margine ciliatis, lobis distantibus paucidentatis vel breviter sparsilobulatis; pedicellis 3–12 mm. longis ascendentibus; calyce 3–5 (fructiferis ad 10) mm. longo 5-partito appresse hispiduloso plus minusve glandulifero, lobis herbaceis paullo inaequilongis lineari-spathulatis vel vere spathulatis cum apice rotundis; corolla 14–18 mm. longa, tubo 3–4 mm. longo 1.5–2 mm. crasso calyce breviori, lobo supremo late obovato 6–8 mm. longo caeruleo integerrimo apice rotundato, lobis lateralibus latis emarginatis nullo modo lobatis caeruleis quam lobo supremo paullo brevioribus; labio tripartito, parte mediale albo cucullato 4–5 mm. longo quam partibus lateralibus falcatis lineari-spathulatis albis vel rariter caeruleis obtusis evidenter breviori; faucibus ochroleucis purpureo-lineatis.—CHILE:

frequent on gravelly slopes on hillsides near Tocopilla, Oct. 18, 1925, *Johnston 3626* (TYPE, Gray Herb.).

This species, which is the most northern of its genus, is related to *S. pinnatus* R. & P., but differs in having the large upper lateral-lobes of the resupinate corolla merely emarginate and not deeply 4-cleft or 4-lobed. The uppermost lobe of the corolla is proportionately larger and the lower smaller than in *S. pinnatus*. In the coloration of the flower and in the gross habit of the plant *S. fallax* seems very similar to its relative.

Salpiglossis brachysiphon, sp. nov., erecta 2–6 dm. alta gracilis ramosissima, partibus inferioribus glandulari-villosulis sed partibus superioribus glabrescentibus vel stipitato-glanduliferis; caulibus pluribus teretibus ad basim subfruticulosus et caudicem humilem laxum formantibus; foliis axillaribus alternis, inferioribus conspicue pinnatifidis 3–7 cm. longis 1–2 cm. latis lobis irregulariter lobulatis vel dentatis, superioribus et mediis integerrimis lanceolato-linearibus 1–3.5 cm. longis 1–3 mm. latis acutis, supremis gradatim ad bracteas lineares 0.5–1 cm. longas reductis; pedicellis gracilibus laxe ascendentibus 2–5 cm. longis apicem versus dense glanduliferis; calycibus 3–4 mm. longis fusco-nervatis glanduliferis irregulariter breviter dentatis, dentibus erectis vix 1 mm. longis; corolla caesia 7–8 mm. longa extus sparsissime glandulifera intus glaberrima, tubo ad 3 mm. longo cylindrico in calyce occulto, faucibus obliquis ca. 2 mm. longis gradatim ampliatis, limbo obliquo cum nerviis purpureo-marginatis reticulato, labio superiori trilobato, lobo supremo longissimo et latissimo elliptico recto ca. 3 mm. longo ca. 2.5 mm. lato apice rotundo, lobis lateralibus et inferioribus oblongis ca. 2.5 mm. longis; staminibus 4 didynamis inclusis 2 mm. supra basem corollae affixis inferioribus ca. 3 mm. longis, superioribus brevioribus ca. 1.5 mm. longis, antheris suis quam eis in filamentis longioribus triplo majoribus; stigmatibus eodem *S. chilensis* persimili; capsula calyce persistente investita ovoidea ca. 3 mm. longa; seminibus prismaticis brunnescentibus numerosis alveolatis.—CHILE: infrequent on gravelly slopes in the hills near Tocopilla, Oct. 18, 1925, *Johnston 3625* (TYPE, Gray Herb.).

This is a brittle clammy glandular plant with dilute-blue flowers. It is clearly a close relative of *S. chilensis* (Gay) Wett., from which it differs in its larger calyx, which includes the tube of the less elongated corolla, in its less reduced upper leaves, in being more glandular and in having definitely alveolate seeds.

SCROPHULARIACEAE

Calceolaria paposana Ph. Fl. Atac. 46 and Viage Des. Atac. 220 (1860).

Reported from Tocopilla by Reiche, Grundz. Pfl. Chile 166 (1907) and Fl. Chile vi. 30 (1911).

BIGNONIACEAE

Argylia radiata (L.) Don, Edinb. Philos. Jour. ix. 261 (1823).

Collected on a gravelly bench in a quebrada near Antofagasta (*J.* 3648). Reiche, Grundz. Pfl. Chile 166 (1907), reports the plant from Tocopilla under the name *A. puberula*. The synonymous *A. Feuillei* DC. is reported from Cobija by Gay, Fl. Chile iv. 409 (1849).

PLANTAGINACEAE

Plantago litorea Ph. Fl. Atac. 46 and Viage Des. Atac. 220 (1860). Growing on dunes near Antofagasta (*J.* 3651).

RUBIACEAE

Galium Aparine L. Sp. Pl. 108 (1753).

Collected at ca. 700 m. alt. in Queb. Huantajaya near Iquique by Werdermann (no. 763). Also reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

CUCURBITACEAE

Sicyos bryoniaefolius Moris, Mem. Accad. Torino xxxvii. 106, t. 6 (1831).

Trailing over rocks on a hillside near Tocopilla (*J.* 3594). The fruit is nearly glabrous. Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

COMPOSITAE

Ophrysosperus triangularis Meyen, Reise i. 402 (1834).

Collected near Antofagasta by Pennell (no. 13018) and near Cobija by Gaudichaud.

Gnaphalium sphacelatum HBK., var. **chilense** DC. Prodr. vi. 234 (1837).

A frequent annual on hillsides near Tocopilla (*J.* 3588).

Perityle Emoryi Torr., var. **elata** (Ph.) Johnston, supra pg. 127.

Growing in sandy soil (*J.* 3654) and in a bare rocky quebrada (*Pennell* 13030) near Antofagasta. A plant from Klatt's herbarium, now in the Gray Herbarium, determined as "*Villanova oppositifolia*" and collected at Cobija by Gaudichaud, although too mature for certainty, seems also referable here.

Perityle discoidea (Ph.) Johnston, supra pg. 128.

On a gravelly hillside near Tocopilla (*J.* 3585).

Bahia ambrosioides Lag. Gen. et Sp. Nov. 30 (1816).

Growing at ca. 200 m. alt. in a quebrada near Antofagasta (*Pennell* 13023) and on a rocky slope with *Cereus* in the hills near Tocopilla (*J.* 3587). Reiche, Grundz. Pfl. Chile 166 (1907), also reports it from Tocopilla.

Amblyopappus pusillus H. & A. Jour. Bot. iii. 321 (1841).

I found a small colony of this on a gravelly slope near Tocopilla (*J.* 3586) whence it has also been reported by Reiche, Grundz. Pfl. Chile 166 (1907).

Senecio leptanthus Ph. Anal. Univ. Chile lxxxviii. 15 (1894).

Growing on the gravelly floor of a quebrada near Antofagasta (*J.* 3655).

Polyachyrus annuus Johnston, supra pg. 134.

Growing on a gravelly hillside near Tocopilla (*J.* 3583, type) and in Queb. Huantajaya near Iquique (*Werdermann* 758).

Polyachyrus roseus Ph. Fl. Atac. 28 and Viage Des. Atac. 202 (1860).

Collected near Antofagasta by Rose (no. 19418). I collected an annual, apparently juvenal plant of this species in a quebrada near Antofagasta (*J.* 3656).

Leucheria modesta (Ph.) Reiche, Anal. Univ. Chile cxvi. 192 (1905) and Fl. Chile iv. 415 (1905).

I collected this species on a gravelly slope in the hills near Tocopilla (*J.* 3584) whence it was reported by Reiche, l. c.

Sonchus tenerrimus L. Sp. Pl. 794 (1753).

There is a specimen of this species from Tocopilla in the museum at Santiago which is apparently the basis of Reiche's, Grundz. Pfl. Chile 166 (1907), report of it from that locality.

FAMILY UNKNOWN

Tetreilema boliviense Turcz. Bull. Soc. Nat. Moscou xxxvi. pt. 2, 200 (1863).

The type of this species was collected by d'Orbigny (no. 276) at Cobija. Turczaninow described two species under his genus *Tetreilema* neither of which has been identified. He placed *Tetreilema* in the *Verbenaceae* but it seems probable that the two species represent different genera and perhaps even distinct families.



Johnston, I. M. 1929. "The flora of the Nitrate Coast." *Contributions from the Gray Herbarium of Harvard University* (85), 138–163.

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