



THE COASTAL PORTIONS OF THE DEPARTMENTS OF CHAÑARAL AND TALTAL. THE LINE OF DOTS AND DASHES INDICATES THE ROUTE TRAVERSED BY THE AUTHOR IN 1925.

CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY

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By IVAN M. JOHNSTON

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I. PAPERS ON THE FLORA OF NORTHERN CHILE

1. THE COASTAL FLORA OF THE DEPARTMENTS OF CHAÑARAL AND TALTAL

THE coastal portions of the departments of Chañaral and Taltal are classical in Chilean botany since Philippi obtained there a very large proportion of the plants he described and named in that pioneer floristic work on northern Chile, the *Florula Atacamensis*. The region is of interest botanically, however, for more than mere sentimental associations. From it were obtained the type-material of some of the common plants of northern Chile. Furthermore the area is remarkable for the large number of species restricted to it or ranging only a short distance beyond its borders. It is a center of pronounced endemism. Probably most attractive to the field-botanist, however, are the close proximity and the violent contrasts of lush mesophytic and decidedly xerophytic plant-associations that have resulted through the localized effect of sea-fog in this prevailing desert region.

The area here treated lies west of long. $70^{\circ} 20'$ W. and consists of the adjoining parts of the provinces of Atacama and Antofagasta, approximately those between lat. $24^{\circ} 30'$ and $26^{\circ} 30'$ S. It fronts the ocean for about 200 km. and, because of irregularities in the coastline, varies between 20 and 45 km. in breadth.

In topography the country is rough. The northern quarter of the area includes the tip of a broad tongue of high land extending from the Cordilleras. This prominent land-mass maintains an altitude of 1500 to 3000 m. and runs to within 10–15 km. of the ocean, dominating the coast for about 80 km. north of Paposo. At no other place in all northern Chile does such a mass of high land so closely approach the ocean. In this region the ridges, rising directly from the narrow coastal plain reach an average height of about 1000 m. In the larger part of our area, that lying to the south of Paposo, the prevailing altitudes are below 1500 m. with only a few scattered points reaching towards 2000 m. The topography here is similar to that in the contiguous regions that extend south towards Coquimbo. It may be described as rising towards the east and covered with numerous hills and small mountain ranges that become higher and more massive as they approach (well beyond our eastern limit) the main Cordilleras.

In the southern half of the area the drainage consists in the main of broad gently descending valleys with dry stream-channels, the branches of which penetrate into the Cordilleras. In the northern

part, however, owing to the high mass of land mentioned, the drainage consists primarily of short, frequently abrupt stream-ways extending only 30 km. or much less into the interior. Throughout the whole region the stream-ways are normally devoid of all running water. Except for a few moist areas that have developed as a result of obstructions of the small sub-surface drainage, these stream-beds are dry and carry water only in the extremely rare periods of copious showers.

Meteorological data are available for only one locality. Observations made at the port of Taltal, alt. 39 m., over a period of ten years are summarized in the *Anuario Estadístico* 1926, vol. i, 4 (1927). These show that the average temperature for the year is 17° C., the average for January (midsummer) being 21.6° C. and that of July (midwinter) being 13.8° C. For the ten years the absolute minimum temperature noted was 5.8° C. and the absolute maximum 30.9° C. These figures are probably characteristic for the coastal plain throughout the length of our area, although they no doubt average several degrees low for the drier interior parts.

The precipitation is excessively scanty and erratic. So far as records are available for the eight years ending with 1921 the average precipitation at Taltal appears to be about 11 mm. yearly. Including these eight years and the following four, through 1925, the average becomes 16 mm. The most of the rainfall each year comes as the result of one relatively large shower. The following tabulation of the precipitations for the years 1919 to 1925 (all available), adapted from the *Anuario Estadístico* for the years 1920 to 1926, although apparently representing a wet cycle, give an idea as to the character and distribution of the rains at Taltal. Along the eastern border of our area, of course, the fall is much less and, especially in the northern part, may be quite lacking.

ANNUAL RECORD OF PRECIPITATION AT TALTAL

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	20.8	14.0	1 viii	10	4
1924	14.4	6.5	10 ix	9	4
1923	20.8	12.0	9 vii	11	7
1922	17.1	3.4	9 v	15	5
1921	4.9	2.0	2 viii	6	2
1920	28.8	14.0	21 vi	6	6
1919	10.6	5.3	29 vi	8	?

Fortunately, however, the meager precipitation is more or less offset by the effects of the wet sea-fogs, the so called "camanchaca." This

fog hangs usually somewhere between altitudes of 300 and 800 m. and drifts landward against the peaks and ridges facing the ocean or through breaks in the chain of coastal hills somewhat into the interior. Near the shore the camanchaca, lowering somewhat at night and rising a little in the morning, may hang at its characteristic altitude for days at a time wreathing the peaks and slopes exposed in a dense cloud and moistening them with mists resulting from its condensation. A definite belt is thus formed on these fog-bathed slopes, in which, especially during the winter, the humidity is high and where frequent protection is afforded against the desiccating effects of the sun. The soil is much moister than in those places depending on the scanty rain and develops a very much more dense vegetation. Because the high coastal ridges in the region north of Paposo are an almost complete obstruction to the fog in its easterly off-sea drift and consequently retain practically all of it banked upon their slopes this section benefits most strikingly from the camanchaca. In this region the fog-bathed slopes have a particularly luxuriant winter- and spring-vegetation and develop a definite fertile zone, which viewed from a distance on a clear day, appears as a distinct green belt on the mountainside.

About Taltal and to the southward the effects of the camanchaca are usually neither so localized nor so conspicuous. The ridges near the ocean are lower and interrupted by the broad mouths of valleys. As a result the fog is not so completely held back and its effects so narrowly concentrated as north of Paposo, but is able to drift inland and dissipate its moisture over a larger area. Except for a few places with special local conditions, the slopes in this region are moistened by fog only as it slowly drifts in passing. The vegetation here is hence less luxuriant and shows less contrasts than further north, but on the other hand it does extend further inland.

The slopes frequently bathed by the sea-fog support three characteristic plants. These are *Cereus spinibarbis*, *Cereus coquimbano* and *Euphorbia lactiflua*. Although growing on the moistest of slopes and frequently covered with fruticose and foliose lichens or even supporting the large epiphyte, *Tillandsia Geissei*, these plants, like all the other shrubs in the fog-belt are xerophytic in type, for otherwise they could not persist during the dry fogless days of summer. Being conspicuous and common plants and growing in any abundance only on those slopes frequently wreathed in fog they are the outstanding species of the zone which because of the comparative luxuriance of its flora has, for convenience, been termed the "fertile belt." As has been already intimated this fertile belt is best developed and most sharply demarked on the hills about Paposo and northward to Miguel Diaz. There the

two species of *Cereus* and the *Euphorbia* are dominant, growing scattered over the slopes or with such species as *Oxalis gigantea*, *Heliotropium Philippianum*, *Salvia Gilliesii*, and *Proustia tipia* forming small thickets. The epiphytic lichens are large and conspicuous. Under the bushes grows *Polypodium Espinosae* and occasionally with it, but more frequently upon stems of shrubs and cactus is found its congener, *P. masafuerae*. About the shrubbery are found numerous small perennials. There are tufted grasses of the genera *Poa*, *Eragrostis*, *Elymus*, *Koeleria*, *Trisetum*, *Stipa* and *Nassella* and attractive species of the higher monocotyledons belonging to the genera *Scilla*, *Leucocoryne*, *Cummingia*, *Zephyra*, *Hippeastrum*, *Alstroemeria*, *Tigridia*, *Sisyrinchium* and *Bipinnula*. Among the dicotyledons the conspicuous perennials are members of the genera *Sisymbrium*, *Trifolium*, *Astragalus*, *Linum*, *Palaua*, *Hypericum*, *Cryptantha*, *Verbena*, *Calceolaria*, *Solanum*, *Bahia* and *Polyachyrus*. The annuals are not especially conspicuous. *Erodium cicutarium* is a common ground cover. Other herbs most frequently belong to the genera *Drymaria*, *Stellaria*, *Lepidium*, *Lotus*, *Adesmia*, *Palaua*, *Malvastrum*, *Centaurium* and *Amblyopappus*. About rocky places in the fertile belt grow the large and very conspicuous *Nicotiana solanifolia* and *Puya copiapina*. The distinctive *Peperomia Doelli* with its succulent green and red leaves and the beautiful violet-flowered *Alstroemeria violacea* also frequent such habitats.

South of the region about Paposó, as already suggested, the fertile belt is less conspicuously developed. Only in a few places as, for example, the head of the high line of sea-cliffs near Aguada Grande is a comparable luxuriance approached. These places, however, are not extensive. In the area about Taltal the camanchaca, merely impeded by a few high hills, drifts inland gradually thinning and eventually disappearing in the dry air encountered there. The slopes of the various hills brushed by the fog, hence, vary according to their location in the amount of moisture they receive from it and consequently in the degree of luxuriance of their flora. Distinctions between the fertile and the non-fertile area are by no means so sharp as further north, the vegetation on the fog-bathed slopes imperceptibly changing as it recedes from the sea from rather mesophytic to more and more decidedly xerophytic, thus becoming more and more like that on the slopes outside the fog-belt until quite indistinguishable in composition. Only those slopes in the fog-belt near the sea are moistened sufficiently to bear a good stand of *Cereus* and *Euphorbia*. Only these I have considered as a part of the fertile belt. But even here the flora is not so rich as further north.

Below the fog-belt the vegetation has to depend for moisture upon some such meager precipitation as that reported at Taltal. Although getting scanty moisture from the clouds, the region, particularly near the shore, gets some benefits from them in the form of increased humidity and their protection from the direct sun. North of Paposo the region below the fertile belt consists of the lower slopes of the hills and the narrow coastal plain. The conditions are desert. The shrubs are strong xerophytes with narrow usually thickened foliage. The most important of these are *Heliotropium pycnophyllum*, *Ophryosporus triangularis* and *Chuquiraga ulicina* which are frequently joined by *Encelia canescens*, *Tetragonia maritima* and several species of *Bargemontia* and *Atriplex*. Several species of *Echinocactus* are present but the large glaucous *E. cinereus* is the most common and conspicuous of them all. Among the herbaceous plants the species of *Calandrinia*, *Adesmia*, *Oxalis* and *Cristaria* are especially numerous and conspicuous. Outstanding species of other genera are *Notholaena mollis*, *Viola polypoda*, *Loasa Bertrandi*, *Loasa tricolor*, *Cruckshanksia pumila* and *Perityle Emoryi*. South of Paposo many of these herbs and perennials extend inland and, particularly on the hills near Taltal, may occur with some of the herbs that center in the fertile belt. In the sand along the ocean are found such characteristic dune plants as *Dioscorea fastigiata*, *D. cylindrostachya*, *Microphyes litoralis*, *Cristaria thinophila*, *C. viridiluteola*, *Skytanthus acutus* and *Coldenia litoralis*.

The flora of the slopes and ridges projecting above the fog-belt and particularly that of the hills facing the ocean north of Paposo is an especially interesting one. On ascending these slopes from the fertile belt it becomes very obvious that soil-moisture decreases rapidly. The rich flora of the fertile belt gives away in an ascent of a few hundred meters first to an arid scrub composed of *Echinocactus* and low bushes, then to a meager association of very hardy deep-rooted xerophytes and finally at about 1000 m. to completely desert slopes absolutely devoid of plants. These barren crests are apparently above the level of shower-bringing clouds and appear to be exposed to the glare of the sun for practically the year round.

Constituting the scrub zone above the fertile belt in the region north of Paposo I found *Echinocactus cinereus* and some of its smaller congeners, and such shrubs as *Ephedra* sp., *Krameria cistoidea*, *K. iluca*, *Adesmia Diaziana*, *Errazurizia multifoliolata*, *Parosela azurea*, *Balbisia peduncularis*, *Llagunoa glandulosa*, *Verbena selaginoides*, *Salvia Gilliesii*, *Bargemontia villosa*, *B. sedifolia*, *Lycium deserti*, *Baccharis taltalensis*, *Chuquiraga ulicina*, etc. Some of these range

down into the upper parts of the fertile belt, others occur in the dry coastal slopes below the fertile belt, while still others are plants of the dry interior. The herbaceous perennials and annuals are similarly heterogeneous. The plants growing at the very limit of vegetation are *Calandrinia sitiens*, *Cassia Brongniartii*, *Adesmia viscidissima*, *Oxalis ericoides*, *Viola Johnstonii*, *Bargemontia linearifolia*, *Heliotropium chenopodiaceum* and *Argyria sitiens*.

The interior back of the coastal hills north of Paposo is quite barren being shut off from the effects of fog by the coastal ridges and in addition, for the most part, projects high above the fog-belt. From Taltal southward the interior shows varying effects, although slight, from the thin fog which occasionally drifts over it. Most of the plants in the region, however, grow in stream-ways where they seem able to obtain some moisture deep in the gravel. The most characteristic of these are the shrubs, *Gypothamnium*, *Oxyphyllum* and *Chiquiraga*. Frequently associated with them are such species as *Heliotropium pycnophyllum*, *H. linariaefolium*, *Bargemontia villosa*, *Senecio Almeidae*, *Gutierrezia taltalensis*, *Gymnophyton foliosum* and *Ophryosporus triangularis*. The herbaceous flora is similar, although much poorer as to species and individuals, to that found along the coast below the fertile belt.

Ecologically the area treated in the present paper is in the main a section of the southern extension of the plant formation which is well developed in Peru and has been treated as the Loma Zone or Loma Formation by Weberbauer, Engler & Drude, *Veg. Erde* xii. 134-149 (1911). This formation can be traced south to between Huasco and Coquimbo. In Chile it is best developed in our area. Although similar in appearance and developing in response to similar climatic and topographic factors, the Loma Formation in Chile differs noticeably from that of Peru in the species associated in it. Many of the genera, however, are the same. If any of our area is to be excluded from the Loma Formation it must be that part along the eastern border in the interior. This region seems to be transitional to the more strictly desert formation which, developing beyond the influence of coastal fog and below 1500 m. alt., extends in the interior from approximately the latitude of Taltal south to about that of Vallenar.

Phytogeographically most of the plants in our area seem to be obviously southern in affinity. Such genera, however, as *Eragrostis*, *Drymaria*, *Alternanthera*, *Cleome*, *Hoffmanseggia*, *Parosela*, *Croton*, *Palaua*, *Malvastrum*, *Eremocharis*, *Nama*, *Salvia*, *Dicliptera*, *Stevia* and *Bidens* have a marked affinity to the northward and for the most part seem to be Loma-types. *Errazurizia*, *Perityle* and *Malacothrix* have

their closest relatives in California or Baja California. *Limonium plumosum* appears to be most closely related to species in the Mediterranean region. *Fagonia* and *Sonchus*, which occur in other parts of Chile and in California, also show this affinity. *Krameria iluca* and *Euphorbia minuta* are of interest, since outside of the Pajonero region they are known only from high altitudes on the puna to the northeast of our area near the Argentine frontier. Somewhat similar is the case of *Salvia Gilliesii* which outside of our area is known only from beyond the Cordilleras in Paraguay and in northern and central Argentina.

Full recognition is given in the present paper to 394 species and varieties. Of this number over one third or some 145 are endemic to the area. More than half of the plants treated do not range south of the Copiapó Valley nor north to Tocopilla. There are four endemic genera, a crucifer, *Werdermannia*, an umbellifer, *Domeykoa*, and two mutisioid composites, *Gypothamnium* and *Oxyphyllum*. The umbellifer has two species while the other three genera are monotypes.

The first collecting done in our area was by R. A. Philippi who traversed the length of it between Dec. 8th and 24th, 1853 and two weeks later, Jan. 9-11, 1854, crossed it on the way from Taltal to the Cordilleras. Philippi landed at Chañaral on Dec. 8th and went inland to the copper mines at Las Animas and to those, in the valley to the north, at Salado. He returned to Chañaral on Dec. 11th and next day followed the shore north to Caleta de Pan de Azucar and then turned inland to the water-hole called Cachinal de la Costa where he camped for the night. This water-hole is unquestionably that now known in the region and shown on my map as Aguada Grande. The morning of Dec. 13th was spent there. Starting at 2 o'clock in the afternoon a march northeasterly for eight hours brought him to a dry camp-site which he calls Cachiyuyal. The exact location of this place is uncertain although it must be about 10 km. south of what is now called Agua de la Isla. Crossing a small pass, Portezuela de la Tapaderas, and traversing the eastern part of the Llano Colorado, Philippi proceeded north the next day, Dec. 14th, to Breas where he turned westward and descended the Valle [or Quebrada] de Tartal [Taltal] to Agua del Clérigo. He camped at Agua del Clérigo the nights of Dec. 14th and 15th. This locality is described by Philippi as located on the eastern flank of Cerro de Hueso Parado, i. e. Cerro Perales, just northeast of the present town of Taltal. Agua del Clérigo is probably that now known as Agua de Perales, a spring situated at the south base of Cerro Perales or may possibly be the water-hole, located in the quebrada which cuts deeply into the southeast flank of the mountain, known as Agua de la Lora. Philippi

collected about Cerro Perales and to the westward along the shore now called Caleta de Hueso Parado. The specimens which he obtained while camping at Agua del Clérigo are for the most part merely labeled as from "Hueso Parado." During his visit the town of Taltal was as yet unfounded. The morning of Dec. 16th Philippi left Cerro Perales by the direct trail to Caleta de Hueso Parado and turning north, going over Malpaso or Paso Malo, continued along the coast to Estancia Vieja where he camped and from which he continued next morning along the coast around the promontory of Punta Grande to Paposo. The old village of Paposo, where Philippi had his headquarters until Dec. 22nd, lies a short distance to the north of the present town of that name. Philippi explored the coastal plain about the town and made one excursion into the hills above visiting Quebrada [or Cajon] del Guanillo on Dec. 20th. In the quebrada he penetrated to about the point where Mina Abundancia is now located. He mentions visiting Agua de Perales, located in the mouth of the quebrada, and, further up, Agua de Arriba. The latter station is unquestionably that now called Posada. During the vain hunt for certain trails he appears to have ascended the sides of the quebrada and got well into the fertile belt. Late in the afternoon of Dec. 22nd Philippi again started northward along the coast camping that night north of Punta del Rincon at a place he calls El Médano. The following day he visited Agua de Panul and Aguada de Miguel Diaz and camped a little north of Botija. On Dec. 24th he continued north to El Cobre. Subsequently he went to Mejillones by boat. He returned by water and landing at Caleta de Tartal [Taltal] on Jan. 8th, 1854. After spending several days in outfitting for his journey in the Cordilleras he again left Agua del Clérigo on Jan. 11th and proceeded up Quebrada de Taltal past Breadal to Cachiyuyal. This latter locality is a different one from that which he visited on Dec. 13th. On Jan. 12th Philippi continued eastward to Cachinal de la Sierra and hence well beyond our area.

The plants which Philippi collected in our area together with those he obtained in the Cordilleras became the basis of his well known *Florula Atacamensis*. Almost all the species he treated in this work were newly described. Unlike many of his later species, however, these appear to be mostly valid. More than half of the total number of species described in the *Florula Atacamensis* were based upon collections from our area. Philippi's herbarium is now preserved in the Museo Nacional at Santiago. Some of the material he collected is also to be found, usually under ambiguous labels, in various herbaria in Europe.

Associated with Philippi's collections in the herbarium at Santiago are four other important, though much smaller and less representative ones made by San Roman, Larrañaga, Borchers and Darapsky. Those by Francisco San Roman are mostly from Esmeralda or Sierra Esmeralda and were made in 1883-4. San Roman, however, also collected at Paposo, Breas and Valle Salado. Almiro Larrañaga made a large collection in 1888 at Breas. This consists of some plants from the dry interior but mostly from the fertile belt. I suspect, therefore, that although labeled as from Breas they may have come in fact from some of the fertile slopes nearer Taltal. Augusto Borchers made collections between 1887 and 1889. The largest number of plants were obtained by him in Oct. 1887 when he appears to have visited Taltal, Hueso Parado, Caleta Oliva and Paposo. Luis Darapsky collected about 1889, almost entirely in the vicinity of Taltal.

Carlos Reiche, during an investigation of *Euphorbia lactiflua* as a possible rubber-plant, visited the area in 1909, cf. Opazo & Reiche, Anal. Agron. iv. 189-237 (1909). Coming overland from Caldera he entered the area from Pozo de Guamanga on Sept. 14, 1909 and went by way of Las Animas to Chañaral. On Sept. 16th going north along the coast to Pan de Azucar he turned inland to Las Bombas, and, the following day went from there north to La Isla. Traveling via Breas he arrived at Taltal on Sept. 18th. After having explored a short distance along the coast south of Taltal he continued on Sept. 20th northward to Paposo. He made a hasty visit to Quebrada de Perales, i. e. Quebrada Guanillo, and along the coast towards El Rincon and on Sept. 22nd returned to Taltal from which he sailed for Valparaiso. There are a few specimens in the museum at Santiago that were collected by Reiche during this journey. Apparently the chief result of the visit was the paper, "Ein Frühlingsausflug in das Küstengebiet der Atacama," Bot. Jahrb. xlv. 340-353 (1911), containing many distributional and ecological notes on the flora of the area.

During October and November 1925, E. Werdermann collected in the region about Taltal. The material which he obtained has been distributed widely in his admirable set of Chilean exsiccatae and is to be found in many of the leading herbaria in America and Europe.

My own collecting in our area (for route see PLATE 1) began on Oct. 28th, 1925, when I arrived at Barquito by train from Potrerillos. The next two days I collected on the slopes and crests directly back of that port and a few kilometers along the coast toward the south, finally returning to Potrerillos late in the day on Oct. 30th. About

a month later I returned to the area, landing at Taltal on Nov. 23rd. On Nov. 25th I went about 10 km. up Quebrada de Taltal and returned to the port along the crest of the hills south of the quebrada. The following day I collected in and about Quebrada de San Ramon, which opens at the far end of Caleta de Hueso Parado just north of Taltal. I ascended the quebrada 7-10 km. The day of Nov. 28th I followed the coast north to Cachinalcito. The next day I proceeded to Paposo following the foot of the hills and going up over the ridge directly back of Punta Grande eventually joining the telegraph trail some 2-3 km. north of the tip of that promontory. Continuing north along the coast on Nov. 30th I reached Aguada del Cardon, a spring in a small quebrada just south of Punta Plata, and next day arrived at Aguada de Miguel Diaz. On Dec. 2nd I visited the adjacent Punta de dos Reyes, ascended the ridge back of it to the very crest of the mountain and returned to the water-hole down a ridge just to the south, thus making a complete circuit of Aguada de Miguel Diaz. The next day I collected in the quebrada above and below the water-hole. The day following I retraced my route south to Agua del Panul where I arrived early in the afternoon. Slides having destroyed the trail by which my animals could obtain water I was forced to leave Agua Panul the morning of Dec. 5th and move a few kilometers south to Aguada de Panulcito. From my camp here I ascended an old but very well marked trail to the very crest of the coastal hills and visited the abandoned Andacolla Mine. Provisions having become exhausted, I returned to Paposo on Dec. 6th. The next day I visited El Rincon, a very foggy and fertile corner in the hills east of Punta del Rincon and just north of Paposo. Here I was again able to reach the very crest of the coastal hills, ascending a well defined trail that leads to the abandoned Parañas Mine. Starting again from Paposo on Dec. 8th, I visited Quebrada Guanillo, ascended it to Mina Abundancia and then cut west across a barren plateau to the head of the abandoned incline-railroad that scars the flank of Cerro Yumbes directly east of Paposo. From this ridge-crest I returned to town by way of a small grassy quebrada that joins Quebrada Guanillo near Agua Perales. On Dec. 9th I returned to Taltal. On Dec. 11 I went up Quebrada Taltal a few kilometers and thence north to Cerro Perales. I ascended this peak following a trail up the principal quebrada on the southeast side, visiting en route Agua de la Lora. After attaining the summit I descended the rough western side of the mountain to a point just west of Agua de Perales. I visited these springs and then followed the well marked trail to Caleta de Hueso Parado and thence to Taltal. On Dec. 13th I left

Taltal, traversed Quebrada de los Changos and skirted the western end of Llano Colorado eventually getting south to Posada Hidalgos. The following day I continued southward by a trail not shown on any map available to me and so consequently I am somewhat uncertain as to its exact path. Leaving the wagon-road and tending more directly southward I followed an obscure trail that starts off through the hills at Posada Hidalgos from near the water-hole and just to its left as one approaches it from the road. After several hours of travel with my pack-train I reached what my guide called Pique de Jacinto Diaz. This is a well dug in a broad sandy stream-way that a short distance below plunges into a gorge on its westerly course to the sea. I judge that Pique de Jacinto Diaz must be at the western or southwestern end of the Sierra Esmeralda. After passing the well the trail, avoiding the gorge, veered to the left and entered another broad quebrada down which I descended until it was joined by another on the right. Ascending this latter to its head I came to what my guide termed the Portezuela de Mina Carola. This is a high pass in the Sierra Esmeralda, adjacent to the Carola Mine, which looks out over a vast tract of land to the south. Descending a steep trail I arrived in Quebrada de la Cachina and followed that stream-way down to the water-hole, some 5 km. from the coast, known as Aguada de la Cachina. On Dec. 15th I visited the crest of the high sea-cliffs to the west and followed them south to their highest point which is known as Cerro de la Cachina. I returned to camp over the dissected granitic plain that stretches south from Aguada de la Cachina. The following day I collected in the region about the water-hole and next day, after retracing my steps a short distance up Quebrada de la Cachina, traveled south until I met the telegraph-line which I then followed southwesterly almost to the coast. That night I camped at Aguada Grande, just within the Department of Chañaral and in the upper part of a quebrada the head of which is at the crest of some very high foggy sea-cliffs. Philippi visited this locality and called it Cachinal de la Costa. I collected in the quebrada about the water-hole, along the crest of the adjacent sea-cliffs and off towards the high headland to the west. On Jan. 18th I followed down the quebrada until it joined Quebrada de Pan de Azucar and then turned west to Caleta de Pan de Azucar. From there I followed the coast to Chañaral and Barquito. The following day I left for Copiapó by rail. I collected in the area 930 numbers.

I keenly enjoyed the period I spent traveling and botanizing in the region. Much of this pleasure can be attributed to the friendliness and courtesy I met everywhere. Several people, however, were

particularly helpful. Through the kindness of Mr. William Wraith, of the Andes Copper Company, I was permitted to start my collecting journeys in northern Chile in the friendly surroundings at Potrerillos where I obtained much help and experienced advice. As a guest of the Company I was also permitted to stay in its house at Barquito while collecting about that port. Mr. J. D. Timberlake, of Copiapó, was another extremely kind and very helpful friend. At Taltal, Mr. A. Campbell, Agent for Grace & Co., was very obliging. Through him I was able to obtain quickly information regarding trails and to get equipped. From Don Celedonio Prado, of Paposo, I also had much valued assistance. Lacking even a letter of introduction I was received by him most hospitably and even provided with provisions on credit. This courtesy made it possible for me to botanize on the rich slopes about Paposo for several days longer than would otherwise have been possible. To all these gentlemen and to the many others who helped me less conspicuously I wish again to state my appreciation of their kindnesses and to give them once more and now publicly my thanks. I hope that their amused curiosity as to why a botanist should deliberately select such a "desert" as a field for collecting may find some answer in this paper.

This paper on the coastal flora of the departments of Chañaral and Taltal is based chiefly upon a study of my collections in the area. These I determined by comparison with Philippi's types at the Museo Nacional in Santiago. I made notes on most of the specimens from the area which are contained in the Museum there and have incorporated these in the present report. After my return to the United States in 1926 the literature on the subject was thoroughly overhauled and my determinations were again checked by material available for comparison there. I have also had assistance from several specialists, particularly from Dr. Carl Epling (*Labiatae*), Prof. A. S. Hitchcock (*Gramineae*), Dr. R. Knuth (*Oxalis*), Dr. F. W. Pennell (*Scrophulariaceae*), Prof. R. Pilger (*Plantago*), Dr. E. E. Sherff (*Bidens*), Mr. L. B. Smith (*Bromeliaceae*), and Dr. E. Werdermann (*Cactaceae*). Prof. Robinson and Mr. Weatherby of the staff of the Gray Herbarium have also assisted me, the former determining my *Compositae-Eupatorieae* and the latter my *Pteridophyta*. To all these persons and to Prof. Francisco Fuentes, who allowed me the important privilege of studying in the Philippi Herbarium, I wish to express my appreciation and thanks for the help without which my task could scarcely have been completed.

CATALOGUE OF SPECIES

POLYPODIACEAE¹

Dryopteris rivularioides (Fée) C. Chr. ex Rosenstock, Hedwigia xlvii. 125 (1906).

This large fern was seen only at Ag. Panul (*J.* 5422) where a local colony of it was found in wet gravel in the lower part of the gulch just above the water-hole. It was determined by Dr. Christensen who wrote regarding it: "The specimen is a mature one and apparently young leaves are rather hairy . . . traces of pubescence are evident. . . In *D. rivularioides* the indusia are small and early falling; very likely the Chilean form has similar indusia. In the creeping rhizome, shape and texture, revolute margins, glands, etc., it agrees closely with *D. rivularioides*. This species is common in southern Brazil, Uruguay, Northern Argentina and Paraguay, growing in humid localities. . . Fern species of marshes and bogs are . . . of a very wide distribution and therefore I do not consider it improbable that *D. rivularioides* occurs in the lowlands west of the Andes. . . All things considered, I prefer to name your specimen *D. rivularioides*, although it, according to the label, grows much larger than any other form seen by me." The plants at Ag. Panul grow 12 dm. tall.

Asplenium fragile Presl, var. **lomense** Weatherby, var. nov., palearum cellulis medianis quadrato-oblongis, lumina magna; frondibus adultis 15–22 cm. longis; stipitibus castaneo-brunneis; laminis linearibus, adultis 10–18 cm. longis, circa 1.5 cm. latis; rachibus brunneis, haud marginatis; pinnis saturate viridibus 24–40-jugis levissime trilobatis vel undulatis, 6–8 mm. longis, 4–8 mm. latis, marginibus integris, costis plus minusve evidenter evolutis ad basin versus subtus coloratis apice saepe furcatis, nervillis 2–3-jugis subremotis simplicibus furcatis vel in latere superiore basali bifurcatis.—CHILE: under rocks in bottom of the gulch above the water-hole at Aguada del Panul, Dept. Taltal, Dec. 4, 1925, *Johnston 5421* (TYPE, Gray Herb.)—PLATE 2, FIG. 1.

Only a single colony of this plant was found. It grew in a moist sheltered place under large rocks on the floor of the steep gulch directly above the watering place at Ag. Panul. The variety differs from typical *A. fragile* in having the stipes and rachis brown rather than merely fuscous beneath and the pinnae bright green, and quite thin with their margins or those of the lobes entire rather than pale green and coriaceous with their margins or those of their lobes crenate-

¹ The determinations and systematic notes on this family have been contributed by Mr. C. A. Weatherby.

dentate. Although the material from Ag. Panul is quite distinct in appearance from all other forms of *A. fragile* there seem to be no characters by which they can be specifically separated. A detailed discussion of this group of *Asplenium* will be published in another place.

Pellaea ternifolia (Cav.) Link, Fil. Hort. Berol. 59 (1841).

Growing under rocks on the arid slopes above the fertile belt above Ag. Panulcito (*J.* 5453) and Ag. Miguel Diaz (*J.* 5305). The two collections represent a form with leaflets proportionately broader than is usual in this species, the sterile ones being nearly orbicular.

Adiantum chilense Kaulf., var. **hirsutum** Hook. in Hook. & Grev. Icon. Fil. ii. t. 173 (1829). *A. glanduliferum* Link, Hort. Bot. Berol. ii. 18 (1833). *A. pilosum* Fée, Gen. Fil. 118 (1850-52).

Growing on a moist hillside at Ag. Cardon (*J.* 5296) and in moist soil under rocks in the quebrada at Ag. Miguel Diaz (*J.* 5307). The plant varies widely in the size and shape of the pinnules, which run from truncate to cuneate at the base. As there appears to be no character except pilosity on the lower surfaces of the pinnules whereby this can be separated from typical *A. chilensis*. Hooker is followed in treating it as a variety of that species.

Notholaena mollis Kunze, Linnaea ix. 54 (1834); Ph. Fl. Atac. 56 and Viage Des. Atac. 27, 230 (1860).

This is the most common fern in our area. It grows about rocks or on cliffs frequently in rather dryish places in the lower part and well below the fertile belt. It was collected near Ag. Grande (*J.* 5764), in the hills southeast of Taltal (*J.* 5124), in Queb. San Ramon (*J.* 5131), between Cachinalcito and Queb. Tunas (*J.* 5172), in Queb. Guanillo near Ag. Perales (*J.* 5587), near Punta del Rincon (*J.* 5257) and near Ag. Miguel Diaz (*J.* 5308). The plants vary greatly in size, the fronds from 0.9 to 4.1 dm. tall, and more or less in the amount of indument.

Notholaena bonariensis (Willd.) C. Chr. Ind. Fil. 459 (1906).

This species was observed only on the ridge above Ag. Panulcito (*J.* 5451) where only a couple of plants were found growing under rocks in the arid scrubby zone above the fertile belt.

Polypodium masafuerae Ph. Linnaea xxix. 107 (1857). *P. squamatum* Ph. Fl. Atac. 56 and Viage Des. Atac. 26, 230 (1860), not L. (1753). *P. atacamense* Baker ex Ball, Jour. Linn. Soc. xxii. 64 (1885) and, more definitely, Ann. Bot. v. 469 (1891). *P. mollendense* Maxon, Smithson. Miscl. Coll. lxxv. pt. 8, 1 (1915); Contr. U. S. Nat. Herb. xvii. 560, 570 (1916).

This *Polypodium* is known on the Chilean mainland only from the



1. ASPLENIUM FRAGILE, VAR. LOMENSE WEATHERBY, VAR. NOV.
2. POLYPODIUM ESPINOSAE WEATHERBY, SP. NOV.



fertile belt between Paposo and Miguel Diaz and is not common. In the upper part of the fertile belt on the slopes at El Rincon (*J.* 5491) it was most common, growing there in moss on bushes or cactus and rarely extending down to the moss on the ground at the foot of the latter. At Ag. Panul (*J.* 5423) a single colony was found growing in moss on the face of a rock in the bottom of the gulch above the water-hole. A single plant was also found growing in the crotch of an arborescent *Cereus* in the upper part of the fertile belt on the slopes near Ag. Miguel Diaz (*J.* 5309). The type of *P. squamatum* Ph. was collected in the fertile belt near Paposo on the slopes of Queb. Guanillo.

The collection from El Rincon comes from a point no great distance from the type locality of *P. squamatum* Ph. and was compared with Philippi's type at Santiago; there can be no doubt that the two collections are conspecific. *Polypodium atacamense* Baker is a renaming of Philippi's species because of the earlier *P. squamatum* L. A photograph of the type of *P. masafuerae* Ph. and scales from the rootstock and frond, generously supplied by Prof. Marcial R. Espinosa, prove beyond reasonable doubt that *P. masafuerae*, already referred here by Christensen & Skottsberg, *Nat. Hist. Juan Fernandez* ii. 41 (1920), is specifically identical. Material kindly lent from the United States National Herbarium shows that *P. mollendense* is also precisely the same, agreeing in all respects with our plant. *Polypodium masafuerae*, the oldest name, must be retained.

Between *P. masafuerae* and *P. pycnocarpum* C. Chr. *Ind. Fil.* 557 (1906) [= *P. macrocarpum* Presl, *Rel. Haenk.* i. 23, t. 1. fig. 4 (1825), not Bory (1810)], as interpreted by Maxon, the differences are slight. In the former, the pale margins of the scales are rather more pronounced, the scales of the rachis tend to be somewhat broader, and the segments of the lamina are perhaps rather more obtuse. In the scanty material of *P. pycnocarpum* seen, I can find no other differential characters, and am inclined to believe Christensen and Skottsberg correct in uniting the two in spite of their different altitudinal range. This distribution, however, may be a matter of water supply for the lomas are moist, the intermediate altitudes are dry and the higher altitudes in the Andes again moist. If the two species are to be united, the earliest valid name, *P. masafuerae* Ph., should be used.

Polypodium (§ GONIOPHLEBIUM) **Espinosae** Weatherby, sp. nov., rhizomate breviter repente glauco carnosio succulento, diametro 1-1.5 cm., paleis membranaceis brunneis a basi lato peltato ovatis lanceolatisve acuminatis integris, 7-9 mm. longis 2-4 mm. latis, dense obtecto, frondes sparsas paucas emittente; frondibus omnino glabris 17-42 cm. altis, apud specimina bene evoluta conspicue apud

specimina depauperata minus dimorphis; fertilibus plerumque majoribus (apud eandem plantam 29 cm., sterilibus 10 cm. altis); stipite stramineo siccato angulato-sulcato 8–22 cm. longo; lamina coriacea deltoidea vel ovata, 7.5–20 cm. longa, 5.5–10 cm. lata, fere ad apicem pinnata; rachi viridi angustissime alato; pinnis distantibus, 4–9-jugis, 2–6 mm. latis, ad 7 cm. longis, infimis longissimis ad apicem frondis versus gradatim decrescentibus linearibus lineari-oblongatis vel ad apicem frondis versus latioribus, ad basin versus angustatis, basi leviter dilatatis supra breviter infra longius decurrentibus, abrupte obtusis vel rarius acutiusculis, margine cartilagineo sparse et minute crenato-denticulato; segmento terminali segmentis proximis lateralibus aequante vel ea superante rarius valde producto ad 6 cm. longo; venatione Marginariae areolis uniseriatis irregulariter anguloso-oblongis costae parallellis vel subobliquis, marginem fere attingentibus; soris uniseriatis rotundis vel subellipticis fere totam spatiam inter costam et marginem occupantibus, ad apices venularum liberarum inter areolas positis; sporis ovalibus circa $50 \times 30 \mu$, flavis, minute verrucosis; frondibus sterilibus vel substerilibus 6–25 cm. longis, stipite 4–16 cm. longo, lamina 6–9 cm. longa 3.5–7 cm. lata, pinnis 3–6-jugis, 6–15 mm. latis, oblongatis oblongis vel obovatis, areolis uniseriatis oblongis obliquis etiam in pinnis latissimis marginem fere attingentibus.—CHILE: under cactus on dryish slope on headland west of Aguada Grande, Dept. Taltal, Dec. 18, 1925, *Johnston 5763*; on cliff and under bushes or rarely in moss on shrubs or cactus on fog-bathed sea-cliffs near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5692*; on earth under bushes in fertile belt above El Rincon near Paposos, Dept. Taltal, Dec. 7, 1925, *Johnston 5492* (TYPE, Gray Herb.); on earth in thicket in the middle of the fertile belt on the slopes above Aguada Panulcito, Dept. Taltal, Dec. 5, 1925, *Johnston 5452*; on earth in and about large tufts of grass in the upper part of the fertile belt on the slopes above Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5306*.—PLATE 2, FIG. 2.

An apparently local and heretofore uncollected species related to *P. intermedium* Colla (*P. translucens* Kunze) of Juan Fernandez and to *P. synammia* (Fée) C. Chr. of central and southern Chile. From them it may be distinguished as follows:

Fronds more or less dimorphic, the fully fertile ones with oblongate to narrowly linear pinnae 2–6 mm. wide, the sterile much smaller on the same plant with oblong to obovate pinnae; pinnae in both commonly obtuse; scales of rootstock bright brown, nearly concolorous, 7–9 mm. long; sori circular or nearly so; spores yellow, broadly oval, $40\text{--}50 \times 30 \mu$, minutely granular-verrucose. *P. Espinosae*.

Fronde not dimorphic; pinnae 8 mm. or more wide, generally acute; scales of rootstock darker at base or center, 5-7 mm. long; spores pale yellow, narrowly elliptic, coarsely verrucose.

Scales of rootstock very dark brown at base, lighter above, not pale-margined; pinnae coriaceous, 2-6 pairs, crenate-serulate; sori oval; spores narrowly elliptic to sublunate, 50-60 \times about 25 μ *P. synammia*.

Scales with dark brown medial band and more or less conspicuous pale margins; pinnae thin, 5-11-jugate, serrate to bipinnatifid; sori round or nearly so; spores more broadly elliptic, about 60 \times 30 μ *P. intermedium*.

It is a pleasure to dedicate so well-marked and interesting a Chilean species to Prof. Marcial R. Espinosa Bustos, Cryptogamic Curator of the Museo Nacional of Santiago.

GNETACEAE

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

This species was founded upon and is with certainty known only from a scanty collection made at Breas in 1888 by Larrañaga. I doubtfully refer to it a plant which grew on a dry rocky shelf on the coastal plain between Agua Dulce and Queb. Anchuña (*J.* 5188). It formed a pallid prostrate growth with colorless or light brownish sheaths and pale dry fruit.

Ephedra rupestris Benth. Pl. Hartw. 253 (1846).

I doubtfully refer to this species a plant collected on a high dry rocky crest above the fertile belt near Ag. Miguel Diaz (*J.* 5366). It is a prostrate pallid shrub with short reddish sheaths and juicy red fruit. The stems are not buried and rhizomatose and the aerial ones not so tufted as in true *E. rupestris* from the highlands of Ecuador, Peru and Bolivia. However, in the structure of the juicy fruit, in the color and form of the sheaths and in the color and size of the stems it much suggests montane material. It is not improbable that our plant is an undescribed species.

POTAMOGETONACEAE

Ruppia maritima L. Sp. Pl. 127 (1753).

Observed only in a saline pool in a vega in Queb. Cachina above Ag. Cachina (*J.* 5716). It was locally common. The specimens apparently represent the var. *rostrata* Agardh as defined by Fernald & Wiegand, Rhodora xvi. 123 (1914). The peduncles are very short.

Zannichellia palustris L. Sp. Pl. 969 (1753).

Abundant in the water-holes at Ag. Grande (*J.* 5787) and Ag. Cachina (*J.* 5717).

Potamogeton sp.

A species of this genus is reported from Paposo by Philippi, Viage Des. Atac. 26 (1860). I strongly suspect that the record is based upon a mistaken field identification of *Zannichellia*.

GRAMINEAE

Bromus Trinii Desv. in Gay, Fl. Chile vi. 441 (1853).

Collected in our area near Taltal (*Werdermann* 812, 833) and on the ridge back of Punta Grande near Paposo (*J.* 5230).

Festuca megalura Nutt. Jour. Acad. Philad. ser. 2, i. 188 (1848).

An erect annual growing in open places on the fog-bathed ridge back of Punta Grande near Paposo (*J.* 5232).

Festuca australis Nees ex Steud. Synop. Glum. i. 304 (1855).

Growing about cactus at head of sea-cliffs near Ag. Cachina (*J.* 5727) and at ca. 400 m. alt. near Taltal (*Werdermann* 806).

Festuca sp.

A coarse tufted perennial found only on the foggy crests of the sea-cliffs near Ag. Cachina (*J.* 5728) and on moist slopes in the fertile belt near Ag. Miguel Diaz (*J.* 5403). Prof. Hitchcock informs me that the plant suggests *F. dolichophylla* Presl of the mountains of Peru and that perhaps it may represent an undescribed species of that relationship.

Poa bonariensis (Lam.) Kunth, Rev. Gram. i. 115 (1829). *P. paposana* Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860).

Infrequent in the fertile belt where it forms rank clumps 5-10 dm. tall. It has been collected on the sea-cliffs near Ag. Grande (*J.* 5801) and Ag. Cachina (*J.* 5730), on the slope of Cerro Perales near Taltal (*J.* 5627), and on slopes near Paposo (*Philippi*, type of *P. paposana*), Ag. Panulcito (*J.* 5474) and Ag. Miguel Diaz (*J.* 5405). Prof. Hitchcock considers this material, which represents *P. paposana* Ph., as referable to *P. bonariensis*.

Eragrostis scabra Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860); Ph. Anal. Univ. Chile xciv. 157 (1896); *Jedwab. Bot. Archiv* v. 207 (1924).

Described and known only from a collection made by Philippi in the fertile belt near Paposo. I could not locate the type at Santiago.

Eragrostis peruviana (Jacq.) Trin. Mem. Acad. St. Petersb. ser. 6, i. 396 (1831). *Koeleria multiflora* Regel & Herder, Ind. Sem. Hort. Petrop. 1858: 23 (1859). *E. deserticola* Ph. Fl. Atac. 55 and Viage Des. Atac. 20, 229 (1860).

An annual which is frequent on dryish gravelly slopes and benches

on the coastal plain. It has been collected near Hueso Parado (Philippi, type of *E. deserticola*), Estancia Vieja (*J.* 5205), Paposo (*J.* 5575), Ag. Cardon (*J.* 5291) and Ag. Miguel Diaz (*J.* 5406). The type of *Koeleria multiflora* was grown from seeds received from Philippi. These came without doubt from our area and probably from Hueso Parado since Philippi reports this species from no other locality. Prof. Hitchcock has kindly helped me with the synonymy of this and the following species.

Eragrostis attenuata Hitchc. Contr. U. S. Nat. Herb. xxiv. 340 (1927). *Sporobolus scaber* Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 20, 228 (1860), not *E. scabra* Ph. (1860).

Moist slopes in the lower part of the fertile belt. It was collected on the foggy crests of the sea-cliffs near Ag. Grande (*J.* 5798) and Ag. Cachina (*J.* 5729) and on slopes at Punta Grande (*J.* 5229), Ag. Cardon (*J.* 5290) and Ag. Miguel Diaz (*J.* 5404). Philippi reports it from Cachinal de la Costa and Hueso Parado. The culms are prostrate or widely ascending.

Distichlis thalassica (HBK.) Desv. in Gay, Fl. Chile vi. 397 (1853).

This was noted in moist alkaline soil near Paposo, Taltal and in Queb. Cachina but was collected only at Ag. Grande (*J.* 5807).

Elymus agropyroides Presl, Rel. Haenk. i. 265 (1830). *E. paposanus* Ph. Fl. Atac. 56 and Viage Des. Atac. 26, 230 (1860).

Forming large clumps 6–12 dm. tall in moist places in the fertile belt near Paposo (Philippi, type of *E. paposanus*), Ag. Cardon (*J.* 5292) and Ag. Miguel Diaz (*J.* 5410). My collections which represent *E. paposanus* Ph. were referred to *E. agropyroides* Presl by Prof. Hitchcock.

Koeleria trachyantha Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860).

Described from material collected in the fertile belt near Paposo by Philippi. I found it growing in a *Euphorbia*-thicket on the fog-bathed head of the sea-cliffs near Ag. Grande (*J.* 5802). It also grows in the fertile belt above El Rincon (*J.* 5541).

Trisetum.

A tall slender species of this genus was collected on the fertile slopes above El Rincon (*J.* 5539) and Ag. Miguel Diaz (*J.* 5407). Prof. Hitchcock determined it as *T. spicatum* (L.) Richt.

Avena hirsuta Roth, Cat. iii. 19 (1806); Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 27, 229 (1860).

Philippi reports this species from Paposo and Miguel Diaz. I did not find his specimens at Santiago. Roth's name, however, is generally considered a synonym of *A. barbata* Brot.

Polypogon littoralis (With.) J. E. Sm. Comp. Fl. Brit. ed 2, 13 (1816).

Growing in moist sand below the water-hole at Ag. Grande (*J.* 5800).

Aira caryophyllea L. Sp. Pl. 66 (1753); Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860).

Reported from the fertile belt near Paposo by Philippi. I could not find his specimens at Santiago.

Nassella major (Trin.) Desv. in Gay, Fl. Chile vi. 265 (1853).

Prof. Hitchcock has referred here a plant I collected on a moist bank near the spring at Cachinalcito (*J.* 5206). The culms are laxly ascending to subprostrate. The fruit is oblong, ca. 1.8 mm. long, pale and very lustrous and with an awn ca. 8 mm. long.

Nassella pungens Desv. in Gay, Fl. Chile vi. 268, t. 75 (1853). *N. pubiflora* of Ph. Fl. Atac. 54 and Viage Des. Atac. 20, 228 (1860).

Growing in moist places in the fertile belt and forming erect tufts that about a decimeter above the base are very densely branched and bushy. The fruit is hairy, mostly oblong and 2 mm. long. This plant, which has been referred to *N. pungens* with some doubt by Prof. Hitchcock, has been collected at the head of the sea-cliffs near Ag. Cachina (*J.* 5731) and on slopes in the fertile belt near Hueso Parado (*Philippi*), on Cerro Perales near Taltal (*J.* 5628), Punta Grande (*J.* 5231) and Ag. Miguel Diaz (*J.* 5408). A plant collected at Ag. Panul (*J.* 5446) may also belong here although its culms are not bushy-branched above the base and its fruit is glabrous.

Stipa speciosa Trin. & Rupr. Mem. Acad. St. Petersb. ser. 6, v. 45 (1842).

What is apparently a form of this species was collected in rocky places at the head of the fog-bathed sea-cliffs near Ag. Grande (*J.* 5806) and Ag. Cachina (*J.* 5733) and on the dry rocky ridge-crests well above the fertile belt near Ag. Miguel Diaz (*J.* 5409). The glumes are greenish or somewhat purplish. The base of the plant is brown. It grows in strict tufts 2.5–5 dm. tall.

Stipa tortuosa Desv. in Gay, Fl. Chile vi. 281 (1853); Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 228 (1860).

One of the more common grasses in the area growing on dryish slopes or on the gravelly floors of quebradas, usually about rocks. It has been collected at Barquito (*J.* 4803, 4804), Ag. Grande (*J.* 5805), Cachinal de la Costa (*Philippi*), Ag. Cachina (*J.* 5732), Posada Hidalgos (*J.* 5670), near Taltal (*Werdermann* 822; *J.* 5116, 5117) and near Paposo (*J.* 5540, 5561). It also occurs about Miguel Diaz and has been reported as far north as Antofagasta.

The type, which was collected by Gay, is said to come from the

Cordillera de Doña Ana. This is probably an error for it is known with certainty only from the coastal hills of our area and southward to about the Vallenar Valley. The cordilleras of the province of Coquimbo are scarcely a likely locality for this coastal species. In the Gray Herbarium there is a collection of this species made by Gay and given as from Copiapó. The type, hence may have come from Copiapó or even from Arqueros where Gay collected more extensively and might have gotten the species.

Stipa plumosa Trin. Mem. Acad. St. Petersb. ser. 6, ii. 37 (1836); Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 20, 228 (1860).

Forming large tufts in rocky places usually just out of the fertile belt. It grows 3–12 dm. tall and becomes brittle-stemmed and frutescent towards the base. It has been collected near Barquito (*J.* 4802, 4805), Ag. Grande (*J.* 5803, 5804), Taltal (*Werdermann* 824; *J.* 5629) and Paposo (*J.* 5599). It is not common.

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

Collected at ca. 300 m. alt. near Taltal by *Werdermann* (no. 814).

Paspalum vaginatum Sw. Fl. Ind. Occ. i. 135 (1797); Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 18, 228 (1860).

Philippi reports this species from Ag. Clérigo near Taltal, Estancia Vieja and Cachinal de la Costa. I collected it only at Ag. Grande (*J.* 5799) where it was creeping in wet gravel below the water-hole.

CYPERACEAE

Scirpus cernuus Vahl, Enum. ii. 245 (1805).

Growing in moist sand near the saline streamlet at the mouth of Queb. Anchuña (*J.* 5200) and in wet sand near the water-hole at Ag. Panulcito (*J.* 5471). *Werdermann* (no. 838) has collected the plant at ca. 300 m. alt. near Taltal.

Cyperus laevigatus L. Mant. Alt. 179 (1771). *C. mucronatus* Rottb.; Ph. Fl. Atac. 53 and Viage Des. Atac. 22, 23, 26, 227 (1860).

Growing about the sandy margin of a spring-fed pool on the sea-shore between Estancia Vieja and Queb. Anchuña (*J.* 5201). Also collected by *Philippi* in wet ground at Ag. Perales in Queb. Guanillo and reported by him as occurring about the water-holes near the town of Paposo.

Cyperus conceptionis Steud. Synop. Glum. ii. 42 (1855). *Mariscus conceptionis* Clarke, Bot. Jahrb. xxx. Beibl. 68, 16 (1901). *C. paposanus* Ph. Anal. Univ. Chile xciii. 343 (1896). *C. laetus* of Ph. Fl. Atac. 53 and Viage Des. Atac. 23, 26, 227 (1860).

Collected in wet soil near Ag. Perales in Queb. Guanillo near Paposo by *Philippi*.

BROMELIACEAE

Puya copiapina Ph. Anal. Univ. Chile xci. 613 (1895). *Pitcairnia* sp. Ph. Fl. Atac. 50 and Viage Des. Atac. 19, 26, 224 (1860).

Growing on rocky ledges or cliffs in the lower part of the fertile belt. It was collected at the head of the sea-cliffs near Ag. Grande (*J.* 5788), in the hills southeast of Taltal (*J.* 5107) and in the quebrada at Ag. Miguel Diaz (*J.* 5321). Philippi collected it near Paposo, probably on the slopes in Queb. Guanillo whence it was also obtained by Reiche. The rosettes of leaves become very numerous and crowded forming domed masses a meter or more broad. The coarse annual flowering stems are 1-2 m. tall and produce 3-8 short spreading branches. The corolla is yellow, each lobe having a greenish splotch at the base. It is possible that this plant may be referable to *P. boliviensis* Baker, Handb. Brom. 126 (1889), a species known only from material collected at Cobija.

Deuterocohnia chrysantha (Ph.) Mez in DC. Monog. Phan. ix. 466 (1896). *Pitcairnia chrysantha* Ph. Fl. Atac. 50 and Viage Des. Atac. 15, 19, 20, 26, 27, 28, 224 (1860).

Frequent on rocky ledges below the fertile belt. It has been collected only at Caleta de Pan de Azucar (*Philippi*, type; *J.* 5840), Breas (*Larrañaga*) and near Taltal (*Borchers*; *J.* 5097) but is present in the coastal strip throughout our area. Philippi reports it as far north as Cobre. Reiche, Bot. Jahrb. xlv. 346-7 (1911), mentions it from near Chañaral and from Queb. Guanillo.

Tillandsia Geissei Ph. Gartenflora xxxviii. 369, t. 1302 (1889); Anal. Univ. Chile xci. 614 (1895). *T. humilis* of Ph. Fl. Atac. 50 and Viage Des. Atac. 19, 20, 26, 224 (1860).

Growing on *Euphorbia*-bushes or on cactus in the fertile belt. Frequent from Taltal to Miguel Diaz. It has been collected at Hueso Parado (*Philippi*), Paposo (*Philippi*; *Reiche*) and Ag. Miguel Diaz (*J.* 5320). The type came from Caldera.

Tillandsia Landbecki Ph. Linnaea xxxiii. 248 (1864).

Growing on shrubs and cactus near the summit of Cerro Perales near Taltal (*J.* 5624).

JUNCACEAE

Juncus acutus L., var. **effusus** Buch. Bot. Jahrb. xii. 250 (1890).

Common and conspicuous in the saline vegas in Queb. San Ramon (*J.* 5126) where it formed coarse stools 9-12 dm. tall. The plant also occurred in similar situations in the very saline vega in Queb. Cachina several kilometers above Ag. Cachina.

Juncus bufonius L., var. **congestus** Wahlenb. Fl. Gothoburg 38 (1820).

Locally common in moist sand near the water-hole at Ag. Panulcito (*J.* 5460). The flowers are glomerate.

LILIACEAE

Scilla triflora Ph. Fl. Atac. 51 and Viage Des. Atac. 20, 26, 225 (1860).

A frequent plant in our area growing usually in gravelly places in the fertile belt. It has been collected at Barquito (*J.* 4761), near Taltal (*J.* 5100; *Werdermann* 768), Breas (*Larrañaga*), Paposo (*Philippi*, type), El Rincon (*J.* 5503) and Ag. Miguel Diaz (*J.* 5371). The single erect stem becomes 3–9 dm. tall. The corolla-lobes are white with a greenish or brownish medial stripe. The plant from near El Rincon has leaves 3 cm. broad. Usually, however, the leaves are well under 7 mm. in breadth.

Leucocoryne narcissoides Ph. Fl. Atac. 52 and Viage Des. Atac. 16, 226 (1860). *L. narcissiflora* Ph. ex Baker, Jour. Linn. Soc. xi. 374 (1871).

Collected in our area near Barquito (*J.* 4762, 4763) and at Cachinal de la Costa (*Philippi*, type). Although given with the original description as from 2000 ft. alt. at "Cachinal de la Sierra" the type of this species came in fact from near the coast at Cachinal de la Costa as shown by the altitude given on the label with the type specimen and by *Philippi's* narrative, Viage 16 (1860). This error is clearly the result of a clerical slip. The species is an extremely variable one especially as to corolla-structures and particularly in the form of the perianth-lobes. Very closely related to *L. narcissoides* are *L. oxypetalata* Ph. from Caldera, *L. incrassata* Ph. from Vallenar and *Stemnatium narcissoides* Ph. from Carrizal Bajo.

AMARYLLIDACEAE

Cummingia campanulata (Lindl.) Don ex Sweet, Brit. Fl. Garden iii. t. 257 (1828); Ph. Fl. Atac. 52 and Viage Des. Atac. 25, 26, 27, 226 (1860).

Growing in the fertile belt near Punta Grande (*J.* 5217), Paposo (*Philippi*) and Ag. Miguel Diaz (*J.* 5369).

Zephyra elegans Don, Edinb. New Philos. Journ. xiii. 236 (1832).

This distinctive species is known in our area only near Taltal where it has been collected by Borchers, Reiche and *Werdermann* (no. 776).

Hippeastrum uniflorum (Ph.) Baker, Jour. Bot. xvi. 83 (1878).
Rhodophiala uniflora Ph. Fl. Atac. 51 and Viage Des. Atac. 16, 225 (1860).

Known only from the type collected by Phillippi at Cachinal de la Costa.

Hippeastrum laetum Ph. Anal. Univ. Chile xciii. 157 (1896).
Rhodophiala laeta Ph. Fl. Atac. 51 and Viage Des. Atac. 23, 26, 225 (1860).

I refer to this species collections from Ag. Grande (*J.* 5755), Taltal (*Werdermann* 864), Punta Grande (*J.* 5218), Paposo (*Philippi*, type) and Ag. Cardon (*J.* 5271). The plant grows on moist slopes in the fertile belt usually in and about shrubbery. The perianth is a beautiful rose-color. The collections from Ag. Grande and Taltal have slightly smaller corollas than in the other collections cited and may represent a variety worthy of a name. The species is very closely related to *H. uniflorum* and is perhaps not distinct. It appears to differ in having 2-4-flowered scapes and broader perianth-lobes and bracts.

Hippeastrum ñañañuca Ph. Anal. Univ. Chile xciii. 150 (1896).

A large local colony of this species was found on a dry gravelly flat at the base of the hills below Ag. Miguel Diaz (*J.* 5370). The perianth is lemon-yellow. The species has not been known north of the Caldera-Copiapó region. The extension of range, hence, is notable.

Alstroemeria violacea Ph. Fl. Atac. 51 and Viage Des. Atac. 15, 16, 23, 26, 27, 225 (1860).

A common and beautiful species characteristic of rocky slopes in the fertile belt throughout our area. It ranges near the coast from Caldera to Tocopilla. It has been collected at Barquito (*J.* 4760), Ag. Grande (*J.* 5756), Taltal (*J.* 5098) and Hueso Parado (*Philippi*, type). Philippi reports it from Paposo and Miguel Diaz where I also observed it. The corollas are a beautiful violet or lavender. The plant should make a handsome ornamental for the gardens.

Alstroemeria graminea Ph. Anal. Univ. Chile xciii. 161 (1896).

Frequent on gravelly benches or in loose gravelly talus along the coastal hills below the fertile belt. It has been collected only near Barquito (*J.* 4811), Taltal (*Werdermann* 802; *J.* 5099), Breas (*Larrañaga*, type) and Paposo (*J.* 5602). It is quite gregarious, forming large local colonies, and is peculiar in its genus because of its annual habit. The perianth is quite irregular. The outer three lobes are white and usually reddish or pinkish on the outer surface. The inner lobes (the abaxial one being half the length of the others) are yellow and spotted with brown. The plant reaches at most 15 cm. in height

and is usually less than 10 cm. tall. There are numerous ascending branches and commonly a peculiar loose tuft of slender unequal fibrous roots.

DIOSCOREACEAE

Epipetrum bilobum Ph. Anal. Mus. Nac. Chile 11, t. 3, fig. 1 (1892); Reiche, Bot. Jahrb. xlii. 190, fig. 2 (1908).

This very distinct species is known only from the Taltal Valley where it has been collected at ca. 400 m. alt. near Taltal (*Werdermann* 866) and near Breas (*Larrañaga*, type.)

Dioscorea tenella Ph. Fl. Atac. 51 and Viage Des. Atac. 26, 225 (1860); also Anal. Univ. Chile xciii. 21, t. 1, fig. 9 (1896).

This species is known only from slopes on Cerro Perales near Taltal (*J.* 5612) and in the vicinity of Paposo on slopes of Queb. Guanillo (*Philippi*, type), on the west side of Cerro Yumbes (*J.* 5555) and on the ridge back of Punta Grande (*J.* 5220). I found only three small colonies of this plant all of them in the drier parts of the fertile belt and trailing over the ground in the shade and protection of cacti. The species seems to be quite distinct.

Dioscorea Besseriana Kunth, Enum. v. 345 (1850); Knuth, Pflanzenr. [Heft. 87] iv. Fam. 43, 197 (1924).

Collected at ca. 400 m. alt near Taltal by *Werdermann* (no. 805). This collection has the leaves much less deeply cordate than does the plant from central Chile.

Dioscorea fastigiata Gay, Fl. Chile vi. 54 (1853). *D. Geissei* Ph. Anal. Univ. Chile xciii. 8, t. 1, fig. 2 (1896). *D. thinophila* Ph. l. c. 10, fig. 13. *D. axilliflora* Ph. l. c. 11, fig. 3.

What I judged in the field to be this species is abundant on the dunes under the headland just north of Chañaral. As with *Euphorbia copiapina*, which also grew there, this *Dioscorea* probably also reaches its northern limit in that vicinity.

Dioscorea cylindrostachya, sp. nov., nana glabra perennis; caulibus saepe solitariis procumbentibus 1–12 cm. longis vix volubilibus gracilibus herbaceis paullo compressis e tuberi subterraneo globoso ca. 2 cm. crasso cortice brunneo tecto erumpentibus, internodiis 1–7 cm. longis; foliis paucis crassiusculis ovatis vel suborbicularibus 5–7-nervatis 1.5–2.5 cm. longis 1–2.2 cm. latis 0.8–2 cm. longe petiolatis apice obtusis et mucronatis basi late cordatis margine integris; paniculis masculinis cylindratis axillaribus 1–3 cm. longis 5–10 mm. crassis 3–10 mm. longe pedunculatis solitariis vel ad apicem caulis versus non rariter aggregatis; perianthio campanulato ad 2 mm. longo segmentis subaequilongis oblongis vel ovato-oblongis obtusis uniner-

vatis; staminibus fertilibus 6 erectis lobis perianthii circa duplo brevioribus supra basin floris in fauce affixis; spicis femineis densifloris breviter pedunculatis; floribus sessilibus; capsulis glabris ambitu orbicularibus vel late truncato-obovatis 11–14 mm. latis; seminibus orbicularibus vel ovatis conspicue alatis brunneis 4–7 mm. diametro.—CHILE: dunes on Punta Reyes below Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5394*; on dunes at mouth of quebrada in hills northeast of Antofagasta, Oct. 19, 1925, *Johnston 3645* (TYPE, Gray Herb.).

This species is related to *D. fastigiata* Gay of the coastal dunes of the province of Atacama but differs in having cylindrical spicate rather than broadly obconic corymbose panicles. Its flowers are very obscurely glutinous. In *D. fastigiata* the perianth is usually sufficiently glutinous to cause the sand to adhere in conspicuous amounts on most specimens. This happens very slightly if at all in *D. cylindrostachya*. The new species is separated by a broad geographical hiatus from its relative and is known only from the dunes near Ag. Miguel Diaz and near La Chimba northeast of Antofagasta. It is locally frequent on the dunes with its short stems trailing over the sand.

IRIDACEAE

Tigridia Philippiana, sp. nov., glaberrima; bulbo ovoideo 15–20 mm. longo 12–15 mm. crasso tunica brunnea chartacea vestito; caule tereti erecto gracili simplici 25–45 cm. alto spatha solitaria saepe 5-flora terminato folium strictum gerenti; foliis plicato-nervosis 3–8 mm. latis, basalibus 1–2 erectis 3–5 dm. longis, caulinis 2 inferioribus 15–40 cm. longis superiora (5–10 cm. longa) evidenter superantibus; spathae valvis lanceolatis, exterioribus subsimilibus viridibus ca. 4 cm. longis 8–12 mm. latis acutis plicatis; pedicellis floriferis spathae aequilongis, fructiferis eam minime superantibus; perianthio caeruleo fugaci ca. 4 cm. diametro; segmentis perianthii in cupulam 15–17 mm. diametro brevem basaliter coalitis, interioribus minoribus 8–10 mm. longis et latis apice rotundis basim versus paullo angustatis, exterioribus obovatis 15–18 mm. longis 14–16 mm. latis apice rotundis cum acumine, ad basim versus evidenter angustatis; antheris ligulatis ascendentibus ca. 5 mm. longis; styli ramis medium versus furcatis, ramulis falcatis 2–2.5 mm. longis; ovario oblongo glabro; capsula oblonga ca. 2.8 cm. longa ca. 7 mm. crassa apice truncata basem versus attenuata; seminibus brunneis aliquid politis dense verrucosis obscure angulatis ca. 1.2 mm. crassis.—*Tigridia* ? Ph. Fl. Atac. 50 and Viage Des. Atac. 16, 26, 224 (1860). *Tigridia* sp. Reiche in Eng.

& Drude, Veg. Erde viii. 166 (1907).—CHILE: In and about a *Euphorbia*-thicket at the head of the foggy sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 17, 1925, *Johnston 5757* (TYPE, Gray Herb.); Taltal, ca. 400 m. alt., Oct. 1925, *Werdermann 854*; fertile belt near Paposo, Dept. Taltal, Dec. 1853, *Philippi*; rich moist grassy slope in fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5368*; Tocopilla, Nov. 1904, *Mozer*.

In gross habit much suggesting the other South American species, *T. lutea* Kl. & Otto, Icon. Pl. Rarior. i. 85, t. 34 (1841) and Baker in Curtis, Bot. Mag. ciii. t. 6295 (1877), but differing in having blue rather than yellow flowers, unclawed inner perianth-lobes and less deeply divided style-branches. *Tigridia Philippiana* is known only from the fertile belt in the coastal hills of the province of Antofagasta. It grows on grassy banks or in and about thickets of *Cereus* and *Euphorbia*.

Sisyrinchium graminifolium Lindl. Bot. Reg. xiii. t. 1067 (1827). *S. chilense* of Ph. Fl. Atac. 50 and Viage Des. Atac. 26, 224 (1860).

Forming tufts on grassy slopes in the fertile belt near Ag. Cachina (*J. 5688*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5367*). The flowers are yellow.

ORCHIDACEAE

Bipinnula taltalensis, sp. nov., glaberrima robusta 3–8 dm. alta; caule erecto pallide viridi basi tubercula fasciculata 10–15 cm. longa 5–10 mm. crassa carnosae fusiformia gerenti; foliis oblongis vel ovato-oblongis obtusis laxe rosulatis 25–45 mm. latis; vaginis in scapo 3–4, internodiis subaequilongis; spica 10–20-flora, bracteis subfoliaceis anguste oblongis vel oblongo-lanceolatis acutis ovario longioribus ad 45 mm. longis; sepalis viridescentibus dorsali anguste oblongo 2.5–3 cm. longo 7–8 mm. lato obtuso vel late acuto lateralibus tortis deflexis 3.5–4 cm. longis 5–7 mm. latis lanceolato-linearibus attenuatis apice et usque ad 1–1.5 cm. infra apicem margine conspicue fimbriatis; petalis superioribus sepalo dorsali saepe paullo brevioribus et cum eo galeam formantibus ellipticis obtusis vel late acutis ca. 11 mm. latis ca. 23 mm. longis albis paullo viridi-tinctis; labello orbiculato-quadrato vel orbiculato-ovato 2–2.3 cm. lato 2.2–2.5 cm. longo basi abrupte contracto et unguiculato, apice truncato vel retuso obscure incrassulo-denticulato; lamina labelli alba infra medium et latera versus viridi-tuberculata; gynostemio satis late marginato, loculis antherae incomplete bilocularibus.—CHILE: rare on moist grassy fog-bathed slope in the fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5372* (TYPE, Gray Herb.).

Obviously related to *B. fimbriata* (Poepp.) Johnston¹ but differing in its larger flower-parts and in its much broader, differently shaped and much less marked lip which is rounded or retuse rather than broadly acute at the apex. The plant comes from about 700 km. north of the most northern reported station of *B. fimbriata* and apparently is the most northerly ranging species of its genus. Only a very few plants were found; these being scattered on the moist fog-bathed grassy slopes of the fertile belt above Ag. Miguel Diaz. The plant is pale green and has greenish sepals, white upper petals smooched with *Penicillium*-green and a white lip which has a few dull-greenish excrescences.

PIPERACEAE

Peperomia Doelli Ph. Fl. Atac. 49 and Viage Des. Atac. 23, 27, 223 (1860).

Growing on ledges and cliffs in the lower part of the fertile belt. It is known only from near Ag. Cachina (*J. 5704*), Agua Perales in Queb. Guanillo (*Philippi*, type; *J. 5591*), Ag. Cardon (*J. 5277*) and Ag. Miguel Diaz (*J. 5393*). Philippi reports it from Ag. Panul. It is an attractive erect succulent with extremely thick verticillate leaves, which are flattish or slightly concave and green above but very strongly convex and reddish beneath. The stems are also reddish.

URTICACEAE

Parietaria debilis Forst. Prodr. 73 (1786). *Freirea erecta* Ph. Fl. Atac. 49 and Viage Des. Atac. 223 (1860). *F. humifusa* of Ph. Viage Des. Atac. 26, 27 (1860).

Erect or more commonly trailing in moist or sheltered places in the fertile belt. It has been collected at Taltal (*Werdermann 865*), Ag. Cachinalcito (*J. 5196*), Paposo (*Philippi*, type of *F. erecta*), Ag. Panul (*J. 5437, 5440*) and Ag. Miguel Diaz (*J. 5392*).

SANTALACEAE

Quinchamalium carnosum Ph. Fl. Atac. 48 and Viage Des. Atac. 222 (1860). *Q. thesioides* Ph. Fl. Atac. 48 and Viage Des. Atac. 20, 222 (1860). *Q. thesioides*, var. *flaccidum* Ph. Fl. Atac. 48 and Viage Des. Atac. 222 (1860). *Q. archifolium* Ph. Viage Des. Atac. 16 (1860).

¹ **Bipinnula fimbriata** (Poepp.), comb. nov. *Chloraea fimbriata* Poepp. Frag. Synop. Pl. Chile 15 (1833); Poepp. & Endl. Nov. Gen. i. 30, t. 51 (1835). *B. mystacina* Lindl. in Hook. Jour. Bot. i. 5 (1834).

A frequent plant on gravelly benches and slopes outside the fertile belt. Its stems are usually prostrate or loosely decumbent. The foliage is commonly juicy and more or less terete. As here taken the species seems to be a very polymorphous one, varying much in the size and shape of the flowers and in the succulence of the herbage. However, it appears to differ, though not too definitely, from the congeners of central Chile in its habit, succulence and pubescent flowers. It has been collected at Barquito (*J.* 4752), Cachinal de la Costa (*Philippi*, type of *Q. carnosum*), Ag. Grande (*J.* 5823), Ag. Cachina (*J.* 5738), near Taltal (*Philippi*, type of *Q. thesioides*; *Werdermann* 843; *J.* 5088, 5138), near Paposo (*Philippi*; *J.* 5565, 5499), between Punta Plata and Punta Buitre (*J.* 5256) and near Ag. Miguel Diaz (*J.* 5354). The plant from near Punta Plata (*J.* 5256) is cinereous with a soft glandular pubescence. Two collections made on the dry slopes above the fertile belt near Paposo and Ag. Miguel Diaz (*J.* 5499, 5354) are glandular and have small dark-colored flowers.

POLYGONACEAE

Chorizanthe commissuralis Remy in Gay, Fl. Chile, v. 287 (1849).

A small annual growing in dryish gravel near Barquito (*J.* 4779) and Taltal (*Werdermann* 860, *J.* 5078). The plant is fragile and is freely disjointing at maturity. In this habit it resembles the closely related *C. brevicornu* Torr. of Southwestern United States.

Chorizanthe deserticola Ph. Anal. Univ. Chile xci. 498 (1895).

This species has been known only from the type collected at Breas by Larrañaga. I found a populous local colony in dry gravel below Ag. Grande (*J.* 5777). Its extremely numerous stems are strictly erect and crowded to form globose shrubby masses 1-2 dm. tall. The lobes of the calyx are pink with white margins.

Rumex crispus L. Sp. Pl. 335 (1753); Ph. Fl. Atac. 48 and Viage Des. Atac. 26, 222 (1860).

Philippi doubtfully reports as this species a *Rumex* seen at Ag. Panul.

CHENOPODIACEAE

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

A frequent plant on gravelly benches below the fertile belt. It was collected only at Ag. Miguel Diaz (*J.* 5378). The plant noted at Ag. Panul by Philippi, l. c., and reported as *C. murale* L. and as *C. album* L., Ph. Viage Des. Atac. 27 (1860), is probably this species. *Cheno-*

podium hastatum is closely related to the Peruvian *C. paniculatum* Hook. and may be only a variety of it.

Atriplex mucronata Ph. Fl. Atac. 47 and Viage Des. Atac. 16, 221 (1860).

A prostrate monoecious perennial known only from the southern coast of the Dept. of Taltal, where it has been collected at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J.* 5767, 5768) and Ag. Cachina (*J.* 5690). *Atriplex hystrix* Ph., from Caldera, is considered by Reiche, Fl. Chile vi. 167 (1911), as indistinguishable from our plant. The Caldera plant, however, is quite distinct.

Atriplex taltalensis, sp. nov., perennis monoica farinosa suffruticosa; caulibus prostratis vel laxe decumbentibus 3–8 dm. longis ramosis; foliis concoloribus obtusis integerrimis vel sparse denticulatis, superioribus confertis subsessilibus obscurissime nervatis orbiculari-ovatis vel cordulatis (vel supremis plus minusve ovato-deltaideis) 1–1.5 cm. longis et latis cum apice breviter mucronatis, inferioribus deciduis orbiculari-ellipticis ca. 2 cm. longis basem versus in petiolum 2–3 mm. longum abrupte contractis; ramulis ultimis glomerulos florum feminarum in axillis foliorum gerentibus sed ad apicem versus glomerulos florum masculinorum nigrescentium in spicas ebracteatas divaricatas cylindricas paniculatim dispositos producentibus; bracteis fructiferis 3–5 mm. latis 4–5 mm. longis late cuneato-obovatis sessilibus medium versus connatis margine herbaceis inaequaliter tridentatis alibi laevibus vel non rariter cristato-tuberculatis; seminibus 1–1.5 mm. diametro ambitu orbicularibus; embryo subannulari, radícula verticali ascendenti.—CHILE: rocky floor of a quebrada near Antofagasta, Oct. 19, 1925, *Johnston 3635*; dryish gravelly benches and slopes about mouth of quebrada, Aguada de Miguel Diaz, Dept. Taltal, Dec. 4, 1925, *Johnston 5379* (TYPE, Gray Herb.); grassy open crests in lower part of fertile belt on ridge back of Punta Grande, Dept. Taltal, Nov. 29, 1925, *Johnston 5219*; Taltal, ca. 400 m. alt., Oct. 1925, *Werdermann 859*.

This plant has been confused with the similar and probably closely related *A. mucronata* Ph. That species, however, is matted and perfectly prostrate in habit, has a firmer scarcely if at all farinose yellowish indument on the foliage and transversely elongated much crested smaller fruit. Possibly the collections from Taltal and Antofagasta, which I have cited, should be excluded for they have stems that are reddish and more slender and leaves that are less scurfy than in the plants which seem typical of the species. The plants cited are all monoecious but field observation goes to show that some plants are predominatingly pistillate. I did not find any plants in which the

staminate flowers noticeably predominated. Doubtfully referable to *A. taltalensis* is an immature specimen collected by Larrañaga at Breas.

Atriplex clivicola, sp. nov., frutescens globosa monoica 3–12 dm. alta ramosissima incana farinosa; foliis integerrimis subplanis saepe plus minusve angulatis ovatis vel rhomboideo-ovatis vel triangulari-ovatis 1–2.5 cm. longis 8–20 mm. latis concoloribus enervatis apice obtusis basi in petiolum 3–5 mm. longum abrupte contractis; floribus in glomerulos bisexuale collectis in axillis foliorum superioribus dispositis; floribus masculinis nigrescentibus spicato-glomeratis; bracteis fructiferis glomeratis 8–12(–14) mm. longis 7–10(–13) mm. latis basem versus connatis latissime ovatis vel transverse elliptico-ovatis vel deltoideis vel cordato-deltoideis, quoad corpus subobovoideis 3–5 mm. longis 2–2.5 mm. crassis pallidis laevibus vel rarissime sparse cristatis, sed quoad marginem grandibus latis herbaceis planis undulatis vel obtuse sparseque grandidentatis; seminibus lenticularibus ca. 2 mm. latis 1.7 mm. altis margine rotundis, testa nigrescenti subnitida; embryo ellipsoideo-annulari radícula verticaliter ascendenti donato.—CHILE: gravelly benches towards crest of hills back of Barquito, Dept. Chañaral, Oct. 28, 1925, *Johnston 4765*; very dry rocky hillside at western end of the Llano Colorado, Dept. Taltal, Dec. 13, 1925, *Johnston 5652*; about rocks on coastal plain near Punta Buitre, Dept. Taltal, Dec. 4, 1925, *Johnston 5239* (TYPE, Gray Herb.).

This monoecious bush was found along the lower edge of the fertile belt and on rocky terraces along the ocean. It also occurs in the dry interior. It does not seem to be closely related to any of the known Chilean species. In Reiche's treatment, *Fl. Chile*, vi. 160 (1911), it keys out with *A. Philippii* and *A. myriophylla*, decumbent spreading plants with relatively small fruits.

Atriplex clivicola Johnston, var. **lopholepis**, var. nov., a varietate genuina differt bractea fructifera basem versus conspicue irregulariterque cristata.—CHILE: dry hillsides and benches below Aguada Grande, Dept. Chañaral, Dec. 17, 1925, *Johnston 5766* (TYPE, Gray Herb.).

Evidently a phase of *A. clivicola* but departing so markedly in its strongly and abundantly cristate bracts that it appears to merit nomenclatorial recognition. In habit and vegetative characters the variety is quite like the species.

Suaeda divaricata Moq. *Chenop. Monog.* 123 (1840); *Ph. Fl. Atac.* 48 and *Viage Des. Atac.* 16, 222 (1860).

Reported from near Cachinal de la Costa by Philippi. I noted what is probably the same species in the saline marsh in Queb. Cachina above Ag. Cachina but as the plant was not in flower, I did not collect specimens.

AMARANTACEAE

Alternanthera junciflora (Remy), comb. nov. *Telanthera junciflora* Remy in Gay, Fl. Chile v. 224 (1849); Ph. Fl. Atac. 47 and Viage Des. Atac. 19, 20, 26, 27, 221 (1860); Reiche, Fl. Chile vi. 138 (1911).

A perennial with slender loosely branched usually erect fruticulose stems 10–15 dm. tall. It grows in rocky places usually along the lower edge of the fertile belt. The sepals are pink. It is known only from near Taltal (*Philippi, Werdermann 779, J. 5622*), near Paposo (*J. 5236*) and Ag. Miguel Diaz (*J. 5299*). Although Philippi reported it from Hueso Parado, Paposo and Miguel Diaz the only specimens in his herbarium are from Hueso Parado. Remy did not give a definite locality for the species but simply said "Se cria en la República." The species concerned here is known only from the coastal hills of the department of Taltal and does not appear to have been collected in the relatively well explored country south of Copiapó, nor is there any similar species there which could be confused with it. Possibly it extends north of our area where the type might have been collected about some of the old ports such as Cobija. The species is most closely related to *A. paniculata* HBK. of Peru and Ecuador.

NYCTAGINACEAE

Oxybaphus elegans Choisy in DC. Prodr. xiii. pt. 2, 431 (1849).

Collected at Taltal by Werdermann (no. 861) and reported from near Chañaral by Reiche, Bot. Jahrb. xlv. 346 (1911).

Oxybaphus micranthus Choisy in DC. Prodr. xiii. pt. 2, 432 (1849); Ph. Fl. Atac. 47 and Viage Des. Atac. 20, 26, 27, 221 (1860).

Philippi reported this species from Hueso Parado, Paposo and Miguel Diaz. He collected it, however, only at Miguel Diaz.

PHYTOLACCACEAE

Anisomera littoralis (Poepp. & Endl.) Moq. in DC. Prodr. xiii. pt. 2, 25 (1849). *Phytolacca littoralis* Poepp. & Endl. Nov. Gen. et Sp. i. 27, t. 45 (1835). *P. chilensis* Miers, Travels ii. 532 (1826), nom. nudum. *A. chilensis* Walter, Pflanzenr. [Heft 39] iv. Fam. 83, 33 (1909); Reiche, Fl. Chile iv. 142 (1911). *Ercilia volubilis* of Ph. Fl. Atac. 48 and Viage Des. Atac. 20, 26, 222 (1860).

A shrub usually scrambling over large cacti in the fertile belt. The racemes of flowers and black juicy fruit are pendant. It has been collected in the area near Taltal (*Werdermann 785*), near Ag. Lora

on Cerro Perales near Taltal (*J.* 5611) and at Ag. Cachinalcito (*J.* 5195). I also observed it near Ag. Grande, on Punta Grande near Paposo, and near Ag. Miguel Diaz. Under the incorrect name of *E. volubilis* Philippi reported it from Agua Clérigo and Paposo.

AIZOACEAE

Tetragonia maritima Barn. in Gay, Fl. Chile ii. 469 (1846); Ph. Fl. Atac. 19 and Viage Des. Atac. 12, 14, 17, 38, 193 (1860).

Common in dry gravelly places below the fertile belt. Most abundant on slopes and benches along the ocean where it forms dense bushes 3–12 dm. tall. The foliage is yellowish green and succulent. It has been collected at Barquito (*J.* 4776) and near Taltal (*Darapsky*; *J.* 5130). Philippi reported it from Las Animas, Cachiyuyal and Breadal.

Tetragonia macrocarpa Ph. Fl. Atac. 19 and Viage Des. Atac. 12, 193 (1860).

Philippi reported this from Las Animas and Cachinal de la Costa. In his herbarium at Santiago there is only one collection of the species made in 1853–54. That is labeled "Caldera, Cachinal, etc." and agrees very closely with material obtained by numerous collectors about Caldera. Since no other collections are to be definitely reported from north of Caldera it is possible that the specimen at Santiago, i. e. the type of *T. macrocarpa*, was obtained at Caldera and that the other stations mentioned on the label and by Philippi are the result of mistaken field identifications.

Tetragonia microcarpa Ph. Fl. Atac. 19 and Viage Des. Atac. 15, 193 (1860).

Philippi reported this species from Cachinal de la Costa. There has evidently been some confusion of data or material in the herbarium at Santiago for the plant I found associated with the label of the type of *T. microcarpa* is obviously not that described by Philippi. The dimensions of the fruit as given in the original description are those of *T. ovata* and I wonder if the name *T. microcarpa* was based upon material referable to that species and since lost.

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

Rather common near the coast throughout our area growing in dry gravelly places below the fertile belt. The branches are usually widely spreading and bear at maturity subglobose juicy red fruits. The fruit is not angled when fresh but in drying becomes somewhat quadrangular. It has been collected at Barquito (*J.* 4777), Ag. Grande (*J.* 5776) and near Taltal (*Borchers*, type). Outside of our

area I have seen collections from Huasco (*Philippi*), Caldera (*Geisse, Werdermann 462*), Antofagasta (*J. 3643*) and Tocopilla (*Reiche; Mozer; J. 3598*).

Tetragonia tenella, sp. nov., annua herbacea 2–8 cm. alta flavo-virens; caulibus papillois ramosissimis laxe ascendentibus gracilibus; ramis infimis oppositis ceteris alternis; foliis oblanceolatis vel oblanceolato-oblongis 2–2.5 cm. longis 5–9 mm. latis acutis sessilibus herbaceis inconspicue uninervatis papillois; floribus axillaribus solitariis; calyce aliquid quadripartito lobis deltoideis acutis flavis 1–1.5 mm. longis extus papillois intus laevibus; staminibus ca. 12 filamentis filiformibus flavis; antheris oblongis 2-ocularibus; stigmatibus 1–2; fructibus ellipsoideo-fusiformibus 5–6 mm. longis ad 3 mm. latis dense papillois vix angulatis teretibus vel paullulo compressis 1–2-ocularibus, loculis uniovulatis; seminibus 1–2.—CHILE: quebrada north of Portezuelo de Mina Carola, Sierra Esmeralda, Dept. Taltal, Dec. 14, 1925, *Johnston 5677* (TYPE, Gray Herb.); Taltal, 30 m. alt., Oct. 1925, *Werdermann 850*.

I found this very distinct species only once. It formed small colonies and grew on dry gravelly benches and hillsides. The plants are yellowish in color and are not particularly succulent. Its habit and fruit readily distinguish it from all known species.

Mesembryanthemum crystallinum L. Sp. Pl. 480 (1753).

A colony of this unmistakable plant was seen on a rocky sea-ward slope near the ocean close to Agua Dulce.

PORTULACACEAE

Calandrinia caulescens HBK. Nov. Gen. et Sp. vi. 78, t. 526 (1824). *Diazia portulacoides* Ph. Fl. Atac. 22, t. 1e and Viage Des. Atac. 196 (1860).

The type of *Diazia portulacoides* came from Miguel Diaz. I collected a plant at Mollendo, Peru (*J. 3546*) which matches the type and like it appears to be a slender phase of *C. caulescens*.

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

Known in our area only from the vicinity of Taltal. I collected it on the upper slopes of Cerro Perales above Ag. Lora (*J. 5623*) and about 18 km. south of Taltal at the head of Queb. de los Infieles (*J. 5648*). *Werdermann* (no. 792) has it from 600 m. alt. near Taltal. The plant is an annual with very loosely ascending stems and formed very local colonies on dryish rocky hillsides.

Calandrinia cymosa Ph. Anal. Univ. Chile lxxxv. 192 (1893).

Frequent on dry sandy or gravelly places along the coast. It has

been collected at Barquito (*J.* 4787), Taltal (*Darapsky*, type; *Werdermann* 853) and Punta Plata (*J.* 5251). It is a very distinctive annual species with loosely cymose yellow flowers.

Calandrinia sitiens, sp. nov., perennis glaberrima prostrata; radice subsimplici verticali elongato 2–4 mm. crasso; caulibus brevibus 1–2 cm. longis 2–3 mm. crassis pluribus jugum foliorum unicum gerentibus apice in pedunculos graciles inconspicue bracteatos plures 5–10 cm. longos prostratos corymbiferos abrupte transmutatis; foliis obovatis vel orbiculari-obovatis carnosus apice obtusis vel rotundis infra medium basem versus in petiolum 5–10 mm. longum 2–4 mm. latum contractis, basalibus rosulatis 4–6 cm. longis 1.5–4 cm. latis, caulinis duobus oppositis 2–3 cm. longis; corymbo laxo ca. 8–15-floro 1–3 cm. longo; pedicellis gracilibus 5–8 cm. longis ascendentibus; bracteis oblongo-ovatis acutis 1–2 mm. longis; sepalis late ellipticis ca. 4 mm. longis virido-fuscis apice rotundis; petalis sanguineis vel rariter purpureo-rubris elliptico-obovatis ca. 4 mm. longis sepalis aequilongis; staminibus 6–8; capsula ovoidea 4–5 mm. longa sepalis paullo longiori; seminibus 1 mm. longis nigris subnitidis cum tuberculis humilibus ellipticis ordinatim tessellatis.—CHILE: rocky very arid almost barren crest near Mina Andacolla near upper limit of vegetation on hills above Aguada Panulcito, Dec. 5, 1925, *Johnston* 5470 (TYPE, Gray Herb.).

A very distinct member of Reiche's "Sect. 5, *Rosulatae*" and apparently most closely related to *C. cymosa* Ph. It differs from that species in its deep perennial root, prostrate habit, tuberculate-tessellate rather than papillate seeds, and blood-red or rarely purplish rather than yellow petals. The branching habit and the disposition of the leaves is similar in both species, but in *C. sitiens* the stems are prostrate rather than loosely ascending as in *C. cymosa*. The inflorescence in both species is shiny, apparently from a glutinous film. The new species was seen only on the extremely arid almost barren rocky crest near the old Andacolla Mine on the hills back of Ag. Panulcito. At that place it was one of the few hardy xerophytes that managed to exist on the very scanty moisture on the crests at ca. 1000 m. alt. and there, well above the fertile belt, and in spite of the increasing aridity, set the upper limit of vegetation.

Calandrinia cephalophora, sp. nov., annua herbacea 7–22 cm. alta glaberrima; radice palari; caulibus simplicibus et erectis vel paullo supra basem in ramos plures ascendentes 2–7 cm. longos ca. 2–3 mm. crassos decompositis apicem versus et inde in pedunculos 7–13 cm. longos aphyllis terminantibus; foliis vix rosulatis oblanceolatis carnosus 3–7.5 cm. longis 1–2 cm. latis acutis basem versus in

petiolum gracilem 1-2 cm. longum gradatim contractis, rameis apicem versus paullo congestis, supremis saepe suboppositis; corymbo capitato-congesto 12-20 mm. diametro; bracteis lanceolatis 2-4 mm. longis; pedicellis 1-2 mm. longis ascendentibus bracteis saepe subbrevioribus; sepalis orbiculari-ovatis 4-5 mm. longis aequalibus viridibus obscure nigro-venosis; petalis purpureo-rubris ca. 3 mm. longis ellipticis sepalis brevioribus apice rotundis; staminibus 10; capsula globoso-ovoidea sepalis aequilonga trivalva; seminibus ca. 0.5 mm. longis echinatis opacis nigrescentibus vel brunneo-nigrescentibus.—CHILE: Taltal, Dept. Taltal, alt. ca. 50 m., Oct. 1925, *Werdermann 855*; bare rocky quebrada, ca. 200 m. alt., near Antofagasta, April 3, 1925, *Pennell 13032*; gravelly slope on hillside opposite Caleta Duendes near Tocopilla, Oct. 18, 1925, *Johnston 3591* (TYPE, Gray Herb.).

This is a very distinctive species which seems to belong in the section *Rosulatae* although suggesting the *Arenariae*. It is characterized by its capitate congested inflorescence, oblanceolate non-rosulate leaves and northern range.

Calandrinia calycina Ph. Fl. Atac. 21 and Viage Des. Atac. 15, 195 (1860).

An annual which is frequent, especially on the gravelly coastal plain north of Taltal. It has been collected at Taltal (*Werdermann 868*), on the dunes at Punta Plata (*J. 5252, 5253*) and on a gravelly slope above the fertile belt near Ag. Miguel Diaz (*J. 5318*). Philippi reports it from Las Animas and Cachinal de la Costa. It ranges southward to the Copiapó Valley (*Werdermann 418*) and Carrizal Bajo and north to Tocopilla. The plants at Punta Plata were of two forms, one with pale green herbage and white petals and the other, the typical common form, with reddish-green herbage and pinkish-red petals.

Calandrinia cachinalensis Ph. Fl. Atac. 20 and Viage Des. Atac. 15, 194 (1860).

A slender erect glaucous annual 3-12 dm. tall which is not infrequent on dry gravel near the coast. It has been collected only at Cachinal de la Costa (*Philippi*, type) and at Ag. Cardon (*J. 5285*). Although Reiche, Fl. Chile ii. 341 (1898), associates this species with *C. litoralis* Ph., *C. cymosa* Ph. and *C. coquimbensis* Barn. its relations are certainly with *C. grandiflora* Lindl.

Calandrinia discolor Schrad. Linnaea viii. Litt. 22 (1833); Ph. Fl. Atac. 20 and Viage Des. Atac. 12, 27, 28, 38, 194 (1860).

Philippi reports this species as occurring from Las Animas to Miguel Diaz apparently using the name loosely to cover any of the robust

species of the genus. He collected no specimens and doubtless the plants he saw are in large part referable to other species I have enumerated for I saw no true *C. discolor* in our area.

Calandrinia taltalensis, sp. nov., erecta 3–4 dm. alta robusta glauca glaberrima ut videtur biennis; caulibus erectis sed imam ad basem saepe breviter decumbentibus ascendentibus paucirameis; foliis obovatis crassiusculis acutis, basalibus 5–13 cm. longis 2–6 cm. latis in petiolum latum gradatim attenuatis in caulem infra medium laxe aggregatis, mediis et superioribus abrupte reductis lanceolato-oblongis; racemis laxifloris bracteosis ascendentibus pluribus; bracteis oppositis orbiculari-ovatis 8–10 mm. longis late sessilibus subscariosis; pedicellis 1–1.5 cm. longis ascendentibus vel patentibus quam bracteis saepissime duplo longioribus; sepalis orbiculari-ovatis viridibus nervatis 6–9 mm. longis obtusis; petalis purpureo-rubris obovatis ca. 13 mm. longis; staminibus numerosis; capsulis globosis ca. 9 mm. longis trivalvatis sepalis aequilongis; seminibus ca. 0.9 mm. longis cum spiculis minutis dense echinatis nigrescentibus opacis numerosis. —CHILE: flat dryish crest back of sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 17, 1925, *Johnston 5784*; rocky bushy plain at mouth of quebrada, Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5284* (TYPE, Gray Herb.).

A member of the group of *C. grandiflora* Lindl. and apparently most closely related to *C. cachinalensis* Ph. from which it differs in its more persistent root, less slender habit, coarsely bracteate shorter racemes and short non-reflexed pedicels. The seeds are similar, though in *C. cachinalensis* the surface-appendages are less rigidly erect and somewhat softer in texture.

Calandrinia lamprosperma, sp. nov., perennis robusta glaucescens ca. 5 dm. alta glaberrima sed sub lente cum papillis minutis cylindricis apicem versus brunneo-glanduliferis ornata; caulibus erectis simplicibus vel apicem versus dichotome ramosis e caudice laxo crasso ramoso fruticoso 10–15 cm. alto erumpentibus; foliis alternis usque ad 4 mm. crassis obovatis 4–6 cm. longis 2–2.8 cm. latis apice obtusis sed cum acumine basi in petiolum brevem gradatim contractis in ramis floriferis basem versus laxe aggregatis sed mediis et superioribus sparsis et valde reductis; floribus conspicue bracteatis in racemum 5–10-florum simplicem vel dichotome ascendentemque ramosum dispositis; bracteis oppositis late obovatis sessilibus 6–8 mm. longis; sepalis late orbicularibus ca. 8 mm. longis viridibus obscure reticulato-venosis; pedicellis gracilibus bracteas valde superantibus, inferioribus abrupte deflexis ad 4 cm. longis, superioribus 1.5–2 cm. longis laxe ascendentibus; petalis obovatis ca. 12 mm. longis 9 mm. latis sepala

duplo superantibus purpureo-rubris; staminibus numerosis; capsulis subglobosis trivalvatis calycibus aequilongis; seminibus nigris nitidis laevibus ca. 0.9 mm. longis numerosis.—CHILE: rocky place in mouth of quebrada below Aguada de Miguel Diaz, Dept. Taltal, Dec. 3, 1924, *Johnston 5317* (TYPE, Gray Herb.).

A very distinct species related to *C. grandiflora* Lindl. It is characterized by its branched shrubby caudex, its peculiar epidermal papillae and smooth shiny seeds. The vegetative parts of the plant were reminiscent of a small plant of the cultivated *Crassula arborescens* (Mill.) Willd., having leaves of like form and a similar though much less extensive branching caudex. The cylindrical papillae developed by the species are peculiar. These are present on most of the vegetative parts but are most abundant on the leaves. The upper fifth of these papillae is brown in color and apparently glandular. The seeds are shiny and black and, although quite smooth to the naked eye, under 40 diameters of magnification appear delicately etched with a fine reticulate pattern.

Silvaea amarantoides Ph. Fl. Atac. 22 and Viage Des. Atac. 15, 17, 196 (1860). *Philippiamra amarantodes* Kuntze, Rev. Gen. i. 58 (1891).

Frequent in dry gravel and sand on the coastal plain of our area where it has been collected at Barquito (*J. 6288*), Cachinal de la Costa (*Philippi*, type) and Punta Plata (*J. 5254*). It differs from the following species in its small, oblong or elliptical, usually pale bracts. *Silvaea corrigioloides* Ph., l. c., from Caldera seems to be synonymous.

Silvaea pachyphylla Ph. Fl. Atac. 21, t. 1c and Viage Des. Atac. 38, 195 (1860). *Philippiamra pachyphylla* Kuntze, Rev. Gen. i. 58 (1891).

The type of this species was collected between Breadal and Cachiuyal east of Taltal. I collected material remarkably matching it at Pique de Jacinto Diaz in the Sierra Esmeralda (*J. 5679*). At that locality it was locally common on the dry gravelly floor of the quebrada. It is prostrate and apparently perennial with rounded thick amplexicaul leaves that are congested and more or less rosy in color. The corolla is purplish red. About Ag. Grande (*J. 5786*) on the dry gravel of the floor of the quebrada I found a similar prostrate apparently perennial plant. This had, however, ovate or oblong leaves and is much like the collection made by San Roman in the Sierra Esmeralda which was described as *S. capitata* Ph., Anal. Univ. Chile lxxxv. 321. (1894). Although much nearer to *S. pachyphylla*, these last two collections mentioned seem to be transitional to *S. celosioides* Ph.

Silvaea celosioides Ph. Fl. Atac. 22 and Viage Des. Atac. 196 (1860). *Philippiamra celosiodes* Kuntze, Rev. Gen. i. 58 (1891).

Collected in our area only at Barquito (*J.* 4788) and Taltal (*Werdemann* 862). The plant frequents dry gravel and, at Barquito at least, grows with *S. amarantoides*. From the latter it differs in its larger, broader, colored bracts. It is very closely related to *S. pachyphylla* and I believe further studies will show these species and *S. fastigiata* Ph. to be phases of one variable species which ranges from southern Peru to the Vallenar Valley in Chile. The vegetative parts of species in this genus seem too variable to serve as the sole basis of specific distinctions.

Portulaca Philippii, sp. nov., ramosa; caulibus e radice perenni crassa ramosa erumpentibus pluribus carnosus basem versus non rariter fruticulosus et plerumque ramosis 5-10(-15) cm. longis procumbentibus vel laxe ascendentibus ad axillas foliorum lanum albidum longiusculum gerentibus, internodiis valde abbreviatis 1-3 mm. longis; foliis numerosis alternis ascendentibus oblongo-spathulatis vel oblongis 5-8 mm. longis 1.5-2.5 mm. latis carnosus compressis persistentibus apice rotundis; inflorescentia euphyllis ca. 6-12 erectis involucreta capitata 1-3-flora; calyce supra rupturam 4-5 mm. longo; sepalis 2 usque ad quintam partem altitudinis a basi connatis triangulari-ovatis apice acutis; corolla majuscula rubra ca. 2 cm. diametro lobis ovatis calycem usque ad duplum superantibus; staminibus 25-35; capsula breviter stipitata globulosa vel ovoideo-globosa ca. 2.5 mm. longa et crassa basem versus circumscisse dehiscenti, parte superiori nitente, parte inferiore straminea disciformi vel ad patelliformi; seminibus reniformibus opacis 0.5 mm. diametro minute tuberculatis nigrescentibus.—CHILE: dry rocky slopes back of sea-cliffs near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston* 5715; open grassy crest at lower edge of fertile belt on ridge back of Punta Grande near Paposos, Dept. Taltal, Nov. 29, 1925, *Johnston* 5224 (TYPE, Gray Herb.); dryish slope just below the fertile belt on the ridge near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston* 5316.

This species belongs to the group of *P. pilosa* L. In the form and dehiscence of its capsule and in the shape and roughenings of its seeds it is quite the same as *P. halimoides* L. as illustrated by Urban, *Symb. Ant.* v. 343, fig. h-j (1907), though of course it is not closely related to that annual yellow-flowered species of the West Indies. *Portulaca Philippii* is a strong perennial with long thick roots. The stems frequently become somewhat fruticose towards the base. The species is distinguished in its group by its persistent habit, compressed

persistent leaves, basally circumscissile capsule and large purple-red corollas. It is the undetermined species reported from near Miguel Diaz by Philippi, Fl. Atac. 20 and Viage Des. Atac. 27, 194 (1860). I have also seen a collection from near Taltal made by Reiche. The plant from near Paposo reported as *P. pilosissima* by Reiche, Bot. Jahrb. xlv. 343 (1911), is probably also the same. On a dry silty elevated beach between Punta Plata and Punta Buitre (*J.* 5250) I collected a form of *P. Philippii* in which the axillary hairs were excessively developed apparently as in the form noted near Miguel Diaz by Philippi. The axillary hairs in this form are very numerous and surpass the leaves in length and partially obscure them in a woolly tangle. The common form of the species has fewer much less evident axillary hairs that are surpassed in length by the leaves. The latter form was found only along the lower edge of the fertile belt.

CARYOPHYLLACEAE

Stellaria cuspidata HBK. Nov. Gen. et Sp. vi. 27 (1823); Ph. Fl. Atac. 10 and Viage Des. Atac. 25, 27, 184 (1860).

Philippi reported this species from Paposo and Miguel Diaz but apparently made no collections of it for I could find none at Santiago. No doubt his reference is to the very common caryophyllaceous plant that forms tangles of procumbent stems about wet shaded places in and just below the fertile belt from Taltal to Miguel Diaz. Not finding flowering plants I did not collect it.

Spergularia arbuscula (Gay), comb. nov. *Paronychia arbuscula* Gay, Fl. Chile ii. 520 (1846); Reiche, Fl. Chile i. 211 (1896). *Arenaria teretifolia* Ph. Fl. Atac. 10 and Viage Des. Atac. 15, 184 (1860). *S. teretifolia* Ph. Anal. Univ. Chile lxxxi. 764 (1892). *A. lignosa* Ph. Fl. Atac. 10 and Viage Des. Atac. 15, 184 (1860). *S. lignosa* Ph. Anal. Univ. Chile lxxxi. 764 (1892).

Frequent in dry rocky or gravelly places below the fertile belt and particularly near the ocean. It has been collected at Barquito (*J.* 4753), Cachinal de la Costa (*Philippi*, types of *A. teretifolia* and *A. lignosa*), Posada Hidalgos (*J.* 5659) and Ag. Miguel Diaz (*J.* 5357). It is a stout twiggy bush 1-6 dm. tall, anomalous in its genus because of its habit. It can be noted in passing that the type of *A. teretifolia* has broad oblong sepals and that *A. lignosa* has lanceolate ones. The species as I have accepted it, however, seems to be quite variable and I do not think this difference is specific. Of similar habit and probably conspecific are *S. oligantha* Ph. and *S. fruticosa* Ph.

Spergularia denticulata Ph. Anal. Univ. Chile lxxxi. 769

(1892). *Arenaria denticulata* Ph. Fl. Atac. 10 and Viage Des. Atac. 15, 184 (1860). *S. Larrañagae* Ph. Anal. Univ. Chile lxxxi. 767 (1892).

An annual or occasionally a perennial herb frequenting dry sandy or gravelly benches. It is known only from Barquito (*J.* 4754), near Caleta de Pan de Azucar (*J.* 5833), Ag. Grande (*J.* 5822), Cachinal de la Costa (*Philippi*, type of *A. denticulata*), Ag. Cachina (*J.* 5737), north of Portezuelo de Mina Carola (*J.* 5672) and Breas (*Larrañaga*, type of *S. Larrañagae*). The seeds of this species are similar to those of *S. stenocarpa* Ph. but are dull rather than very lustrous. The type of *S. Larrañagae* is from Breas where typical material of *S. denticulata* was also collected by Larrañaga. It appears to be merely a coarse form of the species.

Spergularia stenocarpa (Ph.), comb. nov. *Arenaria stenocarpa* Ph. Fl. Atac. 10 and Viage Des. Atac. 19, 184 (1860). *S. Borchersi* Ph. Anal. Univ. Chile lxxxi. 769 (1892).

A very well marked species which is frequent on dry gravelly slopes and benches about Taltal where it has been collected at the following stations,—Taltal, 50 m. alt., (*Werdermann* 799); Queb. de los Infieles ca. 18 km. south of Taltal (*J.* 5641), Agua Clérigo near Hueso Parado (*Philippi*, type of *A. stenocarpa*), Caleta de Hueso Parado (*J.* 5162), south of Paso Malo (*J.* 5177) and Caleta Oliva (*Borchers*, type of *S. Borchersi*). Further north I collected it in Queb. Guanillo near Paposo (*J.* 5604). It is usually an annual but may become somewhat fruticulose and persistent. The plant is yellowish green and appears to be glabrate; in fact the stems are roughened with small sessile or short-stipitate glands. The seeds are wingless, black and very lustrous.

Spergularia cremnophila, sp. nov., perennis; caulibus 1–3 dm. longis prostratis vel laxe decumbentibus numerosis ramosis villosulis glandulosis teretibus e radice erecta profunda crescentibus, internodiis 1–2.5 cm. longis; foliis linearibus vel rariter lineari-oblongis 1–2 cm. longis 1–2(–3) mm. latis carnosulis compressis glabris vel marginem versus villosulis et glandulosis cuspidatis quam internodiis brevioribus vel rariter aequilongis; stipulis hyalinis 2–4 mm. longis triangularibus plus minusve lanceolatis acuminatis apicem versus saepe paullo laciniatis basi connatis; floribus cymosis; bracteis linearibus vel lanceolatis 2–5 mm. longis; pedicellis pubescentibus et glandulosis ascendentibus vel plus minusve patentibus 0.8–2.5 cm. longis; sepalis 6–7 mm. longis oblongo-lanceolatis obtusis margine scariosis; petalis albis ovato-ellipticis apice rotundis 4–5 mm. longis quam sepalis paullo brevioribus, staminibus 10 biseriatis 2–3 mm. longis ovario sesquilateralibus; stylo 1–1.5 mm. longo plus minusve

profunde trilobato basem versus et non rariter ad medium vel ultra integris; ovario ellipsoideo breviter stipitato; capsula ovoidea tri-valvata 4-5 mm. longa 3-4 mm. crassa sepalis aequilonga vel paullo breviori; seminibus nigris lucidis laevibus anguste alatis 0.6-0.9 mm. diametro.—CHILE: decumbent on foggy slope at head of quebrada above Aguada Grande, Dept. Chañaral, Dec. 17, 1925, *Johnston 5821*; prostrate, in crevices at head of fog-bathed sea-cliffs near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5683* (TYPE, Gray Herb.); prostrate on exposed fog-bathed slopes about summit of Cerro de Cachina near the sea southwest of Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5684*.

This species is apparently related to *S. stenocarpa* from which it obviously differs in its large flowers, glandular-villous stems, winged seeds and perennial root. Although it seems to be rather variable in vegetative parts and in the depth of lobing of the style I feel confident that the three collections cited represent a distinguishable natural group of forms.

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

D. paposana Ph. Fl. Atac. 10 and Viage Des. Atac. 18, 25, 184 (1860).

A widely distributed species extending southward along the Pacific Coast to the vicinity of Paposo and Taltal. At the former locality Philippi collected the type of *D. paposana*. I found it to be infrequent in small colonies in the lower part of the fertile belt about Paposo, although material suitable for collecting was found only on the ridge back of Punta Grande (*J. 5213*). Philippi reported it as frequent in Queb. Taltal.

Microphyes litoralis Ph. Fl. Atac. 20 t. 1f and Viage Des. Atac. 194 (1860).

This species previously reported only from the Caldera-Copiapó region was collected on the dunes on the headland just north of Chañaral (*J. 5846*) and on a sandy slope below Ag. Grande to the east of Caleta de Pan de Azucar (*J. 5785, 5832*) and on dune-slopes about Punta Reyes below Ag. Miguel Diaz (*J. 5319*). At each station it was locally common on the sand.

Paronychia chilensis DC. Prodr. iii. 370 (1828). *P. coquimbensis* Gay; Ph. Fl. Atac. 22 and Viage Des. Atac. 25, 196 (1860).

Trailing on moist ground and forming mats in the fertile belt at Ag. Cachinalcito (*J. 5184*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5356*).

Cardionema ramosissima (Weinm.) Nels. & Macbr. Bot. Gaz. lvi. 473 (1913). *Pentacaena ramosissima* H. & A.; Ph. Fl. Atac. 22 and Viage Des. Atac. 19, 196 (1860).

Forming prostrate pungent mats in rocky places along the lower edge of the fertile belt near Taltal (*Philippi*, *Werdermann* 781, *J.* 5617), Paposo (*J.* 5212) and Ag. Miguel Diaz (*J.* 5355).

Silene gallica L. Sp. Pl. 417 (1753).

Collected by Werdermann (no. 840) at ca. 400 m. alt. near Taltal.

RANUNCULACEAE

Ranunculus Cymbalaria Pursh, Fl. Am. Sept. 392 (1814). *R. microcarpus* Presl; Ph. Fl. Atac. 7 and Viage Des. Atac. 22, 23, 25, 181 (1860).

This plant is infrequent but often locally common in wet saline soils. *Philippi* reports it from near Paposo.

BERBERIDACEAE

Berberis litoralis Ph. Fl. Atac. 7 and Viage Des. Atac. 27, 181 (1860).

Known only from the type collected at ca. 260 m. alt. near Miguel Diaz by *Philippi*. It is described as a shrub over 3 m. (duas orgyales) tall.

CAPPARIDACEAE

Cleome chilensis DC. Prodr. i. 238 (1824); Ph. Fl. Atac. 9 and Viage Des. Atac. 19, 25, 27, 183 (1860).

A slender glandular annual herb growing on gravelly slopes and benches in the lower parts of the fertile belt. It has been collected near Taltal (*J.* 5070), Ag. Miguel Diaz (*J.* 5387) and "Hueso Parado, Paposo, etc." (*Philippi*). *Reiche*, Bot. Jahrb. xlv. 345 (1911), mentions its occurrence on the hills near Chañaral. The petals are white and the anthers are purplish red. The plant is not typical *C. chilensis* as that is illustrated by *Delessert*, Icones iii. 1, t. 2 (1827), but appears, rather, to be the var. *pubescens* DC., l. c.

CRUCIFERAE

Menonvillea Gayi Ph. Fl. Atac. 8 and Viage Des. Atac. 12, 182 (1860).

This species barely enters our area being known in it only from the collection made at Las Animas by *Philippi*. It is apparently quite frequent to the southward being the common glabrous annual *Menonvillea* from Copiapó to Ovalle. The specific name is apparently due to the fact that *Philippi* considered, and quite correctly, that his collection from Las Animas was conspecific with one from Arqueros

made by Gay (no. 1036). *Menonvillea parvula* Ph. seems to be a synonym of *M. Gayi* Ph. as is probably also *M. media* Turcz. (= *Cymatoptera chilensis* Turcz.), a species based upon *Bridges 1279* from "hills between Huasco and Copiapó."

Menonvillea orbiculata Ph. Fl. Atac. 9 and Viage Des. Atac. 183 (1860).

I refer here doubtfully two collections made on dry crests above the fertile belt near Paposo, one on Cerro Yumbes (*J. 5552*) and the other above El Rincon (*J. 5515*). These collections have somewhat smaller flowers and less broadly winged smaller fruit than typical *M. orbiculata* from the coastal dunes at Caldera, but resemble it in their conspicuous floccose-tomentose indument and stout habit. True *M. orbiculata* frequently becomes somewhat shrubby below. My collections, however, only suggest this tendency.

Menonvillea parviflora Ph. Fl. Atac. 8 and Viage Des. Atac. 15, 182 (1860). *M. orbiculata* Ph., var. *parviflora* Reiche, Anales Univ. Chile xc. 85 (1895) and Fl. Chile i. 55 (1896).

Growing on dry gravelly slopes and benches at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5773*), near Ag. Cachina (*J. 5697*), Sierra Esmeralda (*San Roman*), and, perhaps, Ag. Cardon (*J. 5275*) and Ag. Miguel Diaz (*J. 5314*). The species differs from *M. orbiculata* in being more slender and glabrous, and in having smaller fruit. Collections by Riveros from near Copiapó may be referable here, but otherwise the plant is known only from our area. Its nearest relative seems to be *M. Gayi* from which it differs in being a taller more erect greener plant and in having smaller more roughened and more narrowly winged fruit. It varies off to the following variety.

Menonvillea parviflora Ph., var. ***aptera*** (Ph.), comb. nov. *M. aptera* Ph. Fl. Atac. 9 and Viage Des. Atac. 19, 183 (1860).

An erectly branched annual growing on dry rocky slopes or in gravel. It is known only from the region about Taltal where it has been collected at Ag. Clérigo near Hueso Parado (*Philippi*, type), near Taltal (*Darapsky, Werdermann 835*), Breas (*Larrañaga*) and Queb. de los Infieles ca. 18 km. south of Taltal (*J. 5640*). It differs from *M. parviflora* only in having wingless or practically wingless fruit. Schulz, Notizbl. x. 466 (1928), has incorrectly determined Werdermann's collection as "*M. chilensis* Turcz."

Lepidium spathulatum Ph. Fl. Atac. 8 and Viage Des. Atac. 15, 25, 27, 182 (1860).

A biennial or perennial with widely spreading stems which is known only from the fertile belt in our area. It has been collected at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5772*), near Paposo

(*Philippi*, *J.* 5514) and Ag. Miguel Diaz (*J.* 5388). Prof. Thellung, who examined my collections of *Lepidium*, wrote me that the species is related to his *L. cyclocarpum*.

Lepidium auriculatum Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 51 (1858).

Referred here is a collection from the grassy crest in the fertile belt on the ridge back of Punta Grande (*J.* 5209). According to Prof. Thellung the collection much resembles authentic material of *L. auriculatum* but is atypical in its caducous calyx, short glands and lightly emarginate silique.

Lepidium bonariense L. Sp. Pl. 645 (1753).

Reported by Schulz, Notizbl. x. 465 (1928), from slopes in a quebrada at ca. 400 m. alt. near Taltal.

Brassica nigra (L.) Koch in Röhling, Deutschl. Fl. ed. 3, iv. 713 (1833); Ph. Fl. Atac. 8 and Viage Des. Atac. 22, 25, 182 (1860).

Reported by Philippi as very common on slopes near Paposo. I did not collect or note the species and as Philippi apparently made no collections I have no check on his determination.

Sisymbrium sagittatum H. & A. Bot. Miscl. iii. 139 (1833); Ph. Fl. Atac. 8 and Viage Des. Atac. 25, 27, 182 (1860).

A very loosely branched slender erect perennial herb growing 5–12 dm. tall on moist slopes in the fertile belt. It has been collected at Barquito (*J.* 4774), Ag. Cachina (*J.* 5698), Breas (*Larrañaga*), Taltal (*Werdermann* 858), Paposo (*Philippi*), El Rincon (*J.* 5517), Ag. Panulcito (*J.* 5463) and Ag. Miguel Diaz (*J.* 5389). The petals are white.

Werdermannia anethifolia (Ph.), comb. nov. *Nasturtium anethifolium* Ph. Fl. Atac. 7 and Viage Des. Atac. 12, 181 (1860).

Heterothrix anethifolia Schulz, Pflanzenr. [Heft. 86] iv. Fam. 105, pt. 3, 298 (1924). *Sisymbrium carnosulum* Ph. Fl. Atac. 7 and Viage Des. Atac. 15, 181 (1860). *N. macrostachyum* Ph. Anal. Univ. Chile lxxxi. 180 (1892). *W. macrostachya* Schulz in Werd. Notizbl. x. 470, fig. 7 (1928). *S. Larrañagae* Ph. Anal. Univ. Chile lxxxi. 185 (1892). *S. pectinatum* Reiche, Anal. Univ. Chile xc. 109 (1895) and Fl. Chile i. 79 (1896).

As here taken this species is a variable but unquestionably a very natural assemblage of immediately related forms characterized by their glaucous more or less fleshy leaves with elongate distant lobes. It appears to be either an annual herb or a perennial from a woody base. The fruit varies from 7–25 mm. in length and from 2–2.5 mm. in breadth. It is weakly compressed. The seeds are brown, alveolate and not mucilaginous when wet. Schulz first referred the plant to

his genus *Heterothrix*, but in habit, foliage and fruit it is not at all in agreement with the other species he places there. In habit it is much like the genus *Sibara* of Baja California. Recently, however, Schulz has erected the genus *Werdermannia* for our plant, and being uncertain as to its exact relationships I am giving the genus provisional recognition.

The material seen by me roughly falls into two groups, one of them including coarse xerophytic perennials with fruit 7–15 mm. long and with broad leaf-segments. This form I collected on dry gravelly slopes about Ag. Cachina (*J.* 5699), on a dry rocky hillside at the western end of the Llano Colorado (*J.* 5654) and in rock crevices near the ocean near Queb. Anchuña (*J.* 5194). The type of *Nasturtium macrostachys* Ph. collected by Borchers near Puerto Oliva belongs here as does apparently also the type of *Sisymbrium Larrañagae* Ph. which was collected by Larrañaga at Breas. The type of the latter species is very fragmentary and consists only of a few snips showing fruit of medium length (ca. 1 cm. long).

The second form is a smaller more bushy plant with an annual or short-persistent root, narrow leaf-segments and fruit 1.5–2.5 cm. long. I have seen it only from the fertile belt where it grows at Barquito (*J.* 4773), Ag. Grande (*J.* 5775) and Taltal (*J.* 5071). This form is apparently *Nasturtium anethifolium* Ph., the type of which came from Las Animas. Perhaps *Sisymbrium carnosulum* Ph. the type of which came from Cachinal de la Costa, is the same although the description does suggest the coarse form. The types of these two Philippian species are so broken and mixed that I could get no help from them in settling the application of these two names. A collection from Taltal made by Werdermann (no. 803) seems to be a luxuriant phase of the slender form.

Mathewsia incana Ph. Fl. Atac. 8 and Viage Des. Atac. 15, 182 (1860).

A small bush 3–6 dm. tall growing in dry gravelly places outside of the fertile belt. In our area it has been collected at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J.* 5774), near Ag. Cachina (*J.* 5748), Sierra Esmeralda (*San Roman*), Taltal (*Darapsky*) and above the fertile belt at El Rincon near Paposo (*J.* 5516). South of our area it occurs back of Caldera and Carrizal Bajo. Schulz, Notizbl. x. 465 (1928), has reported it from Queb. Matancilla near Paposo. In the type of the species from Cachinal de la Costa and in my collections from Ag. Grande the fruit is glabrate or inconspicuously pubescent. All the other material seen by me has the fruit densely stellate-pubescent.

CRASSULACEAE

Tillaea erecta H. & A. Bot. Beechey. Voy. 24 (1830). *T. peduncularis* of Ph. Fl. Atac. 22 and Viage Des. Atac. 196 (1860).

Dryish rocky slopes and cliffs at the lower edge of the fertile belt; not common. It has been collected near Taltal (*Werdermann 832*), Ag. Cardon (*J. 5274*) and Ag. Miguel Diaz (*J. 5386*).

ROSACEAE

Alchemilla arvensis (L.) Scop. Fl. Carn. ed 2, i. 115 (1770); Ph. Fl. Atac. 18 and Viage Des. Atac. 192 (1860).

Reported from the fertile belt near Paposo by Philippi. I could not find his specimens at Santiago.

Acaena trifida R. & P., var. **glabrescens** Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 57 (1858); Reiche, Fl. Chile ii. 229 (1898).

To this variety, which I know only from descriptions, I refer collections from the foggy sea-cliffs near Ag. Grande (*J. 5771*) and Ag. Cachina (*J. 5696*) and from hillsides in the fertile belt on Cerro Perales near Taltal (*J. 5609*), at El Rincon (*J. 5513*), Ag. Panul (*J. 5436*) and Ag. Miguel Diaz (*J. 5385*). It is a small erectly, though sparsely branched undershrub 3–6 dm. tall growing usually on rocky banks or cliffs. In gross habit and in the cut of its leaves it is quite similar to *A. trifida*, but is glabrate and perhaps has somewhat smaller flowers and inflorescence. The plant, although apparently glabrous has an obscure sparse pubescence along the primary and secondary rachises of the leaves.

Acaena canescens Ph. Fl. Atac. 18 and Viage Des. Atac. 25, 192 (1860).

Probably as a result of a clerical error Philippi reports this species from Paposo. The species, however, is one characteristic of vegamargins in the cordilleras and is apparently only a phase of *A. macrostemon* Hook. f. There are no collections of the species from Paposo in the herbarium at Santiago.

LEGUMINOSAE

Cassia Brongniartii Gaud. Voy. Bonite, Bot. Atlas t. 10 (1840–42)
C. misera Ph. Fl. Atac. 17 and Viage Des. Atac. 23, 25, 191 (1860).
C. conjugata R. & P. ex Benth. Trans. Linn. Soc. xxvii. 540 (1871).

Philippi collected the type of *C. misera* in the vicinity of Paposo in Queb. Guanillo near "Agua de Arriba" (called "Posada" in recent maps). I looked for the plant there but did not find it, although I did encounter two seedlings a few kilometers to the northward on the

high very arid barren plain about midway between Mina Abundancia and the crest of Cerro Yumbes (*J.* 5582). A very large although local colony of the plant was found above the fertile belt near the upper limit of vegetation on the high arid ridge above Ag. Panulcito (*J.* 5454). At that station it formed a loose depressed shrub 1.5–5 dm. tall and 3–12 dm. broad. According to Bentham, l. c., Gaudichaud collected the synonymous *C. conjugata* at Cobija. The beautiful and elaborately detailed folio plate of *C. Brongniartii* is no doubt based upon this collection from Cobija. It is certain that it clearly represents *C. misera* and hence the plant with which we are concerned.

Cassia paposana Ph. Fl. Atac. 17 and Viage Des. Atac. 23, 25, 191 (1860).

This species has been collected only in the fertile belt on the slopes in Queb. Guanillo near Paposo (*Philippi*, type), on a rocky slope in the subarid zone above the fertile belt at El Rincon (*J.* 5488) and about rocks on the moist floor of the quebrada above the waterhole at Ag. Miguel Diaz (*J.* 5348). *Philippi* described the plant as a bush ca. 1.5 m. tall. The plants at El Rincon were 6–9 dm. tall while those at Ag. Miguel Diaz were weak and trailing shrubs.

Cassia acuta Meyen ex Vogel, Synop. Cassiae 42 (1837).

I doubtfully refer to this species a dense globose bush 5–10 dm. tall which was frequent in gravelly stream-ways about Ag. Cachina (*J.* 5743). The type of *C. acuta* was obtained a short distance to the east of the old port of Copiapó. The species appears to range southward towards Coquimbo. My collection from Ag. Cachina closely matches material from near Copiapó and near Vallenar. It is possible that *C. acuta* and *C. Cumingii* H. & A. are the same. The type of *C. alcoparra* Ph., from Illapel, has larger leaflets and is slightly less pubescent than my collection.

Cassia eremobia Ph. Anal. Univ. Chile lxxxiv. 443 (1893).

The type of this species is a sterile twig collected by Larrañaga at Breas. It is clearly the same as my collections from between Cascabeles and Agua Dulce (*J.* 5166) and from Punta del Rincon near Paposo (*J.* 5238). It was uncommon and grew on rocky outcrops and ledges on the coastal plain forming a very loosely branched bush 5–9 dm. tall. Also referred to *C. eremobia* are collections from near Taltal (*Werdermann* 844) and from the Sierra Esmeralda near Pique de Jacinto Diaz (*J.* 5671). These latter collections show an approach towards *C. acuta*. It is quite possible that *C. eremobia* may be only a northern variety of *C. acuta* differing in having duller green, slightly glandular, more pubescent, more obtuse rather oblong leaflets.

Krameria cistoidea H. & A. Bot. Beechey Voy. 8, t. 5 (1830).

A phase of this species was found growing on dryish slopes above the fertile belt near Ag. Panulcito (*J.* 5455) and Ag. Miguel Diaz (*J.* 5347) where it formed prostrate shrubby growths 1-1.5 m. broad. The species has not been previously reported from north of Copiapó.

Krameria iluca Ph. Fl. Atac. 9 and Viage Des. Atac. 183 (1860).

Quite typical of this species are the plants collected on dryish rocky slopes above the fertile belt near Paposo on Cerro Yumbes (*J.* 5583) and above El Rincon (*J.* 5489). Like *K. cistoidea*, which grows in ecologically similar situations only 25 km. to the northward, the plant is prostrate. The two species are superficially similar but are readily distinguished since *K. cistoidea* has 5-merous flowers in which 4 stamens and 3 normal petals develop, and *K. iluca* has 4-merous flowers in which only 3 stamens and 2 normal petals develop. *Krameria iluca* is most closely related to *K. triandra* R. & P. of Peru and Bolivia from which it is distinguished by its usually smaller ovate leaves and its abruptly acute petals. The difference in pubescence given by Fries, Nov. Act. Reg. Soc. Sci. Upsal. ser. 4, i. no. 1, 131 (1905), is misleading. Possibly *K. iluca* is no more than a good variety of *K. triandra*. Until the present *K. iluca* has been reported only from high altitudes on the puna of northern Chile and adjacent Argentina. Its occurrence in the coastal hills, hence, is most unexpected.

Hoffmanseggia gracilis (R. & P.) H. & A. Bot. Miscl. iii. 209 (1833); Ph. Fl. Atac. 17 and Viage Des. Atac. 23, 25, 191 (1860).

Larrea gracilis R. & P. Fl. Peruv. iv. t. 377 (1802), for date see Colmeiro, Los Botánica y Los Botánicos Pen. Hispano-Lusitana 45 (1858).

A prostrate perennial of dryish gravelly soils which is frequent along the coastal plain in our area. It has been collected at ca. 150 m. near Taltal (*Werdermann* 813), between Paso Malo and Cascabeles (*J.* 5176), near Paposo (*J.* 5563), in Quebrada Guanillo near Paposo (*Philippi*), near Ag. Cardon (*J.* 5265) and near Ag. Miguel Diaz (*J.* 5350). I also collected this species at Tocopilla (*J.* 3622) and at Mollendo (*J.* 3570). Hooker & Arnott based their name upon *Larrea gracilis* R. & P. which belongs to the plant of the coastal region about Lima. This seems to be conspecific with our plant and to have a synonym in *H. prostrata* Lag. Hooker & Arnott cite a collection from Coquimbo, *Cuming* 880, but whether this is properly determined I can not say. At Santiago our plant is represented from Chile only by *Philippi*'s specimens from near Paposo. Accordingly I wonder as did also Gay, Fl. Chile ii. 234 (1846), if *Cuming*'s collections could be a form of *H. falcaria* Cav., a species which is not uncommon in that part of Chile.

Lupinus microcarpus Sims, Bot. Mag. 1, t. 2413 (1823).

Werdermann (no. 851) has collected this lupine at 600 m. alt. in the hills near Taltal.

Melilotus parviflora Desf. Fl. Atlant. ii. 192 (1800); Ph. Fl. Atac. 14 and Viage Des. Atac. 23, 188 (1860).

Reported by Philippi from Agua Perales in Queb. Guanillo near Paposo.

Trifolium concinnum Ph. Fl. Atac. 14 and Viage Des. Atac. 15, 25, 188 (1860).

This beautiful clover is frequent on moist slopes in the fertile belt. It has been collected at Ag. Grande (*J.* 5826), El Rincon (*J.* 5494) and Ag. Miguel Diaz (*J.* 5351). Philippi's type is labeled "Cachinal & Paposo." The species belongs to the group of *T. megalanthum* Steud. and may be no more than a well marked variety. For convenience, however, I am accepting it as distinct since it has a detached natural range, such large flowers, and such a deeply lobed calyx. The species ranges northwards at least to Mollendo, Peru, where it has been reported as *T. polymorphum* Poir. All the plants seen by me produced abundant cleistogamic flowers along the creeping stems.

Lotus subpinnatus Lag. Gen. et Sp. Pl. Nov. 23 (1816); Ph. Fl. Atac. 14 and Viage Des. Atac. 25, 188 (1860).

Collected on the fertile slopes above El Rincon near Paposo (*J.* 5495) and near Taltal (*Werdermann* 780). Philippi reported it from Paposo but his specimens seem to be lost. I also observed the plant on fertile slopes southwest of Cerro Yumbes.

Errazurizia multifoliolata (Clos) Johnston, Proc. Calif. Acad. ser. 4, xii. 1043 (1924); Rydb. Am. Jour. Bot. xv. 427-8 (1928). *Psoralea multifoliolata* Clos in Gay, Fl. Chile ii. 87 (1846). *Dalea multifoliata* F. Ph. Cat. Pl. Vascul. Chile 54 (1881); Reiche, Fl. Chile ii. 77 (1898). *Parosela multifoliolata* Macbr. Contr. Gray Herb. lxxv. 23 (1922). *E. glandulifera* Ph. Anal. Univ. Chile xli. 689 (1872).

This remarkable plant, previously known only near Bandurrias (*Geisse*), Carrizal Bajo (*King*) and Arqueros (*Gay*), also occurs in our region on the very arid rocky slopes of the coastal hills near the upper limit of vegetation. It grows in local colonies on the ridges above Ag. Panulcito (*J.* 5457) and El Rincon (*J.* 5493) where it forms prostrate or very loosely decumbent shrubs 1-1.5 m. broad and 5 dm. or less tall. The petals are yellow and the disagreeable odor of the plant quite similar to that of its congeners in Baja California. Although the type of *E. glandulifera* Ph. was not indicated, a study of Philippi's herbarium seems to show that the genus and species were based upon a collection by Gay, no. 9[5?]44, from Arqueros,

probably part of the collection upon which Clos based his *Psoralea multifoliolata*.

Parosela azurea (Ph.) Macbr. Field Mus. Nat. Hist., Pub. Bot. iv. 107 (1927). *Psoralea azurea* Ph. Fl. Atac. 14 and Viage Des. Atac. 23, 25, 188 (1860). *Dalea azurea* Reiche, Anal. Univ. Chile xcvi. 488 (1897) and Fl. Chile ii. 77 (1898).

A loosely branched decumbent bush 1–6 dm. tall and 6–12 dm. broad known only from the upper edge of the fertile belt near Ag. Panulcito (*J.* 5456) and on Cerro Yumbes near Paposo (*J.* 5584) and from a dryish ledge adjacent to Agua Perales in Queb. Guanillo near Paposo where the type was probably obtained by Philippi (*Philippi*, type; *J.* 5585). The standard of the flowers is white, the wings and keel are a rich blue.

Astragalus vasticola, nom. nov. *Phaca atacamensis* Ph. Anal. Univ. Chile lxxxiv. 16 (1893), not *A. atacamensis* Fries (1905).

A small young plant, just coming into flower, collected by San Roman at La Brea in 1884 is the type of *Phaca atacamensis*. What is apparently the same species was found to be common on the gravelly benches about Ag. Cachina (*J.* 5739) and local in moist sand below the water-hole at Ag. Grande (*J.* 5824). The plant is an annual or a short-lived perennial with ascending branches and pinkish flowers. The plant of the Caldera-Copiapó region passing as *A. coquimbensis* (H. & A.) Reiche seems to be conspecific.

Astragalus paposanus, sp. nov., perennis tomentosus canescens 1.5–2.5 dm. altus; caulibus ascendentibus subsimplicibus e radice gracili recta profunda orientibus; rhachi folii 4–10 cm. longa fere ad basem foliolata; foliolis oppositis alternisve 9–15-jugis anguste oblongis 8–16 mm. longis 2–4 mm. latis ca. 0.3 mm. longe petiolulatis apice truncatis et saepe emarginatis; stipulis 3–5 mm. longis 1.5–1.8 mm. latis anguste triangularibus acuminatis distinctis membranaceis maturitate plus minusve recurvatis; pedunculis ascendentibus vel divaricatis 3–8 cm. longis quam foliis brevioribus vel ea paullo superantibus; bracteis lanceolatis vel subulatis deciduis 2–3 mm. longis; floribus laxe racemosis; tubo calycis campanulato 3–4 mm. longo; lobis calycis subulatis 2–3 mm. longis inaequalibus; pedicellis ca. 1 mm. longis; corolla purpureo-rosea; vexillo oblongo-obovato 9–10 mm. longo ca. 4 mm. lato reflexo, lamina basem versus in unguem latum brevem gradatim attenuata apice rotundata saepe emarginata; alis carinam evidenter superantibus, laminis 5 mm. longis ad 2.3 mm. latis oblongis apice rotundis, unguibus linearibus 3.5 mm. longis; carina oblonga 3.5 mm. longa apice rotundata, ungue lineari ad 4 mm. longo; ovario lanceolato compresso dense adpresso-villoso; leguminibus inflatis ellipsoi-

deis vel ovoideis chartaceis 2-3 mm. longis 11-15 mm. crassis sessilibus villosis apicem pedunculi versus congestis ascendentibus vel cernuis ca. 2 mm. longe pedicellatis; seminibus numerosis brunneis nigro-maculatis 3.5 mm. longis 2.5 mm. latis valde compressis oblique ovatis latere juxta hilum conspicue intrusis.—CHILE: dry gravelly floor of Quebrada Guanillo above Agua Perales near Paposo, Dept. Taltal, Dec. 8, 1925, *Johnston 5586* (TYPE, Gray Herb.); dry hard gravel along trail between Paposo and Punta del Rincon, Dept. Taltal, Nov. 30, 1925, *Johnston 5564*; on high dryish ridge above fertile belt, slopes above El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5498*.

This plant was seen only in the general vicinity of Paposo where it grew in dry gravel. It is related to *A. vasticola* Johnston, differing in being conspicuously white-tomentose practically throughout. It is possible that it may be only a northern variety of that species.

Astragalus cachinalensis Ph. Fl. Atac. 15 and Viage Des. Atac. 15, 189 (1860).

A perennial with elongate slender trailing stems which grows in the fertile areas at Ag. Grande (*J. 5825*), Cachinal de la Costa (*Philippi*, type), Ag. Cachina (*J. 5740*), El. Rincon (*J. 5497*), Ag. Panul (*J. 5431*) and Ag. Miguel Diaz (*J. 5349*). The corolla which seems to vary some in size has a cream-colored keel and wings and a bluish standard. The species is unquestionably distinct from *A. procumbens* H. & A.

Astragalus melanogonatus, sp. nov., annuus vel perennis herbaceus vel basem versus suffruticosus 1-2.5 dm. altus ascendens vel prostratus laxe ramosus; ramis gracilibus cum pilis albis adpressis vestitis et inde canescentibus sed sub nodis cum pilis nigris plus minusve fuscescentibus; foliis 4-7 cm. longis canescentibus; foliolis 5-15-jugis 3-15 mm. longis 2-4(-5) mm. latis oppositis vel evidenter alternis 0.2-0.5 mm. longe petiolulatis obovate vel anguste oblongis vel rariter anguste elliptico-oblongis apice truncatis et saepe retusis subtus adpresse villosis supra marginem versus sparse adpresseque villosis sed medium versus saepe subglabris; stipulis membranaceis 3-5 mm. longis paullo ultra medium connatis cum pilis nigris albisque adpresse pubescentibus, laciniis libris triangularibus; racemis axillaribus folia evidenter superantibus strigosis 7-12-floris, bracteis lanceolatis membranaceis 1-1.5 mm. longis villosis subpersistentibus; calycibus cum pilis albis et nigris intermixtis vestitis, tubo campanulato 2.5 mm. longo, lobis subulatis ca. 2 mm. longis, vexillo 0.9-1 cm. lato ca. 0.8 mm. longo suborbiculari caeruleo sed medium et basem versus flavescenti apice retuso basi in unguiculum latum ad 2 mm. longum abrupte attenuato; alis flavis cum ungue 2.5 mm. longis,

laminis ca. 6 mm. longis 3 mm. latis quam carina conspicue longioribus; carina ca. 6 mm. longa apicem versus caerulea alibi flava, lamina 2.5 mm. lata apice rotundata; ovario sessili lanceolato margine superiore dense villosa; leguminibus sessilibus valde compressis falcatis pendulis 1.5–2 cm. longis 4–5 mm. latis acutis pilis nigris albisque adpresso-villosis margine abaxillari introflexis; seminibus ca. 24.—CHILE: dry sandy ridge just back of Punta Reyes below Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5353* (TYPE, Gray Herb.); sandy places at mouth of quebrada at foot of hills just north of Antofagasta, Oct. 19, 1925, *Johnston 3632*.

A very well marked species which is superficially most like *A. Volckmanni* Ph. and *A. Rengifoii* Ph., two species of the Province of Atacama. From these, however, it differs in having smaller differently proportioned blue rather than purple corollas. The most striking features of *A. melanogonatus* are its very compressed fruit and the development of black hairs about the stem-nodes. The two collections referred to the species differ in gross habit but in essential details are remarkably similar. They are, I believe, different ecological phases of the species. The plant from near Antofagasta grew on a very sandy slope northeast of the town where except in such an abnormal winter as that of 1925 and 1926 little or no vegetation is to be found. The plant from Punta Reyes grew on the dunes which normally support a small flora. The specimens from Antofagasta are of an ascending annual with fruit 1.7–2 cm. long and the leaflets 7–15 mm. long in 5–7(–9) pairs. On the other hand the specimens from Punta Reyes are of a prostrate perennial with the fruit ca. 1.5 mm. long and the leaflets 3–6 mm. long in 8–15 pairs. The latter collection, the type, is probably more characteristic of the species.

Adesmia tenella H. & A. Bot. Beechey Voy. 19 (1830). *A. vesicaria* Bert. ex Colla, Mem. Accad. Torino xxxvii. 58 (1831); Ph. Fl. Atac. 15 and Viage Des. Atac. 25, 189 (1860).

An herb which is usually prostrate and grows on gravelly benches below the fertile belt. It has been collected at Taltal (*Werdermann 784*), Ag. Cachinalcito (*J. 5182*), Paposo (*Philippi*), Ag. Cardon (*J. 5264*) and Ag. Miguel Diaz (*J. 5343*). It occurs as far north as Tocopilla (*J. 3623*) and is frequent about Valparaiso and Santiago. I am taking up the name *A. tenella* H. & A. since it is older than the familiar *A. vesicaria* Bert. It might be mentioned that the latter species was obviously based upon a mixture of *A. tenella* H. & A. and *A. Smithiae* DC. although tradition has restricted the use of the name to the present concept.

Adesmia filifolia Clos in Gay, Fl. Chile ii. 157 (1846).

I refer here an erect herb collected on a gravelly bench near Ag. Cachinalcito (*J. 5183*). A loosely branched plant, in flower only, from Taltal (*Werdermann 870*) seems to be the same. The material from Cachinalcito agrees well with authentic specimens of the species, except that only the terminal segment of the fruit bears plumose bristles.

Adesmia pusilla Ph. Fl. Atac. 15 and Viage Des. Atac. 15, 189 (1860).

This slender loosely branched annual is endemic to our area occurring in gravelly places below the fertile belt. It has been collected at Punta de Pan de Azucar (*Philippi*, type; *J. 5843*), various places near Taltal (*Werdermann 830*; *J. 5086, 5136*), between Agua Dulce and Queb. Anchuña (*J. 5180*) and in Queb. Guanillo near Paposo (*J. 5580*).

Adesmia parviflora Clos in Gay, Fl. Chile ii. 158 (1846). *A. micrantha* Ph. Fl. Atac. 15 and Viage Des. Atac. 189 (1860).

Observed in our area only near Taltal where it was frequent on dryish gravelly benches in Queb. San Ramon (*J. 5135*) and on dryish gravelly openings in the shrubbery on the summit-ridge of Cerro Perales (*J. 5615*).

Adesmia gracillima, sp. nov., prostrata multicaulis sparse strigosa; caulibus tenuissimis herbaceis laxe ramosis 4-7 dm. longis e radice crassa lignosa recta orientibus; rhachi folii 2-5 cm. longa tenui sparse pallideque strigosa basem versus nuda; foliolis 4-6-jugis imparipinnatis ellipticis integerrimis 4-9 mm. longis 2-3.5 mm. latis basi apiceque rotundis ad 0.4 mm. longe petiolulatis subtus strigosis subpallidioribus supra ut videtur glabris sed sub lente minutissime strigulosis; stipulis subulatis erectis persistentibus 1.5-2 mm. longis ca. 0.25 mm. latis; floribus axillaribus; pedunculo 2-2.5 mm. longo gracillimo; tubo calycis breviter campanulato 1.5 mm. lato et longo basi rotundato sparse strigoso, lobis calycis triangularibus tubo subaequilongis paullo inaequalibus; vexillo ca. 4.5 mm. lato 4 mm. longo suborbiculari paullo reflexo flavo cum venis purpureis obscure lineato extus glabro intus basem versus loco villosa ornato sed aliter glabro apice rotundato basi abrupte late 2 mm. longe unguiculato; alis oblongis flavis ad 4 mm. longis ad 1.7 mm. latis apice obtusis carina paullo longioribus, ungue gracili 2.5 mm. longo margine inferiori ciliato; carina falcata ad 4 mm. longa ca. 2 mm. lata flava apice obtusa margine inferiori ciliata aliter glabra, ungue gracili ca. 2 mm. longo; ovario villosulo; leguminibus subsessilibus 3-4-segmentatis 8-12 mm. longis ca. 2.5 mm. latis facie cum pilis rigidis

paucis contortis non plumosis ornatis longe mucronatis.—CHILE: trailing over rocks on the floor of the steep gulch directly above the water-hole at Aguada del Panul, Dept. Taltal, Dec. 4, 1925, *Johnston 5428* (TYPE, Gray Herb.).

An extremely well marked species without any obvious immediate relatives. In gross appearance the plant presents a habit entirely new for the genus. The stems are extremely slender, very numerous, loosely branching and form a prostrate growth nearly 15 dm. in diameter. The flowers are borne on long slender spreading pedicels springing from the axils of well developed leaves along the upper part of the stems. I found only a single plant of the species. It was in the moist fog-bathed gulch at Ag. Panul.

Adesmia eremophila Ph. Fl. Atac. 15 and Viage Des. Atac. 12, 15, 189 (1860).

A frequent plant in dryish gravel below the fertile belt. It is an annual or less commonly a perennial and forms prostrate growths up to nearly a meter in diameter. The corolla is yellow with the outer surface frequently somewhat brownish. Philippi reported the plant from Las Animas, Cachinal de la Costa and Chañaral Bajo. The only material in Philippi's herbarium collected by him at any one of these stations is a plant given as from Chañaral Bajo (i. e. Finca de Chañaral) and this specimen I accept as type. I collected the species at Ag. Grande (*J. 5828*), near Taltal (*J. 5087, 5137*), near Paposo (*J. 5487, 5581*), near Ag. Miguel Diaz (*J. 5342*), and near Botija (*J. 6295*). Except no. *5487* which came from an arid ridge-crest above El Rincon all the collections came from low altitudes. The plant from the Caldera-Copiapó region which has been called *A. latistipula* Ph. appears to be indistinguishable from *A. eremophila*.

Adesmia viscidissima, sp. nov., suffruticosa dense viscido-villosa; caulibus pluribus laxe ascendentibus 1.5–7 dm. longis saepe laxe dichotome ramosis annuis e radice crassa lignosa recta orientibus; rhachi folii 3–5.5 cm. longa compressa basem versus nuda; foliolis imparipinnatis 11–14-jugis imbricatis 6–12 mm. longis 4–9 mm. latis subsessilibus obovatis apice obtusis vel rotundis superioribus gradatim diminutis; stipulis conspicuis ellipticis 8–13 mm. longis 5–8 mm. latis in petiolo 3–7 mm. longe adnatis; floribus subsessilibus in racemum terminalem 1–1.5 dm. longum conspicue bracteatum dispositis; bracteis cordatis amplexicaulibus 6–11 mm. latis breviter acuminatis; tubo calycis vere campanulato 3–4 mm. longo, lobis calycis valde inaequalibus erectis obtusis, 2 superioribus oblongis ad 4 mm. longis ca. 1.8 mm. latis, 3 inferioribus lineari-oblongis ca. 3.2 mm. longis ca. 1 mm. latis; vexillo transverse ovato-elliptico 6–7 mm. longo 8–9 mm.

lato glaberrimo flavo conspicue purpureo-maculato et -venoso apice rotundo, ungue ad 3 mm. lato apicem versus loco villosa ornato; alis oblique obovatis ad 5 mm. longis 3.5 mm. latis flavis glaberrimis carinam 1 mm. superantibus apice rotundis, ungue lineari 3 mm. longo; carina falcato-triangulari flava apice obtusa margine inferiori horizontali ca. 3 mm. longa ciliata, margine exteriori erecto 3.5-4 mm. alto glabro, ungue ca. 3 mm. longo; ovario adpresse villosa; leguminibus linearibus ca. 1 cm. longis 3 mm. latis ca. 4-segmentatis facie cum pilis 5 mm. longis gracillimis plumosis densissime obsitis; seminibus globosis ca. 1.5 mm. diametro laevibus.—CHILE: arid crest of ridge above the fertile belt near El Rincon, Dept. Taltal, Dec. 7, 1925, *Johnston 5490* (TYPE, Gray Herb.).

This remarkable species was encountered only on the very arid ridge-crest above El Rincon near Paposo, where, well above the fertile belt, it formed a small colony in the decomposed rock on the nearly barren summit. It is a strong-rooted perennial with laxly ascending stems and is excessively viscid with a very oily villous pubescence. Because it is so very clammy it is a very unpleasant plant to handle. The oily viscid secretions come from small brown glands submerged in the epidermal tissue. The stems are clothed with a sparse long-villous pubescence and a very much more abundant short-villous pubescence which on the younger parts of the stem is almost velutinous. The leaves are appressed-villous. The species is probably most nearly related to *A. eremophila* Ph. from which it differs in numerous characters, but particularly in its coarser habit, strong root, different pubescence, subsessile calyx, glabrous vexillum, entire-margined larger leaflets and bracts, etc.

Adesmia cinerea Clos in Gay, Fl. Chile ii. 179 (1846); Ph. Fl. Atac. 16 and Viage Des. Atac. 12, 190 (1860).

Philippi reports this distinctive shrub from near Las Animas. I have not seen his specimens.

Adesmia Diaziana, sp. nov., fruticosa intricate ramosa ca. 1.2 m. alta; ramis gracilibus adpresse villosulis vetustate glabratis et nigrescentibus supra dichotome spinosis; spinis gracilibus 1-2 cm. longis; rhachi folii 1-2 cm. longa tereti adpresse villosula; foliolis paripinnatis 4-6-jugis obovatis vel ellipticis 2-4 mm. longis 1.5-2.5 mm. latis emarginatis brevissime petiolulatis sparse adpresse villosulis; stipulis brunneis lanceolatis caducis erectis 1.5-2 mm. longis 0.3 mm. latis; floribus in axillis solitariis pluribusve vel non rariter in racemum pauciflorum spinescentem dispositis; pedicellis gracilibus 3-8 mm. longis dense adpresse canescenti-villosulis; tubo calycis late campanulato ca. 2.5 mm. longo sparse adpresse villosulo; lobis calycis

tubo brevioribus subulatis 1-2 mm. longis inaequalibus; vexillo transverse elliptico ca. 8 mm. longo 11 mm. lato paullo emarginato flavo conspicue brunneo-venosis glabro, ungue 3 mm. longo ad 1.5 mm. lato extus minute villosulo intus apicem versus cum loco arcuato dense villosulo; alis oblongis flavis brunneo-venosis ad 6 mm. longis 3 mm. latis glaberrimis carinam 1 mm. superantibus, ungue lineari ca. 3.5 mm. longo; carina late falcata ad 6 mm. longa 4 mm. lata acuta pallida margine inferiori ciliato, ungue lineari 3 mm. longo; ovario villosulo; leguminibus ca. 1.7 cm. longis 6 mm. latis ca. 4-segmentatis facie cum pilis 7 mm. longis gracilibus plumosis dense obsitis.—CHILE: rocky slopes above Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5352* (TYPE, Gray Herb.).

An infrequent bush on the dryish rocky slopes just above the fertile belt on the ridge back of Punta Reyes near Ag. Miguel Diaz. The plant is related to *A. melanocaulos* Ph., which occurs from Taltal southward to Ag. Grande, but differs in having flowers twice as large, longer calyx-lobes, canescent pedicels and slightly larger leaves. It is possible that we are concerned here with only a well defined variety of that species.

Adesmia melanocaulos Ph. Anal. Univ. Chile lxxiv. 434 (1893).

The type of this species is a mere snip collected by Larrañaga at Breas. What seems to be clearly the same species was collected on the foggy cliffs near Ag. Cachina (*J. 5741*) and Ag. Grande (*J. 5827*) where it grew flattened against the cliff forming dense intricate shrubby masses 6-12 dm. broad and ca. 3 dm. tall. I doubtfully also refer to the species a plant from the dry rocky slopes above Agua Lora on Cerro Perales near Taltal (*J. 5616*). This is a large bush 1-1.5 m. tall with the leaves and youngest stems gray with a dense appressed-villous pubescence and somewhat glandular as well. A plant from dry gravelly benches and talus just south of Posada Hidalgos (*J. 5660*) is very glandular throughout but otherwise seems to be similar to *A. melanocaulos*.

Adesmia intricata Ph. ex Reiche, Anal. Univ. Chile xcvi. 735 (1897) and Fl. Chile ii. 124 (1898).

I doubtfully associate the above name with a low intricate stiff cinerous bush 6-12 dm. broad and 3-6 dm. tall, which was locally common in a dry sandy shallow quebrada about a kilometer back from the sea-cliffs near Ag. Grande (*J. 5742*). The same species also occurs near Caldera where I have seen collections by Gigoux, Morong (no. 1171) and Rivero (no. 1791). The type of *A. intricata*, given as from Caldera, I could not find at Santiago. I did find a plant from Huasco so determined by Philippi, but that plant does not agree with

Reiche's description. The plants I have cited above also differ from Reiche's diagnosis of *A. intricata*, having rather stiff not particularly slender spines, a dense almost tomentose appressed pale villous pubescence on the leaves and younger parts, and trichomes on the fruit 6-8 mm. long. Reiche has determined Gigoux's collection as *A. calapogon* Ph., which is obviously incorrect. Morong's collection bears the name *Adesmia furcata* Ph.

Vicia vicina Clos in Gay, Fl. Chile ii. 138 (1846). *V. paposana* Ph. Fl. Atac. 15 and Viage Des. Atac. 25, 189 (1860).

Philippi's species, *V. paposana*, the type of which came from the fertile belt near Paposo, appears to represent merely a phase of *V. vicina* Clos. The species is not known otherwise from northern Chile.

Vicia modesta Ph. Fl. Atac. 15 and Viage Des. Atac. 25, 189 (1860).

This species is known only from Paposo (*Philippi*, type), El Rincon near Paposo (*J. 5496*) and Ag. Panul (*J. 5429*) where it grows on moist rich slopes in the fertile belt. It is a slender glabrous annual with scarcely climbing slender stems 2-6 dm. long and small solitary and axillary blue flowers.

Lathyrus magellanicus Lam. Encyc. ii. 708 (1788).

What is apparently a variety of this species was found trailing over the rocks in the fog-bathed gulch immediately above the water-hole at Ag. Panul (*J. 5430*). The foliage is glabrescent or finely short-villous. The corolla is purple.

GERANIACEAE

Erodium cicutarium L'Hér. ex Aiton, Hort. Kew, ed 1, ii. 414 (1789); Ph. Fl. Atac. 12 and Viage Des. Atac. 186 (1860). *E. moschatum* of Ph. Viage Des. Atac. 25, 27 (1860).

An herb frequent in the fertile belt. Philippi reports it from near Paposo and Miguel Diaz. I have characteristic fragments from Taltal, Punta Grande and Ag. Miguel Diaz.

Balbisia peduncularis (Lindl.) Don, Edinb. New Philos. Journ. xi. 277 (1831). *Ledocarpum pedunculare* Lindl.; Ph. Fl. Atac. 12 and Viage Des. Atac. 15, 18, 24, 25, 186 (1860).

A bush 1-2 m. tall growing on hillsides or along dry stream-ways in the quebradas and bearing large golden-yellow corollas. It has been collected at Cachinal de la Costa (*Philippi*), Breas (*Larrañaga*), near Taltal (*Werdermann 800, J. 5069*) and above the fertile belt above El Rincon (*J. 5512*). This northern form of *B. peduncularis* is more slender than the typical form from Coquimbo and has less well developed bracts.

OXALIDACEAE

Oxalis caesia Ph. Fl. Atac. 13 and Viage Des. Atac. 23, 25, 187 (1860).

The type of this remarkable species was collected by Philippi near Agua de Arriba (now called Posada) in Queb. Guanillo near Paposo. I made a collection at that station and found it locally common there on the dry gravelly floor of the quebrada (*J.* 5593). I also collected it on the high dry ridge above El Rincon where it grew in decomposed rock well above the fertile belt (*J.* 5522). The plant is perennial with the slender prostrate fruticulose stems and glaucescent leaves forming pallid mats 5–20 cm. in diameter. Reiche, Bot. Jahrb. xlv. 347 (1911), reports it from the arid interior near Guamango.

Oxalis sp. nov., Knuth, in lit.

A prostrate plant very closely related to *O. caesia* and perhaps only a robust phase of it. It was observed only above Ag. Panulcito (*J.* 5466) where it was rare and local in decomposed rock on the very arid ridge-crest near the upper limit of vegetation.

Oxalis fruticula Ph. Fl. Atac. 13 and Viage Des. Atac. 23, 25, 187 (1860).

The type and only known collection of this species was made near Agua de Arriba in Queb. Guanillo near Paposo by Philippi. I did not find the plant at the type station. The plant belongs to the same group as the last two species and is immediately related to them differing from *O. caesia* in its less pale spathulate-cuneate leaflets.

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

Collected at ca. 300 m. alt. near Taltal by Werdermann (no. 827).

Oxalis breana Ph. Anal. Univ. Chile lxxxii. 1096 (1893).

The type was collected near Breas by Larrañaga. It is sparsely villous. I associate with it a collection from the fertile belt near Ag. Miguel Diaz (*J.* 5401). This material is completely glabrous and is slightly glaucescent but is otherwise similar to the type. *Oxalis bulbocastanum* Ph. from Caldera is very closely related to *O. breana* differing from it chiefly in its smaller corollas.

Oxalis thyrsoidea Reiche, Bot. Jahrb. xviii. 287 (1894).

Known only from near Taltal where it has been collected by Borchers (type) and by Werdermann (no. 770). It is very closely related to *O. breana* of which it may be only a form differing in its more narrow outer sepals and perhaps narrower and more blue-marked petals.

Oxalis atacamensis Reiche, Bot. Jahrb. xviii. 286 (1894). *O.*

trichocalyx Ph. Fl. Atac. 13 and Viage Des. Atac. 25, 187 (1860), not Steud. (1856).

Known only from the type, a very slender glandular plant collected near Paposo by Philippi. Reiche, Bot. Jahrb. xlv. 347 (1911), reports it from near Ag. Perales in Queb. Guanillo near Paposo.

Oxalis sp. nov., Knuth, in lit.

On a moist slope in the fertile belt near Ag. Miguel Diaz (*J.* 5400.) This material is obviously related to *O. atacamensis* and may be only a phase of it differing in being coarser throughout and more densely and coarsely pubescent and in having larger oblong evidently obtuse sepals. The herbage is dark and extremely glandular. A collection made at Bandurrias by Geisse seems to be quite the same.

Oxalis paposana Ph. Fl. Atac. 13 and Viage Des. Atac. 25, 27, 187 (1860). *O. Borchersi* Ph. Anal. Univ. Chile lxxxii. 1096 (April, 1893), not Ph. l. c. 905 (March, 1893). *O. Darapskyi* Ph. ex Reiche, Bot. Jahrb. xviii. 288 (1894).

Growing in rocky places usually outside of the fertile belt. It commonly develops a slender erect fruticulose caudex which arises from the irregularly much thickened underground parts. The root of the *Oxalis* illustrated by Reiche, Bot. Jahrb. xlv. 344, fig. 1 (1911), is characteristic of this species and *O. ornata* Ph. The plant has been collected on the slopes near Barquito (*J.* 4783, 6293), on a rocky crest just back of the sea-cliffs near Ag. Grande (*J.* 5782), near Taltal (*Borchers*, type of *O. Borchersi* and *O. Darapskyi*), on terraces near the ocean between Cachinalcito and Queb. Tunas (*J.* 5181), near Paposo (*Philippi*, type of *O. paposana*), on slopes above the fertile belt on Cerro Yumbes near Paposo (*J.* 5559), in rocky places on Punta Plata (*J.* 5248) and just below the fertile belt on a dryish slope back of Punta Reyes near Ag. Miguel Diaz (*J.* 5402). It is the most common species in our area. The type of *O. Borchersi* Ph. is labeled as from Taltal and not as from Paposo as given in the original description. Some of my material from near Barquito (*J.* 4783 in pt.) has the sepals conspicuously strigose. The other collections have glabrate or inconspicuously pubescent sepals.

Oxalis ornata Ph. Fl. Atac. 13 and Viage Des. Atac. 15, 25, 187 (1860).

Known only from crevices on the sea-cliffs near Ag. Cachina (*J.* 5708), near Paposo (*Philippi*, type), on sides on the quebrada near Ag. Miguel Diaz (*J.* 5398) and on a dryish rocky slope just below the fertile belt back of Punta Reyes near Ag. Miguel Diaz (*J.* 5399). Philippi reports it from Cachinal de la Costa. The species differs from *O. paposana* in its larger rich-yellow corollas, larger less retuse leaflets, very pubescent pedicels and lower habit.

Oxalis ornithopus Ph. Fl. Atac. 13 and Viage Des. Atac. 15, 187 (1860).

Philippi collected the type of this species between Caleta de Pan de Azucar and Cachinal de la Costa. I obtained material which is clearly conspecific on a dry gravelly ridge just above the fertile belt at El Rincon (*J.* 5521). My collection has a slender rhizome with tuberous thickenings and erect simple fruticulose stems 1-15 cm. long. The leaflets are rounded at the apex.

Oxalis gigantea Barn. in Gay, Fl. Chile i. 433 (1845); Ph. Fl. Atac. 13 and Viage Des. Atac. 14, 15, 25, 187 (1860).

A shrub 1-2 m. tall with long strict branches. It was collected only on the sea-cliffs near Ag. Cachina (*J.* 5709) but was noted on Cerro Perales near Taltal and on slopes near El Rincon, Ag. Panulcito and Ag. Miguel Diaz. It was not abundant. Philippi reports it from just north of Chañaral and from near Cachinal de la Costa, and Paposo. Reiche, Bot. Jahrb. xlv. 344 (1911), reports it from back of Chañaral.

Oxalis bicruralis Reiche, Bot. Jahrb. xlv, 347 (1911).

A nomen subnudum applied to material from about Ag. Perales in Queb. Guanillo near Paposo by Reiche who speaks of the plant only as follows, "*O. bicruralis* R., eine vermutlich neue Art mit tiefgespaltenen Teilblättchen, deren schmale Lappen fast senkrecht zu einander stehen." The mention of cleft leaflets suggests that the plant might be a form of *O. paposana*. I found no specimens of the plant at Santiago.

TROPAEOLACEAE

Tropaeolum tricolor Sweet, Brit. Fl. Gard. iii. t. 270 (1828).

Climbing on cactus and through bushes along the lower edge of the fertile belt. It is not common and has been collected only at Taltal (*Borchers, Werdermann* 828), Puerto Oliva (*Borchers*), Punta Grande (*J.* 5235) and Ag. Panul (*J.* 5439). Reiche, Bot. Jahrb. xlv. 346 (1911), reports it from the hills near Chañaral.

LINACEAE

Linum paposanum Ph. Fl. Atac. 13 and Viage Des. Atac. 25, 187 (1860).

A very loosely branched fruticulose perennial which is infrequent in the fertile belt. It is known only from Paposo (*Philippi*, type), El Rincon (*J.* 5527), Ag. Panul (*J.* 5438) and Ag. Miguel Diaz (*J.* 5397).

Linum cremnophilum, sp. nov., perenne vere prostratum fruticulosum 3–5 cm. altum 1–4 dm. diametro glaberrimum; ramis numerosis alternis ramosissimis, vetustioribus cortice crasso pallido conspicue irregulariterque rimoso suberoso vestitis, juvenalibus 5–10 cm. longis gracilibus subprostratis foliosis costatis; foliis basem versus ramuli alternis, ceteris oppositis lanceolatis vel ellipticis vel oblongo-ob lanceolatis 4–7(–8) mm. longis 2–4 mm. latis plus minusve pallidescens acutis vel obtusis costatis sed enervatis margine paullo incrassatis et inconspicue minuteque papillatis basem versus attenuatis biglandulosis; floribus in apice ramulorum solitariis vel in circinnis 2–3-floris dispositis; pedicellis 0.2–1 mm. longis; sepalis 3-nerviis 2.5–3 mm. latis glabris lanceolato-ovatis vel subellipticis apicem versus acutis vel rotundis acuminatis; petalis luteis (in sicco pallidescens) obovatis quam sepalis 3–4-plo longioribus 0.8–1 cm. longis 5–8 mm. latis apice rotundis vel emarginatis basi acutis et subunguiculatis; stylis 7 mm. longis in tubo connatis vel apice saepe ca. 1 mm. rarissime usque ad 4 mm. libris; capsula depresso globosa 3.5 mm. diametro apicem versus brunnescenti; seminibus nitidis oblique ellipticis 2.3 mm. longis 1.2 mm. latis.—CHILE: crevices at head of foggy sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5781*; crevices at head of fog-bathed sea-cliffs near Aguada Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5707* (TYPE, Gray Herb.).

A very distinct species which is known only from crevices about the head of the line of high fog-bathed sea-cliffs near Ag. Grande and Ag. Cachina. It is a decidedly prostrate shrubby perennial with bright yellow corollas. In having its styles connate to or beyond the middle it agrees with *L. Macraei* Benth. and is probably most nearly related to that species. It differs, however, in its prostrate more freely branched habit, smaller and proportionately broader leaves, slightly smaller petals and very detached range.

ZYGOPHYLLACEAE

Fagonia chilensis H. & A. Bot. Misl. iii. 165 (1833).

Frequent in dryish gravelly soils. It has been collected in our area at Barquito (*J. 4782*), Ag. Grande (*J. 5780*), Ag. Cachina (*J. 5706*), Sierra Esmeralda (*San Roman*), Breas (*Larrañaga*), Taltal (*J. 5163*) and on Cerro Yumbes near Paposos (*J. 5558*). The material from Barquito and the Sierra Esmeralda is scabrous and is, hence, referable to the var. *asper* (Gay) Johnston, Proc. Calif. Acad. ser. 4, xii. 1051 (1924).

MALPIGHIACEAE

Dinemandra ericoides Juss. Ann. Sci. Nat. ser. 2, xiii. 255 (1840).
D. strigosa Ph. Fl. Atac. 12 and Viage Des. Atac. 24, 25, 186 (1860).

A prostrate herb or suffruticose plant frequent in gravelly situations below the fertile belt. It has been collected near Taltal (*Borchers*, *J.* 5081), Breas (*Larrañaga*), Queb. San Ramon (*J.* 6297), Paposo (*Philippi*, type of *D. strigosa*), Queb. Guanillo near Paposo (*J.* 5592), Punta Buitre (*J.* 5240) and Ag. Cardon (*J.* 5280). Further north it is known from Antofagasta (*J.* 3647) and from Cobija, the type locality for *D. ericoides*. Niedenzu, Pflanzenr. [Heft 91] iv. Fam. 141, pt. 1, 234 (1928), reports it from Queb. Matancilla.

Niedenzu, l. c., has broken the genus up into two groups determined by the number of anthers matured. Typically *D. ericoides* and *D. strigosa* develop two fertile stamens. My collections from Queb. San Ramon and Queb. Guanillo, however, have flowers developing three fertile stamens quite as in *D. glaberrima* Juss., a species which appears always to mature three fertile stamens. Except for these staminal aberrations, however, the two collections mentioned are quite similar to the other collections cited above and I believe are certainly conspecific with them. In my collection from Antofagasta the flowers show every degree of development in the third anther and in the filament as well. It must be clear, therefore, that the number of fertile stamens produced is not invariably diagnostic even as a specific character. *Dinemandra ericoides* is distinguished from the other species of the genus, *D. glaberrima*, by its conspicuous appressed villous pubescence, usually 2 rather than 3 fertile stamens and northern distinct range.

Dinemandra glaberrima Juss. Arch. Mus. Paris iii. 583 (1843).
D. ramosissima Ph. Fl. Atac. 12 and Viage Des. Atac. 186 (1860).
 ? *D. subaptera* Ph. l. c.

Infrequent on gravel at the mouth of a quebrada near Barquito (*J.* 4781). Reiche, Bot. Jahrb. xlv. 347 (1911), reports it also from the interior between Guamango and Las Animas. My collection is quite similar to the common form of the species found in the Caldera-Copiapó region. Despite its specific name the plants of this species are usually not completely glabrous since a few inconspicuous villous hairs are frequently to be found on the pedicels and bracts and in the upper axils. The species becomes more shrubby than *D. ericoides* and is more southern in its range.

EUPHORBIACEAE

Croton chilensis Müll. Arg. Linnaea xxxiv. 92 (1865) and DC. Prodr. xv. pt. 2, 540 (1866). *C. collinus* Ph. Fl. Atac. 49 and Viage Des. Atac. 24, 26, 223 (1860); not HBK. (1817).

A loosely branched erect shrub 5–15 dm. tall growing in dryish gravelly places along the edge of the fertile belt. It is known only from our area where it has been collected on slopes in Queb. Guanillo near Paposo (*Philippi*, types), El Rincon near Paposo (*J.* 5519), about rocks near Ag. Cardon (*J.* 5279) and on slopes above Ag. Miguel Diaz (*J.* 5395).

Chiropetalum canescens Ph. Fl. Atac. 49 and Viage Des. Atac. 26, 223 (1860). *Argyrothamnia Sponiella* Müll. Arg. Linnaea xxxiv. 148 (1865). *C. Sponiella* Pax in E. & P. Nat. Pflanzenf. iii. Abt. 5, 45 (1890).

Growing in dryish places usually between rocks and commonly forming strict tufts of stems 1–3 dm. tall. It was observed both above and below the fertile belt. Collections have been made at Barquito (*J.* 4780), Ag. Grande (*J.* 5778), near Taltal (*Werdermann* 773, *J.* 5079), Hueso Parado (*Philippi*, type of *C. canescens*), Cerro Perales near Taltal (*J.* 5613, 5614) and Ag. Panulcito (*J.* 5465). The material from Cerro Perales and *Philippi*'s type, which probably came from the slopes of the same peak, are more canescent and have a denser pubescence than the other collection cited. They represent, however, merely an extreme phase of the species connected by obvious transitions to the common, sparsely pubescent forms. The type of *C. Sponiella*, which came from Cobija, is one of these latter.

Chiropetalum cremnophilum, sp. nov., fruticulosum viride; caulibus gracilibus erectis vel decumbentibus 5–25 cm. longis angulatis glaberrimis e rhizomate ramoso lignoso 5–20 cm. longo erumpentibus; foliis ovatis vel ellipticis alternis 1–2 cm. longis 7–13 mm. latis integerrimis margine excepto glaberrimis apice obtusis, basi in petiolum 1–2 mm. longum abrupte contractis rotundis vel subcordatis nerviis infimis 3 vel rariter 5 ultra medium laminae productis, margine extremo pilis malpighiaceis sparsis ornatis; stipulis fere ad 0.7 mm. longis cuneatis vel triangularibus crassis; racemis 0.5–1 cm. longis bisexualibus 3–7-floris 7–22 mm. longe pedunculatis, rhachi et pedunculis glabris vel cum pilis malpighiaceis sparsissime ornatis; bracteis ovatis ca. 0.5 mm. longis sparse brevissimeque ciliolatis; floribus masculinis pluribus, sepalis 2 mm. longis late lanceolatis acutis extus cum pilis malpighiaceis sparse ornatis, petalis calyce evidenter brevioribus divergente tripartitis 1.5 mm. longis, glandulis

disci glabris truncatis, staminibus 5; floribus femineis ad basem racemi solitariis cernuis, pedicellis 1-2 mm. longis saepe cum pilis malpighiaceis ornatis, sepalis 2 mm. longis lanceolatis acuminatis extus apicem versus non rariter cum pilis malpighiaceis ornatis, petalis anguste lanceolatis integris ca. 0.8 mm. longis, glandulis disci majusculis truncatis glabris, styli lobis ultra medium partitis, capsula 4 mm. diametro 2 mm. alta depresso-trigyna cum pilis malpighiaceis vestita, seminibus globosis brunnescentibus glaucis 1.5 mm. diametro laevibus.—CHILE: about head of fog-bathed sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5779* (TYPE, Gray Herb.); about head of foggy sea-cliffs near Aguada Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5705*.

In gross habit extremely similar to *C. Berterianum* Schlecht. of the Santiago-Valparaiso region, but, as shown by floral characters, obviously most closely related to the habitally very dissimilar *C. canescens* Ph. of our area. From *C. canescens* it differs in its dark green herbage, very sparse malpighiaceous pubescence, loose decidedly stoloniferous habit and slender usually decumbent stems. It differs from *C. Berterianum* in having truncate glabrous floral glands, a sparser unmixed pubescence, and few-flowered racemes. The new species is known only from the sea-cliffs near Ag. Grande and Ag. Cachina where it grows in rock-crevices or in rocky places about the foggy crest of the cliffs. The herbage is dark green. The plant is much too violent a departure from *C. canescens* to be an ecological form of that species. It is also to be noted in this regard that *C. canescens* was collected a short distance back of the fertile foggy cliff-head.

Euphorbia minuta Ph. Cat. Pl. Itin. Tarapacá 76 (1891).

The type of this species was collected by Rahmer in Jan. 1886 at Calcalhuay, lat. 19° 48' S., at 3700 m. alt. on the puna near the Chile-Bolivian boundary. Material matching the type very closely was obtained in disturbed dry soil just above the fertile belt above El Rincon (*J. 5518*) and just below the crest of Cerro Yumbes (*J. 5556*). The plant is a glabrous annual with slender reddish branches 2-8 cm. long and is prostrate.

Euphorbia porphyrantha Ph. Anal. Univ. Chile xci. 510 (1895).

This species has been collected at ca. 100 m. alt. near Taltal by Werdermann (no. 816). It is otherwise known only from Finca Chañaral (type), Bandurrias and Huasco.

Euphorbia thinophila Ph. Anal. Univ. Chile xliii. 537 (1873).

A small colony of this species was found in dry gravel and talus in the Sierra Esmeralda north of Portezuelo de Mina Carola (*J. 5678*).

The dark colored stems are decumbent and come from a fleshy fusiform root which is loosely set in the ground. The species is otherwise known only from the type collected over 50 years ago on the coast at Huasco. It appears to differ from *E. porphyrantha* only in having the leaves linear-lanceolate and 2-4 mm. broad rather than ovate and 7-18 mm. broad. These differences, however, seem to be decisive.

Euphorbia copiapina Ph. Fl. Atac. 49 and Viage Des. Atac. 223 (1860). *E. calderensis* Ph. Anal. Univ. Chile xci. 510 (1895).

Collected on the dunes at Caleta de Pan de Azucar (*J.* 5838) and observed in abundance on the dunes on the large point of land just north of Chañaral. The stems are prostrate on the sand and spring from a large fleshy shallowly buried bottle-shaped root. The leaves are rounded or obtuse and have crisped margins and are not acute as in the two preceding species. The species has been frequently collected in the region about Caldera. Otherwise it is known only from Monte Amargo (*F. Philippi*) Chañarcillo (*Philippi*) and Bandurrias (*Geisse*) in the area back from the coast.

Euphorbia lactiflua Ph. Fl. Atac. 48 and Viage Des. Atac. 14, 15, 16, 19, 20, 24, 26, 27, 222 (1860).

This is the predominating and characteristic plant of the fertile belt throughout our area. It is a very lactiferous shrub 1-2.5 m. tall. It was collected only at Barquito (*J.* 4778) and at Ag. Cardon (*J.* 5278). For further notes see Reiche, Bot. Jahrb. xlv. 349-353, fig. 5-7 (1911).

CALLITRICHACEAE

Callitriche turfosa Bertero ex Hegelm. Monog. Callitriche 59, t. 3, fig. 4 (1864).

Growing in and about the margin of the small water-hole at Agua Dulce (*J.* 5187). This water-hole is situated among the rocks at the foot of a cliff very close to the ocean and scarcely above high-tide level. As the name suggests the water is fresh. I have compared my collection with specimens of the original collection by Bertero, with which it agrees in the important details. I have not gone into the validity of *C. turfosa* or attempted to determine its precise relationship.

SAPINDACEAE

Llagunoa glandulosa (H. & A.) Don, Gen. Syst. i. 673 (1831).

Of this species one bush was encountered on a rocky ledge in the dryish shrubby area above the fertile belt near the crest of Cerro Yumbes just east of Paposo (*J.* 5557). The plant is quite typical of

the species although it represents a northerly range extension (from Coquimbo) of about 600 km.

MALVACEAE

Palaua concinna (Ph.), comb. nov. *Sida concinna* Ph. Fl. Atac. 12 and Viage Des. Atac. 25, 186 (1860).

A fruticulose perennial of the fertile belt which has been collected at Ag. Cachinalcito (*J. 5186*), Paposo (*Philippi*, type), El Rincon (*J. 5501*), Ag. Cardon (*J. 5269*) and Ag. Miguel Diaz (*J. 5364*). The corolla is a rose-pink and is borne on slender erect or ascending branches. The species has been considered as indistinguishable from *P. moschata* Cav. of the coast of central Peru. It differs from that species, however, not only in its greatly detached range but in its slender erect or ascending stems, noticeably denser tomentum and short petioles. The petioles of *P. concinna* at most equal the length of the blades and are usually distinctly shorter. Usually the pedicels clearly surpass the subtending leaf. *Palaua velutina* Urb. & Hill, from Tacna, to judge from description, seems to be very closely related to *P. concinna*.

Palaua modesta (Ph.) Reiche, Anal. Univ. Chile xci. 363 (1895) and Fl. Chile i. 215 (1896). *Sida modesta* Ph. Fl. Atac. 12 and Viage Des. Atac. 25, 186 (1860).

An herb developing a definitely perennial root. The stems are at first erect but become decumbent or prostrate. It grows in the fertile belt and has been collected at Ag. Cachinalcito (*J. 5185*), Paposo (*Philippi*, type), El Rincon (*J. 5500*) and Ag. Miguel Diaz (*J. 5362*). The corolla is small and white.

Palaua dissecta Benth. Jour. Linn. Soc. vi. 101 (1862). *P. bipinnatifida* Reiche, Anal. Univ. Chile xci. 363 (1895) and Fl. Chile i. 215 (1896), a slip for *P. dissecta*?

A single colony of what is apparently a form of this species was encountered on a dry rocky bench at the mouth of the quebrada below Ag. Miguel Diaz (*J. 5363*). The specimens differ from the Peruvian forms referable to the species in being erect with a single loosely branched stem and in having petals only 1 cm. long. The petals are purplish-pink. The type of *P. dissecta* Benth. is a mixture consisting of a plant with dissected leaves, the type in the restricted sense, and a plant with entire leaves which seems to be referable to *P. rhombifolia* Graham. The label associated with the type is a printed one of Cuming's giving the source as "Cobija, Iquiqui et Arica."

Malvastrum Hinkleyorum Johnston, Contr. Gray Herb. lxx. 73 (1924).

Growing in open places on gravelly benches at mouths of quebradas below the fertile belt near Ag. Cardon (*J.* 5268) and Ag. Miguel Diaz (*J.* 5361). It is an erect slender annual herb with white petals that are purplish at the base. The material from our area has the stems minutely stellate, rather than glabrous, but otherwise is remarkably like the type of the species. The species, originally described from Arequipa, has been confused with *M. peruviana* but differs in having smaller flowers, pale corollas, more slender habit, larger more conspicuous stipules and very deeply lobed or divided leaves. *Malva scorpioides* Turcz. (1863), not *Malvastrum scorpioides* Schum. (1900), seems to be a phase of it.

Malvastrum peruvianum (L.) Gray, Bot. U. S. Explor. Exped. 146 (1854). *Malva peruviana* L. Sp. Pl. 688 (1753). *M. limensis* L. Amoen. Acad. iv. 325 (1756); Ph. Fl. Atac. 11 and Viage Des. Atac. 25, 185 (1860).

Seen twice, once on an open grassy crest in the fertile belt on the ridge back of Punta Grande (*J.* 5215) and again about the mouth of the quebrada below Ag. Miguel Diaz (*J.* 5360). At the latter station it grew with *M. scorpioides*. The corolla is pink. Philippi collected the species at Paposo.

Cristaria leucantha, sp. nov., perennis paullo fulvescens; caulibus pluribus saepe prostratis sed rariter suberectis vel laxe ascendentibus gracilibus usque ad 8 dm. longis ascendenter breviterque ramosis pilis stellatis sparsis evanescentibus etiam aliis multicellularibus simplicibus numerosis inconspicuis glanduliferis ornatis, caudice fruticoso prostrato ramoso erumpentibus, internodiis medialibus 3-6 cm. longis; foliis cum pilis stellatis subvelutinis, infimis caulum ramorumque ellipticis vel ovato-ellipticis 1-2.5 cm. longis 8-16 mm. latis basi apiceque rotundis margine sparse lateque pinnato-lobatis vel obscure trilobatis, ceteris paullo ultra medium laminae evidenter trilobatis ambitu ovatis vel deltoideo-ovatis apicem versus caulis gradatim diminuentibus, inferioribus 2.5-4 cm. longis et 3-4.3 cm. latis, superioribus 1.5 cm. longis vel minoribus basi reniformibus vel truncatis, lobo mediali evidenter majori in lobulos 1-2-jugatos rotundos latos subimbricatos 1-5 mm. profunde lobato oblongo vel ovato-oblongo apice rotundo, lobis lateralibus ascendentibus irregulariter sparseque lobatis, petiolo lamina saepe breviori sed rariter paullo longiori pilos stellatos etiam alios glanduliferos gerenti; stipulis 5-7 (-12) mm. longis 0.8-1.2(-3) mm. latis oblongis vel oblanceolatis rotundis vel obtusis stellato-pubescentibus; pedicellis gracilibus 2-4 cm. longis ex axillis foliorum superiorum mediorumque gestis sparse stellatis inconspicue glanduloso-pubescentibus; calyce ad anthesim ca.

8 mm. longo stellato, lobis lanceolatis; petalis albis dilute roseo-tinctis 1.5–1.8 cm. longis calyce duplo longioribus; tubo stamineo ad 4 mm. longo; filamentis biseriatis ca. 2 et 3 mm. longis; lobis styli ca. 8 mm. longis; carpellis sparsissime villosulis vel glabratis, alis oblique 4 mm. altis 3 mm. latis, seminibus ad 2 mm. altis ca. 1.3 mm. latis.—CHILE: gravelly floor of the quebrada, Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5270* (TYPE, Gray Herb.).

I associate with this species a prostrate perennial plant I collected on a rocky bushy slope above the fertile belt near Ag. Panulcito (*J. 5458*). It agrees with the type in the color and size of the corolla, but has ovate leaves with the margins merely sparsely and shallowly crenate and not lobed. I consider the plant to be only a leaf-variation. The species is most closely related to *C. Diaziana* from which it differs in its dense velutinous indument. With its relative it forms a small group which seems to be quite lacking in obvious relatives. The white petals, slightly flushed with pink and the spreading usually prostrate habit together readily distinguish the two species from all known congeners.

Cristaria Diaziana, sp. nov., perennis prostrata; caulibus gracilibus usque ad 8 dm. longis sparse breviterque ramosis sparsissime evanescenterque villosis pilis multicellularibus inconspicuis numerosis glanduliferis ornatis viridibus basem versus suffruticosis e radice valida erumpentibus, internodiis 2–10 cm. longis; foliis vix numerosis viridibus herbaceis pilis stellatis sparsis obtectis concoloribus apicem versus caulis gradatim reductis; lamina folii 1.5–3 cm. longa 1–2.3 cm. lata ambitu angulate ovata vel oblongo-ovata saepe subtrilobata sed saepissime elobata (rariter ultra medium evidenter trilobata, lobo mediali valde majori ambitu lanceolato vel ovato saepe trilobulato) margine sinuato-crenata basi truncata vel reniformi quam petiolo sparse villosa paullo longiori; pedicellis 1.5–3 cm. longis gracilibus sparse villosis glandulari-pubescentibus ex axillis foliorum superiorum erumpentibus; calyce ad anthesim ca. 6 mm. longo sparse villosa, lobis lanceolatis; petalis albis supra medium paullulo rubescentibus ca. 1.5 cm. longis calyce duplo longioribus; carpellis ca. 18, alis oblique ovatis 3 mm. longis 2 mm. latis; seminibus ad 1.5 mm. altis ca. 1 mm. latis.—CHILE: prostrate on a dryish rocky slope above the fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5365* (TYPE, Gray Herb.).

In the texture of its leaves and in the sparse pubescence this species much suggests *C. foliosa* Ph. but differs conspicuously in habit and inflorescence. It is most closely related to *C. leucantha* which has a similar prostrate habit and white rose-flushed petals. It differs from

C. leucantha, however, in its very sparse pubescence, the plant being green, hence, rather than somewhat tawny with a velvety indument. Most of the material of the new species has the leaves only obscurely if at all lobed. Two plants, however, have the leaves deeply trilobed.

Cristaria Fuentesiana, sp. nov., perennis prostrata; radice valida dense multicipitali; ramis gracilibus sparse breviterque ramosis paullo flexuosis usque ad 5 dm. longis paucifoliatis pilis minutis stellatis saepe adpressis vix abundantibus et saepe glandulis stipitatis inconspicuis sparsis ornatis, internodiis 3–10 cm. longis quam foliis vicinis saepe longioribus; foliis pallidulis pilis stellatis minutis numerosis adpressis vetustate subdeciduis obtectis subtus pallidioribus basem versus caulis aggregatis, basalibus subpersistentibus conspicuis 4–7 cm. longe petiolatis, lamina ambitu elliptica vel ovata 2–3.5 cm. longa 1.2–2.3 cm. lata sinuata vel grosse crenata vel trilobata basi truncata vel obtusa apice rotunda; foliis caulinis distantibus, apicem versus caulis reductis superioribus in bracteas minus quam 1 cm. longas gradatim transmutatis, medialibus saepe plus minusve simpliciter lobatis 2–3 cm. longis 0.5–3 cm. longe petiolatis lamina quam apud folia basalia saepe paullo latioribus; stipulis foliorum basaliū lanceolatis 3–5 mm. longis 1–2 mm. latis acutis, foliorum medialium conspicuis 5–10 mm. longis 2–5 mm. altis recurvis; pedicellis gracilibus 1.5–5 cm. longis ex axillis foliorum superiorum valde reductorum erumpentibus; calycibus corolliferis ca. 8 mm. longis stellato-pubescentibus, lobis late oblanceolatis; petalis roseis ca. 18 mm. longis calyce aliquando fere duplo longioribus; carpellis glabris 25–30, alis 5 mm. longis 3 mm. latis ovatis; seminibus 1.5 mm. altis 1 mm. latis.—CHILE: prostrate on the foggy flats at the head of the sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5818*; prostrate on fog-bathed slopes near summit of Cerro de la Cachina, ca. 14 km. south of Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5686* (TYPE, Gray Herb.).

This variable, but very distinct species is characterized by its prostrate habit and the strong perennial root which produces a dense distinctly multicipital caudex. The stem-leaves are comparatively few and are gradually reduced up the stem so that the uppermost (those in the inflorescence) are very small and bract-like. The lowest leaves are very long-petioled and, springing from or just above the various heads of the caudex, suggest a rosulate arrangement. The blades on these leaves are very variable as to margin, some being coarsely crenate, others sinuate and some coarsely lobulate-dentate or even coarsely lobed. These irregularities as to margin are inconstant and vary in quantity from leaf to leaf. The stem-leaves are not only

short-petioled but differ from the lower leaves also in having the blades somewhat broader in proportion and usually more distinctly lobed. In the material cited above the leaf-lobes commonly extend only to about the middle of the blade. The blade, hence, may be definitely trilobed or by the deepening of the sinuses of the crenate margin somewhat pinnate-lobed. After considering the variability in the specimens cited I have no hesitation in referring to the species, as a variant phase, a collection from Cerro Cachina (*J.* 6305) which grew with the type and which differs in having the leaves all trilobed with the sinuses extending nearly to the midrib and those of the lobules more than half way to their midribs. After admitting this doubly lobed form there seems no alternative but to admit also a collection from the fertile belt on the foggy crests back of Barquito (*J.* 4757). This material has the characteristic caudex and habit of *C. Fuentesiana* but has a very sparse indument of stellate hairs and is accordingly greener than in the type. Most striking, however, are the leaves which are not only biternate but tend also to be triternately lobed or cleft. If the two aberrant collections just mentioned are admitted to the species, as I believe they should, then the plants referable to *C. Fuentesiana* are not only very variable as to leaf-outline on each plant but from plant to plant also.

In naming this remarkable species in honor of Prof. Francisco Fuentes, Curator of Phanerogams at the Museo Nacional in Santiago I am pleased again to acknowledge my gratitude to him for his kindly interest and help when I was working in the Philippi Herbarium now in his charge.

Cristaria concinna Ph. Fl. Atac. 11 and Viage Des. Atac. 25, 185 (1860).

The type of this species was collected near Paposo by Philippi. I obtained plants clearly referable to it in dry gravel at the mouth of the quebrada below Ag. Cardon (*J.* 5266). It is an erect perennial 6-12 dm. tall. The stems are loosely branched above and spring from a sparsely branched erect fruticose caudex 1-2 dm. tall. The petals are purplish-pink and ca. 14 mm. long. I refer to *C. concinna*, as a phase, a collection from rocky slopes and benches about the mouth of the quebrada below Ag. Miguel Diaz (*J.* 5358). This collection agrees in gross habit with the type and with my material from Ag. Cardon but has petals nearly 25 mm. long and 3-4-plo-pinnately dissected leaves.

Cristaria thinophila, sp. nov., perennis luteo-viridis; caulibus erectis 1-5 dm. altis sparse ascendenter ramosis villosis pilis stellatis substipitatis ascendenter ramosis abundantibus vestitis e caudice fruti-

coso decumbenti vel laxe ascendenti usque ad 5 mm. crasso laxe ramoso erumpentibus; foliis concoloribus breviter tomentos pilis stellatis dense obtectis supra medium caulis abrupte reductis, lamina ambitu oblonga vel oblonga-ovata 3-4.5 cm. longa 2-3 cm. lata fere pinnatifida, lobis basalibus a lobo medio elongato profunde grosseque pinnato-lobato saepe divisus anguste flabellatis 1-1.5 cm. longis saepe grosse lobulatis; petiolo laminae aequilongo vel ea paullo longiori usque ad 6 cm. longo breviter villosus; stipulis 4-6 mm. longis subulato-cuneatis erectis; inflorescentia supra folia projecta bracteis minus quam 5 mm. longis ornata breviter villosa; pedicellis gracilibus 1-3 (-5) cm. longis in vivo subnutantibus; calyce ad anthesim ca. 8 mm. longo villosus, lobis lanceolatis; petalis purpurascensibus ca. 14 mm. longis calyce circa duplo longioribus; carpellis 17-20, alis ovatis 3-4 mm. longis 2.5-3 mm. latis oblique ovatis; seminibus ad 2 mm. altis ca. 1.2 mm. latis griseis.—CHILE: growing on slopes of dunes back of Punta de dos Reyes near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5359* (TYPE, Gray Herb.).

Although in its occurrence, gross habit and yellowish-green herbage this plant suggests *C. viridiluteola* Gay, it appears to be much more closely related to typical *C. concinna* Ph., having quite the same leaf-outline and kind and degree of leaf-lobing. It differs from *C. concinna* in its pubescence, smaller leaves, nodding flowers and different habit.

Cristaria viridiluteola Gay, Fl. Chile i. 322 (1845).

A small erect pink-flowered shrubby perennial, 1.5-5 dm. tall, growing on the dunes on the point of land just north of Chañaral (*J. 5845*) and near Caleta de Pan de Azucar (*J. 5842*). These plants agree closely with the much collected forms of the species from Caldera. Obviously related to this species and probably only a leaf variation is an erect plant, 3-9 dm. tall, which is abundant on the dunes on Punta del Médano (*J. 5246*). This latter plant has the characteristic habit of growth, the same close dense pubescence and the same inflorescence of small pink flowers, but the leaves have an irregular sinuate or coarsely lobed margin with the sinuses of the oblong lobes only rarely reaching more than half way to the midrib.

Cristaria foliosa Ph. Fl. Atac. 11 and Viage Des. Atac. 12, 185 (1860). *C. Borchersi* Ph. Anal. Univ. Chile lxxxii. 316 (1892). *C. setosa* Ph. Anal. Univ. Chile lxxxii. 317 (1892). *C. grandidentata* Ph. Anal. Univ. Chile lxxxii. 318 (1892).

A perennial, frequently very decidedly woody at the base, which forms a loosely branched bushy growth commonly 10-12 dm. tall. It grows below the fertile belt in sand or gravel and usually in rocky places. The leaves are thin and have a rather sparse oily villous in-

dument. The large corolla is pink or purplish pink but in drying becomes purple. The species has been collected at Las Animas (*Philippi*, type of *C. foliosa*), Taltal (*Ball*; *Borchers*, type of *C. setosa*; *Werdermann* 777), in Queb. San Ramon (*J.* 5139), Caleta de Oliva (*Borchers*, type of *C. Borchersi*), below Ag. Panul (*J.* 5432) and near Punta Plata (*J.* 5245). *Ball*, Jour. Linn. Soc. xxii. 156 (1886), reported the plant from Taltal as *C. Spinolae*.

Cristaria lobulata Ph. Fl. Atac. 11 and Viage Des. Atac. 12, 185 (1860).

Philippi collected the type of this species near Las Animas. It seems to be related to *C. foliosa*.

Cristaria integerrima Ph. Fl. Atac. 11 and Viage Des. Atac. 19, 185 (1860). *C. Larrañagae* Ph. Anal. Univ. Chile lxxxii. 320 (1892).

An annual or a very short-lived perennial usually with strict stems and branches. The leaves are entire or have only obscurely undulate margins. It has been collected on hillsides near Barquito (*J.* 4756), in Queb. Infiles south of Taltal (*J.* 5644), in hills southeast of Taltal (*J.* 5091), Taltal Valley (*Philippi*, type of *C. integerrima*), near Breas (*Larrañaga*, type of *C. Larrañagae*). The species is a frequent one in the region about Taltal. The corolla is pink and frequently very dilutely so.

I refer to this species with some doubt a collection from the Sierra Esmeralda north of Portezuelo de Mina Carola (*J.* 5673). The plants are loosely and ascendingly branched and have small (15–30 mm. long) leaves which are variable and tend to be coarsely toothed. The relation of this form with *C. integerrima* is clear as shown by the leaf-outline, texture, pubescence and flowers and it is possible that it may be of hybrid origin, although I am unable to suggest the other parent if it is so.

Cristaria paposana, sp. nov., perennis suffruticosa prostrata paullo fulvescens pilis mollibus stellatis abundanter vestita foliosa; ramis 1.5–2.5 dm. longis rigidiusculis laxe ramosis basem versus fruticosis et caudicem formantibus dense villosis, internodiis 1–3 cm. longis; foliis elliptico-ovatis vel late ovatis numerosis concoloribus velutinis 1.5–3 cm. longis 1–2.8 mm. latis margine integris vel saepe evidenter crenatis vel non rariter subtrilobatis (sinubus lobi usque ad 5 mm. profundis) basi rotundis vel subcordatis apice rotundis vel obtusis; petiolis 0.8–2(–4) cm. longis villosis laminis foliorum superiorum mediorumque saepe subaequilongis vel brevioribus; stipulis 2–3 mm. longis 0.5–1 mm. latis obcuneatis maturitate reflexis deciduis; pedicellis 1.5–2.5 cm. longis villosis ex axillis foliorum erumpentibus; calycibus ad anthesim 7–8 mm. longis, lobis lanceolatis

villosis; petalis dilute rosaceis 12–14 mm. longis calyce sesqui vel subduplo longioribus; tubo staminum ca. 4 mm. longo; filamentis biseriatis 2.5 et 3.5 mm. longis; carpellis ca. 14 glabratis, alis oblique ovatis 3.5–4 mm. altis 2.3–3 mm. latis; seminibus ca. 1.5 mm. altis ca. 1 mm. latis.—CHILE: west slope of Cerro Yumbes near Paposo in rocky ground in dryish shrubby area above the fertile belt, Dept. Taltal, Dec. 8, 1925, *Johnston 5549*; dryish gravelly ridge just above fertile belt, El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5502* (TYPE, Gray Herb.).

Apparently most closely related to *C. integerrima* Ph. from which it differs conspicuously in its prostrate habit, perennial root, abundant soft velvety pubescence and irregular leaf-margins.

Cristaria intonsa, sp. nov., annua erecta stricte ramosa 3–9 dm. alta pilis stellatis ascendente longeque ramosis rigidiusculis vestita viridis; caulibus solitariis vel pluribus breviter stricteque ramosis hispido-villosis; foliis tenuiter herbaceis hispido-villosis concoloribus medium versus caulis maximis utroque diminuentibus; lamina foliorum inferiorum elliptica vel ovato-elliptica subintegra vel paullo crenata 1.5–2.5 cm. longa 9–14 mm. lata petiolo villosa aequilonga vel eo paullo longiori; lamina foliorum mediorum latissime ovata vel ovato-deltaidea 4–4.5 cm. longa ca. 4 mm. lata plus minusve trilobata margine sinuata basi truncata vel reniformi petiolo villosa subaequilonga vel paullo longiori; stipulis subulatis 3–6 mm. longis 0.5–1 mm. latis; pedicellis gracilibus villosis 1–3 cm. longis ex axillis foliorum superiorum reductorum erumpentibus; calyce ad anthesim 6–7 mm. longo villosa; petalis dilute roseis ad 12 mm. longis calyce duplo longioribus; carpellis 17–22 glabris, alis 4–5 mm. longis oblique ovatis; seminibus ad 2 mm. altis ca. 1.3 mm. latis.—CHILE: in a dry silty stream-way on the coastal plain below Aguada del Cardon, Dept. Taltal, Dec. 4, 1925, *Johnston 5267* (TYPE, Gray Herb.).

This plant seems to be most closely related to *C. integerrima* which it resembles in habit of growth and flowers. It differs however, in its somewhat lobed leaves and abundant stiffish villous indument. The herbage in texture is intermediate between that of *C. foliosa* and *C. integerrima*. The plant may possibly be a hybrid of those species.

Cristaria formosula, sp. nov., annua gracilis; caulibus erectis vel laxe ascendentibus 1.5–5 dm. longis paullo flexuosis saepe breviter laxaque ramosis stipitato-glanduliferis glabratis vel sparse stellato-pubescentibus, internodiis 2–8 cm. longis; foliis dissectis saepe 3–5-foliolatis ad apicem versus caulis gradatim reductis pilis sparsis stellatis obtectis subtus subpallidioribus non rariter plus minusve

glanduliferis, foliolis in lobulis remotis saepe dentatis pinnato-dissectis; foliis inferioribus ambitu late ovatis vel triangulari-ovatis basi saepe cordatis vel reniformibus 3-7 cm. longis 3-6 cm. latis, petiolis laminae aequilongis vel ea paullo longioribus; foliis superioribus anguste triangulari-ovatis breviter petiolatis basi truncatis vel leviter reniformibus saepe trifoliolatis; stipulis lanceolatis integris 1-5 mm. longis 1-2 mm. latis; pedicellis 1-3 cm. longis gracilibus glanduliferis non rariter pilis stellatis sparsis vestitis ex axillis bractearum 5-20 mm. longarum pinnatifidarum inconspicuarum erumpentibus in racemos elongatos dispositis; calyce ad anthesim ca. 6 mm. longo pilis stellatis dense vestito, lobis late lanceolatis; petalis roseis 12-17 mm. longis calyce duplo- vel triplo-longioribus; carpellis 20-25 glabratis, alis oblique ovatis 1.5-2 cm. longis; seminibus ca. 1.2 mm. altis ca. 0.8 mm. latis.—CHILE: on dunes and gravel stream-ways on point just south of Caleta de Pan de Azucar, Dept. Chañaral, Dec. 18, 1925, *Johnston 5841*; gravelly floor of quebrada below Aguada Grande, Dept. Chañaral, Dec. 18, 1925, *Johnston 5819* (TYPE, Gray Herb.); head of sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5820*; dry gravelly stream-ways near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5685*; hills near Antofagasta, Oct. 19, 1925, *Johnston 3629*.

This species is readily distinguished from all other species in our area by its loosely branched habit, annual root, and dissected foliage. The leaves are usually divided into 3-5 elongate pinnately lobed leaflets. A collection from near Ag. Cachina (*J. 6306*) is quite like *C. formosula* except that the leaves are only obscurely lobed or are lobed with the lobes broadly joined below. I believe this to be merely a leaf-variation.

Cristaria diversifolia Ph. Anal. Univ. Chile xxxvi. 165 (1870). *C. heterophylla* Ph. Fl. Atac. 11 and Viage Des. Atac. 19, 185 (1860), not H. & A. (1833). *C. parvula* Ph. Anal. Univ. Chile lxxxii. 317 (1892). *C. trifida* Ph. Anal. Univ. Chile lxxxii. 321 (1892).

Frequent in dryish gravelly soils on hillsides and in quebradas, usually outside the fertile belt. Although extremely variable it is readily recognized since it is the only annual in our area with purple or decidedly purplish corollas. It is further marked by its very sparse pubescence and subentire or trilobed leaves. The species is highly variable in the size and proportions of the corolla and in the shape of the sepals, even within a restricted area and particularly in the region about Taltal. The type of *C. diversifolia*, from Hueso Parado, has petals 15 mm. long and about three times the length of the calyx. A collection from near Taltal made by Werdermann (no.

766) has petals over 20 mm. long and something over three times as long as the calyx. Connecting with these large-flowered forms by intergrades is a small-flowered form which has petals (2–5 mm. long) scarcely if at all surpassing the calyx. Representing this small-flowered plant are the types of *C. parvula* Ph. (from "provincia Copiapó") and *C. trifida* Ph. (from "Caldera"). This small-flowered plant I am treating as ***C. diversifolia*** forma ***parvula*** (Ph.), comb. nov. It seems to be the most common form of the species in the southern part of the range of the latter although it is by no means restricted there. In fact at the most northern known station of the species, i. e. Antofagasta, it is represented by the small-flowered phase. I have examined the following collections from our area. The numbers accompanied by an asterisk represent the forma *parvula*. Barquito (*J. 4755**), hills southeast of Taltal (*J. 5089, 5090*, 6299*), Taltal, alt. 50 m., (*Werdermann 790**), Taltal, alt. 200 m., (*Werdermann 766*), Hueso Parado (*Philippi*, type of *C. heterophylla*), between Queb. San Ramon and Paso Malo (*J. 5178**), back of Punta Grande (*J. 5214*), Cerro Yumbes near Paposo (*J. 5548*), between Paposo and Punta Rincon (*J. 5566*).

I doubtfully associate with this species some collections made in Queb. Infiles south of Taltal. One collection (*J. 5643*) seems referable to *C. diversifolia* although the stems do seem somewhat coarser and stiffer than is typical. Another collection (*J. 5642*), has the same coarse stiffish stems, but has the leaves varying in outline from ovate, with crenate or dentate margins, to tripartite. The texture of the leaves is thickish and the pubescence is grayish and suggestive of that of *C. integerrima*. The corollas is purplish pink. I suspect that the collection is of hybrid origin.

Cristaria

I have been unable to place satisfactory a collection made on a dry gravelly outwash plain between Paposo and Punta Rincon (*J. 5567*). The plant is a perennial herb ca. 1 m. tall with numerous ascending branches. The petals are pink. No basal leaves were found. The stem-leaves are usually 3-lobed.

Cristaria ovallea Gay, Fl. Chile i. 330 (1845); Ph. Fl. Atac. 11 and Viage Des. Atac. 12, 185 (1860).

Reported from Las Animas by Philippi. I have not seen Philippi's specimens and I doubt the correctness of his determination.

GUTTIFERAE

Hypericum paposanum, nom. nov. *H. dichotomum* Ph. Fl. Atac. 12 and Viage Des. Atac. 25, 27, 186 (1860), not Lam. (1797).

A plant growing on grassy slopes in the fertile belt. It is known only from our area and has been collected only at Paposo (*Philippi*, type), El Rincon (*J.* 5520), and Ag. Miguel Diaz (*J.* 5396). *Philippi* reports the species from Miguel Diaz but I could not find in his herbarium any specimens from that locality.

FRANKENIACEAE

Frankenia chilensis Presl, var. **aspera** (Ph.), comb. nov. *F. aspera* Ph. Fl. Atac. 10 and Viage Des. Atac. 24, 25, 184 (1860). *F. Nicoletiana*, var. *aspera* Reiche, Anal. Univ. Chile xcii. 922 (1895) and Fl. Chile i. 172 (1896). *F. campestris* Schauer, Nov. Act. Acad. Caes. Leop.-Car. Nat. Cur. xix. suppl. 1, 480 (1843). *F. Nicoletiana* Gay, Fl. Chile i. 248 (1845). *F. farinosa* Remy, Ann. Sci. Nat., Bot. ser. 3, viii. 236 (1847).

Forming low spreading shrubby growths on dry plains near the sea or on adjacent hillsides. The flowers are pink or pinkish. It has been collected in our area at Barquito (*J.* 4786), near Taltal (*Werdermann* 782) and near Paposo (*J.* 5574). I have not seen the type of *F. aspera* which came from Paposo nor, for that matter, any of the material of this genus in the *Philippi* Herbarium. The whole representation of the genus in that herbarium appears to be lost. I doubtfully refer to the var. *aspera* the material I collected at the summit of the sea-cliffs near Ag. Grande (*J.* 5783). This material has corollas 1.5–1.8 mm. long, united styles and numerous sparsely branched stems (1–1.5 dm. long) springing from a very strong perennial root. Material from a dry stream-way near Ag. Cachina (*J.* 5714) is also atypical, these plants being erect with strict branches. It will be noticed that I have referred to the var. *aspera* the common *Frankenia* of Atacama and Antofagasta. The glabrous or nearly glabrous plant of Coquimbo I consider to be typical *F. chilensis* Presl. In all these Chilean forms the lobing or lack of lobing of the style seems to be variable. I seriously doubt that trustworthy specific characters can be found in the style.

VIOLACEAE

Viola polypoda Turcz. Bull. Soc. Nat. Moscou xxxvi. pt. 1, 555 (1863). *V. asterias*, var. *glaberrima* Ph. Fl. Atac. 9 and Viage 183 (1860). *V. psammophila* Ph. Linnaea xxxiii. 14 (1864). *V. pseud-asterias*, var. *psammophila* Reiche, Bot. Jahrb. xvi. 435 (1893). *V. asterias*, var. *caulescens* Ph. Anal. Univ. Chile lxxxi. 491 (1892). *V. asterias*, var. *atacamensis* Ph. Anal. Univ. Chile lxxxi. 492 (1892). *V.*

asterias, var. *depauperata* Ph. Anal. Univ. Chile lxxx. 492 (1892). *V. pseudasterias* Reiche, l. c. 435. *V. calderensis* Becker, Bot. Jahrb. xxxvii. 588 (1906). *V. Werdermannii* Becker, in Fedde, Repert. xxiii. 222 (1926). *V. Werdermannii*, f. *glandulifera* Becker in Fedde, Repert. xxiii. 223 (1926). *V. Werdermannii*, f. *glaberrima* Becker in Fedde, Repert. xxiii. 223 (1926).

A small annual, frequently somewhat succulent, herb with yellow flowers. It grows mostly below the fertile belt in dryish gravelly or sandy places as on dunes, dry stream-ways, benches or not infrequently even on hillsides. In our area it has been collected near Barquito (*J.* 4775), Taltal (*Werdermann* 787, isotype of *V. Werdermannii*; *J.* 5072), Breas (*San Roman*, type of var. *atacamensis*), Paso Malo (*J.* 5168), Ag. Cardon (*J.* 5276) and Ag. Miguel Diaz (*J.* 5391). With the exception of San Roman's collection from Breas all the material cited has been determined by Dr. W. Becker as *V. Werdermannii*. My nos. 5168 and 5391 were determined as the var. *glandulifera*. I am unable to discover how these plants of the province of Antofagasta are to be separated from those of Atacama. The type of *V. polypoda* Turcz. is *Bridges* 1386 from the coastal hills near Huasco! The type of *V. pseudasterias* Reiche, also came from Huasco and seems to be quite the same as *V. polypoda*. *Viola psammophila* Ph. and *V. calderensis* Becker, both from Caldera, are conspecific and seem to represent merely a dwarf dune phase that has been repeatedly collected about Caldera. Reiche has made much of the shape of the style-crests. Most of the plants from Atacama and Antofagasta have the crests rounded or practically entire-margined. True *V. asterias* H. & A. has the crest cut into three elongate lobes. This plant I have not seen north of Coquimbo. Some forms which I place without much question into *V. polypoda* have the crests shallowly but distinctly three-lobed. My collection no. 5072 from near Taltal, which was determined as *V. Werdermannii* by Becker, has some of the plants producing entire stigma-crests and others weakly lobed ones, although in other respects they seem similar. It might be noted here that *V. asterias* H. & A., Bot. Miscl. iii. 145, t. 99 (1833), has an earlier synonym in, and should be replaced by, *V. pusilla* Poepp., Froriep, Notizen xxiii. 277 (1829), a species based upon Poeppig's collection from Concon, Chile.

Viola taltalensis Becker in Fedde, Repert. xxiii. 223 (1926).

This is a plant with the yellowish green herbage and the gross habit of *V. polypoda* but with violet rather than yellow flowers. Referred here by Becker is my material from an elevated beach at Caleta de Hueso Parado (*J.* 5164) and from the dry gravelly coastal plain

between Paposo and Punta Grande (*J.* 5571). The former collection is densely villous, but the latter is quite glabrous and accordingly belongs to Becker's var. *glaberrima*. The types of both species and variety were obtained by Werdermann (no. 794) in coarse gravel at ca. 200 m. alt. near Taltal. It is not impossible that *V. taltalensis* may represent only a hybrid of *V. polypoda* and *V. litoralis*.

Viola litoralis Ph. Fl. Atac. 9 and Viage Des. Atac. 19, 183 (1860).

Common at Caleta de Hueso Parado (*J.* 5129) just south of the mouth of Queb. San Ramon where it grew in dry gravel on an elevated beach just back from the shore. This locality is probably the exact type locality. Werdermann (no. 818), cf. Becker, Fedde, Repert. xxiii. 224 (1926), collected it near Taltal in dry stream-ways at ca. 50 m. alt. The plant is brownish green and has decidedly violet petals.

Viola Johnstonii Becker in Fedde, Repert. xxiv. 110 (1927).

Growing in decomposed rock in excessively dry, nearly barren situations above the fertile belt on the crests above Ag. Panulcito (*J.* 5464, type) and on the slopes just east of the crest of Cerro Yumbes (*J.* 5554). The corolla is violet. The two collections are very similar in details. They may, however, represent no more than a broad-leaved phase of *V. litoralis*. The plants are unquestionably annual and not perennial as indicated by Becker.

MALESHERBIACEAE

Malesherbia humilis Poepp. in Froriep, Notizen xxiii. 291 (1829). *M. humilis* Don, Edinb. New Philos. Jour. xii. 111 (1831); Ph. Fl. Atac. 18 and Viage Des. Atac. 17, 192 (1860).

A small annual which is frequent in dryish gravelly soil. Philippi reports it from Las Animas, Cachinal de la Costa, Llano Colorado and Hueso Parado. I have seen material from Barquito (*J.* 4759), Sierra Esmeralda (*San Roman*), Taltal (*Werdermann* 778; *J.* 5095, 5096) and Puerto Oliva (*Advena*). The flowers are usually pale blue. About Taltal, however, a white form is quite common. Poeppig and Don independently and without reference to each other applied the name *M. humilis* to the present species. Poeppig based his name upon material he himself collected in the upper part of the valley of the Rio Aconcagua. Don's name is founded upon collections of Macrae and of Cuming from Coquimbo.

LOASACEAE

Mentzelia chilensis Gay, var. ***atacamensis*** Urb. & Gilg, Monog. Loasac. 50 (1900). *M. chilensis* of Ph. Fl. Atac. 19 and Viage Des. Atac. 18, 19, 193 (1860).

This plant is frequent in Queb. Taltal where it grows on the gravelly floor of the quebrada and on the adjacent hillsides. It is a prostrate or loosely decumbent annual herb with flowers 2.5–3 cm. broad. The variety, which is a weak one, is known only from near Taltal (*Philippi, Werdermann 798, J. 5092*) and to the eastward near Breas (*Larrañaga*).

The typical form of the species is known only from northern parts of the province of Coquimbo.

Loasa Bertrandi Ph. Anal. Univ. Chile lxxxv. 11 (1893). *L. Arnottiana* of Ph. Fl. Atac. 19 and Viage Des. Atac. 15, 25, 193 (1860).

A common herbaceous annual twining through bushes or forming tangled prostrate nets on hillsides or on the gravelly floors of quebradas near the coast. The opposite leaves are shiny green above and dull beneath. The petals are white but the squamae are yellow below and bright red above the middle. The plant is common and conspicuous but because of its sharply stinging hairs was collected only near Barquito (*J. 4758*) and Taltal (*J. 5094*). I have also seen material from Taltal (*Werdermann 786*), "Cachinal and Paposo" (*Philippi*), Breas (*Larrañaga*) and Desert of Atacama (*San Roman, type*). With the original description the source of the type is given as "In deserto Atacama loco dicto "Brea" legit orn. San Roman." The cover marked "*Loasa Bertrandi*" in the Philippi Herbarium contains two collections, one a mere snip from Breas collected by Larrañaga and second a good specimen collected by San Roman in 1883 in "Desert. Atacama." It is obvious, therefore, that the geographical data given with the original description is confused. Urban & Gilg, Monog. 359 (1900), refer *L. Bertrandi* to *L. elongata* H. & A., a species based upon material from Coquimbo. I have seen no material from south of Barquito that I should care to associate with the present plant. As the name *L. Bertrandi* is clearly applicable to it I prefer to use that name.

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

The common plant I refer here is either a variety of this polymorphous species or a closely related undescribed species. It is an annual, non-twining herb which forms prostrate growths on gravelly soil or on hillsides. Its petals are orange-yellow and the squamae are flesh-colored above and red below the middle. The foliage is provided with stinging hairs. It has been collected only at Taltal (*Werdermann 842; J. 5093*) and at Ag. Panul (*J. 5433*) but is frequent in our area and extends north to Antofagasta and Tocopilla. It is probably the plant reported as no. 113 by Philippi, Fl. Atac. 19 and Viage Des. Atac. 193 (1860).

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

Locally very common on the dry gravelly bed of the quebrada in the Sierra Esmeralda ca. 1.5 km. north of Portezuelo de Mina Carola (*J.* 5674). It is a perennial with a rather brittle juicy root and numerous loosely tufted stems 3–6 dm. long. The stems are usually subdecumbent or ascending and are covered with stinging hairs. The corolla is white. The type of this remarkably distinct species was collected at "Esmeralda" by San Roman. It is otherwise known only from a collection recently made at Antofagasta by Pennell. The relations of *L. sessiliflora* are wholly uncertain. *Its leaves being all alternate and its capsules producing only 3–6 seeds the plant falls in the series *Floribundae* as defined by Urban & Gilg. The plant, however, does not have any obvious relatives there and its squamae, which are as described by Urban & Gilg, l. c. 361, do not accord with those of the other species of that series, nor with those of the series *Malesherbioideae*, the group which our plant in habit most suggests.

Loasa fruticosa (Ph.) Urb. & Gilg, Monog. Loasa. 256 (1900).
Huidobria fruticosa Ph. Anal. Univ. Chile xii. 219 (1855); Fl. Atac. 19 and Viage Des. Atac. 24, 25, 50, 193 (1860).

I saw this remarkable plant only in Queb. Guanillo near Paposo (*J.* 5588) at the same locality at which Philippi, in Dec. 1853, first observed and collected it. It is a pronounced xerophyte growing on the dry floor or the quebrada or occasionally in adjacent hillside gullies above Aguada Pique. Even about Aguada Pique it is very dry and the vegetation very sparse but despite the rapidly increasing aridity the plant extends about a kilometer further inland to near Mina Chimba where it finally disappears and the absolute desert begins. It is usually a widely branched depressed shrub ca. 3 dm. tall and 9–15 dm. broad, but more rarely an erect-branched bush 6–9 dm. tall and 3–5 dm. broad. The flowers are white. The leaves are thick and canescent.

Loasa chilensis (Gay) Urb. Bericht. Deutsch. Bot. Ges. x. 222 (1892); Monog. 258 (1900). *Huidobria chilensis* Gay, Fl. Chile ii. 440, t. 26 (1846); Ph. Fl. Atac. 19 and Viage Des. Atac. 21, 193 (1860).

A slender loosely branched brittle bush 6–12 or even 18 dm. tall growing in gravelly places. It has been collected in our area in Queb. Cachina above Ag. Cachina (*J.* 5687) and at Carrizalillo further inland (*Harding*). I also collected it at the north end of Caleta de Hueso Parado at the mouth of Queb. San Ramon (*J.* 5140) which is probably the station reported by Philippi as being near Mal Paso. The flowers are white.

CACTACEAE

Opuntia spp.

On the dry slopes above the fertile belt at El Rincon, Ag. Panulcito and Ag. Miguel Diaz, and as I recollect, also on the dry landward slopes back of the sea cliffs near Ag. Grande and Ag. Cachina, I observed a cylindropuntia which grew 5-10 dm. tall and was covered with extremely numerous straw-colored spines 2-3 cm. long. The joints became detached very readily. My animals were continually annoyed by them. No flowers of this plant were observed. The plant may possibly be *Opuntia tunicata* Link & Otto, which has been reported from near Taltal by Söhrens, *Monatsschr. Kakteenk.* x. 6 (1900) and is very probably the *Opuntia* sp. from Hueso Parado mentioned by Philippi, *Fl. Atac.* 24 and *Viage Des. Atac.* 198 (1860).

Philippi, *Fl. Atac.* 24 and *Viage Des. Atac.* 16, 198 (1860) also mentions a species of this genus observed on the plains northeast of Cachinal de la Costa. This was said to have yellowish spines and red flowers.

Another *Opuntia*, under the name of *O. sulphurea* Don, is reported from about Las Animas and Chañaral by Philippi, *Viage Des. Atac.* 13, 14 (1860). The determination however, is probably incorrect.

Cereus coquimbanus (Molina) K. Schum. *Kakteen* 58 (1897).
C. nigripilis Ph. *Fl. Atac.* 23 and *Viage Des. Atac.* 15, 25, 197 (1860).

Forming loose clumps 1-2.5 m. tall in the fertile belt throughout our area. Collections were made on the sea-cliffs near Ag. Cachina (*J.* 5703) and in the hills near Taltal (*J.* 5077) which were determined by Dr. Werdermann. Philippi reported it from Paposo and I observed it as common as far north as the slopes about Ag. Miguel Diaz.

Philippi, l. c., also reports "*C. peruvianus* DC." as accompanying his *C. nigripilis*. Just what plant he referred to is uncertain for the determination is certainly incorrect. Perhaps the name was given to some phase of *C. coquimbanus*.

Cereus spinibarbis Otto in Pfeiffer, *Enum. Cact.* 86 (1837).
Eulychnia breviflora Ph. *Fl. Atac.* 24, t. 2a and *Viage Des. Atac.* 18, 25, 198 (1860).

Referred here are collections from the hills near Taltal (*J.* 5076) and from the rocky coastal plain on Punta Grande (*J.* 5572). The common large *Cereus* so characteristic of the fertile belt from Taltal to Miguel Diaz is presumably referable to this species. My two collections were determined by Dr. Werdermann. The outer surface of the calyx and fruit is underlaid with a tissue formed of vesicles, 1-2 mm. in diameter, filled with a pale mucilaginous liquid. The petals are white. The calyx and fruit are covered with brown or sooty trichomes.

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

Dr. Werdermann has determined as this species material collected on the sea-cliffs near Ag. Cachina (*J.* 5702). While obviously a close relative of *C. spinibarbis*, as observed about Taltal and Paposo, the plant differs conspicuously in having larger more globose flowers which are covered with a more abundant loose white or somewhat brownish wool. The areoles on the stems are also much more conspicuously hairy, being villous rather than simply velutinous.

Echinocactus cinereus Ph. Fl. Atac. 23 and Viage Des. Atac. 18, 25, 197 (1860).

I collected this species only on the hills southeast of Taltal (*J.* 5074). Probably conspecific, since it agrees closely with the Taltal plant in habit, is the large glaucous *Echinocactus* which grows frequently in great abundance on the coastal plain of our area and also somewhat less abundantly on the arid slopes above the fertile belt on the coastal hills. Philippi reports it only from Taltal, Paposo and El Cobre. Schumann, Monatsschr. Kakteenk. xi. 5 (1901), also reports it from Taltal. This species and the next five enumerated are referable to the segregate genus *Copiapoa*, Britt. & Rose, Cact. iii. 85-90 (1922).

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

Dr. Werdermann has determined as this species a collection from the western end of the Llano Colorado (*J.* 5655). The stems numbered 25-100 or more and formed a dense subglobose or semispherical masses 5-10 dm. tall on a dry rocky slope. The flowers were rose-colored and the fruit red.

Echinocactus Pepinianus Lem. ex K. Schum. Kakteen 420 (1898).

Doubtfully determined as this species by Dr. Werdermann is a collection from Ag. Cachina (*J.* 5701).

Echinocactus columnaris Pfeiff. Abbild. u. Beschr. ii. sub t. 14 (1847); Ph. Fl. Atac. 23 and Viage Des. Atac. 15, 18, 25, 197 (1860).

Reported by Philippi from Cachinal de la Costa, Taltal Valley, and Paposo.

Echinocactus copiapensis Pfeiff. Abbild. u. Beschr. ii. sub t. 14 (1847); Ph. Fl. Atac. 23 and Viage Des. Atac. 18, 25, 197 (1860).

Reported from Taltal Valley and near Paposo by Phillippi.

Echinocactus humilis Ph. Fl. Atac. 23 and Viage Des. Atac. 25, 197 (1860).

Based upon material collected on the coastal plain near Paposo by Philippi. Britton & Rose, Cact. iii. 89 (1922), were unable to place this species.

Echinocactus occultus Ph. Fl. Atac. 23 and Viage Des. Atac. 15, 25, 197 (1860).

Philippi reports this species as occurring from Copiapó to El Cobre and mentions specific occurrence at Cachinal de la Costa and Paposo. I collected the plant only on a dry gravelly terrace in Queb. Taltal a few kilometers east of Taltal (*J.* 5073). Schumann, Monatsch. Kakteenk. xi. 92 (1901), reports the plant from Breas. This species and the next are referable to the segregate genus *Neoporteria* Britt. & Rose, Cact. iii. 94-100 (1922).

Echinocactus Jussieui Monv. ex Salm-Dyck, Cact. Hort. Dyck. 170 (1850).

A plant collected on the dry shrubby slopes above the fertile belt near the crest of Cerro Yumbes near Paposo (*J.* 5553) has been determined as this species by Dr. Werdermann.

Echinocactus napinus Ph. Anal. Univ. Chile xli. 720 (1872).

Reported from Breas by Schumann, Kakteen, Nachtr. 109 (1903), and from the same general region by Reiche, Bot. Jahrb. xlv. 347, fig. 2 (1911). This species and the following ones are referable to the segregate genus *Malacocarpus* Salm-Dyck. cf. Brit. & Rose, Cact. iii. 187-207 (1922).

Echinocactus Froehlichianus K. Schum. Kakteen, Nachtr. 124 (1903).

Specimens collected between Cascabeles and Ag. Dulce (*J.* 5169) has been determined as this species by Dr. Werdermann. The plant grew on low cliff on the coastal plain.

Echinocactus sp. nov., Werd. in lit.

Plants found on a rocky slope in the Sierra Esmeralda just south of Pique de Jacinto Diaz (*J.* 5676) have been indicated by Dr. Werdermann as representing an undescribed species.

Echinocactus mammillarioides Hook. Bot. Mag. lxiv. t. 3558 (1837); Ph. Fl. Atac. 23 and Viage Des. Atac. 18, 197 (1860).

Philippi reports this species from Taltal Valley.

LYTHRACEAE

Lythrum Hyssopifolia L. Sp. Pl. 447 (1753).

Locally abundant in wet sand in the quebrada just below Ag. Grande (*J.* 5816). The plants grew 10-15 cm. tall and were unbranched.

Pleurophora pungens Don, Edinb. New Philos. Jour. xii. 112 (1831).

A brittle slender-stemmed decumbent or prostrate undershrub

which was observed only twice, once on the gravelly floor of the quebrada near Ag. Grande (*J.* 5817) and again on a gravelly bench just back from the shore on Punta Grande near Paposo (*J.* 5216). Both of these collections have a greenish yellow hypanthium and pinkish petals and filaments. These colors are conspicuously paler than in the plants I saw in the cordilleras of Atacama.

ONAGRACEAE

Oenothera coquimbensis Gay, Fl. Chile ii. 331 (1846).

I refer here material collected in a dry sandy stream-way at Barquito (*J.* 4772) and on the dunes just south of Caleta de Pan de Azucar (*J.* 5839). Similar plants were also collected on dunes near Caldera (*J.* 5065). The plants of these three collections are erect annuals usually less than 3 dm. tall, and are clothed with a fine appressed inconspicuous pubescence. Except for the fine pubescence, they agree well with the original description and with an isotype of the species from the dunes near La Serena. The plants have small flowers, the mature buds being only 3–5 mm. long. These buds do not open and as they are frequently found surmounting ripening capsules they probably are cleistogamic flowers. Whether all the flowers on the plants are cleistogamic or whether only those are which are produced late in the season, I cannot say. I suspect, however, that the early flowers are chasmogamic and that *Oe. grandidentata* Ph., *Linnaea* xxxiii. 68 (1864), the type of which came from Caldera, represents the vernal phase of the species. The type of *Oe. grandidentata* has no open flowers, only a bud ca. 1 cm. long which appears to have been swelling when the plant was collected. This plant is clearly the same as those frequently collected about Caldera which produce corollas with petals 1–2 cm. long.

Reiche, Fl. Chile ii. 258 (1898), has applied the name *Oe. coquimbensis* to the much collected plant of the dry interior (Caldera and Copiapó south to Bandurrias and Valle Carrizal) which has corollas ca. 35 mm. broad and usually has a conspicuously long-villous calyx. Gay, however, correctly described the type as being glabrous or obscurely villous on the younger parts and as having the corollas scarcely 6 mm. in diameter. It is obvious, therefore, that Reiche is incorrect and that the plants he treats as typical *Oe. coquimbensis* are in fact better placed in *Oe. grandidentata*. Reiche in addition treated *Oe. grandidentata* Ph. as a variety of *Oe. coquimbensis* and incorrectly placed under it the small-flowered coastal forms most of which are typical *Oe. coquimbensis*. He has, hence, confused both concepts.

UMBELLIFERAE

Bowlesia integerrima Turcz. Bull. Soc. Imp. Nat. Moscou xx. pt. 1, 170 (1847).

A very loosely branched prostrate canescent annual herb growing in dryish gravelly places. It has been collected in our area on a rocky hillside at the head of Queb. de Infieles south of Taltal (*J.* 5647), at 100 m. alt. near Taltal (*Werdermann* 791), on a rocky sea-ward terrace just above Agua Dulce (*J.* 5191) and on a gravelly bench on the coastal plain between Paposo and Punta Grande (*J.* 5568). The species ranges south at least to the Vallenar Valley and is very readily separable from *B. dichotoma* DC. by having very slender loosely spreading or prostrate stems, usually entire leaves, and in having the smaller fruit covered with trichomes similar to the peltate disk-like ones characteristic of many species of *Croton*. The stems and leaves have an ordinary stellate pubescence. In *B. dichotoma* the pubescence on the fruit is like that on the herbage. The type of *B. integerrima* came from the hills between Huasco and Copiapó and not from Coquimbo as originally given!

Bowlesia incana R. & P. Fl. Peruv. iii. 28, t. 268a (1802). *B. tenera* Spreng. Syst. i. 880 (1825); Urb. in Mart. Fl. Bras. xi. pt. 1, 292 (1879).

Collected by Werdermann (no. 867) at ca. 400 m. alt. near Taltal.

Bowlesia paposana, sp. nov., debilis annua; caulibus 1-5 dm. longis 1 mm. crassis procumbentibus saepe solitariis plerumque dichotome ramosis ubique cum pilis stellatis rigidis sparsis asperatis e radice tenue filiformi orientibus internodiis 3-12 cm. longis; foliis viridibus sparse graciliter stellatis 5-costatis, basibus petiolorum dilatatis in vaginam angustam membranaceam margine fimbriatam saepe connatis; foliis mediis et superioribus oppositis, lamina petiolo subaequilonga vel non rariter duplo breviori 1-2 mm. longa et paullo latiori ad medium evidenter trilobata vel non rariter subquiquilobata basi cordata vel reniformi, lobis saepe triangularibus acutis mucronulatis, lateralibus saepe conspicue dentatis vel bilobulatis, lobo medio ceteris saepe paullo longiori integro vel saepe conspicue 1-2-dentato sinibus rectangularibus; foliis inferioribus alternis lobis obtusis vel rotundis brevioribus; umbellis ad nodos 2 vel rariter 3 sessilibus vel graciliter (usque ad 2 cm. longe) pedunculatis 1-3-floris; floribus subsessilibus; sepalis nullis; petalis ovatis 0.3-0.5 mm. longis albis medium versus longitudinaliter flavo-lineatis glaberrimis apice obtusis vel rotundis rectis; filamentis compresse subulatis quam antheris subglobosis duplo longioribus glabris ca. 0.15 mm. longis; fructibus 2-2.5

mm. longis sessilibus; mericarpiis ovatis stellatis et cum appendiculis linearibus summum ad apicem stellato-glochidiatis munitis, basi rotundis, dorso concavis et saepe per margines laterales inflexos plus minusve obscuris, facie convexis. CHILE: under large cacti on the west slope of Cerro Yumbes just east of Paposo, Dept. Taltal, Dec. 8, 1925, *Johnston 5550* (TYPE, Gray Herb.).

Of this interesting plant only one large colony was seen. On a moist slope in the fertile belt on the south slope of Cerro Yumbes along the trail to Ag. Perales I found an abundance of the plant trailing over the ground in the shelter of a large group of cactus. Among the Chilean species it is most nearly related to *B. uncinata* Colla (= *B. tripartita* Clos), but differs in having stems much less conspicuously scabrous, and in having smaller fruit with the mericarps dorsally inflexed and smaller flowers lacking sepals. *Bowlesia paposana*, however, is most closely related to the Bolivian and Peruvian species. *Bowlesia Mandoni* Rusby (*Mandon 578* from Sorata) and *B. lobata*, var. *humifusa* Ball (Ball's collection from Chicla) resemble our plant but the leaves of these forms (similar to those of *B. incana* R. & P.) are smaller and have shorter rounded rather than acute lobes. They have small sepals and mericarps which are not dorsally inflexed and are angled rather than rounded on the face. The mericarps, however, bear glochids similar in form to those of *B. paposana*.

Asteriscium Vidali Ph. Anal. Univ. Chile lxxxv. 711 (1894).

I refer here the sprawling or decumbent plants I found on a dryish ridge-crest above the fertile belt above El Rincon (*J. 5506*), in gravelly open places in the fertile belt near Ag. Panulcito (*J. 5459*) and on the dryish rocky floor of the quebrada near Ag. Miguel Diaz (*J. 5374*).

Gymnophyton foliosum Ph. Fl. Atac. 24 and Viage Des. Atac. 19, 198 (1860). *Dipterygia foliosa* Kuntze, Rev. Gen. ii. 267 (1891). *G. foliatum* Ph. Viage Des. Atac. 18 (1860).

This very distinct species is known only from our area. It has been collected at the western end of the Llano Colorado (*J. 5651*), in Queb. de Taltal (*Philippi*, type; *J. 5103*), near Taltal (*Darapsky*), between Agua Dulce and Queb. Anchuña (*J. 5190*) and on the ridge above El Rincon (*J. 5505*). Except for the material from El Rincon which grew on a high dry ridge above the fertile belt, the plant was found growing only in dry sandy or gravelly stream-ways forming loose intricately branched shrubs 1-12 dm. tall. The species is peculiar in that it normally produces slender trifoliate leaves. The mericarps are very strongly compressed and have well developed lateral wings.

Bustillosia chilensis Clos in Gay, Fl. Chile iii. 108, t. 32, fig. 4

(1847); Ph. Fl. Atac. 25 and Viage Des. Atac. 17, 38, 199 (1860). *B. filifolia* Ph. Fl. Atac. 25 and Viage Des. Atac. 199 (1860). *Dipterygia Closii* Kuntze, Rev. Gen. ii. 267 (1891). *B. chilensis*, var. *setacea* Ph. Anal. Univ. Chile lxxxv. 711 (1894). *Asteriscium pungens* Drude in E. & P. Nat. Pflanzenf. iii. Abt. 8, 134 (1897).

North of the Caldera-Copiapó region this species is known only from the Taltal region. It is reported from near Portezuelo de las Trapaderas and Breadal by Philippi. Werdermann (no. 772) collected it at ca. 200 m. alt. near Taltal and I found it to be a common herb on the dryish gravelly floor of Queb. Taltal (*J. 5101*) and local on dryish slopes just back of Caleta de Hueso Parado (*J. 5638*). It is a prostrate or decumbent annual with erect peduncles bearing dense globose umbels, 6–10 mm. thick, of yellow flowers.

The plant is most closely related to *Asteriscium*, but differs so greatly in gross habit as well as in flower-color and fruit-structures that it seems well worthy of generic recognition. The annual root, the widely spreading slender stems, the much divided leaves, the small distinctly yellow flowers and the much less compressed fruit are all characters which readily separate *Bustillosia* from *Asteriscium*. Reiche, Bot. Jahrb. xxviii. 10 t. 2, fig. 24 (1899), has given a good figure of the fruit in cross-section.

Domeykoa oppositifolia Ph. Fl. Atac. 25, t. 2c and Viage Des. Atac. 15, 199 (1860).

This species is known only from our area. The type, which I have examined, was obtained at Cachinal de la Costa by Philippi but the plant seems to be most common from Taltal northward. I have seen material collected at ca. 500 m. alt. near Taltal (*Werdermann 793*), from a rocky slope in a quebrada in the hills southeast of Taltal (*J. 5102*), from an elevated beach between Agua Dulce and Queb. Anchuña (*J. 5189*), from a dry gravelly ridge just above the fertile belt above El Rincon (*J. 5504*) and from moist talus in the quebrada at Ag. Miguel Diaz (*J. 5373*). The plant is a slender prostrate herb with a slender short-lived annual root. The minute petals are purple and not infrequently white towards the base.

Domeykoa perennis, sp. nov., glaberrima glaucescens; caulibus 5–15 dm. longis prostratis gracilibus teretibus ca. 1 mm. crassis numerosis stricte dichotomo-ramosis e radice valida crassa vel caudice humili laxe denseve ramoso orientibus, internodiis usque ad 8 cm. longis; foliis inferioribus alternis ceteris alternis vel rariter oppositis; petiolo laminae aequilongo vel ea duplo longiori vel rariter breviori longiorive; lamina ambitu reniformi 7.5–15 mm. longa 10–20 mm. lata ultra medium profunde trilobata vel rariter subtrifoliata; lobis

angulatis latis apice acuminatis sinu acuto sejunctis, lateralibus 3-dentatis vel rariter bilobulatis 2-3-dentatis, lobo medio ceteris subaequilongo 1-3-dentato; pedunculis oppositifoliis gracillimis 1-4 cm. longis; bracteis involucri oblanceolatis vel lineari-lanceolatis 1-2 mm. longis subbiseriatis reflexis; umbellis simplicibus 10-20-floris; pedicellis 1-1.5 mm. longis; petalis late ovatis vel obovatis 1-2.1 mm. longis 0.8-1 mm. latis albis uninerviis, apice obtusis vel breviter acuminatis saepe rectis paullo vel vix incurvis, basi in unguem brevem abrupte contractis; nervo petali supra medium in glandulam late fusiformem crassam abrupte expanso; sepalis minutis subovatis vel obcordatis non rariter dentatis ungue petali brevioribus; filamentis subulatis ca. 0.5 mm. longis; antheris subglobosis; mericarpiis 1 mm. longis angulatis prismaticis vel elliptico-prismaticis dorso planis facie commisurali sulcato et intus in semen paullo intrusis.—CHILE: crevices at head of sea-cliffs, near Aguada Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5689* (TYPE, Gray Herb.); on sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5761*; on moist gravel towards the head of the quebrada above Aguada Grande, Dept. Chañaral, Dec. 16, 1925, *Johnston 5754*.

This species, a very distinct member of the heretofore monotypic genus *Domeykoa*, differs from *D. oppositifolia* in its strong perennial root, somewhat fruticulose stems, much less dissected leaves, white petals and slightly larger flowers and fruit. It grows in the moist fog-bathed area on and near the high sea-cliffs near Ag. Cachina and Ag. Grande. The numerous wiry slightly fruticulose stems are quite prostrate or trail through low shrubbery. The petals are white and not at all purple. The fruit, except for a slight difference in size, is in all details remarkably like that of *D. oppositifolia*.

The study of this new species now makes it clear that *Domeykoa* is very closely related to *Eremocharis*. Bentham & Hooker, followed by Drude, placed the genus next to *Bowlesia*. Reiche, Bot. Jahrb. xxviii. 3, t. 1, fig. 7 (1899), properly removed it from near *Bowlesia* but erred, I believe, in associating it with *Azorella* and *Laretia*. The fruit of *Domeykoa* is quite like that of *Eremocharis* and is discussed below under *Eremocharis fruticosa*. It should be mentioned, however, that the illustration of the cross-section of the fruit of *Domeykoa oppositifolia* given by Reiche, l. c., does not entirely agree with my observations. The endocarp is shown with too thick a wall and is much less angular than I have seen it.

The characters whereby *Domeykoa* may be separated from *Eremocharis* and related genera lie in the form of the petals. *Eremocharis*, *Gymnophyton*, *Bustillosia* and *Asteriscium* all have the petals evidently

drawn out at the apex into a definite linear or ligulate appendage which is decidedly incurved or inflexed. The petals of *Domeykoa* are erect or very slightly incurved at the rounded or simply obtuse apex. As in the genera mentioned, *Domeykoa* has a conspicuous lenticular gland in the middle of each petal. From *Eremocharis* in particular, the genus *Domeykoa* differs in being prostrate rather than an upright bush, in having simple umbels borne along the stems on oppositifolious or falsely axillary peduncles rather than in compound umbels borne towards the apex of the stem, and in having white or purple unappendaged rather than yellow (or rarely purple) apically appendaged petals.

Eremocharis fruticosa Ph. Fl. Atac. 25, t. 2b and Viage Des. Atac. 12, 15, 199 (1860). *E. flexuosa* Ph. ex F. Ph. Cat. Pl. Chile 103 (1881), lapsu calami. *Dipterygia Philippiana* Kuntze, Rev. Gen. ii. 267 (1891).

This species is practically confined to our area being known outside only from near Caldera. It is a slender-stemmed very loosely branched bush growing 1-2 m. tall and appearing to be most at home on rocky cliffs or in dry gravel of stream-ways or elevated beaches. The petals are yellow. While not uncommon it has been collected only at Barquito (*J.* 4764), Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J.* 5765), Queb. San Ramon near Taltal (*J.* 5143), Puerto Oliva (*Borchers*), between Agua Dulce and Queb. Anchuña (*J.* 5192) and between Punta Plata and Punta Buitre (*J.* 5247). Reiche, Bot. Jahrb. xlv. 347, fig. 4 (1911), reports it in the interior between Guamango and Las Animas.

Although the genus *Eremocharis* has been considered only a part of *Asteriscium* I believe that it merits full generic recognition and that it should be enlarged to include several plants of Peru which have similar habit, inflorescence and fruit. The mericarps of these species of *Eremocharis* are not compressed and are about as thick as they are broad. In shape they are prismatic or ellipsoid-prismatic, being plane or very weakly concave on the back and having plane sides (these about equalling the back in width) converging towards the narrow commissure which in turn is definitely sulcate and intrudes noticeably into the seed-cavity. The epicarp is thin and scarcely masks the angles and plane surfaces of the indurated endocarp. Five oil-tubes provide weak ribs down each angle and down the back and each side. In form and plan the fruits of the several species of *Eremocharis* are remarkably alike and practically indistinguishable from that of the genus *Domeykoa*, the genus which is probably the closest relative of *Eremocharis* and which differs only in habit of growth,

inflorescence and the form as well as the color of the petals. Such genera as *Asteriscium*, *Bustillosia* and *Gymnophyton*, with which *Eremocharis* has been associated by Bentham & Hooker and by Drude, all have dorsally compressed mericarps in which the width is much greater than the thickness. As Reiche, Bot. Jahrb. xxviii. 10 (1899), has indicated, *Eremocharis* differs from *Asteriscium* in particular, in its habit of growth, inflorescence and flower-color. The mericarps of *Asteriscium* are not prismatic but are strongly compressed and have a very deeply concave back with the margins (these at times narrowly winged) spreading, erect or even loosely revolute. The fruit of *Gymnophyton* is very strongly flattened and conspicuously winged.

The immediate relatives of *E. fruticosa* Ph. are to be found in the shrubby plants from arid parts of Peru described as members of *Asteriscium* subgenus *Gymnophytum* by Wolff, Bot. Jahrb. xl. 292 (1908). These are slender-stemmed, sparsely leafy bushes about a meter tall which produce compound umbels of yellow (and purple?) flowers. A study in the herbarium indicates that there are other, undescribed Peruvian species of this relationship. It becomes evident, therefore, that *E. fruticosa* is an outlying species of a group prevailing Peruvian.

Reiche, Bot. Jahrb. xxviii. t. 2, fig. 26 (1899), has given what is purported to be a cross-section of the mericarp of *E. fruticosa*. Although I have made numerous sections of the fruit, from eight different collections, I have failed to find any mericarp the cross section of which agreed with that figured by Reiche. The fruit I have examined is quite constant and none seen by me has such a thick epicarp or such a concave back. The epicarp, according to my observations, is thin and scarcely exceeds the endocarp in thickness. In medial cross-section the shape of the endocarp, not to mention the exocarp also, is much more nearly like Philippi's crude diagram. Philippi, of course, has definitely erred in failing to indicate the duplex nature of the mericarpial wall and especially the characteristic intrusion of the commissural wall into the seed.

The Index Kewensis, ii. 861 (1893), lists the generic name *Eremocharis* R. Br. in Sturt, Narrative Exped. Cent. Austr. ii. append. 73 (1849). That designation, however, occurs only in a general discussion under *Clianthus Dampieri* Cunn. where it is merely mentioned as a possible generic name in case the species should prove to be generically distinct. So casual was its publication that Bentham, Fl. Aust. ii. 214 (1864), did not bother to even mention it in his treatment of *C. Dampieri*. As the name, *Eremocharis* R. Br., was not legitimately established and has never once been characterized or even

subsequently used, in fact has never even been associated with a specific name to form a binomial, it would be most pedantic to insist that Philippi's well published name should be considered invalid because of it.

Eryngium pulchellum Ph. Fl. Atac. 25 and Viage Des. Atac. 19, 199 (1860).

This species has been collected only in the general vicinity of Taltal. I have seen collections from Hueso Parado (*Philippi*, type), from near Taltal at ca. 50 m. alt. (*Werdermann* 804), from an elevated beach at Caleta de Hueso Parado (*J.* 5141), from the gravelly floor of a quebrada in the hills southeast of Taltal (*J.* 5645) and from a dry hillside at the head of Queb. de Infieles ca. 18 km. south of Taltal (*J.* 5646). The plant is an erect annual herb usually producing a number of ascending branches. The specimens from Coquimbo and Aconcagua referred to *E. pulchellum* by Reiche, Fl. Chile iii. 96 (1902), are quite distinct and seem to be phases of *E. anomalum* H. & A.

Apium Panul (Bertero) Reiche, Anal. Univ. Chile civ. 832 (1899) and Fl. Chile iii. 111 (1902). *Ligusticum Panul* Bertero; Ph. Fl. Atac. 26 and Viage Des. Atac. 27, 200 (1860).

A white-flowered perennial growing in moist soil and developing elongate trailing stems. It is common in wet sand below the water-hole at Ag. Grande (*J.* 5762) and at Ag. Panul (*J.* 5434) grew in profusion with other lush herbs over the small streamlet there. At Ag. Miguel Diaz it was collected in the quebrada near the water-hole (*J.* 5375) and again on a rich moist bank in the fertile belt (*J.* 5376). Philippi reported it from Ag. Panul and Miguel Diaz.

Apium laciniatum (DC.) Urban in Mart. Fl. Bras. xi. pt. 1, 343 (1879). *Helosciadium deserticola* Ph. Fl. Atac. 26 and Viage Des. Atac. 15, 25, 200 (1860).

A small slender annual herb growing usually in sheltered places. It was collected at Barquito (*J.* 4812), Cachinal de la Costa (*Philippi*, type of *H. deserticola*), Taltal (*Darapsky*, *Werdermann* 795), Queb. San Ramon (*J.* 5142) and Ag. Miguel Diaz (*J.* 5377). Philippi reports it from Hueso Parado and Paposo. Although he gives the type locality of *H. deserticola* as Hueso Parado, the type specimen in his herbarium is labeled as from Cachinal de la Costa. In the text of his Viage he also reports the species from Cachinal de la Costa and not from Hueso Parado, so it seems probable that the locality "Hueso Parado" is incorrect. *Apium laciniatum* is very doubtfully distinct from *A. ammi* (Jacq.) Urb., a species ranging widely in South America.

Daucus montanus H. & B. ex. Schultes, Syst. vi. 482 (1820). *D. australis* of Ph. Fl. 26 and Viage Des. Atac. 19, 25, 200 (1860).

A slender weedy annual frequent on moist grassy slopes in the fertile belt. It has been collected at Hueso Parado (*Philippi*) and El Rincon (*J. 5507*). *Philippi* reports it from Paposo. I observed it as far north as Ag. Miguel Diaz.

PRIMULACEAE

Centunculus erectus Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860).

The type of this species was collected in the fertile belt near Paposo by *Philippi*. *Reiche*, Fl. Chile v. 100 (1910), lists the name in the synonymy of *C. pentandrus* R. Br. which is in turn treated as a synonym of *Anagallis pumila* Sw. by Pax & Knuth, Pflanzenr. [Heft 22] iv. Fam. 237, pg. 331 (1905). *Philippi's* plant, however, seems to be a *Centunculus* and is probably a phase of *C. minimus* L.

PLUMBAGINACEAE

Plumbago caerulea HBK. Nov. Gen. et Sp. ii. 220 (1818); Ph. Fl. Atac. 46 and Viage Des. Atac. 20, 220 (1860).

Known in our area only from Hueso Parado (*Philippi*), Queb. San Ramon (*J. 5147*) and Ag. Cardon (*J. 5282*). It is prostrate or very laxly ascending and frequents rocky places. The corolla is blue.

Limonium plumosum (Ph.) Kuntze, Rev. Gen. ii. 396 (1891). *Statice plumosa* Ph. Fl. Atac. 46, t. 6b and Viage Des. Atac. 14, 24, 26, 220 (1860).

Forming very dense strict tufted growths usually 3 (occasionally even 5) dm. tall and 5-40 cm. thick at the base. The corolla is white. The plant has been collected from "Chañaral usque ad Paposo" (*Philippi*, type), from rocky lower slopes of the hills about Barquito (*J. 4785*), from gravelly benches in Queb. San Ramon (*J. 5148*) and from gravelly stream-ways below Ag. Panul (*J. 5441*). A very extensive colony of the plant was noted on a slightly alkaline silty flat between Cachinalcito and Punta Grande. *Philippi* reports the species in Valle Salado back of Chañaral and from the coastal plain near Paposo. I also noted the species on the sandy slope back of Punta Reyes near Miguel Diaz.

GENTIANACEAE

Microcala quadrangularis (Lam.) Griseb. in DC. Prodr. ix. 63 (1845); Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860).

Collected by *Philippi* near Paposo.

Centaurium cachanlahuen (Molina) Robinson, Proc. Am. Acad. xlv. 396 (1910). *Erythraea paposana* Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860). *E. chilensis*, var. *paposana* Reiche, Anal. Univ. Chile cxviii. 332 (1906) and Fl. Chile v. 123 (1910).

Collected about shrubs on a moist rich slope in the fertile belt at El Rincon near Paposo (*J.* 5524). It was rare. Philippi collected the type of *E. paposana* in the fertile belt, probably on the fertile slopes facing Queb. Guanillo, also near Paposo.

APOCYNACEAE

Skytanthus acutus Meyen, Reise i. 376 (1834); Ph. Fl. Atac. 35 and Viage Des. Atac. 12, 14, 27, 209 (1860).

A shrub with bright yellow flowers which was found growing half buried in the dunes at Punta Plata (*J.* 5249) and at Punta Negra in Valle Salado back of Chañaral (*J.* 4824). Philippi reports it from the valley just east and from the coast just north of Chañaral.

ASCLEPIADACEAE

Cynanchum boerhavifolium H. & A. Jour. Bot. i. 294 (1834). *Cynoctonum boerhaaviaefolium* Decne.; Ph. Fl. Atac. 35 and Viage Des. Atac. 19, 27, 209 (1860).

A vine trailing in tangled masses over rocks or twining in bushes or on cactus. It has been collected near Taltal at Hueso Parado (*Philippi*), at Ag. Lora on Cerro Perales (*J.* 5620) and in Queb. San Ramon (*J.* 5146), near Puerto Oliva (*Borchers*), and near Cachinalcito (*J.* 5197). Philippi reports it from Miguel Diaz. The leaves are thick and fleshy and are very readily detached when fresh. The petals are brownish while the corona is white or pink.

Cynanchum viride (Ph.) Reiche, Anal. Univ. Chile cxviii. 159 (1906) and Fl. Chile v. 113 (1910). *Cynoctonum viride* Ph. Fl. Atac. 35 and Viage Des. Atac. 10, 12, 27, 38, 209 (1860).

A small shrub frequenting dry gravelly soil or rocky places. It forms a strictly erect bush up to 7 dm. tall or is prostrate or somewhat twining. The stems are stiff, shrubby and tend to disarticulate. The flowers are yellow. I collected the plant near Barquito (*J.* 4817), Taltal (*J.* 5161) and Paposo (*J.* 5573). Philippi reports it from Las Animas, Breadal and Miguel Diaz.

Tweedia obliquifolia (Colla) Malme, Ark. Bot. ii. no. 7, 9 (1904).

I doubtfully refer here material found climbing on cactus and over rocks on the dryish upper slopes of Cerro Perales near Taltal (*J.* 5605) and growing prostrate on a gravelly ridge crest above the fertile belt

near Ag. Miguel Diaz (*J.* 5304). The corolla is brownish green and the corona white although becoming rosy in age. The corolla-lobes are broader and the peduncles narrower than in the typical plant of central Chile.

CONVOLVULACEAE

Dichondra repens Forst. Char. Gen. Pl. 40, t. 20 (1776).

Collected near Ag. Lora on Cerro Perales near Taltal (*J.* 5619), on the ridge back of Punta Grande (*J.* 5221), on slopes about El Rincon (*J.* 5523), in the quebrada near Ag. Miguel Diaz (*J.* 5313) and on the ridges above Ag. Miguel Diaz (*J.* 5312). The plant is characteristic of moist or sheltered places and was practically confined to the fertile belt.

Convolvulus dissectus Cav. Icones v. 53, t. 480 (1799).

I refer here collections from dryish rocky seaward slopes between Agua Dulce and Cascabeles (*J.* 5171), a moist slope in the fertile belt back of Punta Grande (*J.* 5208), a dryish gravelly bench near Ag. Perales in Queb. Guanillo (*J.* 5594), moist slopes in the fertile belt near Ag. Panulcito (*J.* 5468), and the rather moist gravel on the floor of the quebrada at Ag. Cardon (*J.* 5281). The plant develops numerous slender sparsely branched prostrate stems from a strong perennial tap root. The leaves vary remarkably on each plant, the lower ones tending to be merely sinuate, the upper ones dissected. Except for a more grayish pubescence our plants are very similar to the common and variable forms of the species in central Chile. The corolla is pink.

Ipomaea chilensis A. Br. & Bouché, Ind. Sem. Hort. Berol., Appendix 1 (1857). *I. paposana* Ph. Fl. Atac. 36 and Viage Des. Atac. 23, 25, 210 (1860).

An annual herb growing in gravelly soil in the fertile belt on the ridge back of Punta Grande (*J.* 5222), near Paposo (*Philippi*, types) and on a ridge near Ag. Miguel Diaz (*J.* 5311). The plant is erect with strict stems or is somewhat twining with stems nearly a meter long.

Cuscuta purpurata Ph. Anal. Univ. Chile xc. 225 (1895).

I refer here the species of *Cuscuta* which grows in dryish areas and is frequent on a variety of hosts. I have seen collections of it from the plains near Ag. Cachina (*J.* 5710), Sierra Esmeralda (*San Roman*), Taltal (*Werdermann* 852, *J.* 5082) and Mal Paso north of Taltal (*J.* 5170). It is usually purplish in color and has conspicuously succulent flowers. *Cuscuta purpurata* appears to include the bulk of, if not all, the material from northern Chile that has been referred to *C. odorata* R. & P. and *C. intermedia* Choisy. The illustrations, R. & P. Fl.

Peruv. i. t. 105 (1798), Choisy, Mém. Soc. Phys. Genève ix. 275, t. 2 (1841) and Yuncker, Am. Jour. Bot. ix. 564, fig. 21 (1923), of these species all show the corollas with longer more protruding stamens than I have seen in this Chilean plant. I have accepted Philippi's name, therefore, since it belongs to the form treated here. It is of course not impossible that *C. purpurata* Ph. may be only a Chilean variety of *C. odorata* R. & P.

POLEMONIACEAE

Gilia glutinosa Ph. Linnaea xxx. 196 (1859) and Anal. Univ. Chile xc. 212 (1895); not Gray (1886). *G. ramosissima* Ph. Cat. Pl. Itin. Tarapacá 53 (1891). *G. glabrata* Ph. Anal. Univ. Chile xc. 213 (1895). *G. ramosissima*, var. *glabrata* Reiche, Anal. Univ. Chile cxx. 194 (1907) and Fl. Chile v. 153 (1910). *G. cobijanensis* Brand, Pflanzenr. [Heft 27] iv. Fam. 250, 98 (1907). *G. chachanensis* Johnston, Contr. Gray Herb. lxx. 82 (1924).

Material of this somewhat variable, albeit readily recognized species was collected in our area in gravelly places on the lower hill-sides near Barquito (*J. 4815*), on a dry sandy slope just inland from Caleta de Pan de Azucar (*J. 5830*) and on the gravelly floor of the dry quebrada near Ag. Cachina (*J. 5700*). The corolla is white. The species grows in dry well drained soil from Coquimbo to southern Peru. Brand, who was followed by Reiche, has rejected the oldest name of this plant, *G. glutinosa* Ph. (1859), apparently because a better understood plant of California was given the same name by Gray in 1886. This procedure, of course, is in direct violation of the rules of priority.

Gilia laciniata R. & P. Fl. Peruv. ii. 17, t. 123 (1799); Ph. Fl. Atac. 36 and Viage Des. Atac. 210 (1860). *G. valdiviensis* Griseb. Abh. Ges. Wiss. Göttingen vi. 131 (1854).

Growing in the fertile belt on the ridge back of Punta Grande (*J. 5210*) and on the flats about the water-hole at Ag. Miguel Diaz (*J. 5390*). Werdermann (no. 839) has collected it at ca. 400 m. alt. near Taltal and Philippi made collections which are labeled "Hueso Parado and Paposó."

HYDROPHYLLACEAE

Nama dichotomum (R. & P.) Choisy, Mém. Soc. Phys. Genève vi. 113 (1833). *N. stricta* Ph. Fl. Atac. 37 and Viage Des. Atac. 25, 211 (1860). *N. strictum*, f. *stricta* Brand, Pflanzenr. [Heft 59] iv. Fam. 251, pg. 151 (1913).

The type of *N. strictum*, a mere form of *N. dichotomum*, was collected in the fertile belt near Paposo by Philippi.

BORAGINACEAE

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

Growing on dunes or sandy places near the sea at Barquito (*J.* 4806), Caleta de Pan de Azucar (*J.* 5836), Punta Buitre (*J.* 5241), Punta Médano (*J.* 5255) and Punta Reyes (*J.* 5413). The plant is either annual or perennial and forms prostrate growths. The corolla is white tinged with pink or rarely bluish. The last three collections cited have broader and more obtuse as well as thicker leaves than the typical forms from the Caldera-Copiapó region.

Heliotropium taltalense (Ph.) Johnston, Contr. Gray Herb. lxxxi. 27 (1928). *Cochranea taltalensis* Ph. Anal. Univ. Chile xc. 349 (1895). *H. rugosum* Ph. Fl. Atac. 38 and Viage Des. Atac. 20, 24, 25, 212 (1860); not Mart. & Gal. (1844). *C. rugosa* Ph. Anal. Univ. Chile xc. 351 (1895).

An erect shrub 1–2 m. tall growing on dryish hillsides usually outside the fertile belt. It has been collected near Taltal (*Darapsky*, type of *H. taltalense*; *Borchers*; *Werdermann* 837; *J.* 5118, 5632), Breas (*Larrañaga*), Queb. Matancilla (*Berninger*), Paposo (*Philippi*, type of *H. rugosum*; *J.* 5544), Ag. Panulcito (*J.* 5476), Ag. Cardon (*J.* 5293) and Ag. Miguel Diaz (*J.* 5414). The corolla is white with a yellowish throat and outside is occasionally rose-tinged.

Heliotropium inconspicuum Reiche, Anal. Univ. Chile cxxi. 245 (1907) and Fl. Chile v. 203 (1910). *Cochranea parviflora* Ph. Anal. Univ. Chile xc. 350 (1895).

A loose globose bush 6–10 dm. tall growing in dry rocky quebradas. It has been collected only at Breas (*Larrañaga*, type), at Ag. Lora on Cerro Perales near Taltal (*J.* 5631) where only a single plant was found, and near Ag. Grande (*J.* 5810, 5811) where it was not uncommon on gravel and talus. The small corolla is white.

Heliotropium chenopodiaceum Clos, var. **ericoideum** (Miers) Reiche, Anal. Univ. Chile cxxi. 244 (1907) and Fl. Chile v. 202 (1910).

A loosely branched slender-stemmed globose bush 3–6 dm. tall growing on dry rocky slopes near the upper limit of vegetation above El Rincon (*J.* 5545) and Ag. Panulcito (*J.* 5477). The flowers are white.

Heliotropium pycnophyllum Ph. Fl. Atac. 38 and Viage Des. Atac. 15, 16, 17, 18, 212 (1860). *H. breanum* Ph. Anal. Univ. Chile xc. 357 (1895). *H. brevifolium* Ph. Anal. Univ. Chile xc. 357 (1895).

Forming a very dense globose bush 3–15 dm. tall in dry rocky or gravelly places. It has been collected near Barquito (*J.* 4807), Cachinal de la Costa (*Philippi*, type of *H. pycnophyllum*), Ag. Grande (*J.* 5809), Breas (*Larrañaga*, type of *H. breanum*), Taltal (*Werdermann* 849), Hueso Parado (*Borchers*, type of *H. brevifolium*), Queb. San Ramon (*J.* 5155) and Punta Colorado north of Paposo (*J.* 5242). The leaves are thickish and have strongly inrolled margins. The corollas are sordid white but commonly become somewhat purplish at maturity. The plant is a marked xerophyte, growing not only along the coast but in the dry interior. *Philippi* reports it in the desert interior south of Breas where I also noted it near Llano Colorado and in the Sierra Esmeralda.

Heliotropium linariaefolium Ph. Fl. Atac. 38 and Viage Des. Atac. 12, 15, 16, 18, 212 (1860). *H. longiflorum* Ph. Anal. Univ. Chile xc. 354 (1895).

A loosely decumbent shrub 1.5–6 dm. tall and 6–12 dm. broad growing in dryish gravel or on rocky hillsides. It grows with *H. pycnophyllum* in the arid country back of the coastal hills but is most common and characteristic on the slopes just outside of the fertile belt. It has been collected near Barquito (*J.* 4750), Las Animas (*Philippi*), Cachinal de la Costa (*Philippi*, type of *H. linariaefolium*), Ag. Grande (*J.* 5808), Ag. Cachina (*J.* 5735), Breas (*Larrañaga*, type of *H. longiflorum*), Taltal (*Borchers*, *Werdermann* 767, *J.* 5119), Queb. Matancilla (*Berninger*), Posada in Queb. Guanillo (*J.* 5600). *Philippi* reported it from the arid interior south of Llano Colorado and I observed it in the Sierra Esmeralda. The corolla is large and orange-colored.

Heliotropium Philippianum Johnston, Contr. Gray Herb. lxxxi. 36 (1928).

A shrub, usually somewhat supported by other bushes, and growing ca. 1.5 m. tall. It is characteristic of the fertile belt. The plant is known only from the ridge back of Punta Grande (*J.* 5233, type), Paposo (*Philippi*), Ag. Panulcito (*J.* 5478), Ag. Cardon (*J.* 5294), Miguel Diaz (*Philippi*) and Ag. Miguel Diaz (*J.* 5415). The corollas, which are fragrant, are white with a conspicuous yellow center. The collections of *Philippi*, which I have cited above, are those upon which he based his report of *H. linariaefolium* from Paposo and Miguel Diaz.

Cryptantha parviflora (Ph.) Reiche, Anal. Univ. Chile cxxi. 821 (1908) and Fl. Chile v. 226 (1910). *Eritrichum parviflorum* Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860).

In our area this species is known only from the two plants I found

on a gravelly terrace on a point just south of Caleta de Pan de Azucar (*J.* 5837) and from the small colony found on a dry slope in the Sierra Esmeralda just north of Portezuelo de Mina Carola (*J.* 5681). The material is quite typical.

Cryptantha subamplexicaulis (Ph.) Reiche, Anal. Univ. Chile cxxi. 826 (1908) and Fl. Chile v. 231 (1910). *Eritrichum subamplexicaule* Ph. Fl. Atac. 39 and Viage Des. Atac. 25, 213 (1860).

A plant with long slender stems, which trail through the grass, or clamber through low shrubbery in the fertile belt, forming loose mats 3–12 dm. broad and 1–2 dm. tall. It flowers the first year but appears to persist and to form a weak slender taproot and a loose fruticulose caudex. It has been collected on Cerro Perales near Taltal (*J.* 5633), near Paposo (*Philippi*, type), on Cerro Yumbes near Paposo (*J.* 5562), on slopes above El Rincon (*J.* 5543), on slopes above Ag. Panulcito (*J.* 5475), in the gulch above Ag. Panul (*J.* 5448) and in the quebrada at Ag. Miguel Diaz (*J.* 5416). I also doubtfully refer here collections from the dunes below Ag. Miguel Diaz (*J.* 5411, 5412), cf. Johnston, Contr. Gray Herb. lxxviii. 42 (1927). These collections are erect and have larger more hirsute calyces.

Cryptantha argentea Johnston, Contr. Gray Herb. lxxviii. 42 (1927).

Forming dense silvery pulvinate mats 5–30 cm. broad and growing in crevices about the head of the high foggy sea-cliffs near Ag. Grande (*J.* 5814, type) and Ag. Cachina (*J.* 5734). The root, though slender, is strong and clearly perennial.

Cryptantha chaetocalyx (Ph.) Johnston, Contr. Gray Herb. lxxviii. 43 (1927). *Eritrichum chaetocalyx* Ph. Fl. Atac. 39 and Viage Des. Atac. 10, 213 (1860).

Although given under the original description as from Pan de Azucar, the type almost certainly came from Caldera, cf. Johnston, l. c. I do not believe that the species occurs within our area.

Cryptantha filiformis (Ph.) Reiche, Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichum filiforme* Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860).

The type of this species, which is a small slender single plant, is given as having been collected at Hueso Parado by Philippi. Nothing like it has been subsequently found in our area although apparently conspecific material has been collected near Tocopilla, Iquique and Caleta Buena further north.

Cryptantha taltalensis Johnston, Contr. Gray Herb. lxxviii. 45 (1927).

An annual frequent in dry gravel on hillsides about Taltal, where

it grows associated with *C. filaginea* (*J.* 5120, 5121 type, 5156, 5634, 5635).

Cryptantha Romanii Johnston, Contr. Gray Herb. lxxviii. 46 (1927).

Known only from the type collection made in the Sierra Esmeralda in 1884 by San Roman.

Cryptantha filaginea (Ph.) Reiche, Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichium filagineum* Ph. Anal. Univ. Chile xc. 536 (1895).

This is the common *Cryptantha* of our area, being generally distributed and growing on dryish hillsides or on gravel. It has been collected near Barquito (*J.* 4808), Caleta de Pan de Azucar (*J.* 5831, 5844), Ag. Grande (*J.* 5812, 5813), Ag. Cachina (*J.* 5736, 5744, 5745), Sierra Esmeralda (*J.* 5682), Taltal (*Werdermann* 809; *J.* 5122, 5123, 5157, 5158, 5179, 5636), Estancia Vieja (*J.* 5204), Queb. Matancilla (*Berninger*), Paposo (*J.* 5546, 5547, 5601, 6285), Ag. Panulcito (*J.* 5479, 5244), Ag. Cardon (*J.* 5295) and Ag. Miguel Diaz (*J.* 5417, 5418).

Cryptantha glomerata Lehm. ex F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1836). *Eritrichum strictum* Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860). *C. microcarpa*, var. *stricta* Reiche, Anal. Univ. Chile cxxi. 818 (1908) and Fl. Chile v. 223 (1910).

Material of this coarse northern form of *C. glomerata*, named *E. strictum* by Philippi, has been collected only on Cerro Perales near Taltal (*J.* 5630), at El Rincon (*J.* 5542), at Ag. Panul (*J.* 5447) and at Miguel Diaz (*Philippi*, type of *E. strictum*).

Pectocarya dimorpha Johnston, Contr. Gray Herb. lxxviii. 115 (1927).

A single colony of this species was found on a dry rocky hillside at the western end of the Llano Colorado (*J.* 5656).

VERBENACEAE

Verbena selaginoides Kunth ex Walp. Repert. iv. 15 (1844). *V. glauca* of Ph. Fl. Atac. 40 and Viage Des. Atac. 20, 27, 214 (1860).

An erect shrub 6–12 dm. tall growing on dry rocky slopes. It has been collected on Cerro Perales above Ag. Lora (*J.* 5618) at probably the same station at which Philippi obtained the material which he cites as from Hueso Parado at 360 m. alt. Other material has been collected at ca. 500 m. alt. near Taltal by *Werdermann* (no. 848). Further north it was seen only in the dry scrub above the fertile belt at El Rincon (*J.* 5509) and above Ag. Miguel Diaz (*J.* 5380). *Philippi* also reported it from Miguel Diaz. The corolla is violet to lavender.

Verbena atacamensis Reiche, Anal. Univ. Chile cxxiii. 371 (1908) and Fl. Chile v. 291 (1910). *V. sulphurea* and *V. erinoides* of Ph. Fl. Atac. 40 and Viage Des. Atac. 20, 25, 214 (1860).

Referred to this species is the slender-stemmed prostrate perennial with white or pink or even purplish corollas which was collected in or just below the fertile belt at Ag. Grande (*J. 5769*), near Taltal (*Werdermann 789, J. 5104*), in Queb. San Ramon (*J. 5144, 5145*), near Paposo (*Philippi*), above El Rincon (*J. 5508*) and near Ag. Miguel Diaz (*J. 5315*). One of Philippi's two collections (that reported as *V. erinoides*) from Paposo and my collections from El Rincon and Ag. Miguel Diaz have the staminal appendages included in the corolla-throat, the other collections mentioned have them more or less extruded and are, hence, more typical of the species. I certainly do not think that these two forms are specifically distinct.

LABIATAE

Teucrium nudicaule Hook. Bot. Misc. ii. 235 (1831); Ball, Jour. Linn. Soc. xxii. 157 (1886). *T. leucanthum* Ph. Anal. Univ. Chile xc. 565 (1895). *T. nudicaule*, var. *leucanthum* Epling, Anal. Mo. Bot. Gard. xii. 114 (1925). *T. bicolor* of Ph. Viage Des. Atac. 21 (1860). *Teucrium* sp. Ph. Fl. Atac. 40 and Viage Des. Atac. 214 (1860).

A shrubby plant 1-9 dm. tall with numerous erect slender branches. It grows in dryish rocky or gravelly places outside the fertile belt. I have seen material from Taltal (*Ball; Borchers*, 2 collections, one the type of *T. leucanthum*), Queb. San Ramon (*J. 5133*), Queb. Guanillo near Paposo (*J. 5579*) and near Ag. Panulcito (*J. 5449*). Philippi noted the plant as occurring from Taltal to El Cobre. The corolla is white or somewhat greenish and inside is more or less streaked with purplish. Material from south of our area has the corolla somewhat darker in color but appears to be otherwise similar.

Stachys pannosa Ph. Anal. Univ. Chile xc. 564 (1895). *S. grandidentata* of Ph. Fl. Atac. 40 and Viage Des. Atac. 27, 214 (1860).

Collected in moist gravel in the quebradas at Ag. Cardon (*J. 5260*) and Ag. Miguel Diaz (*J. 5338*). Philippi also collected it at Miguel Diaz. The type of *S. pannosa*, which was collected near Paposo by San Roman, although somewhat more densely pubescent is clearly conspecific with the material I have cited above.

Stachys crenata Ph. Anal. Univ. Chile xc. 562 (1895).

An annual herb with pink flowers. It was collected on dryish gravel of the floor of the quebrada back of Barquito (*J. 4810*) and on

an elevated beach at Caleta de Hueso Parado near Taltal (*J.* 5132). A collection, apparently made by Reiche, labeled as from "Puerto Oliva" is in the herbarium at Santiago. This species differs from *S. pannosa* in lacking a silky pubescence, in having somewhat smaller corollas and in having, apparently, a less persistent root. The type from Carrizal, between Caldera and Huasco, is certainly conspecific with our plants. Doubtless it is related to some of the species from further south, as to just which one or just how closely it is impossible at present to state.

Salvia Gilliesii Benth. Lab. Gen. et Sp. 265 (1833).

A loose erect shrub 1–2.5 m. tall which is infrequent on rocky dryish slopes just above or in the upper part of the fertile belt. It was collected in the hills southeast of Taltal (*J.* 5085), on the crest of Cerro Perales near Taltal (*J.* 5610), on the upper slopes above El Rincon near Paposo (*J.* 5482), on the upper slopes above Ag. Panulcito (*J.* 5450) and on the upper ridges above Ag. Miguel Diaz (*J.* 5337). Although a large bush with bright blue flowers and widely distributed in our area the plant, for some inexplicable reason, does not appear to have been collected here by others, and is now for the first time reported from Chile. Det. by Dr. C. Epling.

Salvia paposana Ph. Fl. Atac. 39 and Viage Des. Atac. 20, 25, 27, 213 (1860). *S. rhombifolia* R. & P., var. *Philippii* Klotz. Linnaea xxix. 732 (1858).

Because of the advanced maturity of the plant no material was collected. It is an annual and is not uncommon north of Taltal. Philippi's type at Santiago is labeled "Hueso parado, Paposo, etc." Philippi also reports it from Miguel Diaz, where I also observed it. According to Dr. Epling, *in lit.*, the species ranges north to Peru and although closely related to *S. rhombifolia* R. & P. appears to differ in its taller more slender habit of growth, thinner somewhat acutish glabrous or subglabrous leaves, and slightly smaller sparsely hirtellous calyx.

Salvia excisa R. & P. Fl. Peruv. i. 25, t. 36a (1798). *S. chilensis* Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 45 (1858). *S. tubiflora* of Ph. Fl. Atac. 39 and Viage Des. Atac. 15, 16, 21, 25, 27, 213 (1860).

A weak upright shrub 6–12 dm. tall growing in moist soil usually in the fertile belt. The corolla is scarlet. I have seen material from "Cachinal de la Costa, Paposo" (*Philippi*), Paposo (*San Roman*), Ag. Cardon (*J.* 5261) and Ag. Miguel Diaz (*J.* 5336). I also observed the plant at Ag. Cachinalcito and on the fertile slopes at El Rincon. Philippi reports it from Estancia Vieja. *Salvia chilensis* is based upon specimens grown from seeds collected at Paposo. Dr. Epling has

determined our material as *S. excisa* R. & P. writing that the species is closely related to *S. tubiflora* Sm. and distinguished chiefly by being somewhat glandular on the lower leaf-surfaces.

Mentha piperita L. Sp. Pl. 576 (1753); Ph. Fl. Atac. 39 and Viage Des. Atac. 26, 213 (1860).

Philippi reported this species from Ag. Panul. I noted a mint there and at Ag. Miguel Diaz but finding no flowers failed to collect it. Philippi's material appears to be lost. The determination of the species is, hence, open to doubt.

NOLANACEAE

Nolana lepidophylla (Ph.), comb. nov. *Osteocarpus lepidophyllus* Ph. Anal. Univ. Chile xci. 42 (1895). *Alona lepidophylla* Reiche, Anal. Univ. Chile cxxv. 497 (1910) and Fl. Chile v. 425 (1910).

There is a thoroughly typical specimen of this species in the Philippi Herbarium with data as follows—"Pan de Azucar, D." The initial is probably that of Darapsky. The locality "Pan de Azucar" is indefinite and perhaps may refer to a place near Carrizal Bajo, between Caldera and Huasco, rather than the well known locality in our area.

I am accepting the genus *Nolana* as characterized by having a lobed fruit which at maturity breaks apart forming 3-10 nutlets. In situ these nutlets are uniseriate and are more or less broadly joined together ventrally. In these regards it differs from *Bargemontia* in which the nutlets (usually smaller and ovoid) are distinct from one another and are affixed by a basal or subbasal attachment directly to the receptacle. *Periloba* differs from *Nolana* in having multiseriate nutlets. To *Nolana*, besides the typical species such as *N. prostrata* L. and its allies which are mostly Peruvian, I would also refer to the genus as synonyms, *Alona* Lindl. (1844), *Rayera* Gaud. (1842-46), ? *Velpeaulia* Gaud. (1842-46) and *Osteocarpus* Ph. These generic names just mentioned all apply to the narrow-leaved Chilean shrubs treated as species numbers 1-7 by Reiche, Fl. Chile v. 422-26 (1910).

Nolana stenophylla, sp. nov., fruticosa laxa decumbens 1.5-3 dm. alta 3-12 dm. diametro pilis abundantibus multicellularibus glanduliferis brevibus villosula; ramis ultimis 1-2 dm. longis 1.5-2.5 mm. crassis fruticulosus erectis, internodiis 1-3 cm. longis; ramulis rariter elongatis plerumque ad axillas foliorum ramorum fasciculos foliorum formantibus; foliis linearibus compressis carnosus saepe 1.5-3.5 cm. longis 1.3-2.3 mm. latis vix nervatis concoloribus apice rotundis ad basem versus paullo attenuatis; floribus in axillis foliorum solitariis; pedicellis ad anthesim 5-20 mm. longis ascendentibus

gracilibus, fructiferis robustioribus 1-4 cm. longis contortis deflexis; calyce ad anthesim 15-20 mm. longo, tubo cupulato ca. 6 mm. longo 8-10 mm. diametro, lobis lanceolatis acuminatis ascendentibus; calyce fructifero accrescenti 2-2.5 cm. longo; corolla caerulea 2.8-3.5 cm. longa calyce subduplo longiori, tubo ca. 5 mm. longo ca. 2 mm. crasso cylindrico apice in fauces campanulatas ca. 19 mm. longas abrupte expanso in calyce occulto intus villosus, lobis ascendentibus ca. 7 mm. longis ut videtur rotundis; filamentis 5 mm. supra basem corollae affixis 4 et 7 mm. longis glabris; stylo ca. 1 cm. longo; fructu 4-5-lobato 9-12 mm. diametro ca. 5 mm. alto maturitate in nuculos 4-5 uniseriatis paullo inaequales dorso laevissimos grosse umbonatos apice abrupte acuminatos ventre ubique cicatricosos angulatos disruptante.—CHILE: on the rocky and bushy diluvial fan at the mouth of the quebrada just below Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5272* (TYPE, Gray Herb.).

This species is probably most closely related to *N. Gayana* (Gaud.) Johnston, agreeing with that species in the form of its corolla and in its elongate leaves. The nutlets in *N. stenophylla*, however, are twice as large and are acuminate at the apex and the narrower more succulent leaves are very obscurely if at all revolute. The nutlets in the new species are very characteristic. They are simply parts of a disrupted 4-5-lobed fruit. The ventral half of the nutlet, by which it is affixed, is strongly convex or angled and after becoming detached is irregularly roughened. The back is prominently umbonate and quite smooth. The tip of the nutlet is drawn up into a beak usually 1-2 mm. long. The nutlets in *N. Gayana* are affixed by a medio-ventral areola and are ellipsoid. The leaves, stems and calyces in the new species are a rather abundantly glandular-villous.

Periloba longifolia (Lindl.), comb. nov. *Alona longifolia* Lindl. Bot. Reg. xxx. sub t. 46 (1844). *Sorema elegans* Ph. Fl. Atac. 43 and Viage Des. Atac. 16, 17, 25, 38, 217 (1860). *S. bracteosa* Ph. Fl. Atac. 43 and Viage Des. Atac. 217 (1860).

I refer here the succulent herb which is frequent on foggy slopes in the fertile belt. Collections have been seen from near Barquito (*J. 4768, 4769*), Cachinal de la Costa (*Philippi*, type of *S. bracteosa*), Ag. Grande (*J. 5770*), Breas (*Larrañaga*), Taltal (*Werdermann 769*), El Rincon (*J. 5511*), Paposo (*Philippi*, type of *S. elegans*) and Ag. Miguel Diaz (*J. 5383*). The plants in our area are supposed to represent at least two species. I have not only been unable to distinguish these, but have completely failed to find even reasonably constant characters which would separate our plants from the immediately related ones from further south. Accordingly under the name *P. longi-*

folia, the oldest specific name applied to any species of this immediate relationship, I have placed such proposed species as *S. lanceolata* Miers, *S. acuminata* Miers, *S. glutinosa* Ph., *Nolana angustifolia* Ph., *N. napiformis* Ph., etc. By thus enlarging the scope of *P. longifolia* and admitting to it considerable variation a definable unit is obtained and the species becomes comparable with such outstanding species as *Periloba paradoxa* Raf. (*N. paradoxa* Lindl.), **P. baccata** (*Alona baccata* Lindl. = *S. linearis* Miers! and *N. Carrerae* Ph!), **P. pterosperma** (*N. pterosperma* Ph.) and **P. parviflora** (*S. parviflora* Ph.). *Periloba longifolia* is very variable in the amount of pubescence, in the attachment of the leaves and in the size of the corolla. In our area I found that the corolla, which is a very rich and beautiful blue, varies from 3 to nearly 6 cm. in length according to the nutrition of the particular plant.

The generic name *Periloba* Raf., Fl. Tell. iv. 87 (1838), was based upon *Nolana paradoxa* Lindl. as illustrated in the Botanical Magazine, lii. t. 2604 (1825), and Botanical Register, x. t. 865 (1824). Strangely this generic name, although legitimately established and unmistakable as to its application, has been incorrectly cited by numerous authors as a synonym of the liliaceous genus *Nothoscordum*. When *Nothoscordum* was added to the list of Nomina Conservanda at Brussels in 1910 *Periloba* was actually listed as a nomen rejiciendum. *Periloba*, having the same type-species as *Sorema* Lindl. (1844), is clearly synonymous and since it has unquestionable priority must be taken up in place of it. *Gubleria* Gaud. (1842-46), based upon *Alona baccata*, is also a synonym.

Periloba sessiliflora (Ph.), comb. nov. *Nolana sessilifolia* Ph. Anal. Univ. Chile xci. 32 (1895).

The type of this species was collected by San Roman in the Sierra Esmeralda. I am uncertain as to the precise relationships of this plant.

Periloba stans (Ph.), comb. nov. *Nolana stans* Ph. Anal. Univ. Chile xci. 31 (1895).

Reported from near Paposo by Reiche, Fl. Chile v. 416 (1910) and Bot. Jahrb. xlv. 344 (1911). The determination is probably not correct.

Bargemontia glauca, sp. nov., fruticosa laxa decumbens glaberrima ramosa; ramulis 1-1.5 dm. longis usque ad 2.5 mm. crassis glaucescentibus, internodiis saepe 5-10 mm. longis; foliis fasciculatis anguste spathulatis carnosis subteretibus 5-15 mm. longis 1-2.5 mm. latis glaucescentibus apice rotundis vel obtusis; floribus saepe 2 e fasciculis foliorum erumpentibus; pedicellis gracilibus 4-5 mm. longis;

calyce obconico-poculiformi glaucescenti ad anthesim ca. 5 mm. longo extus glaberrimo intus pilis sparsis rigidiusculis brevibus glanduliferis ornato, dentibus triangularibus 1–2 mm. longis; corolla alba infundibuliformi ca. 1 cm. longa extus glaberrima, tubo cylindrico 3–3.5 mm. longo per calycem occulto, faucibus abrupte expansis 3–4 mm. longis ad 4–5 mm. diametro, lobis late triangularibus obtusis ca. 4 mm. latis ad 3 mm. longis ascendentibus; filamentis inclusis 2–2.5 mm. supra basem corollae affixis 5 et 6 mm. longis ad basem versus paullulo expansis et incrassatis, partibus inferioribus et decurrentibus dense villosociliatis, partibus mediis et superioribus glaberrimis; antheris ellipticis 1.5 mm. longis; stylo ca. 1 cm. longo; receptaculo patuliformi obscure lobato extus longitudinaliter sulcato; nuculis 5–8 uniseriatis basi affixis maturitate ignotis.—CHILE: a pale sprawling shrub on the upper slopes of the hills directly back of Barquito, Dept. Chañaral, Oct. 29, 1925, *Johnston 4770* (TYPE, Gray Herb.).

The glaucous, entirely glabrous herbage of this species is probably unique in the family and readily distinguishes the plant from other members of its genus. It belongs with those species of *Bargemontia* which have the base of the filaments very villous and usually somewhat thickened. These species may be broken up into three groups determined by whether the plant is glabrous or not and, if not, whether the hairs are simple or forked. The species with an indument of forked hairs are *B. peruviana*, *B. crassulifolia*, *B. eremobia* and *B. albescens*. Most closely related to these species, although glabrous or nearly so, are *B. clavata* and *B. glauca*. Among the species with an indument of simple hairs are *B. divaricata*, ? *B. micrantha*, *B. mollis*, *B. flaccida* and *B. linearifolia*. These latter species differ much in habit. *Bargemontia glauca* is distinguished from *B. clavata* by its sprawling habit, white corollas and glaucous herbage.

The genus *Bargemontia* is here taken to include plants which for the most part have been referred by past authors to *Dolia* Lindl. (1844), *Aplocarya* Lindl. (1844), *Alibrexia* Miers (1845) and *Leloutrea* Gaud. (1842–46). It is characterized by its relatively small, ovoid or subglobose, basally attached, distinct, uniseriate nutlets. The name *Bargemontia* is here accepted in place of the more familiar *Dolia* since it has definite priority, having certainly been published previous to 1842, cf. *Isis von Oken*, 626 (1842), and probably about 1840 since according to Weddell, DC. Prodr. xvi. pt. 1, 235²² (1869), some of Gaudichaud's plates were published as early as 1839. As to the validity of genera based upon Gaudichaud's plates see the discussion by Sprague, Kew Bull. 395 (1928).

Bargemontia clavata (Miers), comb. nov. *Dolia clavata* Miers

in Hook, London Jour. Bot. iv. 503 (1845) and Illus. S. Am. Pl. i. 56 (1850).

A very dense globose bush ca. 1 m. tall growing on a dry gravelly bench near the water-hole at Ag. Cachina (*J.* 5694). The herbage is glabrous and light green. The leaves are spatulate and nearly terete. The corolla is blue. The species is very closely related to *B. peruviana* of Antofagasta and Cobija, a plant which differs not only in its much more northern detached range but also in having its herbage covered with a dense canescent indument of forked hairs and perhaps also in a somewhat shorter more cylindrical corolla. The type-collection of *B. clavata*, i.e. *Bridges 1324*, came from near the coast between Huasco and Coquimbo and was given by its collector as having pale blue corollas and being a bush 6-9 dm. tall!

Bargemontia sphaerophylla (Ph.), comb. nov. *Alona sphaerophylla* Ph. Fl. Atac. 44 and Viage Des. Atac. 12, 218 (1860).

The type, which is the only known collection of this curious plant, was obtained by Philippi near Las Animas. The habit of the plant clearly shows its relations in the present genus. I was unable to make floral dissections of the type but believe that it has villous filaments and that it is related to *B. clavata* and *B. glauca*.

Bargemontia crassulifolia (Poepp.), comb. nov. *Nolana crassulifolia* Poepp. in Froriep, Notizen xxiii. 276 (1829). *Alona tomentosa* Lindl. Bot. Mag. xxx. sub t. 46 (1844). *Alibrexia rupicola* Miers in Hook. London Jour. Bot. iv. 506 (1845) and Illust. S. Am. Pl. i. 59, t. 11 (1850). *Alibrexia incana* Ph. Fl. Atac. 45 and Viage Des. Atac. 18, 24, 25, 219 (1860). *Alibrexia breviflora* Ph. Linnaea xxxiii. 208 (1864). *Dolia grandiflora* Ph. Anal. Univ. Chile xci. 44 (1895). *Dolia crassifolia* Kuntze, Rev. Gen. iii. 216 (1898).

The type of *Alibrexia incana* was collected by Philippi near the shore at Paposo. Although it was described as an erect bush ca. 4.5 dm. tall the position of the leaves and flowers in the type-specimens seem to indicate that the plant was widely spreading or prostrate. *Bargemontia crassulifolia* occurs near the sea in the region about Valparaiso. To the north it seems to be represented only by the type of *A. incana* and by a collection made by Gigeoux near Caldera. The filaments are quite villous at the base. The indument on the herbage, as in the following species, consists of forked hairs.

Bargemontia eremobia (Ph.), comb. nov. *Dolia eremobia* Ph. Anal. Univ. Chile xci. 45 (1895).

A pallid shrub with decumbent, sprawling or prostrate stems which form mats or occasionally low-domed masses 1-4.5 dm. tall and 5-30 dm. broad in dry gravelly soils. It has been collected near

Posada Hidalgos (*J.* 5662), Breas (*Larrañaga*, type), Queb. San Ramon (*J.* 5128) and Paposo (*J.* 5569). The corolla is yellowish and has villous filaments. Perhaps this species should be associated with *Alibrexia incana* Ph., the type of which came from Paposo. That species, however, has a larger calyx with a deeper calyx-tube, a larger corolla, numerous short (1–2 dm.) stiff ascending branches and a less firm darker indument. In all these characters *A. incana* seems much nearer *B. crassulifolia*. *Bargemontia eremobia* seems much more closely related to **B. albescens** (*Dolia albescens* Ph.) of the Caldera-Copiapó region. The latter species has a firmer and denser indument and appears to be an erect bush about a meter tall. It is usually infested with ants which appear to use as domatia certain gall-like thickenings on the branchlets. *Bargemontia eremobia* is not a myrmecophyte.

Bargemontia micrantha (Ph.), comb. nov. *Alona micrantha* Ph. Fl. Atac. 44 and Viage Des. Atac. 16, 218 (1860). *Dolia micrantha* Reiche, Anal. Univ. Chile cxxv. 503 (1910) and Fl. Chile v. 431 (1910). *D. hirsutula* Ph. Anal. Univ. Chile xci. 46 (1895).

Collected near Cachinal de la Costa (*Philippi*, type of *A. micrantha*) and near Breas (*Larrañaga*, type of *D. hirsutula*). The species seems to be very closely related to the following:

Bargemontia divaricata (Lindl.), comb. nov. *Aplocarya divaricata* Lindl. Bot. Reg. xxx. sub t. 46 (1844). *Dolia divaricata* B. & H. ex Wettst. in E. & P. Nat. Pflanzenf. iv. Abt. 3b, 4 (1895). *Alona xerophila* Ph. Fl. Atac. 44 and Viage Des. Atac. 17, 218 (1860). *Alona rigida* Ph. Anal. Univ. Chile xci. 38 (1895). *Osteocarpus spathulatus* Ph. Anal. Univ. Chile xci. 41 (1895).

I refer to this species the xerophytic bush I observed in the Sierra Esmeralda in the dry gravelly bed of the quebrada just north of Portezuelo de Mina Carola (*J.* 5675). It is a stiff shrub 4–10 dm. tall and clearly conspecific with material collected at Cachiyuyal (*Philippi*, type of *A. xerophila*) and in the Sierra Esmeralda (*San Roman*, type of *A. rigida*). These three collections come from a small natural area in the very arid interior and seem to represent merely a xerophytic phase of *B. divaricata*. A collection from ca. 400 m. alt. near Taltal (*Werdermann 834*) is more nearly typical of *B. divaricata* having more slender and less stiff branchlets. My collection from the Sierra Esmeralda is in advanced fruiting. I have been able to examine, however, a few persistent old corollas and find them indistinguishable from those of *B. divaricata*. The filaments are decidedly villous. The pubescence on the stems in *B. divaricata* is composed of long slender somewhat curly simple hairs which form

a sparse cottony oily indument. In *A. xerophila* and *A. rigida* the pubescence is largely restricted to the nodes and to the growing parts. *Osteocarpus spathulatus* is a form of *B. divaricata* with a conspicuous pubescence.

Bargemontia mollis (Ph.), comb. nov. *Alona mollis* Ph. Fl. Atac. 44 and Viage Des. Atac. 16, 24, 38, 218 (1860). *Dolia macrocalyx* Ph. Anal. Univ. Chile xci. 45 (1895).

A rather succulent shrub with a slimy indument of long simple hairs. It forms a globose bush 1–1.5 m. tall or has decumbent or sprawling stems forming masses 3–6 dm. tall and 6–12 dm. broad. The large corolla is violet or very pale bluish and is villous at the base of the filaments and in the tube. It has been collected only on hillsides near Barquito (*J.* 4771), on a sandy stream-way at Caleta de Pan de Azucar (*J.* 5835), near Cachinal de la Costa (*Philippi*, type of *A. mollis*), on gravelly benches and stream-ways about Ag. Cachina (*J.* 5695) and near Taltal (*Borchers*, type of *D. macrocalyx*; *Vidal*). The species is a very distinct one and is probably most closely related to the following, with which it agrees in its cylindrical merely toothed calyces and large corollas.

Bargemontia flaccida (Ph.), comb. nov. *Alona flaccida* Ph. Anal. Univ. Chile xci. 39 (1895). *A. patula* Ph. l. c.

A loosely and very widely branched, prostrate, pale green shrub 1.5–3 dm. tall and 10–20 dm. broad, growing on the sandy floor of the quebrada-mouth at Caleta de Pan de Azucar (*J.* 5834). The plant has glabrous stems and leaves, although occasionally a very few simple hairs are to be found on the calyces and growing parts of the stems. The conspicuous pale lilac corollas are villous towards the base within as are also the bases of the filaments. The species is known only from Valle Salado (*San Roman*, type of *A. flaccida*), Caleta de Pan de Azucar (*J.* 5834) and eastward in the arid interior at Carrizalillo (*Harding*) and Juncal (*San Roman*, type of *A. patula*). In publishing *A. patula* *Philippi* also reports the species from Queb. de Chaco north of Juncal. In his herbarium, however, I did not find any specimens labeled as from that locality.

Bargemontia linearifolia (Ph.), comb. nov. *Nolana linearifolia* Ph. Anal. Univ. Chile xci. 28 (1895). *N. decemloba* Herzog, Mededeel. Rijks Herb. no. 29, 20 (1916).

The type of *Philippi's* species was collected by *San Roman* in the Sierra Esmeralda. Apparently conspecific is a plant which grows well above the fertile belt on the extremely arid crests at about the upper limit of vegetation on the ridge above Ag. Panulcito (*J.* 5461). This plant differs from *Philippi's* type only in being somewhat more

abundantly glandular-puberulent on the stems and leaves and in having the corolla somewhat smaller. It is pale green and glandular-puberulent and has trailing stems and succulent linear leaves. It has a long tap-root and is apparently perennial. The blue corolla is variable in size, ranging from 12–24 mm. in length, and has deeply notched lobes. The corolla-tube is villous within. The species also occurs about Antofagasta. It is most closely related to *B. mollis*, *B. flaccida* and ***B. tarapacana*** (*Dolia tarapacana* Ph.). The deeply notched corolla-lobes distinguish it readily from its relatives.

Bargemontia aplocaryoides (Gaud.), comb. nov. *Leloutrea aplocaryoides* Gaud. Voy. Bonite, Bot. Atlas tab. 110 (1842–46). *Alona pusilla* Ph. Fl. Atac. 45 and Viage Des. Atac. 16, 219 (1860).

An erect annual herb which is ascendingly branched above the middle. The stems and foliage are covered with a clammy indument of simple spreading hairs. The lavender corolla is completely glabrous inside. The plant grows 2–4 dm. tall and frequents dry sand and gravel near the coast throughout our area. It has been collected near Barquito (*J.* 4814), Taltal (*Werdermann* 774) and Punta Buitre (*J.* 5243).

Bargemontia sedifolia (Poepp.), comb. nov. *Nolana sedifolia* Poepp. in Froriep, Notizen xxiii. 276 (1829). *Fabiana lanuginosa* H. & A. Bot. Beechey Voy. 35 (1830). *Dolia vermiculata* Lindl. Bot. Reg. xxx. sub t. 46 (1844).

An erect globose bush 5–12 dm. tall collected on a rocky hillside near the crest of the hills back of Barquito (*J.* 4767), in dry rocky place near crest of Cerro Yumbes near Paposo (*J.* 5551) and on the rocky floor of the gulch just below Ag. Panul (*J.* 5435). The elongate corolla is white and is practically glabrous within. The tomentose pubescence on the stems and leaves is composed of simple hairs.

Possibly representing a variety or even a distinct species is material from the gravelly coastal plain near Paposo (*J.* 5570) and from the dry ridge-crest above Ag. Miguel Diaz (*J.* 5384). The plant is depressed or prostrate forming masses of stems 3–9 dm. broad and 0.5–1.5 dm. tall. The corolla is pale bluish and the tube barely surpasses the calyx. The leaves and pubescence are similar to those of typical *B. sedifolia*.

Bargemontia deflexa, sp. nov., fruticosa pilis brevibus inconspicuis glanduliferis simplicibus abundanter ornata; ramulis gracilibus usque ad 1.5 mm. crassis cortice pallido obtectis, internodiis 1–5 mm. longis; foliis linearibus vix fasciculatis 1–2 cm. longis ad 1 mm. latis obtusis crassiusculis erectis vel ascendentibus; floribus in axillis solitariis; pedicellis ad anthesim gracilibus 3–6 mm. longis erectis vel

stricte ascendentibus, fructiferis robustioribus usque ad 1 cm. longis ad basem versus arcuate deflexis; calyce ad anthesim ca. 12 mm. longo, tubo subcylindrico ca. 5 mm. longo 3-4 mm. crasso, lobis subulatis inaequalibus 6-7 mm. longis erectis; corolla caerulea 15 mm. longa basi 2 mm. crassa ad summam partem gradatim expansa et ad 12 mm. crassa extus pilis brevibus sparsis glanduliferis ornata intus glabra sed ad basem versus plus minusve glandulifera, lobis brevibus ascendentibus latissime triangularibus obtusis 1-2 mm. longis 2-2.5 mm. latis, sinibus subplicatis; filamentis anguste subulatis glabris ca. 4 mm. supra basi corollae affixis decurrentibus 4 et 5 mm. longis; receptaculo 5-dentato; nuculis 3-8 subglobosis 2-2.5 mm. diametro nigris basi affixis uniseriatis.—CHILE: Carrizalillo, Dept. Chañaral, 1921, *J. E. Harding* (TYPE, Gray Herb.).

This belongs to the group of species with the base of the filaments and the inner surface of the corolla-tube glabrous or merely sparsely villous. These species are prevailingly more northern than are their congeners with villous filaments and include among their number the several Peruvian species of the genus. The principal Chilean species are *B. villosa*, ***B. deserticola*** (*Alona deserticola* Ph.), ***B. foliosa*** (*Dolia foliosa* Ph.), *B. aplocaryoides*, *B. salsoloides* and *B. sedifolia*. *Bargemontia villosa* has a copious loose indument of forked hairs. *Bargemontia deserticola* has simple or a mixture of simple and forked hairs. The remaining species have an indument of simple hairs or are glabrous. The species just described is probably most closely related to *B. foliosa* but is quite distinct. It is characterized by its very slender leaves and conspicuously deflexed fruiting pedicels. It is known only from a fragmentary collection made at Carrizalillo, a locality in the arid interior on the eastern border of our area northeasterly from Caleta de Pan de Azucar.

Bargemontia salsoloides (Lindl.), comb. nov. *Dolia salsoloides* Lindl. Bot. Reg. xxx. t. 46 (1844); Ph. Fl. Atac. 44 and Viage Des. Atac. 24, 25, 218 (1860).

A dense light-green succulent globose bush 1-1.5 m. tall. It was collected on a seaward slope at the mouth of Queb. San Ramon near Taltal (*J. 5167*) and near the mouth of Queb. Guanillo near Paposo (*J. 5590*). The elongate corollas are bluish and are glabrous within. The only other material I have seen that is conspecific is a collection made near Paposo by Philippi. The plant illustrated by Gaudichaud, Voy. Bonite, Bot. Atlas tab. 113 (1842-46), is quite like the plant from Taltal and Paposo. Only material from the northern coast seems to agree with the original description of *D. salsoloides*. This was based upon a plant collected by Macrae in "Chile," prob-

ably during the stop of some coastal boat at Taltal or Cobija. Although apparently glabrous to the naked eye, the plant has the leaves and branchlets beset with short inconspicuous simple gland-tipped hairs.

Bargemontia villosa (Ph.), comb. nov. *Alibrexia villosa* Ph. Fl. Atac. 45 and Viage Des. Atac. 16, 38, 219 (1860). *Dolia villosa* Reiche, Anal. Univ. Chile cxxv. 503 (1910) and Fl. Chile v. 431 (1910).

A pallid plant with decumbent branches forming depressed masses 1–2.5 dm. tall and 3–20 dm. broad. Except near Ag. Panulcito where it was found on the very arid ridge-crests above the fertile belt, the plant was observed only in the gravel of dry stream-ways. It is not noticeably succulent. The corollas are white or rarely pink and are sparsely villous to quite glabrous within. The indument on the stems and leaves consists usually of very abundant soft dendritic or forking hairs. The plant has been collected in our area at Cachinal de la Costa (*Philippi*), Posada Hidalgos (*J. 5663, 5664*), western end of the Llano Colorado (*J. 5653*), Breadal (*Philippi*, type), Breas (*Larrañaga*), Valle de la Brea (*Darapsky 38*), near Caleta de Hueso Parado (*J. 5639*) and near Ag. Panulcito (*J. 5462*).

SOLANACEAE

Lycium deserti Ph. Fl. Atac. 43 and Viage Des. Atac. 217 (1860). *L. desertorum* Ph. Viage Des. Atac. 17 (1860). *L. breanum* Ph. Anal. Univ. Chile xci. 23 (1895).

A spinescent shrub 1–2.5 m. tall growing on the dryish rocky slopes above the fertile belt near Ag. Miguel Diaz (*J. 5382*). I have seen only two other collections, the type of *L. deserti* secured by Philippi between Cachiyuyal and Hueso Parado and the type of *L. breanum* obtained by Larrañaga near Breas. Reiche, Bot. Jahrb. xlv. 343 (1911), however, reports it from the fertile belt near Paposo. Except for this latter record the species is known only from very arid localities. It is endemic to our area unless it prove to be synonymous with *L. fragosum* Miers, Ill. So. Am. Pl. ii. 108, t. 67d (1857), which was collected at Cobija, Iquique or Arica.

Grabowskia glauca (Ph.), comb. nov. *Lycium glaucum* Ph. Fl. Atac. 43 and Viage Des. Atac. 19, 20, 217 (1860).

A pallid shrub 1–2 m. high which grows on dry hillsides about the base of Cerro Perales just northeast of Taltal. At the southwest base of the cerro it was found to be locally frequent along the trail between Agua Perales and Caleta de Hueso Parado (*J. 5608*). It is probably at this station that Philippi collected his type, which he

cites as from "Hueso Parado." Another colony of the shrub was encountered in Queb. San Ramon on the north base of Cerro Perales (*J.* 5127). The flowers and mature fruit of the plant were collected. These prove the plant to be unquestionably a species of *Grabowskia* and probably most closely related to the Brazilian *G. Lindleyi* Miers.

Physalis pubescens L. Sp. Pl. 183 (1753); Ph. Fl. Atac. 41 and Viage Des. Atac. 215 (1860).

Reported by Philippi as growing at Ag. Perales in Queb. Guanillo near Paposo. I have not seen his specimens. These are probably conspecific with the plants of central Chile which Reiche, Fl. Chile v. 323 (1910), treated as *P. peruviana* L.

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

This small-flowered species is not uncommon in gravelly soil in quebradas and on slopes in and below the fertile belt. It has been collected at Barquito (*J.* 4813), Taltal (*Werdermann* 841) and near Ag. Cardon (*J.* 5273).

Solanum Remyanum Ph. Cat. Pl. Itin. Tarapacá 66 (1891). *Witheringia flexuosa* Remy in Gay, Fl. Chile v. 70 (1849), not *S. flexuosum* Willd.

Growing on rocky or gravelly slopes below the fertile belt. It has been collected at Barquito (*J.* 4766), Taltal (*J.* 5068, *Werdermann* 836) and between Cachinalcito and Queb. de las Tunas (*J.* 5193).

Solanum phyllanthum Cav. Icones iv. 35, t. 359 (1797). *S. paposanum* Ph. Fl. Atac. 42 and Viage Des. Atac. 25, 216 (1860).

Growing on rich grassy slopes in the fertile belt. It is a perennial from a stout root and has several stems, which sprawl or trail through the grass or low bushes. The corolla is bluish. It has been collected at the head of the sea-cliffs near Ag. Cachina (*J.* 5693) and on the hills near Paposo (*Philippi*, type of *S. paposanum*), Rincon (*J.* 5510) and Ag. Miguel Diaz (*J.* 5381). The material from Ag. Cachina and Ag. Miguel Diaz has much more abundantly and deeply lobed leaves than does the material from the other two stations. These latter two are typical of *S. paposanum*.

Solanum chilense (Dunal) Reiche, Anal. Univ. Chile cxxiv. 742 (1909) and Fl. Chile v. 358 (1910). *Lycopersicum atacamense* Ph. Fl. Atac. 42 and Viage Des. Atac. 21, 25, 216 (1860).

A sprawling herbaceous perennial which is very variable in leaf-cutting and which may be no more than a southern variety of *S. peruvianum* L. It is not infrequent on dryish gravelly soil along the coast north of Taltal. It has been collected near Taltal (*J.* 5607), Breas (*Larrañaga*), Paposo (*Philippi*, *Johnston* 5589).

Nicotiana Miersii Clos in Gay, Fl. Chile v. 56 (1849); Ph. Viage 12 (1860).

Philippi reports this from Las Animas. I have not seen the specimens.

Nicotiana solanifolia Walp. Repert. iii. 12 (1844); Ph. Fl. Atac. 41 and Viage Des. Atac. 19, 20, 25, 26, 27, 215 (1860).

This very distinctive plant is confined to the fertile belt. It forms a coarse erect woody frame-work of branches 2–10 dm. tall from which arise the leafy flowering shoots. These are subsimple and 4–10 dm. long. The elongate corolla is yellow with the limb greenish and reflexed. The plant has been collected in our area only at Barquito (*J.* 4751), Hueso Parado (*Philippi*) and Miguel Diaz (*J.* 5340), although it is present on most every moist fog-bathed slope. South of our area it has been collected about Caldera and Carrizal Bajo. The species, hence, has about the same range as *Euphorbia lactiflua* Ph. The type of *N. solanifolia* Walp. is said to come from the "Port of Penna blanca," perhaps the Caleta de Peña Blanca which is about 35 km. south of Huasco. *Nicotiana breviloba* Jeffrey, a closely related if not synonymous species, to judge from the description, is said to come from Coquimbo. I have not seen any plants of the present relationship from south of Carrizal Bajo. Our plant, may range to Coquimbo or may possibly be distinct from true *N. solanifolia*, and in that case should be called *N. cardiophylla* Ph. The latter species was based upon material from near Caldera.

Salpiglossis chilensis (Gay) Wetts. in E. & P. Nat. Pflanzenf. iv. Abt. 3b, 36 (1895). *Reyesia chilensis* Gay; Ph. Fl. Atac. 36 and Viage Des. Atac. 19, 210 (1860).

A slender-stemmed, intricately branched herbaceous perennial 2–4 dm. tall which grows in rocky places in the hills southeast of Taltal (*J.* 5084) and further south at the western end of the Llano Colorado (*J.* 5650). It has also been collected at Breas by Larrañaga and near Taltal by Werdermann (no. 821) and Philippi.

Salpiglossis cactorum, sp. nov., erecta 3–5 dm. alta gracilis; partibus inferioribus villosis, partibus superioribus stipitato-glanduliferis; caulibus pluribus teretibus basem versus suffruticosis caudicem humilem laxem formantibus supra basem laxe ramosis; foliis alternis ciliatis, inferioribus oblanceolatis pinnatifidis 2–4 cm. longis 10–13 mm. latis villosis superioribus gradatim transmutatis, summis linearibus integerrimis glabratis vel sparse glandulosis 1–2 cm. longis ca. 1 mm. latis; pedicellis 1–2 cm. longis laxe ascendentibus glanduliferis; calyce 2–3 mm. longo glandulifero nigro-costato, dentibus inaequalibus erectis 0.7–1 mm. longis; corolla violacea 12–15 mm.

longa extus glaberrima vel rare sparsissime glandulifera intus glaberrima tubo 3-4 mm. longo gracili calycem superanti faucibus anguste oblique infundibuliformibus 4-5 mm. longis paullo ventricosus limbo obliquo cum venis purpureo-marginatis reticulato labia superiori trilobata, lobo supremo longissimo et latissimo elliptico recto ca. 4-5 mm. longo 3-3.5 mm. lato apice rotundato, lobis lateralibus et inferioribus oblongis ca. 3 mm. longis; staminibus 4 didynamis inclusis ad 5 mm. supra basem corollae affixis, inferioribus longioribus ad 3.5 mm. longis, superioribus ca. 3 mm. longis geniculatis, antheris quam illis in filamentis longioribus triplo majoribus; stigmatibus illo *S. chilensis* simili; capsula calyce persistente vestita subglobosa ca. 3 mm. longa; seminibus fuscis numerosis alveolatis.—CHILE: rocky hillside near Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5258* (TYPE, Gray Herb.).

This species is related to *S. chilensis* but differs in having flowers over twice as large and vegetative parts more pubescent and glandular. The lobes of the leaves, as in *S. brachysiphon* from Tocopilla, are broad, toothed or irregularly lobed and divaricate and hence differ from the longer, ascending, narrow, practically entire lobes of *S. chilensis*. In addition, the habit of the plant is much less freely branched.

Schizanthus lacteus Ph. Fl. Atac. 45 and Viage Des. Atac. 20, 219 (1860). *S. San Romani* Ph. Anal. Univ. Chile xci. 126 (1895).

An annual herb growing in dryish gravel. It has been collected near Taltal (*Borchers, Werdermann 788, J. 5083*), Hueso Parado (*Philippi, type of S. lacteus*), Cascabeles (*J. 5175*), Queb. Guanillo near Paposo (*J. 5576, 5577*), above El Rincon near Paposo (*J. 5480*), and Paposo (*San Roman, type of S. San Romani*). The typical form of the species has white corollas. San Roman's collection from near Paposo has violet flowers and was made the type of *S. San Romani* Ph. I collected this colored form at El Rincon (*J. 5480*) and in Queb. Guanillo (*J. 5577*). At the latter station it grew with the white-flowered form and, except for flower color, was indistinguishable. The typical form also grows at Antofagasta.

Schizanthus laetus Ph. Fl. Atac. 45 and Viage Des. Atac. 16, 20, 26, 219 (1860).

A handsome species, reminiscent of *S. pinnatus* R. & P., which occurs in moist situations along the border of the fertile belt. It is restricted to our area and has been collected only at Cachinal de la Costa (*Philippi, type*), Taltal (*Werdermann 817*), Cachinalcito (*J. 5207*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5341*).

SCROPHULARIACEAE

Calceolaria bipinnatifida Ph. Fl. Atac. 46 and Viage Des. Atac. 26, 220 (1860).

Abundant locally along the streamlet of fresh water at Ag. Panul (*J.* 5420) where it becomes 6–12 dm. tall and together with *Parietaria* it forms a lush tangle of stems that completely covers the water. The flowers are sulphur yellow. In labeling and describing this plant Philippi indicated its source as Miguel Diaz. However, in his Viage, pg. 26, he definitely states that his material came from Ag. Panul, a locality which he visited and at which he could scarcely have missed this plant. On the authority of Dr. F. W. Pennell, who is studying *Calceolaria* and who has studied the Peruvian relatives of this species in the field, I am recognizing Philippi's species as distinct from *C. pinnata* L. under which it has been treated by Reiche and by Kränzlin.

Calceolaria paposana Ph. Fl. Atac. 46 and Viage Des. Atac. 26, 220 (1860).

A weak shrub, 3–9 dm. tall, with elongate erect branches terminated by cylindrical thyrses of yellow flowers. The plant seems to prefer cliffs and rocky ledges. It was collected in Queb. San Ramon on a dry cliff but at other stations grew in moist situations in the lower part of the fertile belt. I have seen collections from Taltal (*Werdermann* 847), Queb. San Ramon (*J.* 5134), Punta Grande (*J.* 5211), Paposo (*Philippi*, type), Ag. Panul (*J.* 5419) and Ag. Cardon (*J.* 5262).

Calceolaria Kingi Ph. Anal. Univ. Chile xci. 149 (1895). *C. glutinosa* Meigen, Bot. Jahrb. xvii. 289 (1893), not Heer & Regel (1845). *C. racemosa* of Ph. Fl. Atac. 46 and Viage Des. Atac. 26, 220 (1860).

Growing on moist rich slopes in the fertile belt. It is an herb 1.5–10 dm. tall with the leaves mostly basal. Philippi encountered it near Paposo. I found it on the slopes above El Rincon (*J.* 5481) and in two places near Ag. Miguel Diaz (*J.* 5345, 5346). The determination and synonymy are by Dr. Pennell.

Monttea chilensis Gay, Fl. Chile iv. 417, t. 51 (1849); Ph. Fl. Atac. 36 and Viage Des. Atac. 19, 23, 25, 27, 210 (1860). *M. chilensis*, var. *taltalensis* Reiche, Fl. Chile vi. 65 (1911).

A globose bush 9–12 dm. tall growing on rocky slopes below the fertile belt. In our area it is known only along the coast between Taltal and Miguel Diaz. I have seen collections from Taltal (*Borchers*, *Werdermann* 857), near Caleta de Hueso Parado (*J.* 5174).

Paposo (*Philippi*), Punta del Rincon near Paposo (*J.* 5237) and Ag, Miguel Diaz (*J.* 5344). *Philippi* reports it from Hueso Parado, Paposo and Miguel Diaz. Gay illustrated the flowers as violaceous and authors have continued to describe them as so. The plants of *M. chilensis* seen by me in the Dept. of Taltal have the corollas white or greenish outside, the lobes white and slightly purplish at the base, and the throat purplish above within. The texture of the corolla is firm. The leaves are somewhat leathery. Our plants frequently have broad, nearly orbicular leaves. One of these forms is the basis of Reiche's var. *taltalensis*. As plants with leaves quite like those of typical plants from Coquimbo also occur in our area I do not believe the variety worthy of recognition.

Linaria canadensis (L.) Dum.-Cours, var. ***texana*** (Scheele) Pennell, Proc. Acad. Nat. Sci. Philad. lxxiii. 502 (1922). *L. canadensis* of *Philippi*, Fl. Atac. 45 and Viage 16, 26, 219 (1860).

This little annual has been collected near Taltal (*Borchers, Werdermann* 829), "Cachinal (Paposo, etc.)" (*Philippi*) and Ag. Cardon (*J.* 5263). My collections have small, apparently cleistogamous flowers with very reduced spur.

Veronica persica Poir. Encyc. viii. 542 (1808).

Locally frequent on grassy slopes in the lower part of the fertile belt above El Rincon (*J.* 5486).

Orthocarpus australis Benth. in DC. Prodr. x. 537 (1846); Ph. Fl. Atac. 45 and Viage 25, 219 (1860).

Reported from Paposo by *Philippi*. I did not find in the *Philippi* Herbarium any specimens of this genus from the area.

BIGNONIACEAE

Argyria radiata (L.) Don, Edinb. Philos. Jour. ix. 261 (1823). *A. eremophila* Ph. Linnaea xxxiii. 180 (1864). *A. puberula* of Ph. Fl. Atac. 36 and Viage Des. Atac. 12, 16, 38, 210 (1860).

Frequent on the dunes and in dryish gravel. It has been collected at Barquito (*J.* 4816), Taltal (*Borchers, Werdermann* 845), Breas (*Larrañaga*), Miguel Diaz (*J.* 6300) and "Cachinal, Hueso Parado, etc." (*Philippi*, type of *A. eremophila*). A very variable plant. Feuillée's plant, the basis of *A. radiata* as well as of *A. Feuillei* DC., is given by Gay, Fl. Chile iv. 409 (1849), as from Cobija. This may be correct, although it should be noted that the latitude of the collecting locality given by Feuillée, Jour. Obs. Phys. ii. 731, t. 22 (1714), is about that of Ilo, Peru, at which he is known to have collected.

Argyria sitiens, sp. nov., pumila albo-villosa inconspicue minuteque glandulifera; caule erecto 1–2 cm. longo saepe subterraneo e radice recta gracili succulenta 3–5 mm. crassa 8–15 cm. longa angustissime clavata vel subulata erumpenti supra in ramos plures pauciramosos 1–3 cm. longos prostratos villosulos abrupte decomposito; foliis alternis vel superioribus non rariter suboppositis 0.8–1.6 cm. diametro; petiolis gracilibus villosulis 1–4 cm. longis inferioribus quam superioribus conspicue longioribus; foliolis 9–11 anguste oblanceolatis obtusis paucilobatis vel subintegris subtus dense villosis supra sparse villosis margine plus minusve revolutis intermediis 0.8–1.1 cm. longis; calyce 3 (maturitate 4) mm. longo in lobos lineares acutos erectos villosos partito 0.5–2 vel non rariter ad 3 mm. longe pedicellato; corolla lutea ca. 16 mm. longa sparsissime villosula minute inconspicueque glandulifera, tubo gracili tubuloso 5–6 mm. longo ad 1 mm. diametro, faucibus abrupte dilatatis 4–5 mm. longis ad apicem ca. 5 mm. diametro, limbo 11–12 mm. diametro, lobis latis rotundis ascendentibus; capsula 15–22 mm. longa 2.5–3 mm. lata compressa apice acuminata vel valde acuta basi rotundata, valvis trinerviis sparse villosulis; seminibus griseis 1.5 mm. latis obscure minuteque tuberculatis.—CHILE: high very arid crest above the fertile belt near Aguada Panulcito, Dept. Taltal, Dec. 5, 1925, *Johnston 5467* (TYPE, Gray Herb.).

This plant was one of the few extreme xerophytes found near the upper limit of vegetation on the barren excessively arid ridge-crests above the fertile belt near Ag. Panulcito. It grew in dry decomposed rock and was rare. The plant is related to *A. geranioides* DC., but has a different root and habit, as well as fewer leaflets and a less dense pubescence.

ACANTHACEAE

Dicliptera paposana Ph. Fl. Atac. 40 and Viage Des. Atac. 19, 20, 25, 27, 214 (1860).

A perennial with erect or decumbent stems 3–9 dm. tall. I collected it on a gravelly bank near Agua Perales in Queb. Guanillo near Paposo (*J. 5578*), and on the moist rocky floor of the quebrada at Ag. Miguel Diaz (*J. 5339*). The type and only specimen in the Philippi Herbarium is labeled, "Paposo, Hueso Parado etc." Philippi reported it from Hueso Parado, Paposo and Miguel Diaz. The plant belongs in the fertile belt.

PLANTAGINACEAE

Plantago macrostachys Decne., var. nov., Pilger, in lit.

Covering a wet cliff at Ag. Cachinalcito (*J.* 5198, type). Probably referable to this species is the plant observed in the vega at Ag. Perales near Paposo by Philippi, Fl. Atac. 47 and Viage 23, 26, 221 (1860), and reported as being doubtfully *P. Candollei* Rap.

Plantago sp. nov., Pilger, in lit.

This very distinctive plant was seen only in the steep gulch directly above the water-hole at Ag. Panul (*J.* 5444, type). It was locally common growing in the open in moist, very coarse rocky gravel. It is an obvious perennial and in age develops an erect, loosely branched suffruticose caudex.

Plantago litorea Ph. Fl. Atac. 46 and Viage Des. Atac. 20, 220 (1860). *P. litoralis* Ph. Viage Des. Atac. 26 (1860).

A slender annual herb growing on the gravelly floor of the quebrada south of Ag. Cachina (*J.* 5746), at ca. 200 m. alt. near Taltal (*Werdemann* 807) and on the dunes below Ag. Miguel Diaz (*J.* 5298).

Plantago deserticola Ph. Fl. Atac. 46 and Viage Des. Atac. 20, 220 (1860). *P. desertorum* Ph. ex Johnston, Rev. Chile Hist. Nat. xxx. 15 (1926), lapsu calami. *P. brachyantha* Ph. Fl. Atac. 47 and Viage Des. Atac. 20, 221 (1860). *P. deserticola*, var. *brachyantha* Johnston, l. c. 16.

This slender annual grows in gravelly or sandy places and is known only from our area. I have seen collections from Cachinal de la Costa (*Philippi*, type of *P. brachyantha*), near Ag. Cachinal (*J.* 5713, 5747), Hueso Parado (*Philippi*, type of *P. deserticola*), between Queb. Anchuña and Estancia Vieja (*J.* 5199), Paposo (*Philippi*), Punta Grande (*J.* 5223), El Rincon (*J.* 5526), Ag. Panulcito (*J.* 5469) and Ag. Cardon (*J.* 5283). The specimens from Hueso Parado, Paposo and El Rincon are less silky, have slightly larger corolla-lobes and seeds that are a little larger and duller than in the other specimens mentioned. These three are typical *P. deserticola*. The other collections are referable to the var. *brachyantha*. Dr. Pilger considers the species and variety as indistinguishable from *P. rancaguae* Steud., and has so determined all my collections. *Plantago rancaguae* seems to me to be more closely related to *P. hispidula* R. & P. and to differ from our plants in the longer corolla-lobes and the more elongate capsule. Furthermore *P. deserticola* comes from a very detached natural area nearly 500 km. north of the region in which *P. rancaguae* has been reported to grow.

RUBIACEAE

Cruckshanksia hymenodon H. & A. Bot. Miscl. iii. 361 (1833).

A prostrate white-tomentose perennial infrequent in dry stream-

ways below the fertile belt near Barquito (*J.* 4818). The corolla is yellow and the foliaceous sepals white.

Cruckshanksia pumila Clos in Gay, Fl. Chile iii. 196, t. 33 (1847). *C. tripartita* Ph. Fl. Atac. 26 and Viage Des. Atac. 12, 13, 17, 38, 200 (1860). *C. Darapskyana* Ph. Anal. Univ. Chile lxxxv. 738 (1894).

Frequent in dryish gravel outside the fertile belt. It is a prostrate herb with yellow corollas and sepals. In our area the plant is annual or only rarely perennial and does not develop distinctly shrubby stems as does *C. Montiana* Gay, a more southerly ranging form which is distinguished from *C. pumila* only by its habit. *Cruckshanksia pumila* has been collected in our region at Barquito (*J.* 4784), Pan de Azucar (*Philippi*, type of *C. tripartita*), Ag. Cachina (*J.* 5711), Taltal (*Darapsky*, type of *C. Darapskyana*; *Werdermann* 810; *J.* 5106, 5160), Paposo (*J.* 5595, 5560) and Punta Reyes near Miguel Diaz (*J.* 5301). Probably also synonymous with *C. pumila* are *C. chrysantha* Ph., and *C. Geisseana* Ph.

Galium diffusum Clos in Gay, Fl. Chile iii. 180 (1847).

Forming prostrate mats about rocks in the upper part of the quebrada above Agua Lora on the southeast slope of Cerro Perales near Taltal (*J.* 5621). Material collected by Darapsky in Queb. Loritas near Taltal is the same.

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

Collected by Werdermann (no. 863) at ca. 500 m. alt. near Taltal.

Relbunium hypocarpium (L.) Hemsl. Biol. Cent.-Amer. ii. 63 (1881).

Prostrate or scrambling through brush on a moist ridge in the fertile belt near Ag. Miguel Diaz (*J.* 5302).

Relbunium hirsutum (R. & P.) Schum. in Mart. Fl. Bras. vi. pt. 6, 116 (1888).

I somewhat doubtfully refer here a plant collected in gravelly clearings in the fertile belt above El Rincon (*J.* 5525). It forms dense prostrate mats 1-2 dm. broad and in habit and distribution of pubescence is very much like *R. hirsutum*.

VALERIANACEAE

Valeriana pubescens Ph. Fl. Atac. 26 and Viage Des. Atac. 19, 25, 200 (1860).

Growing on cliffs in the fertile belt. I have seen material from near Barquito (*J.* 4819), from sea-cliffs near Ag. Cachina (*J.* 5712), near Taltal (*Borchers*; *J.* 5105); and Hueso Parado (*Philippi*, type). *Philippi* reports it from Paposo.

Valeriana integrifolia Ph. Anal. Univ. Chile lxxxv. 742 (1894).

This species, the type of which came from Punta del Morro near Caldera, can now be reported from 500 m. alt. in the hills near Taltal (*Werdermann 846*) and from ledges on the moist slopes in the fertile belt near Ag. Miguel Diaz (*J. 5300*). The plant is very variable in leaf-outline, varying from entire to pinnately lobed on a single stem.

CUCURBITACEAE

Sicyos bryoniaefolius Moris, Mem. Accad. Torino xxxvii. 106, t. 6 (1831). *S. Badaroa* H. & A.; Ph. Fl. Atac. 18 and Viage Des. Atac. 19, 25, 27, 192 (1860).

Trailing over rocks and shrubs along the lower edge of the fertile belt. It is not common. Philippi reports it from Hueso Parado, Paposo and Miguel Diaz. I collected it near Taltal (*J. 5125*) and at Ag. Miguel Diaz (*J. 5303*).

CAMPANULACEAE

Specularia perfoliata A. DC. Monog. Camp. 351 (1830); Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860).

Collected in the fertile belt near Paposo by Philippi.

COMPOSITAE

Ophryosporus triangularis Meyen, Reise i. 402 (1834). *Eupatorium foliolosum* DC.; Ph. Fl. Atac. 29 and Viage Des. Atac. 27, 203 (1860).

A common bush growing on slopes and in gravel of stream-ways, both in and out of the fertile belt. It is commonly 1-1.5 m. tall but rarely, supported by other shrubs, it attains 2.5 m. in height. The leafy branches are elongate, subsimple and quite erect. In the common form the pappus and tegules are brownish. Frequently I found associating with this form, however, a phase with greenish tegules and pale pappus. The species grows occasionally in the dry interior and develops there a xerophytic phase characterized by shortened branches and excessively crowded leaves. My collection from Posada Hidalgo, one of these xerophytes, has the leaves congested to form a dense cylinder of foliage a little over a centimeter in diameter. The species has been collected at Barquito (*J. 4809*), Ag. Grande (*J. 5758*), Posada Hidalgo (*J. 5661*), Taltal (*J. 5080, 5165*), Ag. Cachinalcito (*J. 5173*), El Rincon (*J. 5483*) and Ag. Panul (*J. 5426, 5427*).

Ophryosporus Johnstonii Robinson, Contr. Gray Herb. lxxvii. 4 (1926).

A compact intricately branched usually globose bush ca. 1 m. tall which grows in rocky ground. It was seen at only three places. On the gravelly alluvial plain just below Ag. Panul (*J.* 5424, type) it is very common along the dry gravelly stream-channels, where it grows with *O. triangularis*. At Ag. Cardon (*J.* 5259) and Ag. Miguel Diaz (*J.* 5310) it grows on rocky slopes in the quebradas. It occurred in moist situations only at Ag. Miguel Diaz.

Eupatorium Remyanum Ph. Fl. Atac. 29 and Viage Des. Atac. 203 (1860).

The type of this species was collected at Miguel Diaz by Philippi. The plant is apparently a rare one for I observed it only once, that in a moist rich hillside gully in the fertile belt on the slopes above El Rincon (*J.* 5484). This collection and a photograph of the type have been studied by Prof. Robinson who reports upon them as follows:

"In separating this plant of northern Chile from the common *E. glechonophyllum* Less., which ranges from Coquimbo to Concepcion, Philippi laid stress chiefly upon the broader and less attenuate leaves and expressed the suspicion that it might be only a variety. Reiche, Fl. Chile iii. 265 (1902), reduces without question *E. Remyanum* to *E. glechonophyllum*, pronouncing it merely a shorter- and broader-leaved form. However, the material collected at El Rincon, which closely matches the type of *E. Remyanum*, not only confirms the differences of leaf-contour mentioned by Philippi but yields further characters which go far to prove the distinctness of the species. The stems, or rather the upright branches from the strongly decumbent or even prostrate base are taller and more virgate than in *E. glechonophyllum* and have much longer internodes and consequently less clustered foliage, the heads are slightly larger and the under surface of the leaves, which in *E. glechonophyllum* is rather pale, is in *E. Remyanum* a vivid green. Finally if the areoles between the veinlets on the lower surface of the leaves (in the dried specimens) be examined with a lens they are found in *E. glechonophyllum* to be flat or nearly so, while in *E. Remyanum* they are curiously wrinkled. Although this is a post mortem trait it seems to be of some real diagnostic worth since it indicates an inherent difference of leaf-texture, that of *E. Remyanum* probably being more fleshy and therefore subject to greater contraction in drying."

Stevia hyssopifolia Ph. Fl. Atac. 29 and Viage Des. Atac. 25, 203 (1860). *S. menthaefolia* Ph. Fl. Atac. 29 and Viage Des. Atac. 15, 19, 203 (1860), not Sch.-Bip. (1852). *S. Philippiana* Hieron., Bot. Jahrb. xl. 364 (1908).

A perennial with erect tufted stems 1-10 dm. tall. It has been

collected near Cachinal de la Costa (*Philippi*, type of *S. menthaefolia*), on a dryish cliff in quebrada above Ag. Grande (*J.* 5760), about the head of the foggy sea-cliffs near Ag. Grande (*J.* 5759) and Ag. Cachina (*J.* 5691), at Hueso Parado (*Philippi*, type of *S. hyssopifolia*), on a dryish rocky hillside at the southwest base of Cerro Perales along the trail between Ag. Lora and Caleta de Hueso Parado (*J.* 5606) and on slopes in the fertile belt at El Rincon (*J.* 5485). *Philippi* also reports it from Paposo although no collections from that locality are extant. The two collections he did make, the types of his two species, represent extremes in leaf-variation. The material that has been collected from south of Taltal Valley has elliptical or lance-oblong leaves. The type of *S. hyssopifolia* and my collections from Cerro Perales, from more arid habitats, have linear leaves. The collection from El Rincon, however, seems to be intermediate in leaf-form, varying greatly in this regard on stems in the same colony and even in the foliage of a single stem. Floral distinctions between the forms do not appear to exist. Perceptible variation also occurs in the firmness of leaf-texture, prominence of veins, abundance or almost complete lack of villous pubescence in addition to the always present glandular puberulence, and finally in the degree to which the cauline leaves are reduced on the upper parts of the stem. Prof. Robinson, who has studied my material, has been unable to correlate these variations either with each other or even with geographical distribution. A collection from Ag. Panul, however, shows perceptible differences in its tegules and achenes which seems to warrant the recognition of a variety distinguished as follows:

Stevia hyssopifolia Ph., var. ***panulensis*** Robinson, var. nov., involucri squamis sparse cum glandulis subsessilibus munitis et cum pilis albis attenuatis eglandulosis etiam ornatis conspicue cum pilis eglandulosis ciliatis; achaeniis ad apicem versus subpatenter hispidulis.—CHILE: on a moist place on the granitic cliff by the water-hole at Aguada del Panul, Dept. Taltal, Dec. 4, 1915, *Johnston 5425* (TYPE, Gray Herb.).

In typical *S. hyssopifolia* the bracts of the involucre have a short glandular puberulence and very few if any non-glandular hairs, while the margin is shortly and often obscurely glandular-ciliolate. The achenes are shortly appressed-strigillose. In gross habit and in its narrow leaves the type collection of this variety is very similar to the material of the typical *S. hyssopifolia* collected at Hueso Parado and at Cerro Perales.

Aplopappus rosulatus Hall, Carnegie Inst. Pub. no. 389, pg. 329, fig. 113 (1928).

A prostrate shrub growing on the moist gravelly flats at the crest of the foggy sea-cliffs near Ag. Grande (*J. 5815*, type) where only three colonies were seen.

Aplopappus deserticola Ph. Anal. Univ. Chile lxxxvii. 592 (1894); Hall, Carnegie Inst. Pub. no. 389, pg. 349 (1928). *A. involucratus* Ph. l. c. 593. *A. Rengifoanus* of Ph. Fl. Atac. 30 and Viage Des. Atac. 15, 204 (1860).

An irregular and sparsely branched shrub 3–15 dm. tall which grows in dry rocky soil or on rock-outcrops outside of the fertile belt. It is known only from our area where it has been collected at Cachinal de la Costa (*Philippi*, type of *A. involucratus*), Ag. Grande (*J. 5752*), Breas (*Larrañaga*, type of *A. deserticola*), Queb. San Ramon (*J. 5151*), Agua Perales near Paposo (*J. 5603*), Ag. Cardon (*J. 5287*) and Ag. Miguel Diaz (*J. 5332*).

Gutierrezia taltalensis Ph. Anal. Univ. Chile lxxxvii. 426 (1894).

Confessing my inability to place satisfactorily the northern Chilean forms of this genus without its revision as a whole, I am referring them to *G. taltalensis*. This species is based upon specimens of a plant, apparently in off bloom, which were collected by Borchers near Taltal. Our plant forms a small bush 3–13 dm. tall and grows in dry rocky places outside of the fertile belt and frequently at some distance back from the coast. It is usually white-flowered but four (*J. 5331, 5472, 5533, 5723*) of my eleven collections have yellow flowers. The foliage varies in shape and size, and the heads vary in amount of glandularity and in the degree of crowding. I have seen the following collections: Ag. Grande (*J. 5751*), Cerro de la Cachina (*J. 5722*), Ag. Cachina (*J. 5723*), Posada Hidalgos (*J. 5665*), Ag. Mantos (*J. 5658*), Taltal (*Borchers*, type; *J. 5112*), Breas (*Larrañaga*), Queb. San Ramon (*J. 5150*), Cerro Perales (*J. 5625*), El Rincon (*J. 5533*), Ag. Panulcito (*J. 5472*), and Ag. Miguel Diaz (*J. 5331*). Borchers' and Larrañaga's collections are apparently the white-flowered form.

Erigeron paposanum Ph. Fl. Atac. 29 and Viage Des. Atac. 25, 203 (1860).

An herb 5–12 dm. tall which is suffruticose below and springs from a definitely perennial base. It grows on the moist slopes in the fertile belt where it is infrequent. The rays are white or cream-colored and usually surpass the disk florets by 0.5–1 mm. The achenes are strongly compressed and have somewhat thickened margins and strigose faces. It is known only from north of Paposo whence I have seen collections from Paposo (*Philippi*, type), El Rincon (*J. 5532*), Ag. Panul (*J. 5443*), Ag. Cardon (*J. 5286*) and Ag. Miguel Diaz (*J. 5330*).

Baccharis taltalensis, sp. nov., glaberrima fruticosa 6–15 dm. alta subglobosa ramosissima; ramis vetustioribus subgriseis evidenter cicatricosis, junioribus 2–10 cm. longis angulatis dense foliosis glandulosis et saepe subverniosis, internodiis 1–10 mm. longis; foliis alternis 1–1.5 cm. longis 1–2 mm. latis linearibus vel anguste oblanceolato-linearibus concoloribus crassiusculis integerrimis costatis sed enervatis sparse glandulosis; capitulis 40–50-floris in axillis foliorum ad apices ramorum congestis corymbum terminalem oligocephalum formantibus campanulatis 5–6 mm. longis 3.5–4.5 mm. crassis utrorumque sexum subconformibus; tegulis 3–4-seriatis imbricatis obtusis glanduliferis margine hyalinis et non rariter fimbriatis longitudinaliter medium versus herbaceis brunneis vel purpurascens, exterioribus oblongis vel ovatis, interioribus oblongo-linearibus vel oblongo-lanceolatis; setis pappi 5 mm. longis numerosis filiformibus albidis flexuosis; flosculis hermaphroditis ad 5 mm. longis, tubo cylindrico 2.5 mm. longo glandulifero, faucibus late campanulatis ca. 0.5 mm. longis, lobis lanceolatis 2 mm. longis, stylo 5 mm. longo paullo exserto in lobos oblongos crassiusculos ad 1 mm. longos glanduliferos diviso, antheris 2 mm. longis partibus fertilibus 1.3 mm. longis appendicula lanceolato-oblonga 0.6 mm. longa; flosculis pistilliferis graciliter tubuliformibus ca. 3.5 mm. longis extus sparse glanduliferis apice irregulariter inconspicueque dentatis, stylo 5 mm. longo corollam conspicue superante in lobos acutos lineares 1 mm. longos divisis; achaeniis costatis glabris.—
 CHILE: dry gravelly slopes near Aguada Grande, Dept. Chañaral, Dec. 16, 1925, *Johnston 5750*; dry gravelly slopes on Cerro de la Cachina near Aguada da la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5721*; dry bushy slopes above the fertile belt, El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5531*; arid ridge crests above the fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5329* (TYPE, Gray Herb.).

A dense dark green glandular-resinous subglobose bush usually about a meter tall. It is a decided xerophyte being observed only in localities of pronounced aridity. Near Ag. Miguel Diaz and El Rincon it was confined to the dry crests of the coastal hills above the fertile belt. On Cerro Cachina it grew near the summit on the dry landward slopes away from the fog laden sea-breezes and at Ag. Grande it grew only on sunny talus slopes in the quebrada beyond the influence of the sea-fog.

The species belongs to Heering's *Eubaccharis* § *Pedicellatae* and is apparently most nearly related to *B. rosmarinifolia* H. & A., from which it is readily separated by having the pistillate and hermaphroditic heads similar in size and form. The pappus in both types of

heads is about 5 mm. long and is not greatly elongated in the pistillate flowers as is the case in *B. rosmarinifolia*. The leaves in *B. taltalensis* are much more slender and less rigid than in its relative. In the character and size of the inflorescence the two species are much alike. The proposed species seems to be a very distinct one and is apparently endemic to our area. I have seen no material, except that cited, which could be possibly referred to it.

Facelia retusa (Lam.) Sch. Bip., var. **chilensis** (F. & M.) Baker ex Beauv. Bull. Soc. Bot. Genève, ser. 2, v. 215 (1913).

Collected at ca. 400 m. alt. near Taltal by Werdermann (no. 801).

Gnaphalium sphacelatum HBK., var. [?] **chilensis** DC. Prodr. vi. 234 (1837). *G. sphacelatum* in Ph. Fl. Atac. 33 and Viage Des. Atac. 207 (1860).

An erect weedy annual growing on a gravelly bench at the mouth of the quebrada at Ag. Miguel Diaz (*J.* 5323). Philippi reported it from near Paposo. Werdermann (no. 783) collected it at ca. 500 m. alt. near Taltal. I refer to the var. *chilensis* the indigenous weedy annual *Gnaphalium* related to *G. spathulatum* Lam. and ranging near the coast at least from Valparaiso to Mollendo.

Gnaphalium

A sprawling perennial growing on rich slopes in the fertile belt above El Rincon (*J.* 5258). The plant is closely related to *G. heterotrichum* Ph.

Encelia canescens Lam., var. **tomentosa** (Walp.) Ball, Jour. Linn. Soc. xxii. 160 (1886); Blake, Proc. Am. Acad. Sci. xlix. 370 (1913). *E. tomentosa* Walp.; Ph. Fl. Atac. 34 and Viage Des. Atac. 12, 208 (1860).

A pallid bush 3–10 dm. tall growing on a sandy bench near the sea at Barquito (*J.* 4820). Philippi reported it from Las Animas.

Encelia canescens Lam., var. **lanuginosa**, var. nov., a varietate typica differt lanugine abundantissima molli opaca pervestita.—CHILE: dry shrubby zone above the fertile belt, El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5529* (TYPE, Gray Herb.).

This variety differs from the typical form in its very thick cottony tomentum. It was seen only on the dryish rocky slopes towards the crest of the hills above El Rincon. A very similar form has been collected near Breas by Larrañaga.

Bidens triplinervia HBK., var. **macrantha** (Wedd.) Sherff, Bot. Gaz. lxxx. 383 (1925). *B. chilensis* of Ph. Fl. Atac. 34 and Viage Des. Atac. 25, 208 (1860).

A perennial with decumbent or widely ascending slender simple branches. I found a colony on a rocky ridge-crest at the upper edge of

the fertile belt near Ag. Miguel Diaz (*J.* 5328) and another larger colony at Ag. Panul (*J.* 5442) where it was common locally on the moist cliffs and talus just above the water-hole. Philippi collected it near Paposo and reported it incorrectly as *B. chilensis* DC., one of the weedy annual species. The present determination is by Dr. E. E. Sherff.

Perityle Emoryi Torr., var. **elata** (Ph.), comb. nov. *Closia elata* Ph. Fl. Atac. 31 and Viage Des. Atac. 19, 205 (1860). *C. Cotula*, var. *elata* Reiche, Anal. Univ. Chile cxii. 159 (1903) and Fl. Chile iv. 108 (1905). *C. Cotula* Remy in Gay, Fl. Chile iv. 120, t. 46 (1849). *C. chilensis* Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 39 (1858). *C. anthemoides* Ph. Fl. Atac. 31 and Viage Des. Atac. 12, 14, 25, 38, 205 (1860). *C. viridis* Ph. Anal. Univ. Chile lxxxvii. 710 cum fig. (1894). (?) *C. elata*, var. *nana* Ph. Anal. Univ. Chile lxxxvii. 711 (1894).

Growing in dryish gravelly places outside of the fertile belt. This variable herb has been collected in our area near Barquito (*J.* 4794), Ag. Grande (*J.* 5790), Hueso Parado (*Philippi*, type of *C. elata*), Taltal (*Werdermann* 796, *J.* 5110), Ag. Cachinalcito (*J.* 5203) and Ag. Miguel Diaz (*J.* 5327). Philippi reported it from Paposo whence the original material (seeds ?) of *C. chilensis* is said to have been obtained.

Although the genus *Closia* has been universally recognized since its original publication in 1849, I have been quite unable to distinguish it from the genus *Perityle* described by Bentham in 1844. The original species of *Closia*, *C. Cotula*, in fact seems to represent no more than a South American foliar variation of *P. Emoryi* Torr., a variable species of Arizona, Sonora, Baja California, and California. In habit the North and South American plants are identical. The only difference I can detect is that the Chilean plant almost universally has the leaves very deeply lobed or parted; in this regard suggesting the Baja Californian *P. robusta* Rydb. In pubescence, distribution of glands, shape and size of achenes, and florets the plants of the two continents are indistinguishable. The Chilean plant does not appear to develop bristles in the pappus and in this regard resembles the common North American phase of the species that has been called var. *nuda* (Torr.) Gray. Whether all the conspicuously rayed Chilean plants are referable to *P. Emoryi*, var. *elata* I can not say. *Closia villosa* Ph., Anal. Univ. Chile lxxxvii. 712 (1894), described from the cordilleras east of Copiapó, has pappus bristles developed. The material apparently referable to this species, which I collected in the cordilleras near Potrerillos (*J.* 3678, 4740), does not have bristles and

is somewhat fruticulose as are also the plants collected in the interior by Werdermann (no. 160, 448). These plants from the interior also tend to have less lobed leaves. Werdermann's collection from near Vallenar (no. 160) has the achenes lacking the characteristic ciliate margin and instead provided on the margin with minute incurved hairs. The plants from the interior hence depart in several details from the plant of the coastal area, and I believe that their disposition had best await the time when more material of them is available.

Perityle discoidea (Ph.), comb. nov. *Closia discoidea* Ph. Fl. Atac. 31 and Viage Des. Atac. 205 (1860). *C. pusilla* Ph. l. c. *C. foliosa* Ph. Anal. Univ. Chile lxxxvii. 709 (1894). *C. digitata* Ph. Anal. Univ. Chile lxxxvii. 710 cum fig. (1894). *C. brachypetala* Ph. Anal. Univ. Chile lxxxvii. 711 cum fig. (1894).

This plant may possibly be only a variation of the last mentioned, but appears to warrant recognition because of its smaller size, much reduced ray-florets, very frequent development of pappus-bristles, and less dissected more evenly margined leaf-lobes. In our area it has been collected near Barquito (*J.* 4793), Pan de Azúcar (*Philippi*, type of *C. pusilla*; *J.* 5829), Sierra Esmeralda (*San Roman*, type of *C. foliosa*) and Taltal (*Werdermann* 775). The type of *C. pusilla* was correctly described as developing pappus bristles. In the type of *C. discoidea*, described as having an esetose pappus, I found that the bristles were occasionally developed. No pappus bristles were found in the heads of the type of *C. foliosa*.

Bahia ambrosioides Lag. Gen. et Sp. Pl. Nov. 30 (1816); Ph. Fl. Atac. 33 and Viage Des. Atac. 16, 25, 27, 207 (1860).

A weak shrub 3-10 dm. tall frequent in the fertile belt. It has been collected near Barquito (*J.* 4791), Taltal (*Darapsky*, *Werdermann* 811), Paposo (*J.* 5226) and Ag. Miguel Diaz (*J.* 5326). The ray florets are white or commonly cream-colored. *Philippi* reports it from Cachinal de la Costa.

Villanova oppositifolia Lag. Gen. et Sp. Pl. Nov. 31 (1816). *Vazquezia biternata* Ph. Fl. Atac. 31, t. 5a and Viage Des. Atac. 205 (1860).

Collected in the fertile belt on the open grassy ridge-crest back of Punta Grande near Paposo (*J.* 5225). *Philippi* found it at Paposo "in detritu ad basin montium litoralium."

Amblyopappus pusillus H. & A. Jour. Bot. iii. 321 (1841). *Infantea chilensis* Remy; Ph. Fl. Atac. 34 and Viage Des. Atac. 25, 208 (1860).

This annual frequents gravelly places usually close to the coast. It has been collected in a dry quebrada just south of Ag. Cachina

(*J.* 5719), near Breas (*Larrañaga*), on a steep foggy alluvial fan about *Cereus*-trunks at Ag. Cachinalcito (*J.* 5202) and in gravelly places near Paposo (*Philippi*).

Cephalophora litoralis Ph. Fl. Atac. 34 and Viage Des. Atac. 208 (1860).

An annual herb 5–25 cm. tall which is frequent in dryish gravelly places. It has a strong odor very reminiscent of *Anthemis Cotula* L. The species has been collected at Barquito (*J.* 4792), Sierra Esmeralda (*San Roman*), Taltal (*Werdermann* 777, *J.* 5159) and near Paposo (*J.* 5596).

Senecio cachinalensis Ph. Fl. Atac. 33 and Viage Des. Atac. 15, 207 (1860). *S. breanus* Ph. Anal. Univ. Chile lxxxviii. 251 (1894). *S. copiapius* Ph. Anal. Univ. Chile lxxxviii. 253 (1894). *S. Larrañagae* Ph. Anal. Univ. Chile lxxxviii. 269 (1894).

A weak shrub with erect elongate flowering branches 2–12 but usually 3–8 dm. tall. It grows usually in the fertile belt although it also occurs in the dryish area back from the coast. In our area it has been collected near Barquito (*J.* 4796), Cachinal de la Costa (*Philippi*, type of *S. cachinalensis*), Ag. Grande (*J.* 5791, 5792), Ag. Cachina (*J.* 5724), Posada Hidalgos (*J.* 5667), Taltal (*Werdermann* 820), Breas (*San Roman*, type of *S. breanus*; *Larrañaga*, type of *S. Larrañagae*), Rincon (*J.* 5534), and Ag. Panulcito (*J.* 5473). After my experience with this plant in the field I feel confident the concept, *S. cachinalensis*, had best be enlarged to include a wider variation than admitted by *Philippi* or by *Reiche*. A study of the types seems to show that *S. cachinalensis* and *S. breanus* were founded on the thrifty forms of the species while *S. copiapius* was based on the xerophytic phase. The type of *S. Larrañagae* is a form more or less intermediate between these two extremes.

Senecio Almeidae Ph. Fl. Atac. 33 and Viage Des. Atac. 16, 207 (1860). *S. myriophyllus* Ph. Fl. Atac. 33 and Viage Des. Atac. 12, 207 (1860).

A weak glabrate bush with succulent herbage which grows 1.5–10 dm. tall in dry gravel outside of the fertile belt or in the areas back from the coast. It has been collected at Las Animas (*Philippi*, type of *S. myriophyllus*), Cachinal de la Costa (*Philippi*, type of *S. Almeidae*), Ag. Grande (*J.* 5753), Pique de Jacinto Diaz in the Sierra Esmeralda (*J.* 5680), Posada Hidalgos (*J.* 5666), Taltal (*Werdermann* 851), Queb. San Ramon (*J.* 5152). The type of *S. Almeidae* has remotely lobed leaves as in my no. 5152, but has large heads (like *J.* 5753) on elongate peduncles. It seems to be a form from a shaded or otherwise sheltered situation.

Senecio paposanus Ph. Fl. Atac. 32 and Viage Des. Atac. 25, 27, 206 (1860).

A pale plant of the fertile belt frequently becoming a weak shrub 5–10 dm. tall. It has been collected only at Paposo (*Philippi*, type), Rincon (*J.* 5535), Ag. Panul (*J.* 5445), Ag. Cardon (*J.* 5288) and (?) Ag. Miguel Diaz (*J.* 5333). The collection from Ag. Miguel Diaz is much more coarse and stiff than any other collection seen but appears to be referable here. *Senecio Philippicus* Regel & Körn., Ind. Sem. Hort. Petrop. 1857: 43 (1858), is probably an earlier synonym of *Philippi's* species.

Senecio Troncosi Ph. Fl. Atac. 32 and Viage Des. Atac. 12, 206 (1860).

An annual growing on the gravelly floor of a quebrada back of Barquito (*J.* 4797). My material matches almost perfectly *Philippi's* type from Las Animas.

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

Common on the gravelly floor of the quebradas near Barquito (*J.* 4822). It has also been collected near Taltal (*Werdermann* 825). Although related to *S. vulgaris* L. this plant seems to be indigenous and readily distinguished from its relative by its leaf-outline.

Centaurea cachinalensis Ph. Fl. Atac. 34 and Viage Des. Atac. 16, 208 (1860).

Forming a loosely branched bush 3–10 dm. tall on fog-bathed cliffs and rocky slopes in the fertile belt. The florets are pink or rosy. The plant is known from Barquito (*J.* 4821), Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J.* 5749), and Ag. Cachina (*J.* 5720).

Centaurea atacamensis (Reiche), comb. nov. *C. floccosa* H. & A., var. *atacamensis* Reiche, Anal. Univ. Chile cxiv. 468 (1904) and Fl. Chile iv. 286 (1905). *C. floccosa* of Ph. Fl. Atac. 34 and Viage Des. Atac. 25, 208 (1860).

I collected this species on a rocky hillside southeast of Taltal (*J.* 5111) and again on a rocky gravelly bench on the coastal plain near El Rincon (*J.* 5530). *Philippi* collected it near Paposo and Borchers got the type-specimens near Puerto Oliva. The florets are white with the tips rose-colored or rarely entirely white. The species is obviously related to *C. floccosa*, which grows in Coquimbo, but is distinguished by its smaller heads, more slender spreading inconspicuously grooved stems, and less dense more persistent tomentum.

Centaurea chilensis H. & A., var. **stenolepis** Ph. Anal. Univ. Chile xc. 42 (1895).

A slender shrub 9–12 dm. tall growing in rocky places in the fertile belt near Barquito (*J.* 4795). The florets are white.

Chuquiraga ulicina H. & A., var. **incana** (Ph.), comb nov. *C. incana* Ph. Anal. Univ. Chile lxxxv. 829 (1894). *C. acicularis* of Ph. Fl. Atac. 26 and Viage Des. Atac. 12, 27, 200 (1860).

A dense shrub 3–10 dm. tall which is frequent in dry places outside of the fertile belt. It grows in our area near the sea and also in the more arid country inland. I collected it on seaward slopes near Barquito (*J.* 4799), on a dry open stream-way at Posada Hidalgos (*J.* 5669) and on the arid shrubby crests above the fertile belt at El Rincon (*J.* 5538). Philippi reports it as growing from "Las Animas usque ad El Cobre."

This northern plant has been treated as *C. ulicina*, but that name is the proper one for the plant of Coquimbo passing as *C. acicularis* Don. The northern plant is characterized by its much shorter stouter leaves which are cinereous with a short dense pubescence. This form in its extreme is very different from the more southern typical one, but material from about Copiapó seems to combine so clearly the characters of the two that a varietal status for our plant seems most justifiable.

Gypothamnium pinifolium Ph. Fl. Atac. 27, t. 3c and Viage Des. Atac. 13, 15, 17, 18, 24, 201 (1860). *Plazia pinifolia* Hoffm. ex Reiche, Anal. Univ. Chile cxiv. 736 (1904) and Fl. Chile iv. 301 (1905).

A loosely branched dark-green somewhat resinous xerophytic shrub 3–12 dm. tall, which grows on hillsides or more commonly in the dry gravel of stream-ways in the area outside of the fertile belt. It grows near the shore and in the arid interior. I have seen material from Barquito (*J.* 4798), Cachinal de la Costa (*Philippi*, type), Agua Mantos (*J.* 5657), Breas (*Larrañaga*), Taltal (*Darapsky*, *Werdermann* 1044, *J.* 5113), Punta Grande (*J.* 5234) and Queb. Guanillo near Paposo (*J.* 5597). Philippi reports it from Las Animas, Cachinal de la Costa, Cachiyuyal, Taltal and Queb. Guanillo. Reiche, Bot. Jahrb. xlv. 344, 347, fig. 3 (1911), reports it from Queb. Chañaral and from between Taltal and Breas. Nothing further is known concerning the range of this monotype. It occurs only within our area. The corollas are violet or violet-purplish. Hoffmann suggested that this plant should be admitted to *Plazia*. It is obviously related there but its differentiated marginal florets and hairy achenes seem significant enough to warrant maintaining it as a monotypic genus.

Proustia tipia Ph. Fl. Atac. 28 and Viage Des. Atac. 19, 24, 25, 27, 202 (1860).

An infrequent stiff spinescent shrub 5–15 dm. tall growing on rocky slopes along the edges of the fertile belt from Taltal to Miguel Diaz. It has been collected at Breas (*Larrañaga*), Puerto Oliva (*Borchers*),

Hueso Parado (*Philippi*, type), and near Ag. Lora on Cerro Perales near Taltal (*J.* 5626). The plant appears to flower late in the summer for during my visit in the area in November and early December only very immature heads were seen.

Chaetanthera glabrata (DC.) Meigen, Bot. Jahrb. xviii. 456 (1894). *Tylloma glabratum* DC.; Ph. Fl. Atac. 28 and Viage Des. Atac. 14, 18, 19, 202 (1860).

A low spreading glabrous herb which grows outside the fertile belt usually in the gravel of dry stream-ways and rarely also in gravelly soils on hillsides. It has been collected at "Cachinal, Taltal, etc." (*Philippi*), Ag. Grande (*J.* 5793), near Taltal (*Werdermann* 826, *J.* 5115), in Queb. Guanillo near Ag. Perales (*J.* 5598), and on a dry ridge above the fertile belt near El Rincon (*J.* 5536). At the latter station all the plants were definitely perennial. Although the other collections show a tendency to become perennial for the most part they are clearly annual. The rays are yellow with the lower surface reddish.

Chaetanthera linearis Poepp., var. **taltalensis**, var. nov., a varietate genuina differt capitulis discoideis, foliis et partibus juvenilibus non rariter inconspicue lanuginosis.—CHILE: dry hillsides just back of Caleta de Hueso Parado near Taltal, Dec. 11, 1925, *Johnston* 5637 (TYPE, Gray Herb.).

Known only from the region about Taltal where it grows on dry gravelly hillsides or perhaps more commonly in dry gravel of stream-ways. Besides the type I have seen collections from Hueso Parado (*Philippi*), Queb. Taltal (*J.* 5114), Taltal (*Werdermann* 815) and from Queb. de Infiles ca. 18 km. south of Taltal (*J.* 5649). The florets are white. The plant is a very slender annual with ascending stems. *Philippi*, Viage Des. Atac. 19 (1860), reported the plant from near Taltal as *C. linearis* Poepp.

Polyachyrus virgatus, sp. nov., suffruticosus 6–12 dm. altus; caulibus vetustioribus caudicem laxe ramosum erectum 1–2 dm. altum formantibus; ramis erectis vel ascendentibus simplicibus virgatis brunnescentibus supra medium evanescenter inconspicueque arachnoideis infra medium glaberrimis 3–5 mm. crassis; foliis 6–10 cm. longis 15–30 mm. latis carnosulis supra medium caulibus abrupte reductis pinnatopartitis minute albo-punctatis supra glabris subtus inconspicue evanescenterque arachnoideis margine revolutis, lobis vix confertis elongatis saepe evidenter irregulariterque lobulatis divaricatis vel antrorse laxaque ascendentibus apice rotundis; base petioli dilatata paullo indurata 1–2 mm. lata vel vix alata, alis petioli non rariter 5–10 mm. infra basem decurrentibus apud folia mediana

auriculas ad 5 mm. latas amplexicaules formantibus; glomerulis capitulorum 15–18 mm. diametro 3–6 globosis in paniculam brevem vel in racemum congestum subspicatum ad apicem pedunculi elongati nudi dispositis; receptaculo glomeruli globoso lanuginoso; bracteis subulatis vel linearibus 2–3 mm. longis glaberrimis rariter sparsissime glanduligeris; involucris flosculorum 1–2-floris 3–3.5 mm. longis glaberrimis tegulo exteriori paullo brevissime ad basem versus callo saepe prominenti notato; flosculis roseis 8.5 mm. longis tubo (faucibus vix differentiatis) 5 mm. longo extus saepe glandulifero, labia interiori in lobos 2 acutos ligulatos 3.5 mm. longos divisa, labia exteriori ovato-elliptica 3.5 mm. longa apice truncata et tridentata; antheris (partibus fertilibus) 1.5 mm. longis linearibus apice appendicula oblongo-lanceolata 1.5 mm. longa coronatis basi cum caudis subulatis sublaevibus 1.2 mm. longis ornatis; setis pappi 5.5 mm. longis albis plumosis uniseriatis.—CHILE: fog-bathed crests of hills near Barquito, Dept. Chañaral, Oct. 29, 1925, *Johnston 4801*; gravelly benches and rocky hillsides near Aguada Grande, Dept. Chañaral, Dec. 16, 1925, *Johnston 5795* (TYPE, Gray Herb.).

Probably most nearly related to *P. Poeppigii* Kunze, of central Chile, but slightly more pubescent and lacking the very large and conspicuous leaf-bases of that species. The leaf-outline of *P. virgatus* agrees with the outline given by Philippi, Anal. Univ. Chile lxi. 270, fig. 6 (1886), as illustrating the leaf of *P. San Romani* Ph. The present species, however, rarely develops leaf-bases as expanded as that illustrated. From *P. San Romani* the new species also differs by lacking a conspicuous arachnoid pubescence on the upper leaf-surfaces. The plant forms a loose weak bush 5–12 dm. tall and is usually about as broad as tall. The corollas are pink.

Polyachyrus San Romani Ph. Anal. Univ. Chile lxi. 270, fig. 6 (1886).

I refer here a collection from a moist bushy slope in the fertile belt back of Punta Grande near Paposo (*J. 5228*). It is a weak brittle scandent perennial with stems and leaves covered with a canescent, almost silvery, thin arachnoid tomentum. The corollas are dilute pinkish. The leaf-bases are conspicuously auriculate, much more so than in the type, but otherwise the collection agrees very well with the type of *P. San Romani*, which came from an undesignated locality in the Desert of Atacama.

The species is obviously related to *P. calderensis* Ph., and to the very closely related *P. tenuifolius* Ph. and *P. selinoides* Reiche. These three are probably only forms of a single species which differs from *P. San Romani* in having much dissected leaf-lobes and a firmer

pubescence. It should be noted that Philippi, and Reiche, who followed him, have incorrectly applied the name *P. niveus* Lag. ex DC., to forms related to *P. calderensis*. A study of the plate and description of *P. niveus* given by De Candolle, *Mém. Comp.* 37, t. 15 (1838), shows that the name belongs to the plant of middle-western Peru properly called *P. echinopsoides* (Hook.) DC.

Polyachyrus annuus, sp. nov., herbaceus 1–4.5 dm. altus; caule ad basem versus in ramos plures ascendentes elongatos sparse vel vix ramosos decomposito vel non rariter ad basem versus simplici et ad medium versus sparse ascendenterque ramoso; ramis evanescenter canescenterque arachnoideis vetustate glabratis; foliis herbaceis vix confertis irregulariter lobatis, supra sparse evanescenter arachnoideis vetustate glabratis, subtus pallidis plus minusve arachnoideis, margine revolutis, lobis integris ovatis vel oblongis latis apice rotundis; foliis inferioribus petiolatis, lamina 2–3 cm. lata 4–7 cm. longa in petiolum vix vel anguste alatum 2–6 cm. longum contracta; foliis medialibus 4–8 cm. longis 2–3 cm. latis ad basem versus paullo vel vix contractis sessilibus basi conspicue plene vel semiamplexicaulibus; glomerulis capitulorum 13–15 mm. diametro paucis; receptaculo glomeruli subgloboso albo-arachnoideo; bracteis 3–4 mm. longis lanceolatis glabris; involucris flosculorum 1–2-floris 4–5 mm. longis glabris; tegulo exteriori callo prominenti non rariter notato; flosculis albis vel rosaceis 6 mm. longis, tubo (faucibus vix differentiatis) 3 mm. longo, labia interiori in lobos 2 lineares acutos 3 mm. longis divisa, labia exteriori 3–3.5 mm. longa 1.6–2 mm. lata apice tridentata; antheris (partibus fertilibus) 1.3–1.5 mm. longis linearibus apice appendicula hyalina 1.3–1.5 mm. longa coronatis basi caudis linearibus 1.1 mm. longis ornatis; filamentis 1.4 mm. longis; setis pappi 4 mm. longis.—CHILE: shelter of brush on slopes in fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5334*; frequent on a gravelly hillside near Tocopilla, Oct. 18, 1925, *Johnston 3583* (TYPE, Gray Herb.); Quebrada de Huantajaya near Iquique, Dept. Tarapacá, Sept. 1925, *Werdermann 758*.

This species is distinguished from all other members of the genus by its completely herbaceous, distinctly annual habit. The material from Ag. Miguel Diaz differs from the other collections cited in being slightly coarser in all parts and in having pink rather than white florets. The broad thin herbaceous leaves with their coarse lobing and the lack of glands on the plant allow *P. annuus* to be readily separated from the annual (probably juvenal) forms I have placed under *P. roseus*.

Polyachyrus fuscus (Meyen) Walp. *Nov. Act. Acad. Caes. Leop.*

Nat. Cur. xix. suppl. 1, 288 (1843). *Diaphoranthus fuscus* Meyen, Reise i. 406 (1834).

Very common on the sandy lower slopes of the hills near the sea at Barquito (*J.* 4800) where it forms domed rather succulent dull green masses 1.5–6 dm. broad and ca. 3 dm. tall. The leaves are succulent and somewhat crisped. The corollas are pink. My collections from Barquito are quite similar to plants collected about Caldera (*Werdermann* 380; *J.* 5058). The type of *P. fuscus* was obtained by Meyen near Mina del Checo at ca. 1200 m. alt. in a quebrada east of Tierra Amarilla. It is described as succulent and as glandular throughout. Because of these characters I follow Philippi and Reiche and refer this very glandular and succulent coastal plant to Meyen's species.

Polyachyrus roseus Ph. Fl. Atac. 28 and Viage Des. Atac. 12, 202 (1860). *P. fuscus*, var. *roseus* Reiche Anal. Univ. Chile cxv. 352 (1904) and Fl. Chile iv. 371 (1905).

I associate here a variable assemblage of plants which differ from what I have called *P. fuscus* in being less glandular and in having the lower surface of the leaves clean and white rather than sordid with a brown tomentum. The plants grow in gravelly stream-ways usually back from the shore. The common form is represented by material from Ag. Grande (*J.* 5797), Breas (*Larrañaga*), Ag. Cardon (*J.* 5289) and Ag. Miguel Diaz (*J.* 5335). These are low shrubs with the stems arachnoid above and usually (except in no. 5335 which is glabrous) glandular towards the base. The leaves are glandular above and white-tomentose beneath. At Ag. Grande (*J.* 5796) and Ag. Cachina (*J.* 5726), growing with the form just mentioned, I found a form differing in having the stems and leaves conspicuously white-tomentose and very sparsely if at all glandular. As some intermediate forms were noted I believe this excessively tomentose plant to be worthy only of a formal name if taxonomic recognition is really desirable.

Perhaps distinct, are annual perhaps juvenal plants collected in Queb. San Ramon (*J.* 5154) and near Antofagasta (*J.* 3656). These have slightly larger leaves, somewhat firmer petioles, and the callous on the tegules less developed. The material from Queb. San Ramon has the peduncles as well as the stems glandular and not arachnoid. The type of *P. roseus* from Las Animas (*Philippi*), while agreeing with the common shrubby form in habit, also has the stems glandular and, except for the white-tomentose under-surfaces of the leaves, is very like *P. fuscus*.

Leucheria modesta (Ph.) Reiche, Anal. Univ. Chile cxvi. 192

(1905) and Fl. Chile iv. 415 (1905). *Chabraea modesta* Ph. Fl. Atac. 28 and Viage Des. Atac. 15, 27, 202 (1860). *L. debilis* Ph. Anal. Univ. Chile lxxxvii. 107 (1894).

A weak annual herb growing in the fertile belt under bushes or in the shelter of rocks. It has been collected near Barquito (*J.* 4823), Cachinal de la Costa (*Philippi*, type of *C. modesta*), Breas (*Larrañaga*, type of *L. debilis*), Taltal (*Werdermann* 808), Punta Grande (*J.* 5227) and Ag. Miguel Diaz (*J.* 5322). The florets are white. The lower leaf-surface varies from conspicuously floccose to glabrate.

Oxyphyllum ulicinum Ph. Fl. Atac. 28, t. 4a and Viage Des. Atac. 15, 25, 202 (1860).

A stiff loosely branched usually globose bush 1–2 m. tall which grows in dry gravelly soils and is infrequent though often locally abundant. I have seen material from Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J.* 5794), Ag. Cachina (*J.* 5725), Posada Hidalgos (*J.* 5668), Breas (*Larrañaga*), Queb. San Ramon (*J.* 5153), El Rincon (*J.* 5537). The plant does not grow near the ocean but only in the more arid localities back of the hills facing the shore. The collection from El Rincon came from the arid scrubby slopes well above the fertile belt. *Philippi* reports the species from Paposo but doubtlessly he collected it in the dryer upper parts of Queb. Guanillo near there. The species is known only from our area and from the stations mentioned. The leaves are rigid with the lobes pungently tipped. The corollas are pinkish to nearly white and hence in color contrast strongly with the purplish protruding anthers.

Hypochaeris grandidentata (Ph.) Reiche, Anal. Univ. Chile cxvi. 601 (1905) and Fl. Chile v. 27 (1910). *Achyrophorus grandidentatus* Ph. Fl. Atac. 29 and Viage Des. Atac. 12, 203 (1860). *A. foliosus* Ph. Fl. Atac. 29 and Viage Des. Atac. 16, 25, 203 (1860). *H. foliosa* Reiche, Anal. Univ. Chile cxvi. 602 (1905) and Fl. Chile v. 28 (1910). *H. deserticola* Ph. Anal. Univ. Chile lxxxvii. 318 (1894). *H. sagittata* Ph. Anal. Univ. Chile lxxxvii. 319 (1894).

I refer here an excessively variable group of forms ranging from the Caldera region northward into our area. Some of these were placed by Reiche in *H. scorzonerae* F. Muell., a species of central Chile. Because I have not had an extended suite of Mueller's species for comparison I prefer to treat our northern plant as distinct, particularly so as it has a detached natural range. I have seen collections from Las Animas (*Philippi*, type of *A. grandidentatus*), Barquito (*J.* 4790), Ag. Grande (*J.* 5789), Cachinal de la Costa (*Philippi*, type of *A. foliosus*), Taltal (*J.* 5108, 5109), Breas (*Larrañaga*, type of *H. sagittata*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J.* 5324, 5325).

Probably also referable here as a pronounced form is a collection from the sea-cliffs near Ag. Cachina (*J.* 5718). This plant has pinnate leaves with the lobes distant, divaricate and ovate.

Malacothrix Clevelandi Gray, Bot. Calif. i. 443 (1876). *Crepis Geisseana* Ph. Anal. Univ. Chile lxxxvii. 328 (1894). *M. senecioides* Reiche, Anal. Univ. Chile cxvii. 192 (1905) and Fl. Chile v. 36 (1910).

An infrequent annual herb on the dryish gravelly floor of the quebrada near Barquito (*J.* 4789). This species, which is infrequent from Coquimbo to Barquito, also occurs in California, Arizona and northern Baja California. The close agreement in all technical details between the material from Chile and the United States is remarkable.

Sonchus asper (L.) Hill, Herb. Brit. 47 (1769); Ph. Fl. Atac. 29 and Viage Des. Atac. 27, 203 (1860).

Philippi reports this species from Miguel Diaz.

Sonchus tenerrimus L. Sp. Pl. 794 (1753). *S. rivularis* Ph. Linnaea xxx. 194 (1859). *S. tenuifolius* Nutt. Trans. Am. Philos. Soc. vii. 438 (1841).

A few plants of this species were observed on a moist ledge on a cliff in Queb. San Ramon near Taltal (*J.* 5149). The plants are annual and appeared to be indigenous. In Chile the species has been collected only at Santiago, Carrizal Bajo, Taltal and Tocopilla. Philippi described the Santiago collection as *S. rivularis* in 1859. He gave the source of the type as "In glareosis fluminis *Mapocho* prope Santiago inveni." The only collection in his herbarium that could possibly be the type is labeled as collected in Nov. 1858 on "Cerro S. Cristobal." Since the Rio Mapocho flows along the southeast base of Cerro de San Cristobal the discrepancy in data is not great.

The species also occurs on the Pacific Coast of North America, where it was first found at San Diego, California, in 1836 by Thomas Nuttall, who considered it native and subsequently described it as *S. tenuifolius* Nutt. The species is best known, however, on the various islands off the coast of California and Baja California, where it is said to seem native and where the chances for widespread introduction are much less than on the adjacent mainland.

The Californian and Chilean plants are quite indistinguishable, so that Nuttall's name must be taken up if this American plant is to be particularly named. Although the species in its occurrence and distribution acts as a native plant in California and Chile I can not find characters to separate it from the distinctive *S. tenerrimus* of southern Europe. It is of course possible that the plant is indigenous on the Pacific Coast and that its presence there is another indication of a

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 Paposó. 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 Paposos 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. ixiioides* 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 caeruleus* 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. Miscel. 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 carnosissimis 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 laxifloro; 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 calyces 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 sesquolongioribus; 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 Quebrada 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. Miscl. 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 ascenduntibus 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 angustequae 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; siliculis 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. Miscl. 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 lacinias 5-6 stellatim distantes spathulatas 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. lxxxi. 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 Paposos 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 obtecta; 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 caerulescenti 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 laxe 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. alibrexioides** (*Velpeaulia alibrexioides* 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). Bentham & 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 triparto, 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 laterallobes 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; stigmate 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

Argyria 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. Fewillei* 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

Ophryosperus 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

Tetrolema 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 *Tetrolema* neither of which has been indentified. He placed *Tetrolema* in the *Verbenaceae* but it seems probable that the two species represent different genera and perhaps even distinct families.

3. UNDESCRIBED SPECIES FROM THE CORDILLERAS OF ATACAMA

Ephedra Wraithiana, sp. nov., erecta fruticem globosum 1–2 m. altum robustum pallide viridem formans; ramulis oppositis erectis 2–3 mm. crassis rigidis 15–20 cm. longis internodiis 5–7 ca. 2–3 cm. longis cortice obscure tuberculatis tenue striatis pallidulis; foliis oppositis 4–5 mm. longis, juventate erectis apicem versus in vaginas cylindricas connatis, lobis subulatis ascendentibus ca. 1 mm. longis, maturitate separatis basi incrassatis et brunneis; strobilis masculinis solitariis vel glomeratis sessilibus in nodis ramulorum gestis oblongo-ovoideis obtusis obscure tetragonalibus ca. 5 mm. longis 3–4 mm. crassis 12–16-floris, bracteis luteis ovato-orbicularibus ca. 2 mm. longis per partem quartam inferiorem vel paullo ultra connatis apice obtusis vel rotundis margine scariosis; perianthio oblongo-obovato bracteas subsuperanti; columna staminali paullo vel vix exserta; antheris sessilibus 5; galbulis floralibus bifloris solitariis vel glomeratis ad nodos ramulorum sessilibus, bracteis ochroleucis membranaceis ovato-orbicularibus ca. 6 per quartam partem basi connatis, tubillo recto 1.5 mm. longo breviter exserto a limbo obliquo integro terminato; galbulis maturis ellipsoideis 7–8 mm. longis, semine exserto plumbaceo ovato dorso convexo facie plano.—CHILE: abundant on hillsides and gravelly benches, Quebrada de Potrerillos above Agua Dulce, Dept. Chañaral, ca. 2600 m. alt., Oct. 22, 1925, *Johnston 3705*; common, Quebrada del Salto below Portezuelo de San Pedrito, Sierra de San Miguel, Dept. Copiapó, ca. 3200 m. alt., Nov. 5, 1925, *Johnston 4865* (TYPE, Gray Herb.).

This species belongs to the section *Pseudobaccatae* and is apparently most closely related to *E. americana* H. & A. It differs from that species, however, in being a very much more robust plant and in having shorter coarser more erect branchlets, leaves more completely connate, more ellipsoid galbuli and apparently fewer anthers. In the coarseness of its twigs *E. Wraithiana* suggests the Argentine, *E. ochreatea* Miers, but that species, of course, has ternate leaves and baccate fruit. The proposed species is the common Ephedra in the arid cordilleras east and northeast of Copiapó where it forms large bushes which not infrequently become 2 m. tall and develop a coarse trunk 1–3 dm. thick and as much as a meter in length. Like the other Chilean species of the genus it is known as "Pingo-pingo." In the vicinity of the Potrerillos mines it is used as fuel although it is not considered as desirable as "Barilla" (*Adesmia* spp.) since it produces more smoke in burning. The species is named in honor of Mr. William Wraith of the Andes Copper Company. It is a pleasure to acknowledge here my appreciation of the kindly interest and invaluable help of Mr.

Wraith at the time when I was beginning my botanical work in northern Chile.

Cardamine (?) **cremnophila**, sp. nov., glaberrima; radice perenni longa descendente multicipitali apicem versus 5–12 mm. crassa; caulibus pluribus 5–15 cm. longis ascendentibus simplicibus vel furcatis, infra medium non rariter suffruticosis et subpersistentibus 3–8 mm. crassis evidenter cicatricosis saepe cum vestigiis foliorum subpersistentibus pallidis conspicue ornatis, supra medium foliosis; foliis confertis, laminis late cordatis herbaceis subconcoloribus obtusis integerrimis vel conspicue dentatis 3–6.5 cm. longis 2.5–5.5 cm. latis, petiolis 7–15 cm. longis 2–3 mm. latis; racemis exsertis aphyllis; pedunculis 5–10 cm. longis; pedicellis anthesi 5–10 mm. longis, maturitate ad 2 cm. longis laxe ascendentibus vel plus minusve declinatis gracilibus sed a toro turbinato ca. 2 mm. crasso terminatis; sepalis ovati-oblongis vel elliptico-oblongis 5–6 mm. longis ca. 2 mm. latis apice rotundis margine hyalinis post anthesin deciduis; petalis albis 11–13 mm. longis 5–6 mm. latis, lamina obovata in unguem gracilem longum contracta; filamentis linearibus 6–7 et 7–8 mm. longis; ovario elongato 20–30-ovulato; capsula ca. 3 mm. longa ca. 2 mm. crassa torulosa paullo compressa subtereti 3–4 mm. longe stipitata, valvis nervo medio carinatis; seminibus uniseriatis compressis ca. 1.8 mm. longis cancellatis.—CHILE: locally common in sheltered places about a cliff in the upper part of Quebrada de San Miguel, Sierra de San Miguel, Dept. Copiapó, ca. lat. 27° 25' S., long. 69° 23' W., ca. 2700 m. alt., Nov. 8, 1925, *Johnston 4927* (TYPE, Gray Herb.).

A peculiar species apparently without any very immediate relative. I could find no material in the Philippi Herbarium at all like it. It is evidently a perennial, having a strong sparingly branched tap root roughened with prominent warty excrescences which are apparently the nodules of rhizophilous bacteria. The plant grew in slightly moist soil in sheltered niches on a cliff and among rocks in shaded talus. It formed low-domed herbaceous masses 2–3 dm. broad and grew in the company of *Cajophora coronata* H. & A. My guides called it "Yerbo gato." In general appearance the plant is most suggestive of *Cardamine* although it is quite atypical of that genus in its habit of growth. The slightly immature fruit at hand seems to be subterete and to have a strong medial keel on the valves. These characters suggest *Nasturtium* although the habit of the plant, its large flowers and uniseriate seeds are more at variance with that genus than with *Cardamine*. I suspect that when fully mature fruit of *Cardamine cremnophila* is available the plant will prove to be worthy of special generic recognition.

Hexaptera macrocarpa, sp. nov., pilosa fusco-viridis 1–2 dm. alta; caulibus pluribus foliosis ascendentibus ramosis 1–2.3 mm. crassis e radice crassa orientibus; foliis integerrimis concoloribus 1–1.5 cm. longis 2–6 mm. latis saepe oblanceolatis sed rariter ad formam plus minusve oblongo-obovatum variantibus supremis non rariter ellipticis, apice obtusis callosis, ad basem versus attenuatis; racemis simplicibus terminalibus 5–10 cm. longis 2–3 cm. crassis multifloris; pedicellis gracilibus 8–16 mm. longis stricte ascendentibus; sepalis oblongis ca. 4 mm. longis et 1.5 mm. latis margine hyalinis apice rotundis dorso pubescentibus; petalis pallide flavescentibus ca. 5 mm. longis 1.5–2 mm. latis quam sepalis evidenter longioribus, lamina ovata longe unguiculata; siliculis circumscriptione late elliptico-orbicularibus 10–12 mm. longis 9–11 mm. latis, valvis purpurascens ellipticis 5–6 mm. longis ca. 4 mm. latis compressis conspicuissime alatis, alis hyalinis 2–3 mm. latis; dissepimento lineari 8–10 mm. longo.—CHILE: diluvial gravel just below Laguna de Valeriano, Dept. Vallenar, ca. 3900 m. alt., Jan. 8, 1926, *Johnston 6058* (TYPE, Gray Herb.).

Growing in the compact diluvial outwash which fills Quebrada de Valeriano just below Laguna de Valeriano. It was seen at no other place and was much less common there than its congener, *H. cuneata* Gill. & Hook., with which it grew. The new species seems to be related to *H. spathulata* Gill. & Hook. and to *H. Jussiaei* Barn. The former species, which is known only from the cordilleras between Mendoza and Santiago, also has entire oblanceolate leaves but differs from our plant in having much smaller very much more narrowly winged fruit and a suffruticose much less diffuse habit. *Hexaptera Jussiaei* differs in its cuneate tridentate leaves and smaller fruit. It is very unlikely that *H. macrocarpa* could be a form of *H. Jussiaei* since that species is represented in the region about Laguna de Valeriano by the northern geographic phase which has been described by Philippi as *H. tridentata*.

Astragalus valerianensis, sp. nov., perennis ca. 3 dm. altus sparsissime strigosus; caulibus erectis vel stricte ascendentibus ramosis internodiis 2–6 cm. longis; rhachi folii 4–6 cm. longa per tertiam partem vel fere ad medium nuda, foliolis suboppositis 5–8-jugis oblongis vel ellipticis 1–1.8 cm. longis 1.5–5(–6) mm. latis apice obtusis vel emarginatis 0.4–0.8 mm. longe petiolulatis; stipulis 4–6 mm. longis ultra medium (2.5–4 mm. longe) connatis membranaceis inconspicue ciliatis; pedunculis erectis vel stricte ascendentibus rectis 8–13 cm. longis quam foliis duplo vel subduplo longioribus; bracteis persistentibus obovatis vel oblongis acutis 1–2 mm. longis; floribus

laxe racemosis 2-3 mm. longe graciliter pedicellatis; tubo calycis campanulato 2.5-3 mm. longo sparse strigoso basi rotundato, lobis calycis triangularibus inaequilongis ca. 1 mm. longis inconspicue ciliatis; vexillo oblongo-obovato ca. 9 mm. longo fere ad 6 mm. lato paullo reflexo, lamina in unguem latum brevem paullatim angustata apice rotunda saepe emarginata medium versus ochroleuca aliter purpurea; alis carinam conspicue superantibus, laminis oblongis 5-6 mm. longis ca. 2.5 mm. latis ad basem versus purpureis alibi ochroleucis, unguibus linearibus ca. 3.5 mm. longis; carina oblonga ca. 3 mm. longa apice obtusa, lamina oblonga ca. 3 mm. longa ad apicem versus purpurea alibi ochroleuca, ungue lineare ad 3 mm. longo; ovario glaberrimo anguste lanceolato compresso breviter stipitato; leguminibus ellipsoideis valde inflatis magnis 4-4.5 cm. longis ca. 2.5 mm. crassis sessilibus pendulis 4-4.5 mm. longe pedicellatis chartaceis saepe purpureo-tinctis glaberrimis; seminibus brunneis ca. 4 mm. longis oblique ovatis compressis laevibus.—CHILE: loamy talus along the Rio de Valeriano near La Cueva, Dept. Vallenar, ca. 2800 m. alt., Jan. 8, 1926, *Johnston 6033* (TYPE, Gray Herb.).

This species which belongs to the section *Phaca* is characterized by its very long strict peduncles, very large pendulous legumes and small purple corollas. I saw it only once. It formed a very large and populous colony on a talus slope and on the adjacent floor of the quebrada of the Rio de Valeriano a short distance below La Cueva. I was quite unable to match my specimens of it in the Philippi Herbarium at Santiago.

Cristaria glomerulata, sp. nov., abundanter glandulifera ut videtur perennis; caulibus decumbentibus vel laxe ascendentibus 1-3 dm. longis laxe ramosis pilis brevibus simplicibus glanduliferis dense obsitis et pilis stellatis minutis sparse ornatis, internodiis 1-3 cm. longis; foliis ad apicem versus caulis paullo reductis; lamina folii firmiusecula ambitu suborbiculata vel ovato-orbiculata usque ad medium in lobos 3-7 inaequales plus minusve abundanter evidenterque dentatos vel subpinnate lobulatos palmatifida pilis stellatis sparsis adpressis vestita sparse glandulifera basi reniformi vel truncata subtus paullo pallidiori vel plus minusve purpureo-tincta; petiolo quam internodiis adjacentibus et lamina saepe evidente longiori dense glandulifero sparsissime stellato-pubescenti; floribus rariter solitariis saepius glomeratis; glomerulis 5-10-floris ca. 1 cm. diametro 3-10 mm. longe pedunculatis foliis adjacentibus distincte brevioribus; pedicellis gracillimis glanduliferis calycem saepe brevioribus axillis bractearum ovatarum lanceolatarumve 1-2 mm. longarum glanduliferum erumpentibus; calyce ad anthesim ca. 4 mm. longo glandulifero pilis

simplicibus et stellatis vix adpressis villosis, lobis oblongis vel ovatis saepe obtusiusculis apicem versus glabrescentibus et herbaceis; petalis purpurascens 3–4 mm. longis sepalis aequilongis; carpellis 10–15 glabratis alis ovatis 2 mm. longis aequilongis.—CHILE: gravelly open soil near Potrerillos, Dept. Chañaral, ca. 2800 m. alt., Oct. 24–26, 1925, *Johnston 4725, 4744* (TYPE, Gray Herb.).

A very distinct species belonging to the group of glanduliferous plants containing *C. glandulosa* Ph., *C. inconspicua* Ph. and *C. multiflora* Gay. It is, however, quite distinct from these species being most closely related to *C. multiflora* from which it differs greatly in leaf-outline, habit, etc. In Reiche's treatment of the genus, Fl. Chile i. 243 (1896), it keys out with *C. glandulosa*, from which it differs in its smaller petals, very glandular stems and petioles, different inflorescence as well as much more northern range.

Euphrasia adenonota, sp. nov., annua minima erecta 1–3 cm. alta simplex vel rariter brevissimeque ramosa brevissime albo-hirsutula purpureo-tincta gracillima; cotyledonibus persistentibus glaberrimis obovatis; foliis crassiusculis trilobatis 2–5 mm. longis, margine valde revolutis et incrassatis, subtus dense glanduliferis cum costa lata incrassata cuneiformi eglandulosa evidenter notatis, supra (praesertim marginem versus) hirsutulis, lobis ovatis vel ellipticis obtusis vel rotundis integris, mediali longissimo; floribus 1–3 in axillis foliorum superiorum maximorum gestis; calyce 2–3 (maturitate ad 4) mm. longo ad medium versus lobato sparse hirsutulo basem versus in pedicellum 1–2 mm. longum gradatim contracto, lobis oblongis vel elliptico-oblongis margine revolutis apice obtusis vel rotundis; corolla 4–4.5 mm. longa subcylindrica calycem 1–2 mm. longe superante glabra, lobis superioribus paullo longioribus rectis 1 mm. longis oblongis obtusis integris, lobis inferioribus ascendentibus; antheris glabris suberectis, loculis calcaratis; capsula late obovata compressa inclusa glaberrima.—CHILE: moist silt and peat in a vega at the head of Laguna de Valeriano, Dept. Vallenar, 4000 m. alt., Jan. 9, 1926, *Johnston 6067* (TYPE, Gray Herb.).

This interesting little plant belongs to the section *Trifidae* and finds its closest relatives in *E. perpusilla* Ph. [cf. Skottsberg, Zur Gefässpfl. Westpatag. 19–21, fig. 3, (1923)] and *E. antarctica* Benth. It is, however, quickly separable from these annuals by its very small size, broad calyx-lobes, glanduliferous lower surfaces of the leaves and very broad thickened ribs of the leaves. In addition it differs from *E. perpusilla* in producing short stiff white hairs on the leaves and calyx and in having less revolute leaves. From *E. antarctica*, in particular, it differs in its simple or subsimple habit, and in its less deeply and more broadly lobed leaves.

Clos, in Gay's Flora de Chile, v. 146 (1849), reports *E. antarctica* from the Cordillera de Hurtado in the department of Ovalle. According to notes kindly furnished me by Dr. F. W. Pennell this record is based upon material referable to *E. adenonota*, for there is a collection of it in the museum at Santiago made by Gay (no. 1090) in Jan. 1837 and labeled as obtained "in andibus humidis, Hurtado, Coquimbo, alt. 3000 m." This collection is associated with a manuscript name that has never been published. Wettstein, Monog. Euphr. 279-80 (1896), cites a collection from the Andes of Illapel which he doubtfully refers to *E. antarctica*. This collection perhaps may also represent *E. adenonota*. My collection from Laguna de Valeriano comes about 180 km. to the north of the locality where Gay collected the species and consequently sets the northern limit, as now known, for the genus in South America. The plant was locally abundant in the large meadow at the upper end of Laguna de Valeriano where I found densely crowded colonies in peat or in tufts of moss or in the silt between the large cushions of *Oxychloe*. The plants are stained with purplish. The corolla is white and is striped down each lobe with red-purple.

Senecio pelolepis, sp. nov., discoideus perennis suffruticosus coactis densissimis candidis vestitus; radice valida; caulibus vetustioribus laxe ascendentibus vel decumbentibus; caulibus junioribus erectis simplicibus 10-18 cm. longis numerosis obscure angulatis basem versus 1.5-2(-3) mm. crassis ad apicem capitula 1-3 laxe disposita 1-4 cm. longe pedunculata gerentibus; foliis strictis oblongis 8-16 mm. longis 2-4 mm. latis concoloribus supremis paullo reductis apice obtusis vel rotundis margine paullo revolutis integerrimis vel distincte irregulariterque sparsi-dentatis -lobulatisve; pedunculis strictis saepe inconspicue bracteolatis; capitulis campanulatis ca. 1 cm. longis 6-7 mm. crassis erectis basi cum bracteis ca. 6 ovatis vel lanceolatis 2-4 mm. longis calyculatis; tegulis 1-2 mm. latis flosculis paullo brevioribus ca. 13 atratis arachnoideis mox glabrescentibus margine anguste hyalinis apice triangularibus plus minusve squarrosis; receptaculo plano alveolato marginibus alveolorum angustis elevatis plus minusve erosis; flosculis homomorphis tubulosis hermaphroditis 40-50 luteis 8-9 mm. longis glaberrimis, dentibus 0.6-0.7 mm. longis triangularibus vesiculosus incrassatis apice incurvis; filamentis ca. 3 mm. longis 0.5-0.7 mm. infra apicem valde expansis et in texturam vesicularem abrupte transmutatis deinde apicem versus gradatim attenuatis; antheris 2.4-2.7 mm. longis cum appendicula ad 0.5 mm. longa triangulari-ovata coronatis; stylo glaberrimo 8-9 mm. longo in lobos ad 1.5 mm. longos lineari-oblongos summam ad apicem ciliatos

divisis; achaeniis glaberrimis costatis.—CHILE: gravelly bench at Junta del Medio, upper Rio de la Carmen, Dept. Vallenar, lat. 29° 22' S., long. 70° 5' W., 2900 m. alt., Jan. 16, 1926, *Johnston 6220* (TYPE, Gray Herb.); dry gravelly bench below Los Cuartitos, upper Rio de la Carmen, Dept. Vallenar, 3300 m. alt., Jan. 17, 1926, *Johnston 6231*.

This species is related to *S. leucus* Ph. from which it differs in its very much firmer and denser chalky-white tomentum, in its smaller heads borne solitary or in groups of 2 or 3, and in the very dark colored involucre. The plant forms a loose unkempt white bush 3–6 dm. tall. My material from near Los Cuartos has been disturbed by cattle and shows numerous erect leafy stems springing directly from a very dense low caudex.

Senecio tinctolobus, sp. nov., perennis humilis griseo-tomentosus discoideus; caulibus numerosis herbaceis erectis vel decumbentibus 2–4 cm. longis simplicibus e caudice fruticuloso erumpentibus, internodiis 1–5 mm. longis; foliis alternis ascendentibus oblanceolatis vel spathulato-oblongis 5–12 mm. longis 2–5 mm. latis in lobulos vel dentes 0.5–1 mm. latos 0.1–1.5 mm. longos oblique incisus vel rariter integerrimis concoloribus crassiusculis enervatis ad basem versus attenuatis et in partem petioliformem paullo differentiatis plus minusve late affixis margine paullo revolutis; capitulis campanulatis erectis terminalibus solitariis 0.5–1(–1.5) cm. longe pedunculatis folia evidenter superantibus 12–15 mm. longis 11–13 mm. crassis, basi cum bracteis 8 subulatis 3–7 mm. longis erectis calyculatis; tegulis 18–22 erectis flosculis subaequilongis arachnoideis et cinerascentibus deinde glabratis et viridescentibus apice acutis margine anguste hyalinis; receptaculo plano alveolato marginibus alveolorum integris glabris; flosculis homomorphis tubulosis hermaphroditis 8–9 mm. longis glaberrimis ca. 120, tubo flavo ca. 3.5 mm. longo, faucibus elongatis flavis, lobis triangularibus incrassatis vesiculosus ca. 0.5 mm. longis rubiginosis apice incurvis; filamentis glabris ca. 0.75 mm. infra apicem valde expansis et in texturam vesicularem abrupte transmutatis deinde apicem versus gradatim contractis; antheris 2.3–2.5 mm. longis cum appendicula ovato-oblonga ca. 0.4 mm. longa coronatis; stylo glaberrimo in lobos 1.3–1.4 mm. longos oblongo-lineares summum ad apicem ciliatos diviso; achaeniis ca. 12-costatis glaberrimis ca. 4 mm. longis elongatis.—CHILE: common on rocky slopes above Laguna de Valeriano, Dept. Vallenar, ca. 4000 m. alt., Jan. 9, 1926, *Johnston 6072* (TYPE, Gray Herb.).

This species falls in group xii of the discoid species as defined by Reiche, Fl. Chile iv. 220 (1905). The leaves are very variable in

outline ranging from entire or sparsely dentate to deeply lobed, being sometimes cleft half way to the midrib. The tomentum is grayish and close, though it thoroughly covers the stems and leaves it is not particularly thick. The florets are yellow with the lobes reddish brown.

Polyachyrus rigidus, sp. nov., fruticosus 3–6 dm. altus prope basem ramosissimus; caulibus erectis rigidis foliosis glabris stipitoglandulosis 1–3 dm. longis; foliis rigidis firmis pinnatifidis stipitoglandulosis apicem versus caulibus reductis subtus pallidioribus juvenitate evanescenter inconspicueque tomentellis margine paullo revolutis, inferioribus late oblanceolatis 5–6 cm. longis 1–1.5 cm. latis ad basem versus in petiolum anguste (0–1 mm. late) alatum vix auriculatum attenuatis, medialibus oblongis 3–5 cm. longis 1.5–2 cm. latis sessilibus basi in auriculas amplexicaules 3–4 mm. latis evidenter productis, lobulis subovatis angulatis dentatis vel angulate lobulatis, apicibus lobulorum dentiumque acutis vel submucronatis neque acuminatis neque spinescentibus; glomerulis capitulorum 2–3 laxe cymosis ca. 1.3 mm. diametro subglobosis 0.5–2(–5) cm. longe pedunculatis; pedunculo bracteis foliaceis 0.5–1.5 cm. longis ornato; receptaculo glomeruli subgloboso tomentoso; bracteis 5 mm. longis rigidis firmis anguste lanceolatis glanduligeris; involucris flosculorum 2-floris ca. 5 mm. longis; tegulo exteriori ceteris subaequilongo glandulifero infra medium callo prominenti saepe incrassato; flosculis albis ca. 9 mm. longis, tubo (faucibus vix differentiatis) ca. 4 mm. longo extus inconspicue glanduloso, labia interiori in lobos 2 lineares 3.5 mm. longos divisa, labia exteriori 3.7 mm. longa 1.9 mm. lata apice tridentata, filamentis ca. 2 mm. longis; antheris (partibus polleniferis) ca. 1.8 mm. longis appendicula ca. 1.6 mm. longa coronatis basi caudis 1.8 mm. longis ornatis; setis pappi 5–6 mm. longis.—CHILE: a glandular oily bush growing about rocks on a dry hillside below Agua Dulce, Quebrada de Potrerillos, Dept. Chañaral, ca. 2550 m. alt., Oct. 22, 1925, Johnston 4700 (TYPE, Gray Herb.).

This species is probably most closely related to *P. latifolius* Ph. from which it differs in being a more compact shrubby plant and in having smaller firmer more glandular less sharply toothed or lobulate leaves of which the lower ones completely lack auriculate bases. From *P. carduoides* Ph. it differs in having leaves with the under surfaces nearly glabrous and the margins lacking spinescent or acuminate teeth.

Pachylaena rosea, sp. nov., glaberrima paullo glaucescens; caulibus subterraneis e radice crassa valida perenne erumpentibus; foliis apice caulibus in superficie humi rosulatis congestis pallide virides-

centibus concoloribus vetustate rubicundis lamina orbiculata vel reniformi 2-4 cm. longa et lata denticulata in petiolum alatum 1-2 cm. longum 3-8 mm. latum abrupte contracta; capitulis campanulatis vel campanulato-hemisphaericis 1.5-4 cm. crassis 2-3 cm. longis e rosulis foliorum orientibus primo aspectu sessilibus sed vere 5-15 mm. longe pedunculatis pedunculo inter folios occulto; involucrio infra medium cupuliformi et vix lobato, lobis erectis imbricatis partibus superioribus denticulatis; lobis involucri interioribus 15-20 cuneato-oblongis vel ligulatis saepe pallide rubescentibus flosculos disci 2-5 mm. longe superantibus, ceteris oblongis vel ovatis distincte brevioribus irregulariter 2-3-seriatis aliis basi bractearum interiorum subregulariter 1-2-seriate affixis aliis paucis basem versus involucri irregulariter dispersis; receptaculo concavo vel latissime concavo-infundibuliformi scrobiculato exappendiculato; flosculis exterioribus 15-20 evidenter ligulatis roseis 2.3-2.8 cm. longis pistilliferis sed cum loculis antherarum abortivis quamobrem incompletis achaenia abortiva gestis in partibus lateralibus involucri cupuliformis (? i. e. margine erecto receptaculi) 2-5 mm. supra basem affixis, limbo 1.5-2 cm. longo 2-3 mm. lato erecto bracteas interiores involucri paullo vel vix superanti apice integro vel inconspicue 2-3-dentato; flosculis disci hermaphroditis perfectis 50-100 flavis ca. 1.5 mm. longis, tubo (faucibus vix differentiatis) ad 1 cm. longo, labia exteriori ligulata ad 5 mm. longa tridentata revoluta, labia interiori in lobos 2 filiformes ad 4 mm. longos revolutos divisa; pappi setis ca. 14 mm. longis albis eleganter plumosis biseriatis numerosis; achaeniis 10-12 mm. longis 2-3 mm. crassis stramineis costatis.—CHILE: local on talus near Potrero de Toledo, Rio de la Laguna Grande, Dept. Vallenar, 2660 m. alt., Jan. 5, 1926, *Johnston 5897* (TYPE, Gray Herb.).

Obviously a close relative of *P. atriplicifolia* Don from which it differs in having the ray-florets conspicuously cerise or rose-colored, the smaller heads narrower and denser, and the undivided lower part of the involucre deeper and very sparingly provided with bracts outside. The plant was seen only once. It grew on a gravelly slope near the trail about opposite Potrero de Toledo at ca. 2600 m. alt. This altitude is lower than that frequented by *P. atriplicifolia* for in the same watershed I observed it down only to ca. 3200 m. alt.

II. SOME UNDESCRIBED SPECIES FROM PERU.

Linum parvum, sp. nov., annum erectum herbaceum 4-9 cm. altum; caule solitario fere ad apicem simplici deinde laxissime sparseque cymoso-ramoso striato 0.5 mm. crasso minute stipitato-glandulifero; foliis paucis oblanceolatis vel linearibus 5-10 mm. longis 1.5-2

mm. latis costatis sed enervatis integerrimis acutis sparse glanduliferis, basi attenuatis glandulis 2 majusculis brunneis globosis ornatis, caulinis oppositis internodiis longioribus, rameis (i. e. bracteis) alternis oppositifloris; floribus in apice caulis solitariis vel in cymas unilaterales simplices vel non rariter dichotomas saepe 3-6-floras dispositis; pedicello 0.3-0.9 mm. longo; sepalis 3- vel rariter 5-nervatis late lanceolatis integris 3(-5) mm. longis, apice herbaceis et recurvatis in faciei interiori sparse pubescentibus; petalis flavis 4.5-5 mm. longis 1.5 mm. latis oblongo-ob lanceolatis sepalis fere duplo longioribus apice rotundis vel emarginatis; staminibus ad 0.5 mm. longe connatis stylum vix superantibus; stylis ca. 2.5 mm. longis infra medium plus minusve connatis glabris; stigmatate capitato; capsulis globosis 3-3.5 mm. diametro minute stipitato-glanduliferis supra medium badiis; seminibus 1.5 mm. longis 1.1 mm. latis nitidis fulvis sublaevibus.—
 PERU: local on dryish sandy places at lower edge of fertile belt in hills directly back of Mollendo, Dept. Arequipa, Oct. 16, 1925, *Johnston 3549* (TYPE, Gray Herb.).

A small-flowered annual herb of the Loma Formation of which the exact relationship is uncertain. It differs from the other species of western South America in being herbaceous and short-lived and in the inconspicuous though abundant stipitate glands which cover the stem.

Eremocharis confinis, sp. nov., suffruticosa decumbens ramosissima glaberrima; caulibus dichotome ramosis flexuosis, internodiis 1-5 cm. longis; ramis foliatis 3-15 cm. longis 1-2 mm. crassis; foliis alternis crassiusculis concoloribus, petiolo elongato paullo compresso saepe 1.5-2 cm. longo ad 1 mm. crasso lamina circa duplo longiori basi paullo dilatato subamplexicauliter affixo, lamina biternate dissecta ambitu deltoidea 8-12 mm. lata, lobis 3 divaricatis subaequilongis linearibus fere ad 1 mm. crassis, lobulis usque ad 3 mm. longis non rariter dentatis; umbellis compositis, pedunculo primario 1.5-3 cm. longo, radiis 3-4 apicem versus paullulo attenuatis fructu delapso persistentibus (5-)12-25 mm. longis imam ad basem bracteis oblongis 1-2 mm. longis ornatis, umbellulis densis 6-7 mm. diametro usque ad 12-floris, bracteolis 4-7 oblongis vel lanceolatis 1-2 mm. longis; pedicellis gracilibus ad 1 mm. longis; petalis viridescentibus, lamina primaria orbiculari vel obovata ca. 1 mm. lata breviter lateque ca. 0.4 mm. longe unguiculata, apice inflexo cuneato parti primariae aequilongo; sepalis 0.3-0.5 mm. longis triangularibus apice acutis acuminatisve erectis; filamentis subulatis 2 mm. longis; antheris 1 mm. longis; fructu 2 mm. longo angulato; mericarpiis dorse leviter concavis laevibus margine acutis sed vix alatis, facie commissurali

sulcata intrusa.—PERU: Candarave, Dept. Tacna, ca. 2950 m. alt., March, 1925, *Weberbauer* 7369 (TYPE, Field Mus.).

Characterized by its decumbent habit and long-petioled sparsely lobed leaves. It is probably most closely related to **Eremocharis triradiata**, comb. nov. (*Asteriscium triradiata* Wolff) from the Cusco region but differs in neither being at all spinescent nor having fasciculate leaves and purple flowers. Cf. supra pg. 90.

Eremocharis dissecta, sp. nov., frutescens 1 m. alta supra medium ramosissima; ramis teretibus subtiliter striatis laxè dichotomeque ramosis, internodiis 2–4 cm. longis; foliis alternis dissectis trifoliolatis crassiusculis concoloribus ambitu deltoideo-ovatis; petiolo 2–3 cm. longo paullulo compresso; foliola terminali 5–10 mm. longe petiolulata 8–12 mm. longa cuneato-obovata cum apice dentata vel saepissime ambitu quadrangulata et trifoliolata vel irregulariter lacerata; foliolis lateralibus usque ad 5 mm. longe petiolulatis saepe irregulariter lacerato-dissectis et in lobulos angustos divergentes sectis; umbellis compositis 1–4 cm. longe pedunculatis; radiis 4–12 mm. longis geminatis ternatisve fructu delapso subpersistentibus imam ad basem bracteis 1–2 inconspicuis usque ad 1 mm. longis ornatis; umbellulis ca. 12-floris 6–8 mm. diametro bracteolis oblongis lanceolatisve pluribus 0.5–1 mm. longis ornatis; pedicellis gracillimis 2–3 mm. longis; petalis albis, lamina primaria suborbiculari ca. 1 mm. diametro brevissime unguiculata, apice ligulato-attenuato inflexo parti primariae subaequilonga; sepalis ovato-deltaideis acuminatis erectis persistentibus ca. 0.25 mm. longis; filamentis subulatis 1.2 mm. longis; antheris orbicularibus ca. 0.8 mm. longis; mericarpiis 1.5 mm. longis prismaticis dorso planis vel leviter concavis margine angulatis sed vix alatis facie commissurali sulcata in semen intrusa; stylopodiis compressis a stylis linearibus ascendentibus coronatis.—PERU: Cerro del Muerto near La Brea, Dept. Piura, ca. 750 m. alt., March 16, 1927, *Weberbauer* 7761 (TYPE, Field Mus.).

Related to **Eremocharis longiramea**, comb. nov. (*Asteriscium longirameum* Wolff) from Ancash, but differing in its more dissected leaves, smaller bracts and shorter and fewer umbel-rays.

Nolana plicata, sp. nov., ut videtur prostrata abundanter breviterque glanduloso-villosa; partibus plantae inferioribus ignotis; ramis fistulosis herbaceis usque ad 4 mm. crassis, internodiis 2–4 cm. longis; ramulis ascendentibus usque ad 1 dm. longis gracilibus 1–1.5 mm. crassis, internodiis 5–18 mm. longis; lamina folii lanceolata vel anguste ovata 2–3 mm. longa 7–15 mm. lata crassiuscula inconspicue pinnato-nervata apice acuta ad basem versus in petiolum 6–10 mm. longum alatum gradatim attenuata margine anguste revoluta integer-

rima subtus paullo pallidiori; floribus in axillis foliorum solitariis; pedicellis gracilibus 1-2 cm. longis erectis, fructiferis paullo robustioribus deflexis; calycibus ca. 15 mm. longis pentangulatis evidenter plicato-carinatis, tubo campanulato 8-9 mm. longo 9-10 mm. lato, lobis triangularibus ca. 7 mm. longis 5-7 mm. latis; corolla ca. 3 cm. longa extus sparse villosa quam calyce duplo vel triplo longiori, tubo ca. 5 mm. longo ca. 2.5 mm. crasso per calycem occulto intus dense villosa, faucibus subcampanulatis ca. 21 mm. longis ca. 15 mm. crassis, lobis ca. 4 mm. longis rotundis ascendentibus; filamentis 6 et 9 mm. longis subulatis 5-6 mm. supra basem corollae affixis; stylo glaberrimo ca. 15 mm. longo; fructu ca. 10 mm. diametro ca. 5 mm. alto 3-5-lobato maturitate in nuculos 3-5 inaequales disrumpente; nuculis dorso valde convexis rugosis brunneis, ad apicem versus carinatis, ventrale subplanis non rariter angulatis cicatrice granda albida conspicue notatis.—PERU: Atiquipa, Prov. Camaná, Dept. Arequipa, ca. 270 m. alt., Nov. 1915, *Weberbauer 7190* (TYPE, Field Mus.).

The nutlets in *N. plicata* have a nearly plane, almost vertical commissural face which is almost completely occupied by the pale attachment scar. The base of the nutlets is very strongly convex and irregularly rugose. Towards the summit there tends to be a rather definite carina developed. The fruit is quite dry and bony. The calyx is strongly angulate by pronounced plications extending down each calyx-lobe in a manner very suggestive of many species of *Mimulus*.

Bargemontia platyphylla, sp. nov., annua herbacea villosa 1-1.5 dm. alta; caulibus pallidis villosis simplicibus vel saepissime imam ad basem ramosis et in ramos plures elongatos simplices vel sparse breviterque ramosos ascendentes vel decumbentes dissolutis, internodiis 2-6 cm. longis; foliis carnosulis concoloribus sparse villosis, laminis foliorum lanceolatis vel lanceolato-ovatis acutis integerrimis obscure pinnatinervatis, medio-caulinis 2-2.5 cm. longis 7-10 mm. latis ad basem versus in petiolis 5-10 mm. longos saepe anguste alatos contractis, superioribus gradatim reductis basalibus longe petiolatis evanescentibus; floribus in axillis foliorum solitariis; pedicellis gracillimis villosis 2-10(-15) mm. longis ascendentibus, maturitate paullo incrassatis arcuate deflexis; calyce ad anthesim 8-10 mm. longo villosa herbaceo, tubo cupulato 2-3 mm. longo 2-2.5 mm. crasso, lobis lanceolatis acuminatis ca. 7 mm. longis paullo inaequalibus erectis; calyce fructifero accrescenti 5-8 mm. diametro; corolla ca. 10 mm. longa caerulescenti (in sicco aurantiaca) lobos calycis paullo vel vix superante extus sparse villosa intus glaberrima, tubo ca. 2 mm. longo ad 2 mm. crasso, faucibus 6 mm. longis ad apicem versus gradatim

ampliatis apice ca. 8 mm. diametro, lobis 2 mm. longis 3 mm. latis rotundis ascendentibus; antheris 2 et 3 mm. longis glaberrimis inclusis; nuculis ovoideis ca. 2 mm. longis ca. 10 basi affixis; receptaculo lobato.—PERU: hills southeast of Moquegua, Prov. Moquegua, ca. 1550 m. alt., March 22–24, *Weberbauer 7455* (TYPE, Field Mus.; ISOTYPE, Gray Herb.).

A very distinct species quickly recognized by its broad leaves and annual herbaceous habit. There are only two other distinctly annual species in the genus. These are *B. aplocaryoides* (Gaud.) Johnston (= *Aloma pusilla* Ph.) of the coastal region of the Prov. of Antofagasta, Chile, and *B. gracillima* Johnston from the same region as the present new species.

Bargemontia gracillima, sp. nov., annua herbacea sparse inconspicueque villosula erecta 1–1.5 dm. alta; caule subtereti gracili ascendente ramosissimo pallido pustulato, internodiis 5–30 cm. longis; foliis linearibus vel anguste spathulato-linearibus ascendentibus vel patentibus 1–2.5 cm. longis 0.8–1.5 mm. latis carnosulis compressis glabratis pustulosis apice obtusis ad basem versus attenuatis; floribus in axillis foliorum solitariis; pedicellis gracillimis 5–13 mm. longis glabris vel sparsissime villosulis maturitate abrupte reflexis; calycibus ad anthesim 4–6 mm. longis glabris vel sparsissime villosulis, tubo breviter cylindrico 2.5–3 mm. longo 1–1.5 mm. crasso, lobis subulatis acutis erectis inaequalibus basem vel fere ad medium faucium attingentibus; calycibus fructiferis distentis, tubo cupulato 2.5–3.5 mm. crasso 1–1.5 mm. alto, lobis ascendentibus vel recurvis; corolla violacea graciliter infundibuliformi 10–12 mm. longa extus sparse puberulenta, tubo ca. 3.5 mm. longo intus villosulo, faucibus ca. 7.5 mm. longis intus glaberrimis, lobis ovatis 2–2.5 mm. longis ascendentibus; filamentis ca. 3.5 mm. supra basem corollae affixis 4 et 6 mm. longis ad basem versus sparsissime villosulis; nuculis ca. 5 nigris uniseriatis evidentibus crasse ovoideis 1.5–2 mm. longis basi affixis.—PERU: hills southeast of Moquegua, Prov. Moquegua, ca. 1550 m. alt., March 22–24, 1925, *Weberbauer 7457* (TYPE, Field Mus.; ISOTYPE, Gray Herb.).

This species is most closely related to *B. platyphylla* Johnston, differing in being more slender throughout and in having a very sparse and obscure pubescence, a corolla about twice as long as the calyx and very slender linear leaves. The species is a very distinct one.

Bargemontia confinis, sp. nov., fruticosa laxa decumbens canescens sparse arachnoideo-lanosa ramosissima eglandulosa; ramis vetustioribus caudicem fruticosum prostratum ramosum formantibus saepe cum fasciculis foliorum marcescentium ornatis e radice perenni profunda valida erumpentibus; ramis juventate foliosis fruticulosissimis

gracilibus ascendentibus 5–15 cm. longis 0.7–1.5 mm. crassis pallidis, internodiis 3–15 mm. longis; ramulis rariter elongatis plerumque ad axillas foliorum ramorum fasciculos foliorum densos formantibus; foliis carnosulis compressis linearibus vel lineari-spathulatis obtusis 3–10(–20) mm. longis 1(–2) mm. latis; floribus in axillis foliorum ramorum solitariis; pedicellis gracillimis 9–18 mm. longis stricte ascendentibus, fructiferis decurvatis paullo robustioribus; calyce ad anthesim 4–5 mm. longis, tubo cupulato ca. 2 mm. crasso, lobis erectis lanceolatis inaequalibus 2–3 mm. longis; calyce fructifero expandente ca. 4 mm. diametro, lobis erectis vel ascendentibus; corolla violacea infundibuliformi 15–17 mm. longa extus glabrata intus glaberrima calyce duplo vel triplo longiori, tubo 3–4 mm. longo subcylindrico, faucibus ca. 10 mm. longis apicem versus dilatatis ad 10 mm. diametro, lobis ascendentibus rotundis 2–3 mm. longis; filamentis ca. 4 mm. supra basem corollae affixis glaberrimis 3 et 5 mm. longis; nuculis 3–5 uniseriatis subglobosis vel subangulatis ca. 2 mm. crassis tuberculatis nigris oblique subbasaliterque affixis.—PERU: with scattered herbs and *Cereus*, Candarave, Dept. Tacna, ca. 2950 m. alt., March 11–13, 1925, *Weberbauer 7382* (TYPE, Field Mus.; ISOTYPE, Gray Herb.).

A well marked species characterized by its large corollas (which are glabrous on the tube within), fasciculate leaves, sparse arachnoid-lanose eglandulose indument and tuberculate nutlets.

Cacabus flavus, sp. nov., annuus prostratus herbaceus glanduliferus sparse villosulus; foliis cordatis 2.5–5.5 cm. latis 3–6 cm. longis conspicue palmato-pinnate nervatis sparse breviterque villosis concoloribus margine integerrimis vel obscure undulatis basi obliquis inaequilateralibus cordatis vel reniformibus, costa dorsaliter arcuata; petiolis 3–9 cm. longis glanduliferis; pedicellis axillaribus erectis 0.8–1.5 mm. longis (maturitate 1–2 cm. longis) glanduliferis; calycibus 9–11 mm. longis breviter villosis glanduliferis campanulatis in lobos anguste triangulares 4–5 mm. longos erectos breviter ciliatos paullo inaequilongos lobatis; corolla flava infundibuliformi gradatim ampliata 2–4 cm. longa 1.5–2.5 cm. diametro, limba vix explanata breviter lateque lobata extus inconspicue villosula, tubo 3–5 mm. longo 2–3 mm. crasso cylindrico per calycem occulto intus basibus decurrentibus incrassatis villosis filamentorum longitudinaliter 5-costato; staminibus 5 inaequalibus corolla 2–3-plo brevioribus, filamentis filiformibus glabris vel sparse villosulis summam ad apicem tubi corollae affixis, uno brevi 2–3 mm. longo, duobus lateralibus 3–4 mm. longis et duobus 8–9 mm. longis; antheris linearibus 5–6 mm. longis bilocularibus consimilibus; stigmate subcapitato, stylo filiformi stamina breviter

superanti; capsula globosa glaberrima subnitenti per calycem investita ca. 8 mm. diametro.—PERU: open rocky slopes, Tiabaya, Dept. Arequipa, ca. 2050 m. alt., April 8, 1925, *Pennell 13066* (TYPE, Gray Herb.); dry ravines in hills southeast of Moquegua, Dept. Moquegua, ca. 1550 m. alt., March 22–24, 1925, *Weberbauer 7459* (FM.).

This species belongs to the group of *C. maritimus*, having the mature calyx tightly investing (and finally ruptured by) the fruit. The calyx is membranaceous, not at all inflated, and is marked only by ten very weak ribs. It is readily separated from the known species of the genus by its bright yellow corolla. To judge from the meager description and figure of *C. integrifolius* Ph., from northern Chile, that species must be closely related. The new species differs, however, in its large yellow flowers and in the form of the corolla and calyx.

Salpiglossis albiflora, sp. nov., annua herba 1–2.5 dm. alta gracilis sparse stricteque ramosa glaberrima vel paullo inconspicueque villosula non rariter plus minusve glandulifera; foliis integerrimis enervatis, basalibus anguste oblanceolatis vel spathulato-linearibus 1–6 cm. longis crassiusculis apice rotundis, caulinis linearibus erectis medialibus saepe 0.5–1.5 rariter ad 3 cm. longis supremis valde reductis; pedicellis gracilibus 1–3 cm. longis ascendentibus axillaribus et quasi terminalibus; calycibus evidente irregularibus 5–6 mm. longis 2–2.5 mm. crassis costatis inter costas pallide scariosis, costis herbaceis brunneis vel purpurascensibus supra in dentes prolongatis, dentibus triangularibus vel lanceolatis supremo recto 2–3 mm. longo ceteris 1–2 mm. longis; corolla alba 14–18 mm. longa; tubo 10–14 mm. longo recto parte inferiori 3 mm. longo gracillimo ca. 0.7 mm. crasso per calycem occulto, parte superiori et media tubulato 1–1.5 mm. crasso, extus glabro vel sparsissime inconspicueque villosulo, intus basem versus rariter retrorso-villoso; faucibus paullo inflatis et obliquis brevibus flavis; limba obliqua, lobis ascendentibus semiorbicularibus vel late ovatis 2–3 mm. latis apice rotundis reticulato-nervosis; staminibus 4 didymis (vel rariter 2?), duobus inferioribus sterilibus supra medium corollae affixis linearibus; duobus superioribus perfectis cum filamentis linearibus glabris infra medium corollae affixis, antheris orbicularibus bilocularibus 1 mm. diametro; stigmatibus bilobatis lobis latissimis margine superiori incrassatis et viscoso-glandulosis inferne auriculatis et scariosis antheras amplectentibus; capsulis ovoideis calyce inclusis; seminibus parvulis brunneis obscure alveolatis.—PERU. Lima: San Bartolomé, ca. 1550 m. alt., April 4, 1910, *Weberbauer 5297*; hills near Chosica, ca. 1650 m. alt., April 1910, *Weberbauer 5325*; grassy slope, Matucana, ca. 2400 m. alt., April–May, 1922,

Macbride & Featherstone 375. Moquegua: Mt. Estuquiña northwest of Moquegua, ca. 1650 m. alt., March 22, 1925, *Weberbauer 7424a* (TYPE, Field Mus.); between Moquegua and Torata, ca. 1950 m. alt., March 21, 1925, *Weberbauer 7424*.

This species, one of the Loma-plants, is obviously most closely related to the other annual Peruvian species, ***Salpiglossis acutiloba*** nom. nov. [= *S. linearis* Johnston, Contr. Gray Herb. lxxxi. 96 (1928); not Hook. (1831)], but differs conspicuously in the form of the corolla-lobes, in the form of the stigma and in the ribbed somewhat curved calyx. The corolla is less pubescent inside and the lower pair of stamens bear rudimentary anthers. When I described *S. acutiloba* I emphasized the occurrence of the fifth stamen. I am now inclined, however, to agree with Miers, *Illust. So. Am. Pl.* ii. 58 (1857), and believe that the fifth stamen may be present or absent in most species of the genus. In form the emarginate and lobed stigma of *S. albiflora* is very similar to that of *S. schwenkioides* (Benth.) Wetts. and consequently quite different from the rhomboidal non-emarginate stigma of *S. acutiloba*.

Polyachyrus mollendoensis, sp. nov., scandens; ramis elongatis scandentibus fistulosis minute abundanter glandulosis glabris; foliis grandis 1-1.8 dm. longis 4-8 cm. latis irregulariter pinnato-lobatis herbaceis supra glaberrimis minute glandulosis subtus dense incano-arachnoideis margine paullulo revolutis, basi in auriculas conspicuosissimas 2.5 cm. latas amplexicaules productis vix decurrentibus, lobulis grossis 3-4-jugatis integris vel sinuato-marginatis apice obtusis vel rotundis, longitudine lobi latitudini subaequilonga; glomerulis capitulorum 1.8-2 cm. diametro subglobosis 1-5 cm. longe pedunculatis 2-4 in cymam laxissimam dispositis; pedunculis bracteis lanceolato-cordatis 1-2 cm. longis ornatis; receptaculo glomeruli subgloboso tomentoso, bracteis 5-6 mm. longis lanceolato-subulatis sparse glanduliferis; involucris flosculorum 1-2-floris 5.5 mm. longis glaberrimis non rariter sparse glanduliferis; tegulo exteriori paullo supra basem callo prominenti saepe notato; flosculis rosaceis 8-9 mm. longis, tubo (faucibus vix differentiatis) 4.5 mm. longo extus glanduloso, labia interiori in lobos 2 acutos 4 mm. longos ligulatos divisa, labia exteriori 2.1 mm. lata 4-4.5 mm. longa apice truncata tridentata; antheris (partibus polliniferis) linearibus 1.5 mm. longis apice appendicula 1.8 mm. longa hyalina coronatis basi caudis 1.5 mm. longis ornatis; setis pappi 5 mm. longis.—PERU: about rocks on side of gulch at lower edge of fertile belt in hills directly back of Mollendo, Dept. Arequipa, Oct. 16, 1925, *Johnston 3538* (TYPE, Gray Herb.).

This species is obviously most closely related to *P. glandulosus* Nutt (*P. villosus* Wedd.) but is a coarse scandent, rather than an erect slender plant, and has very large leaves with 3-4-jugate very broad rounded lobes, rather than much smaller ones with 5-6-jugate elongate angularly toothed or lobulate lobes. The florets are pinkish with stamens of a similar although somewhat darker shade.