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LEAFLETS  
OF  
WESTERN BOTANY

VOLUME IV

SAN FRANCISCO, CALIFORNIA  
1944-1946

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ALICE EASTWOOD AND JOHN THOMAS HOWELL

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# LEAFLETS *of* WESTERN BOTANY

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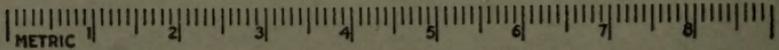
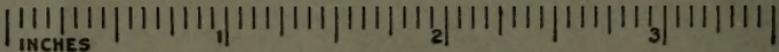
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ALICE EASTWOOD and JOHN THOMAS HOWELL

MARIPOSA, A NEGLECTED GENUS

BY ROBERT F. HOOVER

**Mariposa** (Wood) Hoover, gen. nov., *Liliacearum*. *Calochortus* sect. *Mariposa* Wood, Proc. Acad. Philad. 1868: 168. The genus *Calochortus* as currently accepted includes at least two, and probably more, sharply differentiated groups. Although *Mariposa* has generally been recognized as a section distinct from typical *Calochortus*, its truly distinctive features appear to have been overlooked; at least, no mention of most of these features can be found in any publication. During the twenty-eight years of my residence in California, I have been particularly interested in that group of plants, and my observations have convinced me that two different genera exist where only one has been recognized. The two genera differ in the following respects.

Leaves never grooved; stigma-branches slender, on a short style; seeds rather coarsely reticulate-pitted, not much flattened, dark purple or purple-tinged, at least in all Californian species; chromosomes always in a multiple of ten<sup>1</sup>.....*Calochortus*

Leaves all with a sharp groove extending the entire length on the upper side; stigma-branches stout, sessile on ovary<sup>2</sup>; seeds very minutely reticulate, the reticulations not forming evident pits, much-flattened, whitish or greenish; chromosomes usually in a multiple of seven or eight .....*Mariposa*

Although it must be admitted that I have been unable to examine mature seeds of all the species, no species has yet been seen which in any way combines the characters of the two groups as listed above. It therefore does not seem consistent with scientific methods of classification to place them in one genus. Probably the generic characters have been overlooked because adequate material of living plants has not been available to botanists.

If it is still considered desirable to unite the two groups in one genus, it should be remembered that there are many pairs of genera, at present universally regarded as distinct, which resemble each other more than do *Calochortus* and *Mariposa*. Examples are *Agrostis* and *Calamagrostis*, *Vicia* and *Lathyrus*, *Medicago* and *Melilotus*, *Stellaria* and *Arenaria*, *Clarkia* and *Godetia*, *Lamium* and *Stachys*, and *Aster* and *Corethrogyne*. If genera

<sup>1</sup> Information as to chromosome numbers was obtained from data published by Beal (Bot. Gaz. 100:528—547,—1939).

<sup>2</sup> This key character refers to the condition in anthesis. In fruit, the capsule in most species of *Mariposa* containing no seeds and not becoming expanded, presents the appearance of a style.

\* Leaflets of Western Botany, Vol. IV, pp. 1-16, February 2, 1944.

are to be based on the actual relationships of plants rather than on mere custom or tradition, a uniform procedure ought to be followed in all such cases.

It may be noted that there is a third group of species occurring in California, represented by *Calochortus Weedii* Wood, which is different from both *Mariposa* and true *Calochortus*. These species have fibrous-coated bulbs and probably constitute another distinct genus. However, I have had very little opportunity to study living plants of the *Calochortus Weedii* group and consequently am unwilling to venture a definite statement as to its generic status.

Field and garden observations have convinced me that the species listed below are all valid. There is a considerable number of other species which undoubtedly should be transferred to *Mariposa*, but as I am not familiar with them, I refrain from making any change in their classification.

**Mariposa catalinæ** (Watson) Hoover, comb. nov. *Calochortus catalinæ* Watson, Proc. Amer. Acad. 14: 268 (1879).

**Mariposa clavata** (Watson) Hoover, comb. nov. *C. clavatus* Watson, Proc. Amer. Acad. 14: 265 (1879).

**Mariposa Leichtlinii** (Hooker) Hoover, comb. nov. *C. Leichtlinii* Hooker, Bot. Mag. ser. 3, 26: pl. 5862 (1870).

**Mariposa lutea** (Douglas) Hoover, comb. nov. *C. luteus* Douglas ex Lindley, Bot. Reg. 19: pl. 1567 (1833).

**Mariposa macrocarpa** (Douglas) Hoover, comb. nov. *C. macrocarpus* Douglas, Trans. Hort. Soc. Lond. 7: 276 (1828).

**Mariposa pratensis** (Purdy) Hoover, comb. nov. *C. superbus* var. *pratensis* Purdy ex J. T. Howell, Leafl. West. Bot. 1: 12 (1932).

**Mariposa splendens** (Douglas) Hoover, comb. nov. *C. splendens* Douglas ex Bentham, Trans. Hort. Soc. Lond. ser. 2, 1: 411 (1834).

**Mariposa superba** (Purdy) Hoover, comb. nov. *C. superbus* Purdy ex J. T. Howell, Leafl. West. Bot. 1: 11 (1932).

**Mariposa venusta** (Douglas) Hoover, comb. nov. *C. venustus* Douglas ex Bentham, Trans. Hort. Soc. Lond. ser. 2, 1: 412 (1834).

In addition to those listed above, there are two species of *Mariposa* which apparently have never been named. Both of them, so far as they have received any attention at all, have been confused with *M. venusta* and universally referred to that species. The three species, however, are readily distinguished by the following features.

Stem with several (usually 3 to 5) bulblets at base; glandular area of petal  
 lunate or nearly rectangular, transversely elongate; capsule be-

fore dehiscence stout (narrowly lanceolate in outline), 4—6 cm. long .....*M. argillosa*

Stem with one bulblet, rarely two or none; glandular area of petal rounded or somewhat quadrate, scarcely if at all transversely elongate; capsule before dehiscence rather slender (linear in outline), 6—8 cm. long.

Petals without markings above the lowest third, with a red spot surrounding the glandular area and frequently a small round red spot immediately above it; seeds 5—6 mm. long, 2.75—3 mm. wide<sup>3</sup> .....*M. simulans*

Petals with a conspicuous central dark spot and frequently also a lighter spot near the apex; seeds 4.5—5.25 mm. long, 1.75—2 mm. wide .....*M. venusta*

**Mariposa argillosa** Hoover, spec. nov. Glauca; caule basi aliquot bulbos ferenti; petalis albis usque ad purpureis, prope medium macula rubra saepe flavescenti-circumdata tinctis, areola glandulosa transverse orthogonia vel lunata; capsula lanceolata; seminibus 5.5—6 mm. longis, 3 mm. latis.

Stem with several bulblets at base; herbage glaucous; petals white to purple, with red spot near middle, the red spot often surrounded by pale yellow, the glandular area transversely rectangular or lunate; capsule lanceolate in outline; seeds 5.5—6 mm. long, 3 mm. wide.<sup>3</sup>

*Mariposa argillosa* resembles *M. venusta* in the color and markings of the petals, but the shape of the glandular area of the petals and the shape of the capsule indicate a closer relationship to *M. lutea*, to which, remarkably enough, no botanist appears to have referred it. In some localities it grows in company with *M. lutea*, but under such circumstances remains genetically distinct from that species. Dried specimens, in which the shape of the glandular area is not easily visible, are readily confused with *M. venusta*, and are usually found labelled as that species in herbaria.

This species is always found in hard clay soil in areas of volcanic or metamorphic rocks. The following specimens have been seen, indicating a distribution in the California Coast Ranges from San Mateo County to San Luis Obispo County. San Mateo Co.: Portola, *Elmer No. 4763*; Redwood City, *Abrams No. 7499*. Santa Clara Co.: near Coyote, *Ferris No. 823*. San Benito Co.: Arroyo Dos Picachos, *J. T. Howell No. 13814*, *Hoover No. 3488* (type). San Luis Obispo Co.: San Luis Valley, *Summers in 1882*.

<sup>3</sup> The measurements given refer only to fully developed seeds not distorted by crowding.

**Mariposa simulans** Hoover, spec. nov. Habitu *M. venusta* accedens; petalis albis extus sæpe dilute rosaceis, circum areolam glandulosam rutilis et sæpe maculam rutilam proxime supra areolam ferentibus; seminibus 5—6 mm. longis, 2.75—3 mm. latis.

Plant with appearance of *M. venusta*; petals white, often pink on the outside, the glandular area surrounded by bright red, and often also with a small red spot immediately above; seeds 5—6 mm. long, 2.75—3 mm. wide.

*Mariposa simulans* is obviously closely related to *M. venusta*. The seeds of the two species differ in shape, but plants in flower can hardly be distinguished except by the color markings of the petals. In the latter respect, *M. simulans* resembles *M. catalina*, a species which is quite different in characters of the fruit. This superficial resemblance to *M. catalina* has suggested the proposed specific name. The distinctness of *M. simulans* from *M. venusta* may be subject to doubt, but it should be noted that, although both species occur in the same region, no intergrading plants or apparent hybrids between them have ever been collected.

This is a local species, known to occur only in a limited section of San Luis Obispo County. I have observed it in the field only once, but have since studied it under cultivation. The following collections have been seen:

La Panza, *Keck No. 2815* (type, Herb. Univ. Calif.); Trout Creek, *Condit in 1908*; old road to Pozo, *Eastwood No. 15144*.

## A NEW MANZANITA FROM BAJA CALIFORNIA

BY ALICE EASTWOOD

**Arctostaphylos australis** Eastwood, spec. nov. Fruticosa, divaricate intricateque ramosa, dense foliosa; caulibus senioribus glabris, junioribus puberulis; foliis subpallidis, ellipticis, apice acutis, basi obtusis, puberulis, in juventute rubescentibus, maximis 3 cm. longis et 2 cm. latis, petiolis circa 5 mm. longis; paniculis in alabastro erectis, ramis gracilibus, rubris, bracteis minutissimis; floribus albis, 4—5 mm. longis, segmentis calycis glabris, membranaceis, rubescentibus; fructu glabro, 4 mm. diametro, nuce solida.

Type in Herb. Univ. Calif., Los Angeles, collected in flower in Pine Canyon near San Antonio Mesa, Baja California, March 27, 1940, by Carl Epling and Wm. Robinson, and in rather young fruit by the same collectors on the ridge above Pine Canyon near San Vincente, Baja California, April 25, 1940.

The striking inflorescence erect in bud with almost thread-like branches and minute bracts at once suggests affinity of this plant with *A. insularis* Greene from Santa Cruz Island, Cali-

fornia. It differs, however, in the puberulent indument on leaves and young stems, the smaller flowers, the paler green smaller leaves, and the small berries each containing a single nut. The young leaves have a rosy tinge and the budding panicles are a dark red.

## A NEW FRUTICULOSE ERIOGONUM

BY JOHN THOMAS HOWELL

**Eriogonum Ripleyi** J. T. Howell, spec. nov. Fruticulus depressus ex radice lignea elongata crassiuscula, ramis divergentibus prostratis vel ascendentibus, cortice tenuissime rugulosa nigro-grisea vestitis, et ramulis abbreviatis folia in rosula terminali ferentibus supra basibus foliorum veterum persistentibus conferte vestitis infra et ramulis raris elongatis folia separata ferentibus tomento albo vestitis, caulibus 5—15 cm. longis, ad 5 mm. diametro; foliis 2—6 mm. longis, 0.5—1 mm. latis, anguste oblanceolatis, valde revolutis, tenuiter villosis supra, dense tomentosus infra, acutis, angustatis in petiolum brevem basi late expansum et membranceo-marginatum; pedunculo ebracteato perbrevis, 1—3 mm. longo, glabro, solitarium involucrum ferenti; involucris campanulatis, 3 mm. longis, 3 mm. latis, tenuissime villosis vel subglabris, late submembranaceo-marginatis, prominenter lobatis, lobis 3 ad 5, inæqualibus, triangularibus, ad 1 mm. longis, sæpe mucronulatis, involucri basi late cuneatis; bracteolis linearibus subvillosis et minutissime glanduloso-papillatis; pedicellis sparse pilosis; perianthiis eximiiis, segmentis albis medio rubido-costatis, margine crenulatis, plus minusve undulatis, submarginatis, intus levissime glanduliferis prope basin, segmentis exterioribus suborbicularibus, 3—3.5 mm. longis, 3.5—4 mm. latis, interioribus minoribus, late obovatis, 3 mm. longis, segmentis perianthii basi paulo crassiusculis et conjunctis circa 0.5 mm.; filamentis prope basin dense villosis-tomentosis; ovario glabro; achenio ignoto.

Type: Herb. Calif. Acad. Sci. No. 311,671, collected on steep declivities of sandy clay on the edge of a sandstone mesa where it was associated with pinyons, 13 miles southwest of Frazier's Wells, el. 6000 feet, Coconino County, Arizona, May 13, 1943, by H. D. Ripley and R. C. Barneby, No. 5226.

The most remarkable character of *E. Ripleyi* is the short stalk which carries a solitary involucre and which is without bracts either at the base or at the top. If there were bracts at the base of the structure, it might be interpreted as the so-called pedicel which is the distinctive mark of the subgenus *Ganysma*, but since no bracts are discernible and since the character of the foliage and flowers does not suggest an affinity to that group, the structure is undoubtedly an ebracteate peduncle. The only other

species in *Eriogonum* that I know which has a similar structure is *E. cæspitosum* Nutt., a rather variable species widespread in the western United States. Although these two species are characterized by a structure so unusual, I do not believe that it indicates an especially close relationship since there seem to be fundamental differences in the flowers and foliage.

In the flowers of *E. cæspitosum*, the perianth-segments are united below and drawn down into a slender solid stipe-like base which is diagnostic of the subgenus *Eueriogonum*, and although this structure is sometimes quite short in certain forms of *E. cæspitosum*, it is always present. In *E. Ripleyi*, no such structure is indicated: the perianth-segments are united below, but they form a shallow and hollow bowl that is broadly cuneate or rounded above the callous base. Flowers of this kind are found in several groups of the subgenus *Oregonium*.

The arrangement of leaves in *E. cæspitosum* and *E. Ripleyi* is quite different, but since both species are depressed dwarfs with much-condensed habits, the divergence in this character is almost concealed under a marked habitual simulism. In the more loosely branched forms of *E. cæspitosum*, however, the character of the shoot may be discerned: a naked stem bearing a congested terminal tuft of leaves, a type of shoot which is produced by the excessive elongation of the first internode of the season's growth and the rosulate abbreviation of all others. As in the character of the perianth-base, this type of branching in *E. cæspitosum* is highly characteristic of the subgenus *Eueriogonum*.

In *E. Ripleyi*, the character of the vegetative shoot is quite different and I believe holds the most obvious clue to its relationship. The usual type of leaf-arrangement for the species is found on the numerous spur-like branches, where the leaves are rosulate-congested because of the very short internodes. The stems below this tuft of leaves are entirely covered by the persistent imbricated bases of leaves of past seasons and it is only on the main stems of the plant after these long-persistent bases have been finally sloughed off that a blackish-gray finely furrowed bark is apparent. Besides this shortened kind of shoot which gives to *E. Ripleyi* its characteristic appearance, there is another kind which appears to be occasional or rare. In this the internodes

are relatively elongate so that the leaves are quite discrete and the whole is clothed by a white tomentum. This is a vigorous type of shoot representing a season's growth and it may arise directly from an old basal stem or from the end of one of spur-branches. It does not appear to produce an inflorescence, but after the season's growth it passes into the usual slow-growing type of stem which alone seems to be floriferous; and from the axils of its spaced leaves, in subsequent seasons secondary spur-branches may arise.

In the abbreviated branches of *E. Ripleyi*, I can see only a remarkable condensation of the plant axis that is scarcely exceeded in *Eriogonum* even in the cushion-plants of alpine summits, a character, however, only specific in significance; but in the rarer elongate type of shoot, I can perceive a direct phylogenetic connection between *E. Ripleyi* and such southwestern dwarfs as *E. bicolor* M. E. Jones and *E. pulchrum* Eastw. of the *E. microthecum* group. In these, both kinds of branches also occur, but the more common typical kind is the elongate sort which is so rare in *E. Ripleyi*. Also there are marked correspondences between the plants in the leaves, involucre, and flowers. The revolute leaves with expanded bases are quite similar in the three; the membranous margin of the involucre in *E. Ripleyi* has a textural equivalent in *E. bicolor*; and the bowl-like flower-base which is so shallow in *E. Ripleyi* is much deeper and more or less bulbous-inflated in the other two. Hence, as far as the ebracteate peduncle is concerned, I would interpret it as yet another morphologic expression of the marked condensation and reduction which seems to characterize *E. Ripleyi*, and I should judge that in this outstanding character, *E. Ripleyi* might bear to the *E. microthecum* group much the same relation that *E. caespitosum* bears to the *E. umbellatum* group.

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## A NOTE ON THE DISTRIBUTION OF SOME WESTERN DICOTYLEDONS

BY R. C. BARNEBY

Among the plants from the southwestern deserts collected during recent years by Mr. H. D. Ripley and the writer there have inevitably turned up a few records of special interest, whether on account of the rarity of the species involved or as evidence of

an extended range. Some of these have already found their way into print through monographic studies, but others, particularly those belonging to groups of which our knowledge is more or less up to date, seem unlikely to be published for many years, and it is in order to place them on record that these notes have been prepared. It has also seemed a convenient opportunity to set down a few observations on the habitat or peculiar attributes of the less common species, particularly when such details are not generally known.

The numbers cited below are derived from the collections of Mr. Ripley and the writer, and corresponding specimens have been deposited in the herbarium of the California Academy of Sciences.

ATRIPLEX GRACILIFLORA M. E. Jones. Colorado: alkaline clay knoll 16 miles north of Loma, Mesa Co., alt. 4950 ft., No. 5471. This most distinct and interesting species is known to me only from one or two collections from southeastern Utah, but like many plants endemic to the Navajo Basin it extends eastward into Colorado. Our material agrees with Jones' diagnosis in being annual, in spite of Rydberg's suggestion (Fl. Rocky Mts. & Adj. Pl. 248,—1917) in his key to the genus that it belonged with the shrubby or perennial species. This error may have arisen from the fact that Jones, in searching for an affinity for *A. graciliflora*, stated that "this remarkable plant must rank near to the shrubby *A. canescens* [James] in the fruit character, though so unlike it in all other respects." This observation seems to smack of the superficial, for the only feature common to the fruiting structure of *A. canescens* and *A. graciliflora* lies in the decurrence of the bracts along the pedicel of the pistillate flower. In *A. graciliflora*, the orbicular, obscurely sinuate fruiting bracts are strongly connate throughout their whole circumference except for a minute terminal pore through which the style is exerted in anthesis, and in this character the species recalls the monotypic genus *Zuckia* Standl., while the entire fruit resembles to a marked degree the samara of a *Ptelea*.

STANLEYA VIRIDIFLORA Nutt. California: Smoke Creek, northeast of Viewland, Lassen Co., alt. 4400 ft., No. 5761a. *Stanleya viridiflora*, although mentioned by Jepson (Fl. Cal. 2:20, 1936) as having been collected near the boundary of California

in Esmeralda County, Nevada, has not actually been reported from the state. The nearest station recorded by Rollins in his monograph of the genus (*Lloydia* 2:124,—1939) is in southeastern Oregon or perhaps adjacent Nevada, in any case some 180 miles distant from the present locality. In Lassen County, exactly as I have seen it in the neighborhood of Elko, Nevada, *S. viridiflora* occurs exclusively on denuded slopes of alkaline clay such as are the home of species of *Miltitzia* A. DC. and *Scutellaria nana* Gray.

*SOPHORA SERICEA* Nutt. Utah: Enterprise, Washington Co., alt. 5750 ft., *No.* 4968. Though widely distributed over the plains east of the Rockies from South Dakota to Texas, and extending westward through Arizona as far as Yavapai County, *S. sericea* has apparently remained unknown north or west of the Colorado River. In the western part of its range the species often occurs along roadsides, in disturbed places or in fallow ground where, although well-established, it has the air of being a comparatively recent immigrant. Specimens in herbaria may often be found among undetermined *Astragalus*.

*PARRYELLA ROTUNDATA* Wooton. Arizona: Willow Springs north of Cameron, Coconino Co., alt. 4850 ft., *No.* 4876. In the summer of 1942 a few specimens of this curious legume were discovered by Mr. Ripley at the foot of the great escarpment known as the Echo Cliffs at a point about a mile south of Willow Springs. They grew in crevices of hard red sandstone pavement, forming low, gnarled bushes of rounded outline and only two or three decimeters high. In early June, when the related but very different *Parryella filifolia* T. & G., which grew nearby on dunes along a watercourse, was only then beginning to expand its first racemes, *P. rotundata* was already in mature fruit, and no flowers were obtained. According to Kearney and Peebles (*Fl. Pl. Ariz.* 452,—1942), the species, although first collected half a century ago, has been known only from the type-locality near Winslow, where Wooton stated that he encountered but a single plant, and it thus appears to be one of the rarest of our western *Fabaceæ*. Well-developed leaves with their very numerous and crowded orbicular leaflets tapering upwards along the rachis somewhat resemble the fronds of *Notholæna sinuata* var. *crenata* Lemm.

CYMOPTERUS GILMANI Cov. & Mort. Nevada: Spotted Range, southwest Nye Co., alt. 4500 ft., *No. 3418*; north end of Desert Range, Clark Co., alt. 3500 ft., *No. 3337*; Pintwater Range, Clark Co., *No. 2913*. Also observed on Sheep Mt. near Jean, Clark Co. Although not uncommon throughout the low limestone mountains of southwest Nevada, this species seems to have been reported only from Death Valley in adjacent California. On one deeply eroded calcareous hill at the foot of the Pintwater Range, *C. Gilmani* was noticed as the dominant species on hot banks of detrital gravel mixed with clay: with it grew *Acamptopappus Shockleyi* Gray and *Penstemon petiolatus* Bdg. As they approach maturity the large handsome fruits are sometimes suffused with rose or purple, though normally the wings at least are white.

CYMOPTERUS BASALTICUS M. E. Jones. Nevada: foothills of the Snake Range, 8 miles west of Baker, White Pine Co., alt. 5800 ft., *No. 3566*. An exceedingly rare plant, long known only from the type station west of Wawa in Beaver County, Utah, where it was said to occur at an altitude as high as 7000 feet. In Nevada it is confined to an area of sterile, alkaline clay hills, where it is associated with *Hermidium alipes* Wats., *Artemisia spinescens* D. C. Eat., and *Penstemon dolius* M. E. Jones.

CYMOPTERUS RIPLEYI Barneby. This species is evidently more widely distributed in southern Nevada than was at first supposed, having now been collected in Lincoln County (near Crystal Springs, *No. 4410* and *4411*; Pahrnagat Mts., *No. 4405*) and in yet another locality in Nye County (east of Warm Springs, *No. 4433*). It is strictly confined to sand-dunes or deep sandy soil of open valleys, and sometimes occurs in great abundance.

CYMOPTERUS JONESII C. & R. Nevada: detrital slopes beneath cliffs along the Muddy River, 2 miles south of Caliente, Lincoln Co., *No. 2517*. Rather common in the juniper belt of the Highland Range, whence it had seeded down into the gorge of the Muddy River: otherwise known only from southwestern Utah.

SWERTIA ALBICAULIS (Griesb.) O. Kze. (? var.). Nevada: Toquima Range, between Belmont and Manhattan, Nye Co., on sandy slopes among pines, alt. 7400 ft., *No. 3670* (fl.) and *3999* (fr.). According to St. John's recent account of *Swertia* (Amer.

Midl. Nat. 26:1—29,—1941) this plant keys out to the dichotomy embracing *S. albicaulis* and *S. modocensis* St. J., but it does not entirely agree with the description of either. With its strongly pubescent herbage, opposite leaves and solitary linear-elliptic fovea, it would doubtless fall, however, within the specific limits of *S. albicaulis* as treated by Jepson (Fl. Calif. 3:94,—1939), and without fuller understanding of St. John's segregates from this species it seems undesirable to describe further forms. In any case it is interesting to note that, with the exception of *S. gypsicola* Barneby, it is the only *Frasera* of its type as yet encountered in Nevada, and moreover in a station strikingly remote from the northern Sierra Nevada, where its near relatives are so highly developed.

*ASCLEPIAS CUTLERI* Woodson. Utah: along the San Juan River west of Bluff, San Juan Co., alt. 4500 ft., No. 5382. *Asclepias Cutleri*, described quite recently from northeastern Arizona, has not been reported outside that state. On the dunes near Bluff, where it is associated with *Eremocrinum albomarginatum* M. E. Jones, *Astragalus sabulorum* Gray, and *Euploca albiflora* (Raf.) Jtn., it is rather abundant and of characteristic habit. The few stems which rise from a slender though deep-seated vertical root are abruptly bent near the surface of the ground and spread horizontally over the sand, while the narrowly linear leaves are somewhat distichously arranged in short, flat sprays. The pendent follicles are indeed remarkable.

*NAMA PUSILLUM* Lemmon. Nevada: Sheep Mt. near Jean, No. 3328; near Garnet, No. 3340. Also observed near Glendale—all localities in Clark Co., alt. ca. 2500 ft. Apparently known hitherto only from the deserts of southern California, and nowhere common. The related *N. densum* Lemm., which is widely distributed on alkaline dunes of the interior and extends southward in Nevada at least to Callaway (No. 3638) and the Pancake Range (No. 3651) in Nye County, was inexplicably omitted by Tidestrom from the Flora of Utah and Nevada.

*STACHYS ROTHROCKII* Gray. Utah: valley of the Virgin River near Orderville, Kane Co., alt. 5400 ft., No. 4806. *Stachys Rothrockii* is recorded by Epling (ap. Fedde, Repert., Beih. 80, 1934) only from the plateau region of northern Arizona and New Mexico lying between the Colorado River and the Mogollon

Escarpment, so the present locality marks a somewhat surprising extension of range. At Orderville the species occurs on knolls of stiff "gumbo" clay such as have been described by J. T. Howell (Leafl. West. Bot. 3: 137,—1942) as the home of *Phacelia cephalotes* Gray, *Astragalus ampullarius* Wats., and *Eriogonum subreniforme* Wats., and it is interesting to record that the same rare species, with the exception of the phacelia, are again present, forming another island of a peculiar and limited association. The *Stachys* has a distinctive manner of growth. At this station (as well as near Williams, Ariz.) it was observed that the perennial root runs horizontally at considerable depth, giving rise at intervals to slender, at first simple, herbaceous stems, which thus appear to spring solitary from the earth. For six inches or so the erect primary axis is subterranean, with few, elongated, very slender yet evidently quadrangular internodes, but at its emergence it becomes abruptly more robust and commonly produces one or more pairs of opposite, ascending branches. The lowest, subterranean, minutely bracteate nodes frequently bear adventitious roots.

QUINCULA LOBATA (Torr.) Raf. Nevada: dry lake bed between Crystal and Garnet, Clark Co., alt. 2050 ft., No. 3348. *Quincula lobata* has been fairly frequently reported from as far west as California (e. g., by Britton and Brown), but the western floras do not substantiate the record. The most reliable and recent account of its distribution as given by Kearney and Peebles (Fl. Pl. Ariz. 792,—1942, as *Physalis*) suggests Yuma County, Arizona, as the western limit of its occurrence: no record at all has been seen from Nevada. This form has exceptionally large flowers.

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## A RECONSIDERATION OF THE GENUS MILTITZIA

BY JOHN THOMAS HOWELL

On June 10, 1934, as I travelled northward from Susanville to Alturas on my first collecting trip into northeastern California, a species of *Miltitzia* was one of the most exciting and provocative plants which I discovered—exciting because this was one of my early meetings with the genus in the field, provocative because the aspect of the plant with its lavender and violet corollas was

more like *Phacelia Fremontii* as I remembered that species in southern Californian deserts than like the *Miltitzia* of my herbarium experience. Again four years later, on August 8, 1938, when botanizing on the saline flats of Long Valley, Mono County, California, I eagerly collected summer-dried fragments of *Miltitzia pusilla* for a "new phacelia," a plant quite beyond my experience in *Phacelia* because it was a *Miltitzia*! And yet again, on May 15, 1941, the problem of *Miltitzia* again came to the fore, this time on the east side of Montgomery Pass, Nevada, where young plants of *Phacelia gymnoclada* presented an appearance so *Miltitzia*-like that I was at a loss in the field to be certain of their generic position. More recently, while attending to a systematic revision of *Phacelia* sect. *Microgenetes*, I was so impressed with the *Miltitzia*-like character of the group that a critical study of *Miltitzia* was determined imperative in order that the relative positions of *Miltitzia* and *Phacelia* sect. *Microgenetes* might be definitely stated. Now, as a result of a detailed study of *Miltitzia*, I have concluded that it should be treated as a section in *Phacelia*, coequal with and most closely related to section *Microgenetes*.

A review of the literature discloses that I am not the first to be puzzled by the proper position of species that have constituted the genus *Miltitzia* A. DC. The earliest species in the group was described doubtfully as a species of *Eutoca* R. Br. by Hooker and Arnott (1840), who remark that it differs "by the persistent but marcescent corolla . . ." the character which to the present day remains the most critical for the group. In 1857, when describing *Emmenanthe parviflora*, the second known species now referable to *Miltitzia*, Asa Gray discussed briefly the differences between *Miltitzia* and *Emmenanthe* Benth. and concluded that *Miltitzia* should be treated as a subgenus of *Emmenanthe*. Later, in treating the more numerous species in his *Conspectus of the North American Hydrophyllaceae* (1875, p. 312), he allied *Emmenanthe* sens. lat. to *Phacelia*, indicating clearly the real generic cleavage between his two subgenera by his subgeneric diagnoses (pp. 328, 329). In 1871, Torrey confused a collection of *Miltitzia* with the type collection of his *Phacelia pusilla*; and relatively recently, Brand annotated as *Phacelia* this same collection in the United States National Herbarium, although years

before it had served Gray as the type of *Emmenanthe pusilla*. The impressive similarity between *Miltitzia* and *Phacelia* sect. *Microgenetes* led M. E. Jones to remark concerning *Emmenanthe glaberrima*: "This would appear to belong to section *Microgenetes* of *Phacelia* and probably does. . . . *Emmenanthe* as now regarded stands on a slim foundation" (1908, pp. 51, 52). The most recent evidence of the confusing nearness of *Miltitzia* to *Phacelia* has been the renaming of an old widely distributed *Phacelia* as a new *Miltitzia* (Osterhout, 1926, p. 35). Most recent floristic workers in west American botany, as well as Brand, monographer of *Hydrophyllaceæ*, have recognized *Miltitzia* as a distinct genus, the yellow marcescent persistent corolla being used to separate it from *Phacelia* and the turgid and ovoid capsule to separate it from *Emmenanthe*.

Actually there is very little difference between *Phacelia* and *Miltitzia* on the one hand and *Emmenanthe* on the other in the character of the capsule, although this has been diagnostically stressed by Brand (1913, p. 58) and by Jepson (1943, p. 224), and in his original description of *Emmenanthe*, Bentham described the ovary as "oblongo-compressum" (1835, p. 281). Certainly the capsule of *Emmenanthe* is not "plano-compressa" as it is described by Brand (l. c.), and although in shape it is more elongate-oblong than in *Miltitzia*, the capsule of *Miltitzia*, as in many species of *Phacelia*, varies from ovate and oblong-ovate to truly oblong. Gray (1875, pp. 328, 329) and Jepson (l. c.) contrast the persistent style of *Miltitzia* with the deciduous style of *Emmenanthe*, but this is a distinction that is not maintained in *Miltitzia*. However, the marked habitual dissimilarity between *Emmenanthe* on the one hand and *Phacelia* and *Miltitzia* on the other is indicative of a real generic break which finds proper morphologic support in the character of ovules and placentæ. In *Miltitzia* and *Phacelia* the ovules are characteristically attached by their sides to fleshy placentæ, while in *Emmenanthe* the pendent ovules are attached by their proximal ends to the wing-like margins of membranous placentæ. The reticulate seeds of *Emmenanthe* are strongly compressed and submeniscoidal, quite unlike the seeds of any *Phacelia* or *Miltitzia* that I know.

A detailed study of all species of *Miltitzia* has disclosed that the marcescent corolla is the only character by which they may

be separated from *Phacelia*. Even this is not diagnostic since in *Phacelia* there are several species characterized by marcescent corollas more or less persistent: *P. saxicola* A. Gray, *P. Quickii* J. T. Howell, *P. marcescens* Eastw.; and there are several others in which the corolla is truly persistent: *P. sericea* (Grah.) A. Gray, *P. Lyallii* (A. Gray) Rydb., *P. idahoensis* Henderson, and *P. lenta* Piper. Although the bright yellow color of the corolla is very striking in several species of *Miltitzia*, this could scarcely be considered a generic character even if the color were constant and not frequently tinged with lavender or violet. In evaluating the characters by which *Miltitzia* might be allied either to *Phacelia* sect. *Microgenetes* or to *Emmenanthe*, I regard the character of the placentæ and of the transversely corrugated seeds much more important than the character of the persistent flavescent corolla. Hence, *Miltitzia* is here presented as a section of *Phacelia*, it being accepted as a well-distinguished group of related species that is closely allied to section *Microgenetes* from which it was undoubtedly derived.

After my review of all entities formerly referred to *Miltitzia* as a genus, I regard that the following transfers are in order. A systematic revision of the section with full synonymy will be presented in a later paper.

**Phacelia** sect. **Miltitzia** (A. DC.) J. T. Howell, stat. nov. *Miltitzia* A. DC. in DC. Prodr. 9: 296 (1845). *Emmenanthe* § *Miltitzia* (A. DC.) A. Gray, Proc. Amer. Acad. 10: 328 (1875).

**Phacelia** *lutea* (H. & A.) J. T. Howell, comb. nov. *Eutoca lutea* H. & A., Bot. Beech. Voy. 373 (1840).

**Phacelia** *inundata* J. T. Howell, nom. nov. *Emmenanthe parviflora* A. Gray, U. S. Pacif. RR. Reports 6: 84, tab. 15 (1857). Not *Phacelia parviflora* Pursh (1814) nor *P. parviflora* Phil. (1895).

*Phacelia inundata*, as I have observed it in northeastern California, is not a species confined to the littoral zone of desert lakes, but rather it is a remarkable and peculiar plant characteristic of summer-dried playas left exposed as lake-waters recede during the dry season. Although the plants do not grow in the water even in the vegetative stage, they are truly lacustrine in that it is apparently essential for germination that their seeds be submerged for a period in the saline waters of evanescent shallows.

**Phacelia** *glaberrima* (Torr.) J. T. Howell, comb. nov. *Emmenanthe glaberrima* Torr. ex S. Wats., Bot. U. S. Geol. Explor. 40th Paral. (King's Exped.) 257 (1871).

**Phacelia** *adenophora* J. T. Howell, nom. nov. *Emmenanthe glandulifera* Torr. ex S. Wats., l. c. Not *Phacelia glandulifera* Piper (1906).

*Phacelia tetramera* J. T. Howell, nom. nov. *Emmenanthe pusilla* A. Gray, Proc. Amer. Acad. 11: 87 (1876). Not *Phacelia pusilla* Buckl. (1843) nor *P. pusilla* Torr. (1871).

That the flowers of this species are predominantly and typically tetramerous is one of the most intriguing facts disclosed by my studies in sect. *Miltitzia*. Surely here is one of the most advanced species of this highly specialized group of desert annuals: a lowly halophytic herb with flower-parts reduced, not only in size but also in number, an anomalous departure, it would seem, in *Hydrophyllaceæ*.

*Phacelia salina* (A. Nels.) J. T. Howell, comb. nov. *Emmenanthe salina* A. Nels., Bull. Torr. Bot. Club 25: 381 (1898). *E. foliosa* M. E. Jones, Zoe 4: 278 (1893). Not *Phacelia foliosa* Phil. (1891); nor *P. salina* M. E. Jones ex Brand, Das Pflanzenr. IV. 251: 119 (1913), as a synonym.

I am happy to acknowledge the help of Mr. C. A. Weatherby of the Gray Herbarium, whom I consulted about the proper specific epithet that should be used for this species.

*Phacelia scopulina* (A. Nels.) J. T. Howell, comb. nov. *Emmenanthe scopulina* A. Nels., Bull. Torr. Bot. Club 25: 380 (1898).

*Phacelia inyoensis* (Macbr.) J. T. Howell, comb. nov. *Miltitzia inyoensis* Macbr., Contrib. Gray Herb., n. ser. 49: 41 (1917).

*Miltitzia pinnatifida* Osterhout (Bull. Torr. Bot. Club 53: 35,—1926) is referable to *Phacelia Ivesiana* Torr.

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 Torrey, J., ex S. Wats. 1871. Bot. U. S. Geol. Explor. 40th Paral. (King's Exped.), p. 253.

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TWO LAKE COUNTY RECORDS. In May, 1943, while on a collecting trip with Mr. M. S. Baker, I collected *Micropus amphibolus* Gray (No. 18002) and *Stylocline gnaphaloides* Nutt. (No. 18003) in Lake County, California, where the plants grew together in shallow soil on an exposed outcrop of volcanic rock, 5 miles from Lakeport on the road to Hopland. These collections represent northward extensions of the known ranges of both species, the *Micropus* from Marin County, the *Stylocline* from Monterey County.—J. T. Howell.





# LEAFLETS *of* WESTERN BOTANY

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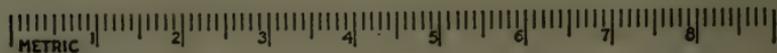
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ALICE EASTWOOD and JOHN THOMAS HOWELL

THE BOTANICAL COLLECTIONS OF CHAMISSO  
AND ESCHSCHOLTZ IN CALIFORNIA

BY ALICE EASTWOOD

Otto von Kotzebue of the Royal Imperial Navy of Russia made two trips around the world and visited California on both. The first was in the ship *Rurik*, the main object being the discovery of the Northwest Passage. With him as naturalists were Adelbert von Chamisso, a noted poet and author, and Johann Friederich Eschscholtz, entomologist, zoölogist, and ship's doctor. The *Rurik* arrived in San Francisco October 1, 1816, and remained one month. This was an unfavorable time of the year for collecting plants or insects, but judging by the number of distinct species of plants collected, it must have been a year of early rains. I have collected in San Francisco on Thanksgiving Day nearly a hundred species of plants in bloom on such a year,\* when

“. . . smiling spring its earliest visit paid,  
And parting summer's lingering blooms delayed.”

The account of the plants and descriptions of the new species were published in *Linnæa*, a botanical journal published by D. F. L. von Schlechtendal and founded in 1826. Chamisso and Schlechtendal were joint authors of most of the new species, but some were described by Chamisso alone. The locality cited was “ad portum San Francisco” and all were collected, according to Chamisso, in the hills and downs about the Presidio. Very few if any are to be found there today.

In the following list of the new species the order in which they were published is followed. In *Linnæa*, volumes 1, 2, 3, Chamisso and Schlechtendal were joint authors; in volume 4, Chamisso was the sole author, and in volume 6, the *Labiata* were described by George Bentham, the authority on the family, and the *Compositæ* by C. F. Lessing, who had done some notable work in *Vernonia* and the author of “Synopsis Generum Compositarum.”

## VOLUME 1

CHEIRANTHUS ASPER (*Erysimum capitatum* (Dougl.) Greene), “in litore,” wall-flower, p. 14. FRANKENIA GRANDIFOLIA, “in sabulosis,” yerba rheuma, a salt marsh plant, p. 35.

\* Cf. Eastwood, “Plants in flower in November and December, 1897,” *Erythea* 6:114 (1898).

Leaflets of Western Botany, Vol. IV, pp. 17-32, April 28, 1944.

## VOLUME 2

RUBUS VITIFOLIUS, blackberry (leaves green on lower surface), p. 10. RUBUS URSINUS, blackberry (leaves downy on lower surface), p. 11. FRAGARIA CALIFORNICA, wood-strawberry, p. 20. *Fragaria chiloensis* also noted. HORKELIA CALIFORNICA, p. 26. ROSA CALIFORNICA, p. 35. POTAMOGETON AMERICANUS, pondweed, p. 228. SCROPHULARIA CALIFORNICA, bee-plant, p. 585.

## VOLUME 3

POLYGONUM PARONYCHIA, sand joint-weed, p. 57. HYPERICUM ANAGALLOIDES, marsh St. Johns-wort, p. 127. OROBANCHE CALIFORNICA, cancer-root, p. 134.

## VOLUME 4

LESSINGIA GERMANORUM, "in arenosis," p. 203. This represented a new genus named in honor of G. E. Lessing, a famous dramatist, his great-nephew, C. Lessing, and C. F. Lessing, the author of the *Compositæ* collected by Chamisso. MYOSOTIS CHORISIANA (*Allocarya Chorisiana* Greene), "durationeque annua (vel bienni)," p. 444. An annual growing in wet places and very unusual in fruit or flower at this time of year. PHACELIA CALIFORNICA, p. 494. PHACELIA MALVÆFOLIA, p. 499. CERATOPHYLLUM APICULATUM (*C. demersum* L.), "in stagnis," p. 506.

## VOLUME 6

The following *Labiata* by Bentham: THYMUS CHAMISSONIS (*Micromeria Chamissonis* Greene, *Satureia Chamissonis* Briquet), yerba buena, p. 80. STACHYS AJUGOIDES, p. 80. STACHYS CHAMISSONIS, p. 80. The following *Compositæ* by Lessing: DIPLOPAPPUS ERICOIDES (*Aplopappus ericoides* H. & A., *Ericamerica ericoides* Jepson), heather-like composite, pp. 114-117. ASTER CALIFORNICA (*Erigeron glaucus* Ker.), seaside daisy, p. 121. BAHIA ARTEMISLÆFOLIA (*Eriophyllum artemisiaefolium* Kuntze), lizard leaf, p. 253. TROXIMON APARGIOIDES (*Agoseris apargioides* Greene), California dandelion, p. 801. FRANSERIA CHAMISSONIS, p. 507, var. MALVÆFOLIA and var. BIPINNATISECTA, p. 508. CEPHALOPHORA DECURRENS (*Helonium puberulum* DC.), sneezeweed, p. 577. COINOGYNE CARNOSA (*Jaumea carnosa* Gray), salt-marsh composite, p. 520. TANACETUM CAMPHORATUM, tansy, p. 521. ARTEMISIA CALIFORNICA, worm-wood, p. 523. OLIGOCEPHALUS PYCNOCEPHALUS (*Artemisia pycnocphala* DC.), sand worm-wood, p. 524. Also: MYRICA CALIFORNICA Cham., wax-myrtle, p. 575.

ESCHSCHOLTZIA\* CALIFORNICA Cham., "in arenis sterilibus siccus ad portum San Francisco," was first described and illustrated in Hor. Phys. Berol. in 1820 and redescribed more fully in Linnæa, vol. 1, p. 553.

The following species also were collected, not considered as new species; some had been already described by authors in earlier publications, and some given names of species already known and later described as new or mistakes corrected.

## VOLUME 1

SILENE NICÆENSIS Ait. (*Silene verecunda* Watson), p. 41. PLANTAGO MARITIMA L., p. 167. HYDROCOTYLE VULGARIS L. (*H. prolifera* Kellogg or *H. ranunculoides* L.), p. 256.

\*The original spelling of this was *Eschscholzia*, Hor. Phys. Berol. 73 (1820).

## VOLUME 2

POTENTILLA ANSERINA L. (*P. pacifica* Howell), silver-weed, p. 24. VIOLA CANINA L. (*V. adunca* Smith), blue violet, p. 35. TRIGLOCHIN MARI-TIMA L., arrow-grass, p. 151. PHOTINIA ARBUTIFOLIA, toyon, Christmas berry, p. 541. CASTILLEJA TOLUCCENSIS HBK. (*C. latifolia* H. & A.), Indian paint brush, p. 579. MIMULUS GLUTINOSUS Wendl., sticky monkey-flower, p. 586.

## VOLUME 3

POLYGONUM ACRE L., dotted smart-weed, p. 51. RUMEX SALICIFOLIUS Weim., willow-leaved dock, p. 60. CORNUS CIRCINNATA L'Herit.? (*C. californica* C. A. Meyer), creek dogwood, p. 139. VERONICA BECCA-BUNGA L., (*V. americana* Schwein), speedwell, p. 558.

## VOLUME 4

NAJAS FLEXILIS (Willd.) Rostk. & Schm., water plant, p. 501. MYRIO-PHYLLUM SCABRATUM Mx. (*M. exalbescens* Fern., *Rhodora* 21:120), water plant, p. 506.

## VOLUME 6

SOLIDAGO PETIOLARIS Ait. (*S. spathulata* DC.), golden-rod, p. 502. SOLI-DAGO LANCEOLATA Ait. (*S. occidentalis* Nutt.), p. 502. SOLIDAGO STRICTA Willd. (*S. elongata* Nutt.), p. 502. SOLIDAGO PUBERULA Nutt. (*S. californica* Nutt.), p. 502. GRINDELIA INULOIDES Willd. (*G. maritima* (Greene) Steyermark, Ann. Mo. Bot. Gard. 21:576), gum plant, p. 503. MOLINA LINEARIS R. & P. (*Baccharis Douglasii* DC.), p. 505. BACCHARIS GLOMERIFLORA Mx. (*B. pilularis* DC.), coyote-brush, p. 506. HELIANTHUS PROSTRATUS Willd. (*Helianthella Cannonæ* Eastw.), p. 511. ACHILLEA MAGNA L. (*A. californica* Pollard), yarrow, p. 520. ANTENNARIA MARGARITACEA R. Br. (*Anaphalis margaritacea* B. & H.), pearly everlasting, p. 524. GNAPHALIUM PILULARE Wahl. (*G. ustulatum* Nutt.; cf. I. M. Johnston, Contr. Gray Herb., n. ser., 70:87,—1924), cud-weed, p. 525. GNAPHALIUM DECURRENS Ives (*G. californicum* DC.), everlasting, p. 525. GNAPHALIUM CHILENSE Spreng., p. 525. QUERCUS AGRIFOLIA Née, coast live-oak, p. 538. CORYLUS AMERICANA (*C. rostrata* var. *californica* Ait.), hazel, p. 538.

## VOLUME 10

*Leguminosæ*, pp. 590-591, by Th. Vogel: TRIFOLIUM FIMBRIATUM Lindl. (*T. Wormskjoldii* var. *fimbriatum* Jepson, *T. Willdenovii* var. *fimbriatum* Ewan). DALEA CLIFFORTIANA Willd. (*Astragalus Gambellianus* Sheldon). SYRMATIUM, a new genus, with two new species: *S. GLABRUM* (*Lotus scoparius* (Nutt.) Ottley) and *S. TOMENTOSUM* (*Lotus eriophorus* Greene). VICIA SITCHENSIS Bong. (*V. gigantea* Hook.).

## THE COLLECTIONS OF ESCHSCHOLTZ

In 1824, Kotzebue made a second voyage in the ship *Proderpatic* (i. e., *Enterprise*) and Eschscholtz came as naturalist. They landed in San Francisco September 27 and departed November 23, a stay of nearly two months. During this time Eschscholtz visited Mission Santa Clara and Mission San Rafael and from there rode across valleys and hills to Sonoma and Bodega

Bay. He remained at the Russian settlement a week and returned by sea to San Francisco. Off Point Reyes they were driven ashore by a violent storm and finally entered the Golden Gate on October 12. In November another trip was taken on which they ascended the Sacramento River in small boats as far, supposedly, as Rio Vista. Eschscholtz does not give the exact place where his collections were made, but from the plants collected all but one could have come from San Francisco. The new species were published in "Mémoires de l'Académie Impériale des Sciences de St. Petersburg," vol. 10, 1826. An abstract of this publication was given in *Litteratur-Bericht* in *Linnæa*, vol. 3, pp. 147-153. In these abstracts the description of the new species by Eschscholtz were republished and have been considered authentic:

ABRONIA LATIFOLIA, "in arenos marit." yellow sand-verbena. HOITZIA SQUARROSA (*Navarretia squarrosa* H. & A.), "in arenos," skunk weed. POLEMONIUM CAPITATUM (*Gilia Chamissonis* Greene), in arenos." SOLANUM UMBELLIFERUM, "fruticetis," nightshade. RIBES TUBULOSUM "fruticetis." This must have been *Ribes malvaceum* and not *R. glutinosum* Benth., the common wild currant of San Francisco, as the leaves are described as white-tomentose on lower surface. *Ribes malvaceum* has not been found in San Francisco. VELEZIA LATIFOLIA (*Frankenia grandifolia* C. & S.). ERIOGONUM ARACHNOIDEUM (*E. latifolium* Sm.). LONICERA LEDEBOURII, "fruticetis," twin-berry. CEANOTHUS THYRSIFLORUS, "fruticetis," California lilac. This was described as twice the height of a man. RHAMNUS CALIFORNICA, "fruticetis," coffee-berry. HENDECANDRA PROCUMBENS (*Croton californicus* Muell. Arg.), "in arenos." LUPINUS CHAMISSONIS, "in arenos," blue sand lupine. LUPINUS SERICEUS Pursh (*L. arboreus* Sims), flowers described as yellow.

On the first expedition, during the month of October, sixty-nine species were collected. Among them were two new genera and thirty-three new species. Three were synonyms having been previously described by other authors. On the second expedition, Eschscholtz named and described thirteen species, three among them previously described.

Linnæa has been my source of information concerning these important collections. To Dr. E. O. Essig I am indebted for the historical data which were published in the *Quarterly* of the California Historical Society, vol. 12, pp. 191-209 (1933) under the title "The Russian Settlement at Ross." Dr. August C. Mahr's "The Visit of the 'Rurik' to San Francisco in 1816" was published in the *History, Economics, and Political Science* series of Stanford University, vol. 2, no. 2. It has been useful in checking

my own lists of the botanical collections and also drew my attention to the part devoted to *Leguminosæ* in vol. 10 of Linnæa (vol. 11 being cited by mistake). The set of Linnæa in the Library of the California Academy of Sciences is incomplete and both volumes 10 and 11 are wanting. I am indebted to the Library of the University of California for loaning them.

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### NOTES ON PLANTS OF NEW MEXICO—III

A. L. HERSHEY AND P. J. LEYENDECKER, JR.

*State College, New Mexico*

During the past few years the authors have made plant collections in various parts of New Mexico. Among these collections, which are deposited in the New Mexico State College Herbarium unless otherwise stated, are some species which represent new additions to the flora of New Mexico or new distributional records for the state.

*Calamagrostis Scribneri* Beal was found growing in a moist meadow along the banks of a clear mountain stream in the Jemez Mountains, Sandoval County (Herb. Iowa State College). This plant ranges from Washington to Oregon and south to Colorado. This record extends its known range some 300 miles south. The clumps were quite robust, and in general the species is well adapted to its habitat in the Jemez Mountains. Several of the larger clumps had been grazed, yet it appeared that the plants were recovering, and there was some evidence of reproduction.

*Eragrostis hypnoides* (Lam.) B. S. P. was collected by J. O. Bridges on sand bars in Lake B. H. Hall at Elephant Butte Dam near Hot Springs, Sierra County. During the summer of 1940 the water in this reservoir was very low, and many sand bars were exposed. On these sandy islands this creeping meadow grass occurred rather abundantly. At the present time the reservoir is practically filled to its maximum and it is doubtful whether this species will be reported again from this locality for some time.

*Agrostis Bakeri* Rydb. was collected by Q. Hare near Cowles and was identified by J. R. Swallen. This collection (U. S. Nat. Herb.) extends the known range for this grass several hundred miles southward.

During the summer of 1941 the junior author chanced to collect an unusual spiderwort four miles south of Corona, New Mexico. The plant, which is only four to six inches tall, did not compare with any of those listed in Wooton and Standley's Flora of New Mexico. The plant was identified by Dr. Edgar Anderson of the Missouri Botanical Garden as *Tradescantia Wrightii* Rose & Bush. The species appears to be endemic to the Guadalupe Mountains and the area in Lincoln County where this specimen was collected. Although this is the second report of this species in New Mexico, the authors consider it of enough interest to be included in these notes.

During the past few years several collecting trips were made by the authors along the United States-Mexico boundary in the San Luis Mountains of southwestern New Mexico and among the species collected was *Quercus Toumeyi* Sarg. (*Hershey-Leyendecker No. 2654*.) This low oak with small leaves which are rusty pubescent on their under surfaces grows in small clumps on the eastern slopes of the San Luis Mountains. This represents an eastward extension of its range in the United States.

The authors would also like to include in this report some notes recently submitted by Dr. E. O. Wooton on two species of *Salicornia* which were not included in Wooton and Standley's Flora of New Mexico.

"*Salicornia utahensis* Tidestrom, Proc. Biol. Soc. Wash. 26:13 (1915). Described from material collected by Kearney and Shantz, three miles north of Grantsville, Utah, January, 1913. Specimens (in U. S. Nat. Herb.) from New Mexico are: between Tularosa and White Sands, Oct. 20, 1916, *R. L. Piemeisel No. 6483*; salt flats, Carlsbad, June 30, 1924, *W. T. Lee No. 170*; salt lake southeast of Carlsbad, Aug. 12-20, 1924, *Standley No. 40343*, abundant; flats about Laguna Grande de la Sal, east of Carlsbad, Aug. 1937, *W. B. Lang*. The plant grows only in alkaline soil and may be expected in such locations any place in the state. It is one of the species called samphire or glasswort in the textbooks. It is a certain indicator of alkali too concentrated for most other species to endure.

"*Salicornia rubra* A. Nelson. A single specimen of this species was collected by Standley at the salt lake southeast of Carlsbad, Aug. 12-20, 1924 (*Standley No. 40344*), who says of

it 'annual, erect, bushy, glaucous, common.' This and the preceding species were collected at the same time. They are easily separable, as *S. rubra* is a rather small, slender-stemmed annual, with elongated, slender spikes of many flowers, while *S. utahensis* is a coarser, larger, perennial plant with short, thickened, clavate spikes, bearing few flowers in what looks like the thickened end of the stem."

*Suckleya Suckleyana* (Torr.) Rydb. was collected in the summer of 1942 near Clayton in Union County (*Hershey No. 2418*) and also near Ima in Quay County (*H. Bradford & Hershey No. 2655*). The latter locality represents a farther extension of the range of this species southward in the United States.

*Sisymbrium Irio* L. is listed in Tidestrom and Kittell's Flora of Arizona and New Mexico as "rare, waste ground" (p. 63). For the past several years the authors have observed the growth of this winter annual in southern New Mexico and have found it very abundant in the Rio Grande Valley. During the winter the plant makes a rapid growth and later produces seed in great abundance. It has become a very common weed in southern New Mexico, west Texas, and parts of Mexico.

*Swainsona salsula* (Pall.) Taubert has become quite common in Dona Ana County, along the Rio Grande, and in deserted fields where irrigation water is available (*Hershey No. 2400*). This noxious legume is not widely distributed at present, but because of its vegetative reproduction by creeping root stocks it warrants observation in irrigated areas of the state.

*Conium maculatum* L. was reported from the Mesilla Valley, Dona Ana County, by F. R. Fosberg in 1940.\* While engaged in a survey of poisonous plants occurring in New Mexico, the authors have collected this toxic plant in many localities. It is common in the mountains of Otero (*Hershey No. 2490*), Grant (*Hershey No. 2658*), Catron (*Hershey No. 2458*), and Colfax counties. Further investigations will probably show it to be well established in most of the moist, mountainous regions of the state.

*Euphorbia antisiphilitica* Zucc. was collected in the San Andreas Mountains of Socorro County by D. Laughter (*No.*

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\* Fosberg, F. R., "The Æstival Flora of the Mesilla Valley Region, New Mexico," *Amer. Midl. Nat.* 23:58.

2171) in 1940. A number of the plants were reported as growing in gravelly soil on the east slopes of the mountains, a locality where the authors have not been. Probably no other collections have been made of the species in New Mexico.

*Microrhannus ericoides* Gray has been collected on the foothills east of the Guadalupe Mountains in Eddy County (*Hershey No. 2633*). E. O. Wooton writes in personal correspondence that he was "more or less responsible for omitting this species [i. e., in Wooton and Standley's *Flora of New Mexico*], as the species has since been found in the very region traversed by the writer [Wooton] when making sets for distribution in 1897; it was either not seen then or was confused with something else and not collected." He reports the following collections from New Mexico as deposited in the U. S. National Herbarium: "Arroyo ranch (Hagerman property), June, 1914, *Wooton*; Carlsbad Cavern, 1924, *Vernon Bailey*; dry plains east of Carlsbad, 1924, *Standley*; Carlsbad, 1924, *W. T. Lee*; east of Carlsbad, 1937, *W. B. Lang*." He also lists collections of the species from the "Santa Catalina Mountains, near Dudleyville, and Santa Rita Range Reserve" in Arizona.

*Phacelia integrifolia* Torr. was collected in the Big Hatchet Mountains in Hidalgo County (*Hershey-Leyendecker No. 2659*). These plants were growing gregariously on a fresh earthen embankment in a small canyon on the east slope. The plants were very robust but not numerous.

*Verbascum Blattaria* L. was collected on one of the trips to the San Luis Mountains, Hidalgo County (*Hershey-Leyendecker No. 2660*). These plants were very common in a deserted ranch yard on the west slope a few miles east of Cloverdale.

Among recent collections have appeared several plants of *Compositae* which the authors would like to record as occurring in New Mexico. These include such common weeds as *Tragopogon pratensis* L., *Tragopogon dubius* Scop. (*Hershey No. 2661*), *Centaurea Picris* Pall. (*Hershey No. 2368* and *2662*), *Centaurea melitensis* L. (*Hershey No. 2663*), and *Cirsium arvense* (L.) Scop.

*Pinaropappus parvus* Blake was found in abundance on the rocky cliffs about permanent pools in the Guadalupe Mountains (*Hershey-Leyendecker No. 2641*). On the low ridges to the

east of the mountains there was a great abundance of *Pinaropappus roseus* Less. (*Hershey-Schaffner No. 2664*), while *Evax prolifera* Nutt. occurred in great abundance on the low mesas which had been flooded during the early spring of 1941 (*Hershey-Schaffner No. 2665*).

*Agoseris heterophylla* (Nutt.) Greene was recently collected at Mangas Springs, Grant County, where O. B. Metcalfe collected many new species. This composite (*Hershey-Smith No. 2667*) shows great variation in size, from a few inches in height at the edge of low hills to a foot or more in height along the edges of the small bogs still present in this locality.

*Oxytenia acerosa* Nutt. grows quite rank on cretaceous formations near Waterflow, San Juan County. This tall, nearly shrub-like composite has come into prominence lately as being poisonous to livestock in New Mexico and Utah. The extent of its distribution within New Mexico has not been definitely determined.

*Xanthisma texanum* DC. covers large areas of the plains of eastern New Mexico (*Hershey No. 2666*). It is surprising that this species has been omitted from the state floras.

*Zexmenia podocephala* (Gray) Gray was found rather commonly under the oaks and low-growing shrubs of the San Luis Mountains (*Hershey-Leyendecker No. 2668*). This plant is a perennial with tuberous-thickened roots and showy yellow flowers. Previous reports have given the distribution of this species as southeastern Arizona and northern Mexico.

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## A NEW PHACELIA FROM SOUTHERN OREGON

BY JOHN THOMAS HOWELL

**Phacelia Peckii** J. T. Howell. Herba annua gracilis erecta 5—15 cm. alta; caulibus sæpe purpurascenti-tinctis, hispido-hirsutulis vel hirsutulis, capitato-glandulosis, sæpe elongatis infra folia prima foliacea, ramis paucis, plerumque substrictis adscendentibus; foliis sparsis, anguste oblongis vel lanceolatis, 1—2.5 cm. longis, 0.2—0.5 cm. latis, substrigillosis supra, glanduloso-hirsutulis infra, subacutis, basi attenuatis in petiolum anguste marginatum sæpe 0.5—1.5 cm. longum; racemis substrictis non flexuosis, 2—4 cm. longis, floribus approximatis, pedicellis 1—3 (vel 5) mm. longis; segmentis calycis ad anthesin 2 mm. longis, 0.25—0.5 mm. latis, in fructu valde inæqualibus, 3—6 mm. longis, 0.25—1 mm. latis, linearibus vel oblanceolatis, apice rectis et planis, hirsutulis glandulosisque; corolla violacea, late

rotato-campanulata, 5—6 mm. longa, tubo circa 2 mm. longo, lobis subintegris; squamis 1 mm. longis, oblongis, quadratis, marginibus connatis; staminibus 5 mm. longis, filamentis barbatis processus pileoscentes elongatos planiusculos subretrosos numerosos ferentibus, antheris 0.66 mm. longis; stylo et ramis 4—5 mm. longis, stylo et basibus ramorum piliferis, ramis 3—4 mm. longis; ovario 1 mm. longo, ovulis 8—11; capsula plerumque elliptico-ovata et 4 mm. longa, subacuta infra apiculum, sparse longe et breviter hirsutula, paulum glandulosa, valvis longitudinaliter sulcatis dorso; seminibus subovatis, acute angulatis, 1—1.5 mm. longis, fuligineis, tenuiter et minute reticulato-foveolatis.

Type: Herb. Calif. Acad. Sci. No. 301079, moist ground near the top of Grizzly Peak, Jackson County, Oregon, collected by Prof. Morton E. Peck, July 17, 1913, *No. 3291*. There is a duplicate in the Herbarium of Willamette University.

*Phacelia Peckii* is not a new plant even in botanical literature, for it has been known by numerous collections from Josephine and Jackson counties in southern Oregon under two different names. Usually it has been referred to *P. Pringlei* Gray, which is a rare and highly localized species confined to the Scott Mts. of northern California, but Macbride (Contrib. Gray Herb. n. ser. 49: 40,—1917) mistook *P. Peckii* for *P. verna* Howell, another rare plant which is restricted to ridges of the Umpqua Valley near Roseburg, Oregon. Although *P. Peckii* is closely related to *P. Pringlei*, it is quite distinct in a number of small characters and the habit of the two is quite different. In *P. Pringlei* the lavender corollas are 3—4 mm. long, the filaments bear short retrorse processes, the ovules are 4—7 in each capsule, and the coarsely pitted seeds are 1.5—1.66 mm. long. In *P. Peckii* the violet corollas are 5—6 mm. long, the processes on the filaments are elongate and hair-like, the ovules number 8—11, and the finely reticulate-pitted seeds are 1—1.5 mm. long. Both species are slender, but in *P. Pringlei* the subumbellately clustered branches tend to spread while in *P. Peckii* the branches are usually fewer and substrictly erect. *Phacelia Peckii* may also be related to *P. Greenei* J. T. Howell, a little-known plant of Siskiyou County, California, in which there are only 4 ovules to each capsule (cf. Amer. Midl. Nat. 30: 17).

It is an honor to name this Oregon endemic for Prof. M. E. Peck, enthusiastic student of the Oregon flora and distinguished author of "A Manual of the Higher Plants of Oregon."

## A NEW VARIETY OF ECHINOCEREUS

BY GRAHAM HEID  
*Hollywood, California*

**Echinocereus Salm-Dyckianus** Scheer var. **noctiflorus** Heid, var. nov. Cæspitosus; caulibus longis, tenuibus, procumbentibus vel pendentibus; aculeis tenuibus, teretibus, centrali porrecto; floribus elongatis, segmentis perianthii multis, roseis purpureis vel coccineis, semper nocturnis; fructu viridescente, pyriformi, tuberculato.

Plant branching from the base; stems up to 1.75 inches in diameter, and to 24 inches long, procumbent or hanging from cliffs. Ribs 7 to 10; areoles small, round; spines yellow or gray-white, acicular, radials about 8, variable in length, central one porrect, up to 0.5 inch long; flowers produced high or low on stem, purplish-pink to scarlet, opening at night; ovary and tube up to 3.5 inches long, axils of scales with weak, white, brown-tipped spines and long cobwebby wool; perianth-segments many, spreading or often recurved; fruit dull green, pear-shaped, tuberculate.

Type: Herb. Calif. Acad. Sci. No. 305550, collected by Dr. R. T. Craig near Cerocahui, southwestern Chihuahua, Mexico.

This plant is one of a complex involving *E. Salm-Dyckianus* Scheer and *E. Scheeri* Lem. The habit of night-opening flowers is not complete inasmuch as the stigma is exerted in the daytime, regardless of the weather, in many of the plants. Unlike flower-color, however, this character seems to be a bionomic rather than a mutational one, and therefore seems worth varietal recognition.

Dr. Craig reports the plant as common in the mountains of southwestern Chihuahua up to 9000 feet, growing from rocky cliffs and among pines.

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MARIN COUNTY MISCELLANY—II

BY JOHN THOMAS HOWELL

In some respects, Point Reyes Peninsula on the ocean side of Marin County, California, is no more a part of the mainland than are the islands off the coast of southern California. From the "mainland" of Marin County the peninsula is cut off by the San Andreas Fault which has formed a rift valley between Tomales Bay and Bolinas Lagoon, and the differential movement of land masses on either side of the fault line is quickly apparent when one perceives that granite is common on the peninsula but is entirely lacking to the eastward. Although the geological

features are obvious enough to those trained to see them, to many the occurrence of certain plants on Point Reyes is an even more obvious indication of the insular character of the region. The presence of a grove of Bishop Pine (*Pinus muricata* Don) early indicated to students of the California flora that the locality was different from the rest of Marin County and continued field work has disclosed many plants which tell as clearly as the geology that the areas on either side of the fault line have had different histories. From the point of view of plant distribution, the Bishop Pine aligns Point Reyes Peninsula with regions to the north and south where the pine is also found, the regions to the north forming a somewhat interrupted coastal strip from the Russian River northward to Trinidad Head, Humboldt County, the regions to the south occurring either as widely separated plant-islands or as actual islands as far south as middle Lower California. Many plants that are found with the pine on Point Reyes bear out the floristic interrelation between the different regions and every botanical visit to that part of Marin County west of the San Andreas Fault is not only an opportunity to wonder at the plants that have been isolated there due to diastrophic disturbances in ages past, but each succeeding visit is also a stimulus to detect new botanical links between Point Reyes Peninsula and other Bishop Pine-lands.

On July 4, 1943, Dr. Hans Leschke and I made a collecting trip to Point Reyes Peninsula and among the plants that we collected are several that have not before been reported from the region and that emphasize again its peculiar insular character. Because of war-time restrictions on travel by private automobile, we went by bus from San Francisco to Inverness and from there we walked as far along the Point Reyes road as our botanical activities would permit, going beyond Ledum Swamp almost to the head of Drakes Bay. Although we traversed a route that a hundred collectors have taken since the visit of John M. Bigelow in April, 1854, our exceptional success amazes me and I cannot but venture the thought that botanical expeditions afoot are not without compensation. Most of our collecting centered in Ledum Swamp where so many remarkable plants are associated with the Labrador Tea (*Ledum glandulosum* Nutt.) and where Mr. Stacey and I found so many interesting carices in 1936 (cf. Leaflet

West. Bot. 1:231). At that time three carices new to Marin County were discovered and now at this time three more carices are to be reported as well as more than a half dozen other plants from the swamp or along the road.

*AGROSTIS LONGILIGULA* Hitchc. Ledum Swamp in wet soil or on drier ground adjacent, *No. 18250*. Hitchcock (Man. Grasses p. 341) gives the range for this grass as from Mendocino County, California, north to Tillamook County, Oregon. The plants that grow on Point Reyes are not typical in that the awn does not exceed the lemma or is reduced to a rudiment, but in all other characters they correspond closely to specimens from the north coast of California. In one plant the ligules are nearly 11 mm. long, 5 mm. longer than the maximum given by Hitchcock.

*CAREX PHYLLOMANICA* W. Boott. In wet part of Ledum Swamp, growing up among bushes of Labrador Tea, *No. 18255*. The distribution of this species has been definitely known along the Pacific coast from Alaska south to Mendocino County, California, although Mackenzie (*Erythea* 8: 35) indicated that a collection made by Bigelow in "California" probably came from Santa Rosa, Sonoma County. With the present report of this species from the Point Reyes Peninsula it would appear likely that Bigelow made his collection not in Sonoma County but on his visit to "Punta de los Reyes" 90 years ago.

*CAREX MONTEREYENSIS* Mkeze. Slope under the pines just north of Ledum Swamp, *No. 18266*. Most of the plants associated with the pines on Point Reyes are species that occur with the pine along the northern California coast in Mendocino and Humboldt counties, but here is an outstanding record of a plant whose distribution is to be correlated with the occurrence of coastal pine-lands to the south. Although Mackenzie gave the distribution of *C. montereyensis* as "southwestern California, near the coast" in 1931 (*N. Amer. Fl.* 18: 129) and as "near the coast, California" in 1940 (*N. Amer. Caricææ*, plate 133), I can find in the literature no collections cited by him except from Pacific Grove, Monterey County (cf. Jepson *Fl. Calif.* 1:223). Hence it is of interest in citing the new station from Marin County to list the following collections which definitely outline the known distribution of this species. These specimens, which were collected by Eastwood and Howell unless otherwise noted, are in

Herb. Calif. Acad. Sci. and have been determined by the late J. W. Stacey: near Pescadero, San Mateo Co., *No. 6056*; Año Nuevo, San Mateo Co., *No. 6049*; 12 miles north of Salinas, Monterey Co., *No. 2171*; Point Lobos, Monterey Co., *Mason & Lee No. 9143*, *Wheeler No. 4285*, *Eastwood & Howell No. 6029*; Cambria, San Luis Obispo Co., *No. 5955*; Huasna district, San Luis Obispo Co., *No. 4143*; Chalk Hill between Edna and Arroyo Grande, San Luis Obispo Co., *No. 4139*.

CAREX LEPTALEA Wahl. Wet part of Ledum Swamp, *No. 18254*. This carex, which is so widely distributed in North America, is one of the rarest species in California. In 1922, Mackenzie reported it in California from only a single collection made by J. P. Tracy at Patricks Point, Humboldt County (*Erythea* 8:50). Aside from that record and a second Humboldt County specimen collected by Mr. Tracy at Humboldt Hill (*No. 5086*, Herb. Calif. Acad. Sci.), the plant may be reported from two collections made in Trinity County: Scott Ranch, 3 miles south of Trinity Center, *Mrs. H. C. Cantelow in 1936*, and Trinity Center, *J. T. Howell No. 12703*. The discovery of *C. leptalea* on Point Reyes Peninsula was one of the biggest botanical thrills I have experienced in many a day!

JUNCUS BOLANDERI Engelm. Wet soil of Ledum Swamp, *No. 18259*. Although I have known the Bolander Rush from several localities in Marin County for a number of years, I cannot find that it has been reported from there. In 1936, Mr. Stacey and I collected it along the road to Point Reyes (*No. 12650*) and more recently I have made collections of it on Mt. Tamalpais at Rock Spring and in Potrero Meadows (*No. 14853, 17025*). The species occurs northward chiefly in the Coast Ranges to middle-western Oregon.\*

STELLARIA BOREALIS Bigel. var. BONGARDIANA Fern. Wet soil among shrubs, Ledum Swamp, *No. 18261*. A northern plant ranging from southern Alaska to Mendocino County, California, and occurring locally in eastern North America, this chickweed may now be reported from Marin County. Farther west towards the Point Reyes Lighthouse, *S. littoralis* is found and, although

\* Since writing the above, I find that Dr. H. L. Mason reported *Juncus Bolanderi* from Ledum Swamp (which he called Inverness Ridge Marsh) in 1934 (Carnegie Institution of Washington Publ. No. 415, p. 119).

some puzzling intermediates between the two species occur, the plant from Ledum Swamp is definitely the variety named.

*Ceanothus gloriosus* J. T. Howell var. *porrectus* J. T. Howell, var. nov. Frutex porrectus, 0.3—0.5 m. altus, caulibus pauciramosis, ramulis gracilibus patentibus decumbentibus vel adsurgentibus; foliis oblongo-ellipticis vel late obovatis, sæpe 1—2 cm. longis, 0.5—1 cm. latis, margine 4-8 dentibus spinescentibus utrinque instructis, rarissime subintegris, stipulis 2—4 mm. longis; ceteris speciei.

Type: Herb. Calif. Acad. Sci. No. 314109, collected on Inverness Ridge in the forest of *Pinus muricata* on the road to Point Reyes, Marin County, California, June 4, 1939, J. T. Howell No. 14710; again collected under pines near Ledum Swamp, July 4, 1943, No. 18265, and on March 26, 1944, No. 19348.

With its low sprawling habit and smaller leaves, the present plant appears quite different from either typical *C. gloriosus* which is prostrate or var. *exaltatus* which is erect, both of which have usually larger leaves. Except in habit, it resembles *C. Masonii* McMinn, but since both morphologic and field evidence indicates to me a hybrid origin for that species, I would regard it wrong to propose as a variety of *C. Masonii* our present plant, which appears to be a relatively stable woodland type that had nothing to do with the suspected hybrid origin of *C. Masonii*. Our plant is apparently the same as the "Mount Vision Ceanothus" which is described from Mount Vision near Inverness by Van Rensselaer (*Ceanothus*, p. 55) as "showing an apparent relationship to *C. Masonii*, *C. ramulosus*, and *C. gloriosus*." I do not believe that it is closely related to *C. ramulosus* (Greene) McMinn except as that species may have been one of the parents of *C. Masonii*. Plants of the "Mount Vision Ceanothus" have been cultivated in the Strybing Arboretum of Golden Gate Park for several years and there they have maintained the sprawling habit and distinctive appearance of var. *porrectus*.

HYDROCOTYLE VERTICILLATA Thunb. Wet ground, Ledum Swamp, No. 18253. This lowly pennywort, so widely ranging across the United States, has apparently not before been reported from Marin County. The nearest stations to Point Reyes given for the species or its var. *cuneata* by Jepson (*Fl. Calif.* 2:615) are the Suisun Marshes and Crystal Springs Lake, both in the San Francisco Bay region. An earlier collection of *H. verticillata* from Point Reyes is one I made in 1933 (*No.* 11712) when I

found it on the west side of Drakes Bay growing with *Lilæopsis occidentalis* C. & R.

*ARCTOSTAPHYLOS MEDIA* Greene. Along the road west of Ledum Swamp, No. 18270. Only leafy assurgent stems from procumbent bushes were obtained but their identity is quite certain. The plant cannot be *A. Uva-ursi* which I have collected on the rocky ridge near the Point Reyes Lighthouse because the stems are not prostrate, the apex of the leaves is acute, and their upper surface is slightly stomatiferous. Since the type of *A. media* which was collected in Washington possibly represents a hybrid between *A. Uva-ursi* and *A. columbiana* Piper, it may not be regarded as entirely scientific to apply the name to plants in California, where botanical opinions vary widely as to an acceptable segregation of entities in the *columbiana-virgata* complex and where, as a result, one of the suspected parents of "*A. media*" may be any one of several closely related entities. However, the name *Arctostaphylos media* is very useful and, by restricting its application to the procumbent plants whose assurgent branches are without bristly pubescence, it will embrace a rather common "entity" whose morphological stability is greater than that of many species recognized in the genus. Until the hybrid origin of *A. media* is fully demonstrated, the name may properly and usefully serve to designate a distinctive Pacific Coast plant whose range is now known to extend from Vancouver Island southward to Marin County, California.

*CRYPTANTHA HISPIDISSIMA* Greene. West side of pine ridge beyond Inverness, No. 18271. Like *Carex montereyensis*, this plant is another which links the Point Reyes region with districts to the south. According to Johnston (Contrib. Gray Herb. n. ser. 74:93), the species occurs in the South Coast Ranges from San Francisco to Los Angeles County. More recently Jepson (Fl. Calif. 3:348) has included *C. hispidissima* in *C. Clevelandii* Greene, but that species is also restricted to the southern mountains of the state. It is of special interest to note how markedly separate both habitally and ecologically are *C. hispidissima* and *C. leiocarpa* (F. & M.) Greene on Point Reyes Peninsula, although Jepson (ibid., p. 349) remarks that "on morphological grounds *C. leiocarpa* is weakly and inconstantly distinguishable from *C. clevelandii*" (i. e., including *C. hispidissima*).

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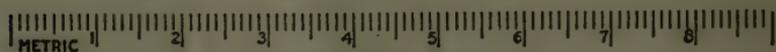
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## SOME NEW WORLD CYPERI

BY HUGH O'NEILL

AND

BROTHER BENEDICT AYERS, F. S. C.

*Langlois Herbarium, Catholic University of America*

## 1. THREE NEW SPECIES FROM MEXICO

**Cyperus Arsenii** O'Neill & Benedict, spec. nov. (Non *Chlorocyperus Arsenii* Palla, Österr. Bot. Zeitschr. 63: 403,—1913.) Perennis. Radices fibrosæ 0.1—0.3 mm. crassæ. Rhizoma gracile, repens, circa 1—3 cm. longum, squamis lanceolatis 5—8 mm. longis indutum. Culmi 8—15 cm. alti, omnino 0.2—0.3 mm. crassi, apice minute scabridi, trigoni, filiformes, sulcati, non septato-nodulosi, basi tuberascentes fibrosique. Foliæ duæ in culmis singulis, culmo breviores, 5—10 cm. longæ, 0.3—0.8 mm. latæ, attenuatæ, planæ vel conduplicatæ, rectæ, membranaceæ, non septato-nodulosæ, apice antrorse scabridæ alibi glabræ; vaginæ purpureo-fuscæ, in fibris dissolutæ. Bracteæ 2, valde inequales, longiores antheiam valde superans, 0.5—5 cm. longæ, 0.5—1 mm. latæ, marginibus (costaque interdum) antrorse minuteque scabridæ, alibi foliis similes. Spiculæ 5—7 in capitulum hemisphericum 5—7 mm. diam. contractæ, 4—5 mm. longæ, 1.5—2 mm. latæ, oblongæ, obtusæ, subcompressæ, 8—12-floræ. Rhachilla 0.3—0.4 mm. lata, recta, straminea, exalata. Glumæ inæquales, 1.3—1.6 mm. longæ, 0.8—1 mm. latæ, acutæ, late ovatæ, membranaceæ, vix mucronulatæ, indistincte **trinerves, flavo-fuscæ, carina viridi, marginibus non hyalinis.** Stamen 1, raro 2, achenio non persistentes; filamenta 1.2 mm. longa, 0.1 mm. lata, linearia, rubra; antheræ 0.2 mm. longæ, 1 mm. latæ, ellipsoideæ, flavæ connectivum non productum. Stylus circa 0.5 mm. longus, trifidus. Achenium 1 mm. longum, 0.5—0.6 mm. latum, trigonum, purpureo-fuscum, obovoideum vel ovoideum, minute punctulatum, vix stipitatum, lateribus planis, non falcatum.

The type specimen is *Arsène No. 7411*, collected near San Miguel del Monte, Michoacán, No. 843010 in Herb. Missouri Bot. Gard. Cotypes are: *Pringle No. 7182*, Valley of Mexico (G\*); *Gentry No. 6431*, Ocurahui, Sinaloa (CU).

*Cyperus Arsenii* belongs to section *Dichostylis* subgenus *Eucyperus*. It can be distinguished from the two nearest related species, *C. sesleroides* and *C. Tweedei*, by its rough culm, the other species having perfectly smooth culms. The black leaf-sheaths and the white or pale yellow mucronate glumes of *C. ses-*

\* The following symbols are used in this paper to indicate institutions from which material is cited: CAS, California Academy of Sciences; CU, Catholic University; F, Field Museum; G, Gray Herbarium; M, Missouri Botanical Garden; NY, New York Botanical Garden; UC, University of California; UM, University of Michigan; US, United States National Herbarium.

*leroides* are easily differentiated from the purplish-brown leaf-sheaths and the golden-brown obtuse glumes of *C. Arsenii*. *Cyperus Tweediei*, known only from Tucuman, Argentina, has dense heads containing 15—30, 12—24-flowered spikelets with their glumes broadly hyaline-margined. *Cyperus Arsenii*, known only from Mexico, has lax heads containing 5—7, 8—12-flowered spikelets with the glumes not hyaline-margined.

**Cyperus Pennellii** O'Neill & Benedict, spec. nov. Perennis. Radices fibrosæ, circa 0.1—0.5 mm. crassæ, pubescentes. Rhizoma abbreviatum, lignosum. Culmi 0.5—2 mm. alti, 1—1.2 mm. crassi, basi tuberascentes fibrosique, trigoni, rigidi, multistriati, leves, non septato-nodulosi. Foliæ 4 vel 5, interdum a bracteis vix distinctæ, culmo valde superantes, 2—5 cm. longæ, 1—5 mm. latæ, planæ, acuminatæ, rectæ, subcoriaceæ, leves, non septato-nodulosæ; vaginæ fuscæ, in fibris dissolutæ. Bracteæ 3—6, antheram valde superantes, 2.5—11 cm. longæ, 1—5 mm. latæ, marginibus antrorse scabridæ alibi foliis similes. Spiculæ numerosæ in caput hemisphericum 15 mm. altum 20—30 mm. latum congestæ, 7—9 mm. longæ, 2—2.5 mm. latæ vix compressæ, divergenti-ascendentes, pleiostichæ, 6- vel 7-floræ. Rhachilla 0.5 mm. lata, geniculata, viridis, exalata. Glumæ 2.8—3 mm. longæ, 1.6-2 mm. latæ demum divergentes, non imbricatæ, obtusæ, non mucronulatæ, membranaceæ, 7—9-nerviæ, flavo-fuscæ, carina viridi leve, marginibus hyalinis. Stamina 3; filamenta 3—4 mm. longa, 0.1 mm. lata; antheræ circa 0.6 mm. longæ, 0.15 mm. latæ, flavæ, lineares, connectivum productum. Stylus circa 1 mm. longus. Achenium 2 mm. longum, 0.8—1 mm. latum, ellipsoideum, purpureo-fuscum, minute puncticulatum, vix apiculatum, nec stipitatum nec falcatum, lateribus planis.

The type specimen was collected by F. W. Pennell at Remudo, Durango, Mexico, *No. 18470*. It is in Herb. Acad. Nat. Sci. Philadelphia. A cotype, *Pennell No. 18472* (US), was also collected at the same place.

*Cyperus Pennellii* is most closely related to *C. manimæ* from which it may be distinguished by the extremely dwarfed culms which are only 0.5—2 cm. tall, whereas *C. manimæ* has culms 18—80 cm. tall. Another difference is that the glumes of *C. Pennellii* are 2.8—3 mm. long, while the glumes of *C. manimæ* are 1.6—2.5 mm. long. Apparently this species is endemic in the State of Durango, Mexico. So far it is known only from the type locality, Remudo, between El Salto and Cueva, on andesitic soil.

In Kükenthal's classification, *C. Pennellii* falls in the subgenus *Mariscus* section *Laxiglumæ*. It is readily distinguished from all the other species of this section by its extremely dwarfed habit.

**Cyperus Howellii** O'Neill & Benedict, spec. nov. Perennis. Radices pubescentes, 0.5—1.5 mm. crassæ. Rhizoma abbreviatum. Culmi subjuncti, 25—70 cm. alti, apice 1.5—2 mm. basi 2—2.5 mm. crassi, obtuse trigoni, rigidi, papilloși, haud scabridi, multistriati, non septato-nodulosi. Foliæ 8—10 in culmis singulis, plerumque culmo breviores, 10—50 cm. longæ, 3—5 cm. latæ, attenuatæ, planæ vel conduplicatæ, coriaceæ, arcuatæ, interdum obsolete septato-nodulosæ, marginibus antrorse spinulosæ, glaucæ; vaginæ purpureo-brunneæ in fibris dissolutæ. Bracteæ 3—5, inequales, antheram valde superantes, 3—40 cm. longæ, 1—3 mm. latæ, marginibus spinulosæ plerumque papillosæ, alibi foliis similes. Spicæ 8—15 mm. longæ, 8—10 mm. latæ, plures in caput 30—40 mm. diam. contractæ vel explicatæ radiis 5—10, 1—4 cm. longis. Spiculæ 9—11 mm. longæ, 2—4 mm. latæ, oblongo-lanceolatæ, acutæ, turgidæ divaricatæ, perdense pleiostichæ, 10—16-floræ. Rhachilla 0.5 mm. lata, recta, decidua vel diu persistens, exalata. Glumæ cito deciduæ, 2—3 mm. longæ, 2 mm. latæ, late ovatæ, acutæ, chartaceæ, non mucronulatæ, obscure 11—13-nervosæ, rubro-fuscæ, carina fusca, marginibus stramineis non hyalinis. Stamina 3; filamenta 2—2.5 mm. longa; antheræ 1.2 mm. longæ, 0.2 mm. latæ, lineares, rubræ, connectivum rubrum productum. Stylus circa 1 mm. longus. Achenium 1.2—1.5 mm. longum, 0.7—1 mm. latum, obovoideum vel ovoideum, atosanguineum, minute puncticulatum, lucidum, apiculatum, substipitatum, non falcatum, lateribus planis.

As type we designate *J. T. Howell No. 10560* (Herb. Calif. Acad. Sci. No. 216724) collected at Mazatlan, Sinaloa, Mexico; an isotype is in the Catholic University Herbarium. As cotypes we cite: *J. T. Howell No. 8415* (CAS), Socorro Island, Revillagigedo Islands; *J. T. Howell No. 10528* (CAS), Isabel Island, Tres Marias Islands; *J. T. Howell No. 10477* (CAS), San Juanito, Tres Marias Islands.

*Cyperus Howellii* is apparently endemic to the Revillagigedo Islands, Tres Marias Islands, and the adjacent coast of Mexico. I. M. Johnston (Proc. Calif. Acad. Sci., ser. 4, 20:55,—1931) mentions this plant as "aff. *brunneus* Sw." From this it is clearly distinguished by its wingless rhachilla and its red, not black, achene. It has also been suggested that this plant might be *C. glaucus* Steud. According to Kükenthal (Fedde Repert. 23: 189,—1926), *C. glaucus* is synonymous with *C. brunneus* Sw.

*Cyperus Howellii*, according to Kükenthal's classification is to be placed in the subgenus *Mariscus* section *Turgiduli*. It is most closely related to *C. ligularis* L. and *C. javanicus* Houtt. (*C. pennatus* Lam.). In common with these two species, the culm is papillose; in distinction to these two species, the rhachilla is wingless.

## 2. THE STATUS OF *CYPERUS BOTTERI*, *CYPERUS MOHRII*, AND *CHLOROCYPERUS ARSENI*

*Cyperus Botteri* Boeck. (Allg. Bot. Zeitschr. 2:2,—1896) is based upon Botteri's No. 33, Orizaba, Mexico. One sheet of this number is in the New York Botanical Garden. Britton recognized the plant as a distinct species which he named *C. Mohrii*, evidently being unaware that Boeckeler had already used the same specimen as the type of *C. Botteri*, possibly because the label on this specimen was misread as Baker No. 33 (Britton ex Clarke, Kew Bull. Add. Ser. 8:10,—1908). Unfortunately this misreading has been repeated by Kükenthal (Pflanzenr. IV. 20 (Heft 101): 461,—1936), who treats *C. Mohrii* as a valid species with the comment "nicht gesehen." Kükenthal (loc. cit.), however, places *C. Botteri* in the synonymy of *C. ischnos* Schlechtend. and cites Botteri's specimen, No. 33, from Orizaba. This plant is certainly not the same as *C. ischnos*. While it has glumes with tridentate apex, it differs from *C. ischnos* in having a conspicuously broadly winged rhachis and a scabrid culm, while *C. ischnos* has a wingless rhachis and a smooth culm.

*Chlorocyperus Arsenii* Palla (Österr. Bot. Zeitschr. 63:403,—1913) is based upon *Arsène* No. 5318 and 5580, both from Morelia, Michoacán. One sheet of each of these numbers is in the New York Botanical Garden and in the Missouri Botanical Garden. The isotype, No. 5318, has been photographed by the Catholic University. This plant as treated by Kükenthal is *C. ischnos* var. *Arsenii* (Palla) Kükenth. All these specimens of *Arsène*, however, have a well-developed broad wing on the rhachis and scabrid culms and in other respects are indistinguishable from *C. Botteri*. Accordingly *C. Botteri* seems best treated as follows:

*CYPERUS BOTTERI* Boeck., Allg. Bot. Zeitschr. 2:2 (1896).  
*C. Mohrii* Britton ex Clarke, Kew Bull. Add. Ser. 8:10 (1908).  
*C. ischnos* Schlechtend. var. *Arsenii* (Palla) Kükenth., Pflanzenr. IV. 20 (Heft 101): 462 (1936). *Chlorocyperus Arsenii* Palla, Österr. Bot. Zeitschr. 63:403 (1913).

## 3. TWO NEW NAMES IN *CYPERUS*

*Cyperus manimæ* H. B. K. var. *phæocephalus* (Griseb.)  
O'Neill & Benedict, stat. nov. *C. phæocephalus* Griseb., Abh.

Goett. Ges. Wiss. 19:216 (1874). *Mariscus phæcephalus* (Griseb.) Clarke, Kew Bull. Add. Ser. 8:16 (1908).

Grisebach assigned the name *Cyperus phæcephalus* to a plant with dark purple glumes. Clarke, although he placed this plant in the genus *Mariscus*, was of the opinion that the plant could not be maintained separately from *C. manimæ* (notes appended to several of his determinations, e. g., *Forrer No. 9*, Mazatlan, Durango, Mexico, in the New York Botanical Garden).

A thorough study of specimens of this plant from Mexico and South America by the authors has led to a similar conclusion. The only character which separates this plant from *C. manimæ* is its dark purple glumes. (*Cyperus manimæ* has light brown glumes.) Coloration of glumes is usually of little significance. Forms intermediate in color between the dark purple of *C. phæcephalus* and the red to brown glumes of *C. manimæ* can be found, e. g., *Pringle No. 8921*, *F. Müller No. 1988*, *Pringle No. 3160*; *Fisher No. 129*, all of which were collected in Mexico. On this account it seems best to treat Grisebach's species as a variety of *C. manimæ*.

The range of this Cordilleran plant appears to be Mexico to Argentina. Hitherto it has been reported only from South America, where it is apparently common in Peru and Bolivia. The present publication extends its range to Mexico.

ARGENTINA: Sierra de Cordoba, *C. Galander* (NY); Prov. de Jujuy, *Venturi No. 4889* (CU); Prov. de Tucuman, *L. R. Parodi No. 10686* (CU).

BOLIVIA: *O. Kuntze No. 7* (NY); near La Paz, *Rusby No. 100* (NY); Sonata, *Rusby No. 158* (NY), *No. 174* (UM), *G. Mandon No. 1394* and *No. 1434* (NY); La Paz *Bang No. 95*, *No. 95a* (NY); Depto. Cochabamba, *Eyerdam No. 24655*, *No. 25024* (UC).

COLOMBIA: *Mutis No. 2903* (NY).

ECUADOR: *A. Rimbach No. 200* (NY); Prov. Tunguragua, *Hitchcock No. 21899* (NY); *Spruce No. 5904* (NY).

PERU: *C. Vargas No. 685* (F); Depto. Cuzco, *Vargas No. 9737* (UC).

MEXICO: Pochuca, Hidalgo, *Rose et al. No. 8883* (US); Somoriel, Hidalgo, *Rose et al. No. 9214* (NY, US); Trinidad, Hidalgo, *Pringle No. 8291* (US); El Salto, Durango, *Pennell No. 18370* (CU); Amecameca, Federal District, *Fisher No. 134* (M, US); Ajusco, Federal District, *Orcutt No. 3710* (M, US), *No. 3711* (US); Mt. San Rafael, Federal District, *Lyonnet No. 721* (US); Lomagrande, Vera Cruz, *Balls No. 5384* (US); Mt. Orizaba, Vera Cruz, *Seaton No. 283* (G, US); La Parada, Oaxaca, *Nelson No. 1005* (US); Esperanza, Puebla, *O. Purpus No. 2510* (US).

**Cyperus nudiceps** (Clarke ex Standl.) O'Neill., comb. nov.  
*Kyllinga nudiceps* Clarke ex Standl., Field Mus. Bot. Ser. 4: 199  
 (1929).

This species belongs to the subgenus *Kyllinga* section *Eukyllinga*. It is most nearly related to the pantropical *C. peruvianus* (Lam.) N. F. Williams as shown by the reduction of leaves and bracts, the quadrangular culms, the puberulent roots, the smooth-keeled, wingless glumes, etc. Apparently it is confined to Cocos Island. The following key shows some of the distinguishing characters:

- Culms 0.5 mm. thick at apex and at base; bracts perfectly smooth, 2—4 mm. long; head 5—6 mm. in diameter containing about 30 ovate to ovate-lanceolate spikelets, spikelets 2.2—2.5 mm. long; achene 1 mm. long, oval.....*C. nudiceps*
- Culms 1—2 mm. thick at the apex, 3 mm. thick at the base; bracts antrorsely scabrid on the margins, 4—30 mm. long; head 6—10 mm. in diameter, containing 100—200 oblong spikelets, spikelets 3.5 mm. long; achene 1.3 mm. long, oblong-obovate.....*C. peruvianus*

### THREE NEW SPECIES FROM THE STATE OF WASHINGTON

BY ROBERT F. HOOVER

**Lithophragma Thompsonii** Hoover, spec. nov. Pubescens; rhizomatibus plerumque purpurascens; caulibus haud bulbiferis, 15—35 cm. altis; foliis radicalibus non nullis, tenuibus, vel trilobatis sinibus extendentibus circa ad medium vel interdum breviter quinquelobatis, lobis latis integris vel breviter 2—4-lobulatis; foliis caulinis sæpissime 2, late separatis, partitis ad basin vel fere ad basin in 3 segmenta linearia vel oblanceolata integra paucidentata vel trilobata lobis linearibus divergentibusque; pedicellis floriferis divergentibus, 1—2 mm. longis, fructiferis subrectis, 4—7 mm. longis; calyce cyathiformi basi acuto, ad anthesin 3.5—4 mm. longo, in fructu 4—6 mm. longo, lobis late triangulis, 1 mm. longis vel brevioribus; petalis albis, 5—6 mm. longis, laciniatis 7—9-lobatis, lobis basalibus brevibus angustissimis; carpellis junctis ad calycem tantum basi, in fructu calyce paululum longioribus.

Okanogan County: Omak, *Fiker No. 8*. Grant County: near Coulee City, *Thompson No. 6162*. Yakima County: East Selah Hills, *Hoover No. 5661*; south rim of Cowiche Canyon, *Hoover No. 5694*; south fork of Wide Hollow Creek, *Hoover No. 5745* (type).

The existence in Washington of any species of *Lithophragma* having simple basal leaves has not previously been recorded. The

two other species known to occur in the state, *L. parviflora* (Hook.) Nutt. and *L. bulbifera* Rydb., both have most of the basal leaves parted into three distinct leaflets.

It is a pleasure to name this *Lithophragma* for Mr. J. W. Thompson of Seattle, an authority on the flora of Washington and one of the few persons who have collected the species. When I was in the army and stationed in Seattle, Mr. Thompson generously invited me to make full use of his privately owned herbarium located in his home. Most of the work involved in describing these three new species was done in Mr. Thompson's herbarium.

**Lomatium tuberosum** Hoover, spec. nov. Radix oblonga vel raro subglobosa tuberformi, 5—10 cm. longa, 2—4 cm. diametro, axi longo vel horizontali vel verticali; petiolis foliorum radicalium 7—12 cm. longis, laminis glabris glaucis cuneatis, 4—8 cm. longis, ternatis denique 3—4-plo pinnatis, segmentis ultimis linearibus, 3—6 mm. longis; caulibus gracilibus, 12—23 cm. altis, subnudis, plerumque ferentibus prope basin bracteam unam scariosam interdum terminatam lamina reducta; umbella ex 5—8 radiis divergentibus composita, radiis in fructu 2—8 cm. longis, 8—12-floris, tantum paucis floribus fructiferis; bracteolis paucis inconspicuisque, anguste linearibus; pedicellis ad anthesin brevissimis, in fructu divaricatis, 7—14 mm. longis; petalis purpurascens; antheris flavis; fructu sine alis 4—5 mm. lato, 9—11 mm. longo, alis aliquantum crassis, latitudine minore quam 1 mm.

Yakima County: hill above Selah Creek, *Hoover No. 5603*; hills south of White Swan, *Hoover No. 5726* (type). The plants were found only on gentle slopes among loose rocks. At both localities the number of plants in flower in 1942 was very small.

This is one of the species which formerly would have been referred to *Leptotænia*, which is not tenable as a genus, as Mathias and Constance have shown (*Bull. Torr. Club* 69: 244,—1942). Specimens of the two collections cited were identified by Mathias and Constance, but with an expression of doubt, as *Lomatium cuspidatum* M. & C. (*Leptotænia Watsonii* C. & R.), an endemic of the Wenatchee Mountains. Examination of the specimens of *L. cuspidatum* reveals several differences, the most conspicuous of which is in the root. These differences are here summarized.

Plant with a long stout vertical cylindrical tap-root; old leaf-bases forming a tuft of coarse fibers on root-crown; stems usually comparatively stout, usually bearing 1 to 3 well-developed leaves above the base; petioles about equaling or mostly shorter than blades; ultimate leaf-divisions lanceolate to ovate, 2 to 4 mm. long; petals and anthers (except for pollen) bright purple.....*L. cuspidatum*

Plant with an oblong tuberous root; old leaf-bases membranous, not persistent; stems always slender, bearing at most only one leaf-sheath (sometimes with small blade) above the base; petioles longer than blades; ultimate leaf-divisions linear, 3 to 6 mm. long; petals dull purple; anthers yellow even without pollen.....*L. tuberosum*

In my opinion, *L. tuberosum* is most closely related to *L. minus* (Rose) M. & C., a very rare and poorly known species of eastern Oregon which is likewise tuberous-rooted. The one available specimen of *L. minus* was supplemented by an authentic illustration published by Coulter and Rose (Contrib. U. S. Nat. Herb. 7: pl. 8) and the accompanying description. The following differences are evident.

Stem, rays, and pedicels stout; leaves primarily pinnate; ultimate leaf-divisions 1.5 to 3 mm. long; fruit 13 to 16 mm. long, the wings fully 1 mm. wide.....*L. minus*

Stem, rays, and pedicels slender; leaves primarily ternate; ultimate leaf-divisions 3 to 6 mm. long; fruit 9 to 11 mm. long, the wings less than 1 mm. wide.....*L. tuberosum*

**Erigeron basalticus** Hoover, spec. nov. Perennis ex radice gracili; caulibus multis patentibus vel pendentibus super rupes, ramosis, 7—25 cm. longis, dense hirsutis, fragilibus, radicanibus prope basin; foliis plurimis, saturo-viridibus, 15—40 mm. longis, laminis sensim angustatis in petiolem, oblanceolatis vel late obovatis, trilobatis, lobis integris vel sæpe 1- vel 2-dentatis, foliis inferioribus mox marcescentibus, apice tridentatis vel aliquot subintegris, foliis supremis sæpe multo reductis et bracteatis, integris vel tantummodo dentatis; capitulis ramulos breves terminantibus in apicibus caulium; involucro ad anthesin 10—12 mm. diametro, bracteis plerumque subæqualibus, circa 30—35, herbaceis, margine scariosis, pubescentibus, 5—6 mm. longis; radiis 25—30, lilacinis vel albis, 6—7.5 mm. longis; acheniis 1.5 mm. longis; setis pappi circa 10, albescentibus, fragilibus, 2.5—3 mm. longis.

Yakima County: west base of Selah Butte, *Hoover No. 6021*; Selah Creek, *Hoover No. 5983* (type). This species grows on dry vertical basalt cliffs and apparently is restricted to the canyon of the Yakima River, together with its small tributary canyons, between Yakima and Ellensburg. It is in flower through the summer from May to October.

So far as I have been able to ascertain, only three other known species of *Erigeron*, at least on this continent, have lobed leaves. Of these, *E. compositus* Pursh is distinctive in having the leaves all basal. *Erigeron allocotus* Blake, which is known only from the type locality in Wyoming, has lobed cauline leaves similar to those of *E. basalticus* and might be considered its closest relative. The

two are very different in habit, however, *E. allocotus* having erect stems with few leaves on the upper part. As to other differences, the stems of *E. allocotus* are less hairy, its leaves or their lobes are mostly narrower, and its flower-heads are noticeably smaller than those of *E. basalticus*. *Erigeron vagus* Payson, a Colorado species, apparently resembles *E. basalticus* more closely in habit but is a much smaller plant with small leaves crowded in tufts at the ends of branching rootstocks and with flower-heads on comparatively long leafless peduncles.

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## A GROUP OF LUPINES RELATED TO LUPINUS ONUSTUS

BY ALICE EASTWOOD

In this group three species have been described: *Lupinus onustus* Watson (Proc. Amer. Acad. 11: 127,—1876), type collected in California by Mrs. M. E. Pulsifer Ames at Indian Valley, Plumas County, also by J. G. Lemmon, Sierra County; *L. mucronulatus* Howell (Erythea 1: 109,—1893), type collected by Thomas Howell in serpentine near Waldo, Josephine County, Oregon; and *L. violaceus* Heller (Muhl. 2: 65,—1905), type collected by Heller, No. 8037, under pine trees “on the first ridge west of Sisson,<sup>1</sup> Siskiyou County, California . . . growing in thick mats, the stems not rising much above the ground.” All of these plants are alike in the decumbent habit, similar leaves with long-spreading petioles and broadly oblanceolate to narrowly spatulate open spreading leaflets, and with many leaves from the base of the plant; the flowers are on the violet or purple shades and roundish in outline; the banner is broad with the middle groove deep, apex not notched and on the back finely pubescent near the base, also with some hairs on the middle or near the upper edges; the wings are broad, covering the keel; the keel is curved, broad at the middle, and more or less ciliate; the ripe legume is broad and thick with a few large seeds; the upper calyx-lip is bidentate and the lower is longer and entire.

LUPINUS ONUSTUS Watson. Several specimens from Plumas County, California, agree so well with the original description that to see the type was not necessary for identification: Mrs. R. M.

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<sup>1</sup> Now Mt. Shasta City.

*Austin No. 41*; *Mrs. Mary Strong Clemens*, Greenville; *Mrs. H. C. Cantelow*, 2 miles north of Quincy, Highway 89. These are all in flower and similar. At Forest Lodge, near Greenville, the author collected good specimens in flower and fruit, *No. 14461*.

LUPINUS MUCRONULATUS Howell. Through the kindness of Dr. H. L. Mason a specimen of *L. mucronulatus* from the Brandege Herbarium of the University of California was loaned to the author. This was collected at Waldo by Thomas Howell and is probably part of the type collection. Two specimens are on the sheet, one with leaflets narrowly spatulate, obtuse, and mucronulate at apex; the other with leaflets oblanceolate, pointed at apex and base. The same leaflet variation is seen in other members of the group.

Specimens from the mountains of Trinity County, California, appear to represent *L. mucronulatus*: *Eastwood & Howell No. 4919*, on the road from Minersville to Trinity Center, a complete plant with flowers and immature fruit; *Mrs. E. C. Van Dyke*, specimen from Trinity Center, without flowers or root but with fruit almost ripe, 1 cm. broad, 3 cm. long; *Lester Rowntree*, Big Flat Road, several flowering branches only. All of these have the spreading decumbent habit, long petioles, narrowly spatulate leaflets verging to oblanceolate, upper and lower surface with scattered appressed hairs, the flowers similar in shape and size to those of *L. mucronulatus*, the keel slightly ciliate.

LUPINUS VIOLACEUS Heller. Besides the type collection of *L. violaceus* (*Heller No. 8037*), several specimens from Shasta Springs and Mt. Shasta City represent the species in the Herbarium of the California Academy of Sciences. The best specimen is *Eastwood No. 11864* collected under pines at Shasta Springs. It is a complete plant with roots, flowers, and fruit. The heavy fruit is a marked feature of the group. The smaller flowers distinguish this from the two preceding.

*Lupinus violaceus* Heller var. *shastensis* Eastwood, var. nov.<sup>2</sup> Specimens collected near Baird, Shasta County, California, *Eastwood & Howell No. 1819*, have the small flowers of *L. viola-*

<sup>2</sup> *Lupinus violaceus* Heller var. *shastensis* Eastwood, var. nov. A specie differt: foliolis 2/3 minoribus, infra densissime argenteo-sericeis, pedunculis et racemis longioribus.

Type: Herb. Calif. Acad. Sci. No. 216343, collected at Pollock's Store near Baird, Shasta County, California, April 21, 1934, *Eastwood & Howell No. 1819*.

*ceus* but the leaflets are not half the size, the upper surface is glabrous but the lower more densely pubescent with long silvery appressed hairs. Two specimens are on the sheet, one with flowers a trifle larger than the other; the peduncles and racemes are much longer than in any of the specimens of *L. violaceus* and the flowers are whorled.

*Lupinus violaceus* Heller var. *delnortensis* Eastwood, var. nov.<sup>3</sup> From Del Norte County, California, we have two collections similar to *L. violaceus* in habit, leaves, and small flowers: French Hill, near Adams Station, *Eastwood No. 69*, collected August, 1907; on the grade from Patrick Creek to Shelley Creek, *Eastwood & Howell No. 3666*. This latter is a complete specimen in flower and immature fruit which, however, is advanced sufficiently to show its character. In these specimens the upper calyx-lip is more deeply bidentate and the lower lip longer, ovate-lanceolate in shape; the keel appears to be glabrous; the upper surface of the leaflets is glabrous, the lower lightly appressed-pubescent; the shape of the flower is that of the group.

#### KEY TO THE SPECIES AND VARIETIES

Flowers about 10 mm. long.

Keel densely ciliate, upper leaf-surface glabrous, lower appressed-pubescent ..... *L. onustus*

Keel lightly ciliate, upper and lower leaf-surface lightly pubescent....  
..... *L. mucromulatus*

Flowers about 8 mm. long.

Keel ciliate.

Longest leaflets 4 cm. long, 1 cm. broad..... *L. violaceus*

Longest leaflets 10 mm. long, 4 mm. broad.. *L. violaceus* var. *shastensis*

Keel glabrous..... *L. violaceus* var. *delnortensis*

## A NEW LUPINE FROM MT. RAINIER

BY ALICE EASTWOOD

*Lupinus rainierensis* Eastwood, spec. nov. Ramosus basi et supra ex radice simplici et lignea; caulibus gracilibus, circa 2—3 dm. altis, glabris vel parce pubescentibus, ramis patentibus; petiolis inferioribus foliolis longioribus, petiolis superioribus foliolis subæqualibus, foliolis 6 vel 7, circa 4 cm. longis, 5—10 mm. latis, oblanceolatis, obtusis cum acumine, supra

<sup>3</sup> *Lupinus violaceus* Heller var. *delnortensis* Eastwood, var. nov. A specie differt: carina glabra; calycis labio superiore bifido profundius, labio inferiore longiore ovato-lanceolato.

Type: Herb. Calif. Acad. Sci. No. 235467, collected on the old road on the grade between Patrick Creek and Shelley Creek, Del Norte County, California, July 2, 1936, *Eastwood & Howell No. 3666*.

fere glabris, infra leviter adpresse pubescentibus; floribus circa 10 mm. longis, violaceis, verticillatis in racemis ramulos terminantibus; pedunculis plerumque folia superantibus; pedicellis gracilibus, circa æquilongis calycibus, adpresse pubescentibus; tubo calycis brevissimo, basi gibboso, labio superiore circa 2 mm. longo, basi 2 mm. lato, apice abrupte bidentato, tecto vexillo, labio inferiore 7 mm. longo, lanceolato-attenuato; vexillo glabro, ex basi reflexo, violaceo, croceo-maculato, 7 mm. longo, 8 mm. lato, ungue lato, basi gibboso, croceo, margine crispo; alis 8 mm. longis, 6 mm. latis, ungue 1 mm. longo; carina exserta, inferiore parte flavescenti, superiore parte violacea, margine leviter ciliata prope medium.

Type: Herb. Calif. Acad. Sci. No. 235204, collected June 20, 1936, on White River at boundary of Mt. Rainier National Park, King County, Washington, by Eastwood and Howell, No. 2922.

The following specimens in Herb. Calif. Acad. Sci., though taller and with flowers a little larger, seem to belong to this species: *Eastwood No. 9655*, Mountaineer's Camp, Kitsap County, Washington; *L. S. Rose in 1916*, South Fork Snoqualmie River, elev. 1500 ft., King County, Washington; *H. M. Hall No. 10945*, north base of Mt. Hood, Oregon. This species was collected in August, 1943, on Mt. Rainier by Dr. Hans Leschke, who collected also and readily identified *L. subalpinus* Piper & Robinson and *L. volcanicus* Greene, but this was neither and evidently new to Mt. Rainier. In studying Dr. Leschke's plant, I came across the specimen that I have taken as the type and the others listed above. *Lupinus rainierensis* may be distinguished from related species by the following tentative key:

- |                                       |                                       |
|---------------------------------------|---------------------------------------|
| 1. Stems widely spreading above.....  | 2                                     |
| 1. Stems simple .....                 | 3                                     |
| 2. Leaves pale on lower surface.....  | <i>L. columbianus</i> Heller          |
| 2. Leaves green on both surfaces..... | <i>L. rainierensis</i> Eastw.         |
| 3. Pubescence shaggy.....             | <i>L. volcanicus</i> Greene           |
| 3. Pubescence appressed.....          | <i>L. subalpinus</i> Piper & Robinson |

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## SPECIFIC AND VARIETAL TRANSFERS IN CYPERACEÆ, TRIBE SCIRPEÆ

BY A. A. BEETLE

*Division of Agronomy, University of California, Davis*

The description of the unnatural genus *Isolepis* (*Cyperaceæ*) by R. Brown (Prod. Fl. Nov. Holl.,—1810) has considerably delayed an appreciation of generic limits within the tribe *Scirpeæ* and has been a major factor in the nomenclatorial unrest within

the group. An appreciation of the names described under *Isolepis* has proved to be a prerequisite to a monograph of many sections in the genus *Scirpus*, a study which has been under way for some time and which has resulted in the accumulation of some routine transfers. The following are presented at this time:

- Bulbostylis conifera** (Kunth) Beetle, comb. nov.  
*Isolepis conifera* Kunth Enum. Pl. 2:206 (1837).  
*Isolepis ciliifolia* Steud. Syn. Pl. Glum. 2:99 (1855).  
*Scirpus Reichenbachii* Boeck., Linnæa 36:737 (1870).  
*Fimbristylis conifera* Reich. in Boeck., l. c.
- Bulbostylis conostachya** (Boeck.) Beetle, comb. nov.  
*Isolepis conostachya* Boeck., Flora 61:597 (1858).  
*Scirpus conostachys* Boeck., Linnæa 36:756 (1870).
- Bulbostylis densa** (Wall.) Beetle, comb. nov.  
*Scirpus densus* Wall. in Roxb. Fl. Ind. 1:231 (1820).  
*Isolepis densa* R. & S. Mant. Syst. Veg. 2:71 (1824); Wight, Contrib. Bot. Ind. 109 (1834).  
*Isolepis tenuissima* D. Don, Prod. Fl. Nepal. 40 (1825).
- Bulbostylis Gardneriana** (Steud.) Beetle, comb. nov.  
*Isolepis Gardneriana* Steud. Syn. Pl. Glum. 2:99 (1855).
- Bulbostylis Labillardieri** (Steud.) Beetle, comb. nov.  
*Isolepis Labillardieri* Steud. Syn. Pl. Glum. 2:96 (1855).
- Bulbostylis pilosa** (Steud.) Beetle, comb. nov.  
*Isolepis pilosa* Steud. Syn. Pl. Glum. 2:97 (1855).
- Bulbostylis Pringlei** (Britton) Beetle, comb. nov.  
*Scirpus Pringlei* Britton, Bull. Torr. Bot. Club 15:103, pl. 80 (1888).
- Bulbostylis Schraderiana** (Steud.) Beetle, comb. nov.  
*Isolepis Schraderiana* Steud. Syn. Pl. Glum. 2:103 (1855).
- Bulbostylis subdisticha** (Boeck.) Beetle, comb. nov.  
*Scirpus subdistichus* Boeck., Linnæa 36:490 (1870).
- Bulbostylis trichoides** (Schrad.) Beetle, comb. nov.  
*Isolepis trichoides* Schrad. in R. & S. Mant. Syst. Veg. 2:64 (1824).
- Bulbostylis trichokolea** (Steud.) Beetle, comb. nov.  
*Isolepis trichokolea* Steud. Syn. Pl. Glum. 2:96 (1855).
- Bulbostylis Wallichiana** (Schult.) Beetle, comb. nov.  
*Isolepis Wallichiana* Schult. in R. & S. Mant. Syst. Veg. 2:533 (1824).  
*Isolepis capillaris* D. Don, Prod. Fl. Nepal. 39 (1825).
- Fimbristylis armerioides** (Miq.) Beetle, comb. nov.  
*Isolepis armerioides* Miq. Fl. Ind. Bot. 3:310 (1859).
- Scirpus africanus** Beetle, nom. nov.  
*Scirpus tenuis* Spreng. in Flora Beil. p. 12 (1829). Not Willd. Enum. Pl. 1:76 (1809).  
*Isolepis tenuis* Schrad. Anal. Fl. Cap. 15 (1832). Not Presl, Delic. Prag. 144 (1822).  
*Isolepis atropurpurea* Nees, Linnæa 7:495 (1832). Not R. & S. Syst. Veg. 2:106 (1817). Nor *Scirpus atropurpureus* Retz. Obs. 5:14 (1789).

*Isolepis pusilla* Kunth Enum. Pl. 2:190 (1837). Not *Scirpus pusillus* Vahl Enum. Pl. 2:246 (1806).

**Scirpus amazonicus** Beetle, nom. nov.

*Scirpus fluitans* L. var. *emergens* Pfeiff., Rep. Spec. Nov. 33:202-204 (1933). Not *Scirpus emergens* (Norman) Fernald, Rhodora 45:281 (1943). This plant and *Scirpus confervoides* Poir. are the only American representatives of the Section *Eleogiton* (Link) Pax. This section, principally African, does not seem to have received taxonomic study in more than a century since Nees (1834 to 1836 in Linnæa) treated the section as the genus *Eleogiton*. Two of his names have been overlooked:

**Scirpus rubicundus** (Nees) Beetle, comb. nov.

*Eleogiton rubicunda* Nees, Linnæa 10:164 (1836).

*Isolepis rubicunda* Kunth Enum. Pl. 2:188 (1837).

**Scirpus striatus** (Nees) Beetle, comb. nov.

*Eleogiton striata* Nees, Linnæa 9:29 (1834).

*Isolepis striata* Kunth Enum. Pl. 2:189 (1837).

**Scirpus mindorensis** Beetle, nom. nov.

*Isolepis Cumingii* Steud. Syn. Pl. Glum. 2:101 (1855). Not *Scirpus Cumingii* Boeck., Linnæa 36:491 (1870).

*Fimbristylis Cumingii* F.-Vill. in Naves & F.-Vill. Noviss. App. Fl. Philipp. 308 (1882).

/ / /

The species of the section *Reigera* (Opiz Seznam 83,—1852) were treated under the sectional name *Bolboschæmus* (Palla, 1904) by Beetle (Amer. Jour. Bot. 29:82-88,—1942) at which time the earlier sectional name was overlooked. Since that time a study containing some valuable points (Fernald, Rhodora 45:279-296,—1943) has added to our knowledge of the section. Fernald accepts the eastern North American plants included by Beetle in his composite *Scirpus maritimus* L. as *Scirpus maritimus*, but points out that the American material differs from the European in sufficient degree to form a geographical variety. This in no way changes the status as a variety of the local but very characteristic *Scirpus maritimus* L. var. *Fernaldi* (Bicknell) Beetle. Except for this variety, then, the American material of *Scirpus maritimus* becomes:

**Scirpus maritimus** L. var. *agonus* (Fernald) Beetle, comb. nov.

*Scirpus maritimus* L. var. *Fernaldi* (Bicknell) Beetle forma *agonus* Fernald, Rhodora 45:288 (1943).

/ / /

Further study of the Hawaiian material of *Scirpus paludosus* A. Nels. has revealed that its unusually large, pale and long-rayed

spikelets amply justified its description as a variety by Hillebrand. On the other hand its affinities, as shown by its lenticular achene, are with *Scirpus paludosus* (achene lenticular) and not *Scirpus maritimus* (achene trigonous) which was recognized as cosmopolitan at the time of Hillebrand's study.

*Scirpus paludosus* A. Nels. var. *digynus* (Hillebrand) Beetle, comb. nov.  
*Scirpus maritimus* L. var. *digynus* Hillebrand, Fl. Hawaiian Isl. 475 (1888).

1 1 1

ERIOPHORUM CRINIGERUM (Gray) Beetle. The proper listing of the above combination in the Gray Herbarium Index calls attention to the incorrect form used at the time the combination was originally made (Beetle, Leaf. West. Bot. 3:165,—1943).

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## A NOTE ON ERIOGONUM

BY C. V. MORTON

*Smithsonian Institution, Washington, D. C.*

In 1935 I described<sup>1</sup> a new species, *Eriogonum panamintense*, from the Death Valley region of California. At that time only a single collection was known, but shortly afterward two additional specimens were received from Mr. M. French Gilman, viz., Titus Canyon, Grapevine Mountains, Inyo County, California, June 23, 1935, *Gilman No. 1831*, and Wildrose Canyon, Panamint Mountains, Inyo County, California, Aug. 12, 1935, *Gilman No. 2009*.

The purpose of this note is to point out a new synonym, *Eriogonum reliquum* Stokes (Leaf. West. Bot. 2:52,—1937), based on specimens collected in Charleston Park, Charleston Mountains, Clark County, Nevada, by I. W. Clokey (*No. 7491*), distributed as No. 706 of the *Plantæ Exsiccatae Grayanæ*. The flowers are somewhat smaller, but otherwise the Clokey specimens are identical with the type of *E. panamintense*, the publication of which two years previously was undoubtedly overlooked by Miss Stokes. The occurrence of *E. panamintense* in Nevada was to be expected, for the Charleston Mountains form a natural phytogeographic unit with the Panamint and Grapevine mountains of California.

---

<sup>1</sup> Journ. Washington Acad. Sci. 25:308 (1935).

THE TYPE LOCALITIES OF CERTAIN  
CALIFORNIAN BLACKBERRIES

BY JOHN THOMAS HOWELL

In a recent genetic and taxonomic study of our Californian blackberries by Spencer W. Brown (*Amer. Journ. Bot.* 30: 686–697,—1943), a new species and two new varieties were named and described but an inadequate statement was given for the localities where the types were collected. Although such data may not be of much importance to a student primarily concerned with the genetics of a group of plants, they are of critical interest to a systematist, and because we have been particularly interested in the systematics of western blackberries at the California Academy of Sciences, I obtained for our records through the coöperation of Miss Annetta Carter the type collection data from the Herbarium of the University of California where the types are deposited. In order that the published record of our blackberries may be systematically complete, these data are given here:

RUBUS LEMURUM Brown (*Amer. Journ. Bot.* 30: 695). Type (pistillate): Herb. Univ. Calif. No. 666159, collected in ravine 15 miles north of Fort Ross, Mendocino County, California, *Brown No. 42015*.

RUBUS URSINUS C. & S. var. MEDUSÆ Brown (*ibid.*, p. 696). Type (pistillate): Herb. Univ. Calif. No. 666171, collected in bog along State Highway No. 20 at Cold Spring in the upper Clear Lake region, Lake County, California, *Brown No. 41053*.

RUBUS URSINUS C. & S. var. PENTAPHYLLUS Brown (*l. c.*). Type (pistillate): Herb. Univ. Calif. No. 666162, collected on U. S. Highway No. 199, 4.6 miles south of Redding, Shasta County, California, *Brown No. 41131*.

---

SMALL GERANIUM IN CALIFORNIA. The occurrence of *Geranium pusillum* Burm. f. was to be expected in California since it is commonly established in Oregon and Washington, but one would have anticipated its appearance in the western coastal parts of the state. Instead the first Californian record of this Eurasian species that I have seen comes from Independence, Inyo County, where specimens were collected by Mark Kerr in 1941.—J. T. Howell.

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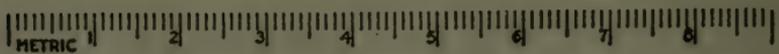
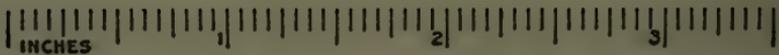


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## PUGILLUS ASTRAGALORUM III

BY R. C. BARNEBY

The following paper, the third of a series of miscellaneous notes on *Astragalus*, is based mainly on material gathered by Mr. H. D. Ripley and the writer in the southwestern States. There are also included, however, a few changes in nomenclature which have been found necessary in the course of more extended studies. During the preparation of the manuscript it has been possible to make critical comparisons at the New York Botanical Garden (NY), Pomona College (PO), and the University of Notre Dame (ND), and I wish to acknowledge with gratitude the facilities offered by the curators of these herbaria. I am also especially indebted to Mr. F. W. Peirson and to the California Academy of Sciences for the gift of valuable specimens.

Types of proposed entities, as well as most of the other collections cited, are deposited in the herbarium of the California Academy of Sciences.

***Astragalus canovirens*** (Rydb.) Barneby, comb. nov. *Homalobus canovirens* Rydb., Fl. Rocky Mts. & Adj. Pl., ed. 2, 1126 (1922). *Astragalus Coltoni* var. *foliosus* Jones ex Eastw., Zoe 4:115 (1893), nom. nud. *A. Coltoni* var. *moabensis* Jones, Contr. W. Bot. 8:11 (1898).

COLORADO: Yellowjacket, west of Cortez, Montezuma Co., Ripley & Barneby No. 5362. UTAH: north of Blanding, San Juan Co., No. 5390.

I agree with Rydberg in regarding *A. canovirens* as a species distinct from, though closely allied to, *A. Coltoni* Jones, from which it differs not only in the regularly pinnate leaves, but also in the coarser, more heavily pubescent stems, denser racemes of slightly longer flowers, and wider, more coriaceous pods. The stems of *A. Coltoni* rise from an intricately branched aerial caudex, those of *A. canovirens* from the summit of a multicipital taproot.

***Astragalus iodanthus*** Wats. var. ***typicus*** Barneby, nom. nov. *A. iodanthus* Wats., Bot. King Expl. 70 (1871), sensu stricto.

The plant described by Watson is the uncommon form of this variable species characterized by a comparatively long calyx and

large violet-blue flowers (fig. 19). I have seen it only in the mountains of northern Nevada between 5000 and 6000 feet, as at Unionville in the West Humboldt Mountains or on Emigrant Pass in Eureka County. At similar altitudes near Virginia City, whence came part of Watson's material, and throughout the range of the species, the flowers are commonly smaller and either ochroleucous or but faintly lilac-tinged. In these two montane variants of var. *typicus* the relative proportions of the petals remain nearly constant: in desert valleys of northwestern Nevada and adjacent California, however, at altitudes between 4000 and 4600 feet, the species is represented by a race in which the lamina of the keel-petals is much enlarged at the expense of the claws, and the keel itself is exerted beyond the wings and sometimes nearly equals the banner. Since this variation is readily recognizable and occupies a distinct altitudinal zone, it may be worthy of separation under the name

*Astragalus iodanthus* Wats. var. *diaphanoides* Barneby, var. nov., a var. *typico* nob. præsertim carinæ majusculæ alas superantis vel saltem æquantis lamina 6 mm. usque longa unguiculis suis manifeste longiori diversa. Præterea legumine ob suturam dorsalem plus minusve introversam septiferamque inferne imperfecte biloculari a var. *typico* sæpissime ulterius recedit, sed hæc nota inconstans videtur.

NEVADA: between Reno and Dewey, Washoe Co., alt. 4200 ft., *Ripley & Barneby No. 5659*. Type in Herb. Calif. Acad. Sci., No. 313543. *Ibid.*, No. 4494, flor. Washoe Valley, *Dr. Stretch* (NY). Quinn River Crossing, Humboldt Co., alt. 4100 ft., *Ripley & Barneby No. 4559*. Trinity Mts., northwest of Lovelock, Pershing Co., alt. 4500 ft., No. 5637 (*forma pube crispula magis copiosa transitum ad A. pseudiodanthum Barneby præbens*). CALIFORNIA: Smoke Creek, northeast of Viewland, Lassen Co., alt. 4600 ft., No. 5768. Fig. 20—23.

Apart from the peculiar flower, the var. *diaphanoides* is also notable for the structure of the pod. In all but one of the cited collections the dorsal suture is more or less broadly introverted along the lower half of the legume, thereby forming a distinct though narrow partial septum, 0.5—1.5 mm. high, which, on account of the strong dorsiventral flattening of the fruit, divides the cavity into two almost separate locules. As this feature appears to be not entirely constant, it cannot be used as diagnostic. It should be remarked, however, that Rydberg, noticing the sep-

tum in the legume of Dr. Stretch's specimen from Washoe Valley, was sufficiently impressed to refer that collection (Bull. Torr. Bot. Club 54:20,—1927) to *Hamosa drepanoloba* (Gray) Rydb. (*A. diaphanus* Dougl. ex Hook.), a species with papery-translucent pods endemic to the valleys of the Columbia and John Day rivers in Oregon and Washington, and to this misdetermination can be traced the Nevada record of *H. drepanoloba* in the North American Flora.

That it was possible for Rydberg to refer two specimens of what is here considered the same species, *sensu lato*, to two separate genera (*Xylophacos* and *Hamosa*) is sufficient indication of the variability and somewhat anomalous character of *A. iodanthus*. While the large-flowered extreme of var. *typicus* is sometimes difficult to separate from *A. cibarius* Sheld., a species naturally placed in *Xylophacos* Rydb., the more pubescent phase of var. *diaphanoides* exhibited by Ripley & Barneby No. 5637 presages a definite trend toward *A. pseudiodanthus* Barneby, a species not known to Rydberg, but one which by his own criteria would be classed with *Batidophaca* Rydb. Moreover both Jones (Rev. Astrag. 203) and Rydberg himself (Bull. Torr. Bot. Club 52:144,—1925) have remarked on the extraordinary resemblance between *A. iodanthus* and forms of *A. lentiginosus* Dougl. (i. e., *Cystium* Rydb.). Thus *A. iodanthus*, which under various aspects combines salient characters of *Cystium*, *Hamosa*, and *Xylophacos*, and is at the same time related through *A. pseudiodanthus* to *Batidophaca*, furnishes yet further proof (if any be needed) of the unreality of Rydberg's astragaline genera.

ASTRAGALUS NATURITENSIS Pays., Bot. Gaz. 60:377 (1915).  
*A. desperatus* Jones, Rev. Astrag. 203 (1923), pro parte, non  
*Zoe* 2:243 (1891). *Batidophaca desperata* Rydb., N. Amer. Fl.  
24:319 (1929), quoad syn., non descr.

COLORADO: sandy ledges of cliffs and on detrital slopes beneath the Cliff Palace, south end of the Mesa Verde, Montezuma Co., alt. 6600—6700 ft., Ripley & Barneby No. 5359. Fig. 16, 17.

Authentic material of *A. naturitensis*, a species which seems to have been reported only from the type-locality in Montrose Co., Colorado, about seventy miles north of the present station, has not been available for comparison, but our gathering, in all but

the ochroleucous coloring of the petals, answers so perfectly to Payson's description that one can scarcely doubt the correctness of the determination. It is not known whether Rydberg was familiar with the original *A. naturitensis*, but it seems unlikely, as the name appears in the North American Flora merely as a doubtful synonym of *Batidophaca desperata* (Jones) Rydb. In this disposition he followed Jones, who had already suppressed the species in favor of his own *A. desperatus*, in my opinion quite unjustifiably. It is true that the two are closely allied and similar in general facies, stipule, leaf, and flower, but the pods are entirely different. As will be seen from the accompanying illustration, the legume of *A. naturitensis* (fig. 17) is narrowly lanceolate in outline, gently falcate up to the gradually acuminate tip, at least four times as long as its greatest diameter and minutely strigulose with short, filiform, appressed hairs, in contrast to that of *A. desperatus* (fig. 18) which, though variable in size, is much more strongly inflated, proportionately twice as wide, abruptly arched towards the apex into a characteristic porrect triangular beak, and villous with long spreading hairs seated on a pustular base. In addition the peduncles of *A. naturitensis* are more slender and flexuous, inclined to be arcuate-prostrate in fruit, the racemes remain very short at maturity and do not elongate as in *A. desperatus*, while the pod is held either erect or horizontal to the axis and is never strongly declined. *Astragalus desperatus*, it is true, is somewhat variable in the density of vestiture of the pod, but the hairs are always long and spreading: the corolla, as also, apparently, in *A. naturitensis*, may be purple, wholly ochroleucous, or with just the wings and keel purple-tipped.

Both the flower and the legume of *A. desperatus* vary in size within rather unexpectedly wide limits, the smallest extreme having been recognized as var. *petrophilus* Jones (*Batidophaca petrophila* (Jones) Rydb.), but this seems to be an insignificant entity. In the summer of 1943, one of the driest seasons on record in the Southwest, several collections of *A. desperatus* were made in southeast Utah and near Grand Junction, Colorado, the type locality. In nearly every case the dimensions of our specimens either agree more closely with var. *petrophilus* as shown in its type (San Rafael Swell, Utah, Jones, PO) than with the typical form, or are exactly intermediate, and it is only an occasional

individual, from a locality especially favored by moisture or shaded exposure, that agrees precisely with well-developed *A. desperatus*. From these observations I conclude that var. *petrophilus* is merely a depauperate form, and *Batidophaca petrophila* should therefore be reduced to synonymy with *A. desperatus*.

*Astragalus humistratus* Gray var. *crispulus* Barneby var. nov. ab *A. humistrati* formis omnibus hucusque descriptis imprimis caulibus foliis calycibusque pube patula crispa undique villosulis, foliis brevissimis 1—3 cm. tantum longis, necnon leguminis minoris vix 7 mm. longi pauciovulvati valvulis tenuiter membranaceis manifeste diversa.

ARIZONA: roadside bank in pinewoods above Nutrioso, Apache Co., alt. 8150 ft., *Ripley & Barneby No. 5074*. Type in Herb. Calif. Acad. Sci., No. 313637. Fig. 24—26.

The group of *Astragali* immediately allied to *A. humistratus* Gray has been variously treated by Jones (Rev. Astrag. 81, sequ.) as a single polymorphous species with three named varieties, and by Rydberg (N. Amer. Fl. 24:315, sequ.) as a group of about half a dozen species in his genus *Batidophaca*. The recognized entities are all very similar in habit and structure, and differ chiefly in the length and compression of the pod and in the quantity and distribution of the pubescence. These characters, however, are subject to some fluctuation and Rydberg's species, even disregarding such obviously minor variations as he recognized under the names *Batidophaca stipulacea* and *B. humivagans*, are not very clearly defined either morphologically or geographically. Therefore, although the var. *crispulus* is at least as distinct from the typical phase of *A. humistratus* as *A. Hosackiae* Greene is from the latter or from *A. sonora* Gray, I am disposed for the present to follow Jones' classification and to regard the plant described above merely as another marked variety within the compass of a complex and widely distributed species.

In its slender habit, short subsessile leaves, and few-flowered racemes the var. *crispulus* is likely to recall *A. humistratus* var. *tenerimus* Jones (*A. sonora* var. *tenerimus* (Jones) Kear. & Peeb.), a form which is known only from the high parks of the Kaibab Plateau, but the resemblance goes no further. The var. *crispulus* is unique among its close relatives both in pubescence and in the texture of the pod. In all described varieties and segregates of *A. humistratus*, the pubescence is composed of straight, basally or sometimes medially attached, strigose hairs more or

less closely appressed to the surface of the leaflets, stems, and pods. Throughout the herbage of var. *crispulus*, on the other hand, the hairs are of a quite different character, being not at all appressed or even evidently ascending, but rather spreading, curly and tangled, and extremely fine: the vesture of the pod is similar but shorter and mixed with a few longer, straight hairs. The pod itself is smaller than in any of the other varieties, with a maximum length of 7 mm., while it is more strongly curved into almost half a circle and has thinly membranous, at length translucent valves. The corolla becomes ochroleucous immediately after fertilization, but at first anthesis the banner at least is veined and suffused with pale and sordid rose.

The var. *crispulus* was seen in only one locality along Nutrioso Creek in the yellow pine forest of the White Mountains, but it was locally plentiful. The stems were strictly prostrate and rather freely branched, and formed wide circular mats on an open gravel bank. Both typical *A. humistratus* and its variety *sonoræ* (Gray) Jones were also collected in the neighborhood, the former in the shade of pines a few miles to the south towards Alpine, the latter at the upper edge of the pinyon-zone above Eagar, and the differences were very apparent even in the field.

***Astragalus flexuosus* Dougl. var. *Diehlii* (Jones) Barneby, comb. nov. *A. Diehlii* Jones, Rev. Astrag. 194 (1923). *Pisophaca Diehlii* (Jones) Rydb., N. Amer. Fl. 24: 324 (1929).**

UTAH: Buckhorn Truck Trail east of Castle Dale, Emery Co., Ripley & Barneby No. 4732. East of Cisco, Grand Co., No. 5423. COLORADO: west of Mack, Mesa Co., No. 5424.

Jones himself doubted the specific distinctness of this race, acknowledging that it might be "only an extreme form of *A. flexuosus*." In fact, in the Index to the Revision of *Astragalus* the plant is listed as a variety of *A. flexuosus*, but this combination, which lacks any reference to the description in the text, must be regarded as a *nomen provisorium* and is therefore invalid.

***Astragalus flexuosus* Dougl. var. *sierræ-blancæ* (Rydb.) Barneby, comb. nov. *Pisophaca sierræ-blancæ* Rydb., N. Amer. Fl. 24: 323 (1929).**

The var. *sierræ-blancæ*, reduced by Tidestrom and Kittell (Fl. Ariz. & N. Mex. 207,—1941) to *A. flexuosus*, is indeed very close to the species, differing mainly in the glabrous legume.

**Astragalus niveus** (Rydb.) Barneby, comb. nov. *Phaca nivea* Rydb., N. Amer. Fl. 24:348 (1929). *A. Peirsonii* Munz & McB., Bull. S. Calif. Acad. Sci. 31:67 (1932). ? *A. Crotalariae* var. *piscinus* Jeps., Fl. Calif. 2:350 (1936), quoad pl. descr., non *A. piscinus* Jones.

CALIFORNIA: Algodones Sand-dunes west of Yuma, Imperial Co., Ripley & Barneby No. 2783.

The type of *Phaca nivea* Rydb. (*MacDougal in 1904*, NY) was collected near the head of the Gulf of California, that of *A. Peirsonii* (*Munz & Hitchcock No. 12132*, PO) about a hundred miles to the north in southeast Imperial Co., California: it is apparent that they represent the same species. I have not seen Dr. Jepson's specimens from near Yuma (where *A. niveus* is plentiful), but from the description it seems probable that the same plant was intended. *Astragalus piscinus* Jones is a glabrescent plant which has otherwise been recorded only from the Pacific coast of the peninsula of Baja California.

An earlier *Astragalus niveus* is recorded by the Index Kewensis: it appeared, however, merely as a synonym of *A. pelliger* Fenzl, ascribed by Bunge (*Gen. Astrag. Geront. 2:189,—1869*) to de Monbret, and was never validly published.

ASTRAGALUS SABULONUM Gray.

NEW MEXICO: sandy valley 17 miles south of Shiprock, San Juan Co., Ripley & Barneby No. 5285. Also observed near Farmington, San Juan Co.

A new record for the flora of New Mexico, but scarcely surprising, since the species is found on dunes along the San Juan River in adjacent Utah, whence it follows the Colorado River southward into Sonora.

**Astragalus iochrous** Barneby, nom. nov. *A. violaceus* St. John, Research Stud., State Coll. Wash., 1:98 (1929), non *A. violaceus* Basil., Not. Syst. Herb. Hort. Petrop. 3:115 (1922).

**Astragalus monoensis** Barneby, spec. nov. egregia sed affinitatis adhuc dubiæ, hinc stipulis connatis *Chatodontibus* Gray inter quos ob legumen obcompressum calycem multoties superans anomala, vel *Ocreatis* Gray (*Batidophaca* ser. *Humistratis* Rydb.) a quibus legumine subbiloculari graviter discrepat, illinc *A. inyoensi* Sheld. (*Tii* sp. Rydb.) qui ovario longe stipitato stipulisque disjunctis a nostra differt accedens, nec ulla cum specie (nisi cum *A. striatifloro* Jones, habitu notulisque compluribus haud absimili sed quoad stylum exsertum carinamque acuminatam omnino singulari) arcte comparanda.

Herba perennis humilis pulchella cryptophyta indumento e pilis patulis adscendentibusque brevibus plus minusve crispatis constituto præter petalos undique molliter villosos vel subsericeo-cinerascens: caulibus numerosis e radice verticalis graciliusculi pluricipitis collo subterraneo emissis, 1—2 dm. longis, prostratis flexilibus sed haud abrupte flexuosis exangulatis hinc inde divaricatim ramosis, inferne filiformibus nudis, superne magis robustis et confertim foliatis, tota longitudine pube laxiuscule adscendenti indutis: stipulis difformibus, imis scariosis erectis vix 1 mm. longis obtusis subperfecte adnatis connatisque (ut caulem ocrea cupuliformi utrinque emarginata laxè vaginent) in medias summasque herbaceas ovato-acuminatas 2—3 mm. longas reflexas per tertiam partem tantum connatas breviusque adnatas gradatim accrescentibus, omnibus extus pubescentibus intus glabris, imis nonnumquam demum glabratis: foliis præsertim patulis, petiolo gracili 3—6 (vel 12) mm. longo incluso 1—3 cm. longis: foliolis (4 vel) 5—7-jugis, approximatis vel foliorum summorum juniorumque valde congestis, oblongis obovatisve obtusis vel leviter retusis, 2—6 mm. longis, sæpissime conduplicatis, manifeste falcatis, utrinque canescenti-villosulis, sursum secus rachin paulo decrescentibus: pedunculis adscendentibus rectis, folium suffulcrans saltem breviter superantibus vel sæpius eo dimidio longioribus, in racemum 6—10-florum primo congestum subcapituliformem demum laxiorem et ineunte fructu circa 1 cm. longum abeuntibus: bracteis subulatis herbaceis anguste scarioso-marginatis 1.5—3 mm. longis pedicellum gracilem superantibus: floribus patentibus: calycis membranacei extus sericeo-villosi tubo campanulato vel late tubuloso-campanulato 3—4 mm. longo,

#### FIGURES OF ASTRAGALUS

Fig. 1—5. *A. platycarpus* var. *montezumæ* Bby. 1, raceme and leaf  $\times \frac{1}{2}$ ; 2, ventral view of pod  $\times 1$ ; 3, lateral view of pod  $\times 1$ ; 4, longitudinal section of pod  $\times 1$ ; 5, cross-section of pod  $\times 2\frac{1}{2}$  (all from type-collection).

Fig. 6 and 27. *A. platycarpus* var. *typicus* Bby. 6, cross-section of pod  $\times 2\frac{1}{2}$ ; 27, pair of leaflets  $\times 1$  (both from type).

Fig. 7—15. *A. monoensis* Bby. 7, habit of young plant  $\times \frac{1}{2}$  (*Ripley & Barneby No. 5833*); 8 and 9, lateral and apical views of pod  $\times 1\frac{1}{2}$  (type); 10, cross-section of pod  $\times 2$  (type); 11, 12, and 13, flower, wing, and keel-petals  $\times 2$  (*Ripley & Barneby No. 5833*); 14 and 15, lower and upper stipules  $\times 4$  (*Ripley & Barneby No. 5833*).

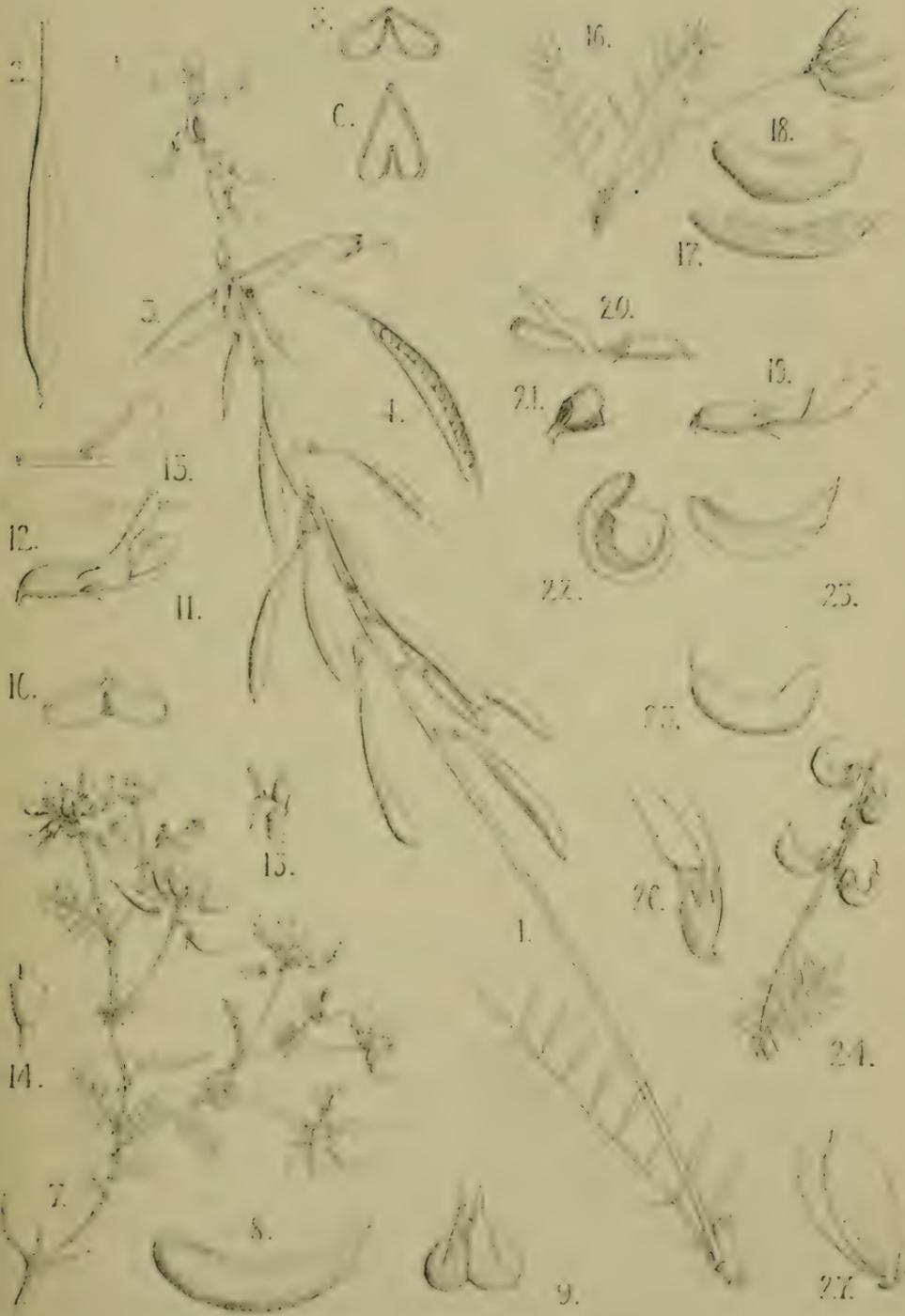
Fig. 16 and 17. *A. naturitensis* Pays. 16, leaves and raceme  $\times \frac{1}{2}$ ; 17, pod  $\times 1\frac{1}{2}$  (both from *Ripley & Barneby No. 5359*).

Fig. 18. *A. desperatus* Jones. 18, pod  $\times 1\frac{1}{2}$ .

Fig. 19. *A. iodanthus* var. *typicus* Bby. 19, flower  $\times 2$  (type-collection, NY).

Fig. 20—23. *A. iodanthus* var. *diaphanoides* Bby. 20, flower  $\times 2$  (*Ripley & Barneby No. 4498*); 21, base of calyx with bracteole  $\times 4$  (*Ripley & Barneby No. 4498*); 22 and 23, longitudinal sections of pods  $\times 1$  (*Ripley & Barneby No. 5768, 4559*).

Fig. 24—26. *A. humistratus* var. *crispulus* Bby. 24, raceme and leaf  $\times 1$ ; 25, pod  $\times 3$ ; 26, flower  $\times 3$  (all from type).





ad basin obliquam minutissime bibracteolato (sed bracteolæ sæpe in vestigia exigua ægre cernenda reductæ sunt vel omnino deficient), ovario turgescenti mox rupto, dentibus subulatis acutiusculis circa 2 mm. longis, ciliatis, sinu lato obtusiusculo inter se separatis: petalis ex albo lutescentibus, vel vexillo dilute purpureo-striatulo carinaque apice maculata: vexillo oblanceolato-obovato profunde emarginato, explanato circa 12 mm. longo, in unguiculum latum sensim angustato, medium versus ad angulum fere rectum retroarcuato, marginibus patentibus vel leviter reflexis: alis subrectis, 10—11 mm. longis, lamina oblanceolata obtusa auriculo parvo reflexo incluso 6 mm. longa: carinæ (7 vel) 8—9 mm. longæ petalis secus margines tota fere longitudine connatis, unguiculis rectissimis circa 4.5 mm. longis, laminis oblique semiorbicularibus, inferne per anulum dimidium in apicem obtusum æqualiter arcuatis, superne levissime concavis subrectis: legumine sessili (vel ob pericarpium carnosulum in sicco contractum quasi-substipitato) chartaceo valde turgido, ambitu de visu ventrali ovoideo vel ovoideo-acuminato, de visu laterali lanceolato-lunato, basi abrupte obtuso vel truncato, apice acuto, valde falcato et præter rostrum acutum vel acuminatum vacuum compressum obcompressum, 1.5—2 cm. longo, suturis ventrali per totam longitudinem acuta dorsali prominula sed depressa et infra medium legumen introversa ut septum præsertim incompletum 1—2.5 mm. altum suturam oppositam vix attingentem efformet, sectione compressa obcordata, 6—9 mm. lato, 3—5 mm. alto, valvulis pulchre reticulatis stramineo-purpurascensibus pube brevissima strigoso-villosula indutis: seminibus valde compressis, 2—2.5 mm. longis, circa 2 mm. latis, ad hilum emarginatis, atrocastaneis.

CALIFORNIA: near Crestview, Mono Co., 10 Aug. 1938, *J. T. Howell No. 14500*. Type in Herb. Calif. Acad. Sci., No. 313539. Hills north of Mammoth, sandy plain, alt. 7900 ft., *Peirson No. 6093*. Valley north of Mammoth and east of Inyo Crater Lake, Mono Co., alt. 7500 ft., *Ripley & Barneby No. 5833*. Fig. 7—15.

*Astragalus monoensis* was first collected nearly twenty years ago by Mr. F. W. Peirson, to whom the writer is indebted for a portion of his original material. Since then it has been collected twice, always in the region immediately north of Mammoth, the three stations lying but a few miles apart. Mr. J. T. Howell, who kindly communicated the fine specimens selected as the type, alone has obtained the mature fruit.

The species is a remarkable one in that it exhibits a combination of characters not previously met with in North America. If the pod were considered the sole criterion of affinity in the genus—a course which Rydberg followed to unfortunate lengths—*A. monoensis* would be included quite naturally in *Tium* sensu Rydb., the falcate, obcompressed and imperfectly bilocular

legume being not unlike that of *A. salmonis* Jones (though with the ventral, not the dorsal, suture concave) or that of *A. inyoensis* (though sessile). By the same system it might equally well be classified with certain varieties of *A. lentiginosus* Dougl. (*Cystium* Rydb.), though differing in the campanulate calyx. It departs, however, from all these species and their close allies in the connate stipules, a character which has proved of fundamental import almost throughout the genus, both in Asia as well as in the New World. Yet an attempt to attach the species to some natural group characterized by connate stipules is scarcely more successful. In general aspect *A. monoensis* is likely to recall *A. sonora* Gray (sect. *Ocreati* Gray), but in that species, as well as its relatives, the stipules are scarious throughout, and the pod has no vestige of dissepiment. Perhaps more closely allied are the *Chatodontes* (*A. Austinæ* Gray etc.), but these are of rather different aspect, the long-villous, compressed pod is but little exserted from the calyx, and the keel of different shape. The species most closely resembling *A. monoensis* in the form of the stipules, in pubescence and in general habit is the singular *A. striatiflorus* Jones (sect. *Cystiella* Barneby), confined to a small area about Zion Park in southern Utah: but this species, with its attenuate keel, exserted style and membranous legume, seems otherwise remote. Yet again, in the general structure of the pod as well as in the obscurely bibracteolate calyx, *A. monoensis* may be linked with the very different *A. iodanthus* var. *diaphanoides* Barneby. It is probable that the species will eventually constitute a section apart.

In a narrow valley surrounded by pinewoods on the east slope of the Sierra Nevada north of Mammoth, *A. monoensis* is found in flat open places where the soil is composed of fine white gravel mixed with sand. Here, in a xerophytic association of low herbs which includes *Hulsea vestita* Gray, *Oenothera xylocarpa* Cov., and *Eriogonum esmeraldense* Wats., the species occurs locally but in some quantity, forming mats of silvery herbage closely pressed to the ground, or more often climbing up through the twigs of a dwarf *Artemisia*, when the whole plant becomes more lax and green. The numerous stems, filiform below but branched and stouter above, arise from the multicapital, subterranean crown of a slender taproot, rather in the manner of *A. lentiginosus* var.

*ineptus* (Gray) Jones which grows nearby. The short leaves with their congested leaflets vested in villous hairs, the subcapitate racemes of proportionately large ochroleucous flowers, and the peculiar stipules are characteristic.

***Astragalus remotus*** (Jones) Barneby, comb. nov. *A. arrectus* var. *remotus* Jones, Rev. Astrag. 162 (1923); Clokey, Madroño 6:217 (1942). *Tium remotum* (Jones) Rydb., N. Amer. Fl. 24:391 (1929).

In the original description Jones characterized his variety as "the extreme variation [of *A. arrectus*] caused by aridity and hot climate," and stated that "all these forms intergrade from one to the other as you go south." There is, however, no evidence whatever that *A. remotus* intergrades with *A. arrectus* or its allies. Since its discovery by Jones at Good Springs, Nevada, the species has been collected on numerous occasions in the canyons of the Charleston Range by Clokey (cf. loc. cit.), Maguire, and the writer (*No.* 2897, 3371), and from the copious material now at hand it is evident that it there maintains its identity. It has been found nowhere else. *Astragalus eremiticus* var. *typicus* Barneby (*A. arrectus* var. *eremiticus* (Sheld.) Jones), the "form" with which, from its southerly occurrence, one might expect *A. remotus* to intergrade, is amply distinguished by its larger calyx and flower, as well as by the long stipe and narrow partition of the pod.

***Astragalus platycarpus*** (Rydb.) Barneby var. ***typicus*** Barneby, comb. et var. nov. *Tium platycarpum* Rydb., N. Amer. Fl. 24:387 (1929), Bull. Torr. Bot. Club 57:398 (1930). Fig. 6, 27.

This species, perfectly distinct from its nearest allies *A. Drummondii* Hook., *A. scopulorum* Porter, and *A. racemosus* Pursh, is inadequately known from the type only, a single branch bearing one raceme in advanced flower and one in ripe fruit (NY). It was collected by Brandegee in southern Colorado in 1873, but the precise locality, recorded on the label as Oak Creek, has not been identified. A collection from the Mesa Verde, which I had at first supposed to represent the long-lost *A. platycarpus*, proves on comparison to differ in a number of details and may be described as

***Astragalus platycarpus*** (Rydb.) var. ***montezumæ*** Barneby, var. nov.

florum leguminisque structura cum var. *typico* sat bene congruens, sed ab eo foliolis anguste linearibus 0.3—3.5 mm. tantum latis utrinque cinereis, nec ellipticis 6—9 mm. latis superne glabratiss, racemis laxioribus axin primariam multo superantibus, necnon legumine striguloso (nec glabro) magis obcompresso graviuscule absimilis.

COLORADO: plateau at the south end of the Mesa Verde, Montezuma Co., alt. 6900 ft., *Ripley & Barneby No. 5357*. Type in Herb. Calif. Acad. Sci., No. 313546. Fig. 1—5.

The final status of *A. platycarpus* var. *montezumæ* must inevitably await further collections of Brandegee's plant, when it may prove to be merely an extreme form of the species. From the material now available, however, I judge it to be a distinct race characterized by its narrow, strigose-cinereous leaflets, very long and lax racemes, and by the strigulose, more strongly obcompressed legume: in the structure of the flower the two varieties are nearly identical.

The var. *montezumæ*, a rather coarse, erect, perennial herb with stout fistular stems 5—6 dm. tall, ochroleucous petals, and pendent, long-stipitate, linear-oblongate, retroarcuate pods, is locally common along the rim of the Mesa Verde overlooking the canyon of the Mancos River, where it occurs on flat sandy ground among the junipers and pinyons. Although abundant in its zone, in the parts of the Mesa which rise above 7000 feet it is abruptly replaced by the superficially similar *A. scopulorum* Porter.

*Astragalus Paysonii* (Rydb.) Barneby, comb. nov. *Hamosa Paysonii* Rydb., Bull. Torr. Bot. Club 54:22 (1927); N. Amer. Fl. 24:425 (1929).

Apparently a well-marked species, differing from *A. umbraticus* Sheld. in the pubescence and smaller flowers. It is known to me only from the type (*Payson & Payson No. 2748*, NY) which came from western Sublette Co., Wyoming, at a point some 600 miles east of the nearest known station for *A. umbraticus*.

*Astragalus Bigelovii* Gray var. *typicus* Barneby, var. nov. *A. Bigelovii* Gray, Pl. Wright. 2:42 (1853), sensu stricto.

*Astragalus Bigelovii* Gray var. *mogollonicus* (Greene) Barneby, comb. nov. *A. mogollonicus* Greene, Bull. Torr. Bot. Club 8:97 (1881). *A. Bigelovii* fma. *MacDougalii* Gdgr., Bull. Soc. Bot. Fr. 48:xiv (1902), non *A. MacDougalii* Sheld.

*A. Bigelovii* auct. pro parte. *A. Thompsonæ* Kearn. & Peeb., Fl. Pl. Ariz. 489 (1942), pro parte, non Wats.

ARIZONA: Colorado Plateau south of the Grand Canyon, *L. F. Ward in 1901* (NY). Southwest of Frazier's Wells, Coconino Co., among pines, alt. 6500 ft., *Ripley & Barneby No. 5220*. Near Flagstaff, Coconino Co., *MacDougal No. 128* (NY, type-collection of fma. *MacDougalii* Gdgr.). East of Flagstaff, stony plateau among pines, alt. 6600 ft., *Ripley & Barneby No. 3103*. NEW MEXICO: bleak grassy summits of the Mogollon Mts., *Greene in 1881* (ND, type of *A. mogollonicus* Greene).

Kearney and Peebles (loc. cit.) have recently drawn attention to the existence in northern Arizona, far out of the natural range of *A. Bigelovii*, of a plant combining the pod of that species with other characters of *A. Thompsonæ* Wats., to which, in fact, they refer their aberrant material. Likewise for some years I have possessed a collection of an *Astragalus* from Flagstaff, Arizona, which could not be satisfactorily placed either with *A. Thompsonæ* or with *A. Bigelovii*, and which I had tentatively identified as Gandoger's fma. *MacDougalii*. This race, which occurs from the Grand Canyon southeast along the Mogollon Rim into southwestern New Mexico, is the plant described long ago by Greene as *A. mogollonicus*, and, although the name was reduced by Jones (Rev. Astrag. Index) and more recently by Tidestrom and Kittell (Fl. Ariz. & N. Mex. 220,—1941) to a synonym of *A. Bigelovii*, I believe that it is at least sufficiently distinct to deserve varietal recognition.

*Astragalus Bigelovii* var. *mogollonicus* differs most evidently from *A. Thompsonæ* in the smaller, narrower and nearly straight pod with a perfect septum (i. e. not unilocular at the apex), but it is also a lower, more congested plant, with denser racemes and shorter peduncles. The habitual characters also serve to distinguish it from *A. Bigelovii* var. *typicus*, which moreover has somewhat larger flowers, pods and leaflets, and a pubescence of shorter, more closely appressed and matted hairs. In stature and pubescence var. *mogollonicus* most closely resembles *A. Bigelovii* var. *Matthewsii* (Wats.) Jones, which I have recently collected near the type-locality, Fort Wingate, New Mexico (*No. 5253, 5258*), but in that variety the pod is conspicuously inflated. More impressive than the morphological differences, often difficult to

make out in herbarium specimens, is the perfect geographic segregation of *A. Thompsonæ* and each variety of *A. Bigelovii*. Thus *A. Thompsonæ*, which, on the structure of the legume, may be treated specifically, is endemic to the Sonoran Zone of the Navajo Basin, its range being approximately limited by the Virgin and Little Colorado rivers to the south and west, the Uintahs to the north, and the foothills of the Rocky Mts. to the east: *A. Bigelovii* var. *typicus* is widely distributed in, but confined to, the desert grasslands from southern Arizona east to Texas and south to Durango: while vars. *mogollonicus* and *Matthewsii* occupy distinct territories in the wide band of mountains which divide the two major areas, occurring in open pinewoods of the Transition Zone.

ASTRAGALUS CRASSICARPUS Nutt.

ARIZONA: stony mesa 4 miles southeast of Eagar, Apache Co., alt. 7750 ft., *Ripley & Barneby No. 5049*.

Some doubt seems still to exist in the literature as to the occurrence of a member of the section *Sarcocarpi* Gray west of the Continental Divide. In his monograph of *Geoprimum* (Bull. Torr. Bot. Club 53: 164,—1926) Rydberg recorded a specimen from Arizona, without precise locality, which he referred doubtfully to *G. pachycarpum* (T. & G.) Rydb., remarking that the legume was atypical for the species: this record, however, was dropped from his later account of the genus in the North American Flora. More recently Tidestrom and Kittell (Fl. Ariz. & N. Mex. 221,—1941) reported *A. crassicaarpus* (as *A. caryocarpus* Ker) from eastern Arizona, but it is not mentioned in Kearney and Peebles' Flora of the state (1942). Our specimens, collected in early September, bear fruit only: while the pods exactly resemble those of typical *A. crassicaarpus* in shape and size, the valves seem to be unusually thin-walled. It is hoped that botanists visiting the region in the spring will secure flowering material for further study.

ASTRAGALUS PARRYANUS Tidestr. *Oxytropis Parryi* Gray.

NEVADA: in calcareous scree, denuded ridge of the Egan Range on the northern slope of Ward Mt., White Pine Co., alt. 8900 ft., *Ripley & Barneby No. 4014*. Top of ridge about 2 miles north of Toyabe Dome, Nye Co., alt. 10500 ft., *Hitchcock & Martin No. 5610* (NY).

Not previously recorded from Nevada. The species was long supposed to be confined to the main range of the Rocky Mts., where it is known to extend from Lincoln and Sublette counties, Wyoming, south into the high peaks of northern New Mexico: evidently it is much more widely distributed. Utah specimens have been seen from the La Sal Mts. (*Purpus* No. 6574, PO) and Abajo Peak (*Maguire & Redd* No. 1943, PO; *Goodman & Hitchcock* No. 1413, NY) and from the Wasatch Plateau at Scofield (*Jones in 1904*, NY). The material from Nevada differs slightly from the typical Rocky Mountain form in the extremely small size of the flowers, the banner being scarcely 8 mm. in length, and the keel, including its apiculate beak, between 5 and 6 mm. One collection from Abajo Peak, however, has equally short corollas.

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## NEW WESTERN PLANTS—V

BY ALICE EASTWOOD

***Arenaria stenomeris*** Eastwood, spec. nov. Caules dense caespitosi ex radice perenne, 1—2 dm. alti, glabri, graciles, foliosi; foliis nodis inferioribus 3-verticillatis, filiformibus, erectis, 2—2.5 cm. longis, rigide acuminatis, basi dilatatis, glabris; floribus cymoso-paniculatis, bracteis subulatis, rigide attenuatis, ramulis filiformibus erectis; sepalis et pedicellis florum mediorum et superiorum stipitato-glandulosis; calyce basi truncato, sepalo ovato-acuminato, superante capsulam; petalis albis, anguste linearibus, 1 mm. latis, sepalos superantibus 2—3 mm.; staminibus 10, filamentis filiformibus, circa 3 mm. longis; capsulis ovatis, obtusis, circa 4 mm. longis; seminibus orbicularibus, anguste alatis, circa 1 mm. diametro.

Type: Herb. Calif. Acad. Sci. No. 320030, collected May 19, 1944, on limestone cliffs in a canyon at the south end of Meadow Valley Range, Lincoln Co., Nevada, by H. D. Ripley and R. C. Barneby, No. 3469. This is related to *A. aculeata* Watson, differing in the long, narrow, linear petals and capsules surpassed by the sepals.

***Dodecatheon spilantherum*** Eastwood, spec. nov. Glabrum, 2—5 dm. altum; foliis integris, pallido-viridibus, laminiis late oblanceolatis, 4—6 cm. longis, 8—15 mm. latis, apice obtusis, basi angustatis ad petiolum marginatum aequilongum laminiis; ramis umbellae circa 6 vel 12 inaequalibus in umbellis; floribus nutantibus, violaceis; calyce 4 mm. longo, segmentis acuminatis longioribus tubo; segmentis corollae violaceis basi albis, oblongis, circa 1 cm. longis et 2 mm. latis; basi staminum alba tuberculata in lineis circa 1 mm. longa, antheris circa 4 mm. longis, albis, basi maculatis, macula atro-purpurea, triangulari; capsulis erectis apice dehiscentibus in 5 valvis.

Type: Herb. Calif. Acad. Sci. No. 312345, collected May 25, 1941, near Sunnyside, northeastern Nye County, Nevada, by H. D. Ripley and R. E. Barneby, *No. 3618*. It grew in heavy moist soil along the White River, at an altitude of 4900 ft.

In June, 1938, Miss Anita Noldeke sent a single specimen of this species which she collected on Whiskey Creek, Mono County, California. I had named it as a new species with this name, but hesitated to publish it until better specimens could be obtained. These that have been selected are much larger specimens, represented by four plants, three with single scapes and one with two. The underground petioles of the leaves are papery-membranous and show no tendency to form tubers. The roots are slender, fleshy, fascicled. The chief distinguishing feature is the triangular pointed purple spot on the anthers to which the specific name refers.

---

A NEW NAME FOR A CALIFORNIAN GROUNDSEL. While attending to some bibliographic details arising from a report on my Sierra Nevada collections of 1944, I noted that the name of the High Sierran endemic, *Senecio Muirii* Greenm. (*Ann. Missouri Bot. Gard.* 5: 56,—1918), is antedated by the South African *S. Muirii* L. Bolus (*Ann. Bolus Herb.* 1: 192,—1915). The small Sierran alpine may be properly called *Senecio speculicola* J. T. Howell, *nom. nov.*—J. T. Howell.

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PEREGRINATOR RUBIACEARUM. Another Old World weed is to be added to our California weed flora, *Crucianella angustifolia* L. Specimens were collected in scrub oak thickets on dry hills near Igo, Tehama County, on May 22, 1944, by Dr. Alan A. Beetle, who reports that it is abundant in the area. This accession to the Madder Family in California is a slender erect annual with vegetative parts as in *Galium* but with conspicuous white-margined floral bracts that mostly conceal the inconspicuous flowers of the elongate spike. The plant is indigenous to southern Europe and northern Africa.—J. T. Howell.

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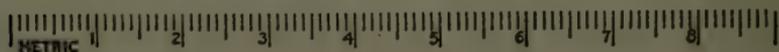
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PUGILLUS ASTRAGALORUM IV:  
THE SECTION DIPLOCYSTIUM

BY R. C. BARNEBY

## INTRODUCTION

The study of *Astragalus* § *Diplocystium*, the results of which are presented in this paper, was begun in 1940 when it was found impossible by use of the existing monographs of the genus to identify with any degree of confidence or accuracy more than half the forms encountered by the writer in the deserts of Nevada and California. By reference to M. E. Jones' Revision of *Astragalus* it was generally feasible to arrive at some sort of determination, but it soon became evident that many of his names covered unreasonable extremes of variation, or that his descriptions and indications of range were either inaccurate or actually misleading. Recourse to Rydberg's monograph of the genus *Cystium* in the New World, a much more critical and ambitious treatment than that of Jones, was only rarely more fruitful of results, while both the nomenclature and the specific concept adopted by him in the North American Flora appeared altogether unsatisfactory. The imperfect nature of the current manuals and monographs was made even more manifest by the confusion found to exist in herbaria among plants of this alliance, and the necessity of a critical reevaluation of this difficult and extensive group became doubly apparent.

Although a large amount of material has been examined and some clarification of the literature and taxonomy has been achieved, much still remains unknown about the section, and several of the races accepted here are at present ill-defined and perhaps chimerical. Further exploration, particularly in the still obscure mountains of Nevada where § *Diplocystium* is very highly developed, will be necessary before the picture can be anything like complete, while the difficult question of specific limits, here almost completely evaded by the reduction of all the known relatives of *A. lentiginosus* to varieties of that species, can probably be solved only by cultural and genetic studies. The present account is offered rather as a basis for further investigation than as an attempt at a definitive monograph: it is hoped, nevertheless,

that by use of the key, descriptions, and figures it will at least be possible to determine with greater certainty than heretofore the majority of the specimens to be met with in the herbarium and the field.

#### ACKNOWLEDGMENTS

In the course of the preliminary studies the writer spent several days at the New York Botanical Garden where most of Rydberg's types are preserved together with a large quantity of material determined by him. This visit was of special value in giving an insight into the scope of Rydberg's specific concepts which often (in *Cystium* at least) do not at all correspond with his published descriptions, prepared, it seems, chiefly from a single sheet. For permission to study at the Garden, I am specially grateful to Dr. H. A. Gleason. I am also much indebted to Dr. P. A. Munz for the loan of the copious material at Pomona College: it is largely from specimens in this collection that the figures were prepared. To Mr. Ira W. Clokey and Mr. Frank W. Peirson I am grateful for gifts of pertinent material. Mr. N. Y. Sandwith of Kew Gardens supplied valuable information about the types of *Astragalus lentiginosus* and *A. diaphamus*, thus clearing up a long-disputed nomenclatural point. Finally to the persons in charge of the herbaria listed below, in particular to Miss Alice Eastwood, Prof. M. L. Fernald, Mr. J. T. Howell, Dr. Theodor Just, Dr. T. H. Kearney, Dr. H. L. Mason, Mr. R. H. Peebles, Dr. H. K. Svenson, and Dr. P. C. Standley I am indebted for help and many courtesies.

#### HERBARIA IN WHICH CITED MATERIAL HAS BEEN SEEN

(Symbols in parentheses have been used in the customary manner to indicate the herbarium in which cited material was examined)

Brooklyn Botanic Garden, Brooklyn.....	(Br)
California Academy of Sciences, San Francisco.....	(CAS)
Chicago Natural History Museum (Field Museum).....	(F)
Gray Herbarium, Harvard University.....	(G)
Herbarium of H. D. Ripley and R. C. Barneby.....	(RB)
New York Botanical Garden, New York.....	(NY)
Pomona College, Claremont.....	(PO)
Santa Barbara Botanic Garden, Santa Barbara.....	(SB)
Southern California Academy of Sciences, Los Angeles.....	(LA)
U. S. Field Station, Sacaton, Arizona.....	(SAC)
University of California, Berkeley.....	(UC)
University of Nevada, Reno.....	(UN)
University of Notre Dame, South Bend.....	(ND)

## HISTORY OF THE SECTION DIPLOCYSTIUM

The segregation of the species of *Astragalus* native to the North American continent into species-groups, series, sections, and subgenera has exercised the ingenuity of all the authorities who have dealt with the genus. For our purpose it is not necessary to go back beyond Gray's classic memoir of 1863 (Proc. Amer. Acad. vol. 6) in which he first united the Linnean *Phaca*, hitherto accepted by Bentham, Nuttall, Hooker, and Torrey, with *Astragalus* proper, and arranged the species in groups according to the structure of the pod. Although abandoned as a genus, *Phaca* was here retained as a major division of *Astragalus* under the title of "series" to contain the species with unilocular pods, while those with partially or perfectly bilocular pods were placed in *Astragalus* series *Astragalus*. These two series, which were about equivalent to the subgenus of modern taxonomists, were again divided into sections (§) with names formed adjectivally in the nominative plural (the "series" of today). In Gray's memoir three of the five species in § *Diplocystium* which had then been published, *A. diphysus*, *A. lentiginosus*, and *A. Fremontii*, were placed together for the first time to form the section *Diphysi* in ser. *Astragalus*: of the two others known at that period *A. Coulteri* had not been seen by Gray himself, while *A. Arthu-Schottii* was known only from flowering material, and both were included in another section.

By 1871 more material had accumulated from exploration of the West and when Watson published a revised synopsis of the genus in the Appendix to the King Report he was able to make a number of additions and corrections. The *Diphysi* here include four species, *A. diphysus*, the newly described *A. platytropis*, *A. lentiginosus*, and *A. Coulteri*. *Astragalus Fremontii* and *A. Arthu-Schottii* were reduced respectively to the two last. The next systematic treatment was Sheldon's Preliminary List (1894) in which Gray's section was remodeled and enlarged to contain ten species, and renamed *Astragalus* ser. *Eu-astragalus* § *Lentiginosus*. Here we find correctly placed, in addition to the species admitted by Watson, two newly described forms, *A. araneosus* and *A. MacDougali*, together with *A. salinus* Howell and *A. latus* Jones. The section, however, is spoiled by the inclusion of *A. bajaensis* Sheld. with unilocular pods, and *A. diaphanus*

Dougl., at that time altogether obscure and in any case not closely allied to the rest, while *A. Coulteri* (with its congener *A. eremicus* Sheld.) is again, and inexcusably, referred to quite another section.

It was partly the unsatisfactory nature of Sheldon's List which prompted Jones to prepare his own taxonomic arrangement, and he brought to the subject not only a profound field-knowledge of the plants themselves, but also an attitude of mind totally dissimilar to that of his predecessors. For a number of years he attempted to perfect a classification based primarily on characters of the flower, stipules, and pubescence, similar, one may imagine, to that applied by Alexander von Bunge to the *Astragali* of the Old World, and although this proved in the main impracticable for our species, the Revision of *Astragalus* as it finally appeared in 1923 contained a number of radical innovations. Not least among these was the reduction of the *Diphysi* to a single species with some fifteen varieties which he attached to his section *Inflati*, a large and somewhat heterogeneous group in which *A. lentiginosus* was anomalous in having a bilocular fruit. *Astragalus platytropis*, however, was not included in this general reduction.

Meanwhile Rydberg had started that generic segregation of *Astragalus* species which was to culminate in the North American Flora in the recognition of no less than twenty-seven genera. In 1906 he revived for two of the *Diphysi* in the Flora of Colorado the genus *Cystium*, originally proposed by Steven for three species from the Levant but long ignored by nearly all systematists. This was followed in 1913 by a new batch of sixteen combinations in the same genus and, finally, by raising nearly all Jones' varieties of *A. lentiginosus* to specific rank and by the description of twelve new species he raised the number of *Cystia* to thirty-three.

The small group of species, similar in aspect to the *Diphysi* but with legumes seldom inflated, for which Rydberg created his series *Palantia* of *Tium*, is here included in the account of § *Diplocystium*. They have had a less complex taxonomic history than the *Diphysi* proper, for the first two species, *A. mokiaceus* and *A. ursinus*, were not described until 1878. Gray considered these to be allied to *A. iodanthus* Wats. Sheldon placed them in his § *Sericophyllus*, an odd mixture of unrelated and dissimilar plants,

while he disposed of the closely allied *A. palans* in his § *Oroboideus*. Jones treated all of these, as well as *A. Wilsonii* Greene and *A. amplexus* Pays., as varieties of *A. lentiginosus*, a course which has been followed in the present paper. My own views on the relationship of these species have been expressed in a previous note on *Astragalus* (Proc. Calif. Acad. Sci. IV, 25:163—4, passim,—1944).

In the classification proposed below, an elaboration of that in Jones' Revision of *Astragalus*, the section *Diplocystium* is restricted to a single species, *A. lentiginosus*, with forty varieties.

#### DEFINITION OF THE SECTION

The section *Diplocystium* may be separated from related groups in North America which also bear sessile, bilocular, terete or didymous (but never tricarinate) pods by various combinations of characters. The section *Sarcocarpi* Gray (*Geoprimum* Rydb.), which replaces § *Diplocystium* on the prairies east of the Continental Divide, differs in the fleshy texture of the indehiscent or tardily dehiscent legume. From § *Uliginosi* Gray it is readily distinguished by the pubescence of basifixed, never medially attached hairs: from the caulescent species of § *Mollissimi* Gray by the more shortly cylindrical calyx-tube, smaller flowers, and strongly arcuate banner: and from §§ *Orocystium* and *Cystiella* by the stipules, petiolar or obscurely cauline but never connate.

#### PHYLOGENY AND CLASSIFICATION

The varieties of *A. lentiginosus* fall readily into three groups distinguished by the size of the flowers and the length of the racemes, and it has been suggested by the writer (Proc. Calif. Acad. Sci. IV, 25:161,—1944) that these might be specifically separated. On purely morphological grounds this arrangement is certainly both convenient and possible, but it would fall far short of a true expression of the numerous cross-relationships manifestly existing between members of each group. Thus var. *diphysus* and var. *tehachapiensis*, judged by structural criteria alone, would be placed in the same species, although their very close relatives var. *australis* and var. *sierræ* would in each case belong in another, and a similar situation would arise with such obvious

twins as vars. *sesquimetralsis* and *albifolius* or vars. *platyphylidius* and *salinus*.

In spite of numerous attempts at breaking up the unwieldy *A. lentiginosus* into more than one species or into subspecific units, I have failed to find adequate criteria in the plants themselves to support the desired result. Field-knowledge of more than half of the recognized races has merely deepened my conviction that Jones was correct in his estimate of the specific limits of the species. The evolution of the section seems to have progressed not as a lineal sequence but as a number of radiating (and sometimes anastomosing) lines which have given rise to forms morphologically similar but of different immediate origins. For example, starting from the complex made up of the closely related vars. *salinus*, *macrolobus*, and *Fremontii*, a chain of races, each link of which is cemented by the existence of structurally (and often geographically) intermediate individuals, can be traced southwestward from central Nevada through the vars. *floribundus*, *ineptus*, *sierræ*, *tehachapiensis*, *cæsariatus*, and *nigricalycis* to var. *variabilis*, and another southeastward through vars. *Kennedyi*, *araneosus*, *diphysus*, and *yuccanus* to var. *australis*. When these progressions are laid side by side it becomes apparent that starting from a given point the original stock has produced, as it has been affected by similar climatic conditions, to a series of parallel forms. In attempting a classification which will reconcile the demonstrable affinities with the visible aspect of the forms of *A. lentiginosus*, only two consistently satisfactory arrangements are possible: either each race must be regarded as a distinct species, or all must be united as subsidiary categories of a polymorphic whole.

The varieties of *A. lentiginosus*, as known at present, are not of equal stature: some, indeed, are doubtfully distinct, while others appear to be isolated and might, in another group of the genus, pass as species of the first rank. It is noticeable, however, that every example of the latter type is comparatively little known, whereas all those represented by extensive collections are found to intergrade at some point with a related variety. For this reason it has been thought prudent not to employ a complicated hierarchy of subspecies, varieties, and forms (as will eventually be needed) to indicate their relative values, though some discussion of the facts will usually be found in the text.

## CRITERIA

*Legume.* In § *Diplocystium* the pod is exceedingly variable in both size and shape, though in some of the varieties either one or the other may be nearly constant. Thus in vars. *typicus*, *vitreus*, and *australis* the pod can be either broadly ovoid with the ventral suture convex at the middle of the valves or narrowly ovoid-lunate to lanceolate-falcate with both sutures curved upward throughout their entire length. In vars. *tehatchapiensis*, *Fremontii*, *ineptus*, *variabilis*, etc., on the other hand, the outline remains fairly constant, but the length and degree of inflation fluctuate within rather wide limits. Equally unreliable is the character of the pubescence, often used by Rydberg as a criterion, for whereas in a few cases glabreity (e. g. vars. *salinus*, *scorpionis*, and *Kennedyi*) or more often the presence of at least some hairs on the valves (e. g. vars. *typicus*, *variabilis*, *ineptus*, *albifolius*, *stramineus*, etc.) appears from the available material to be diagnostic, in the majority of cases both states occur with almost equal frequency, though seldom in the same population. The true septum in *A. lentiginosus* (i. e. the partition formed by dorsal introversion of the valves) is typically, and indeed nearly always, complete at the center of the pod, but the degree to which it is produced into the beak of the pod and its absolute width are equally subject to variation. In a few cases, notably var. *mokiensis*, the septum traverses merely half the width of the cavity, and in several it may be complete or fail (on the same plant) to reach the ventral suture. Much more trustworthy as a criterion is the texture of the pod which may be membranous (very thin and translucent), chartaceous (papery and shining but scarcely diaphanous), coriaceous (leathery), or even woody, and considerable reliance has been placed on this character in the key and in the definition of races. It should be noticed that the word "chartaceous" has been used by Jones to denote a state which is here described as leathery (cf. var. *chartaceus*).

*Calyx.* Both the absolute and the relative dimensions of the calyx and calyx-teeth are of the greatest value as criteria in § *Diplocystium*, though the former especially is to some degree subject to variation coincident with the age and luxuriance of the individual plant. As a rule, however, the length of the teeth relative to the tube is constant, in spite of an occasional specimen

in which the teeth, stipules, and bracts are all abnormally elongate or abnormally abbreviate, this usually correlated with a similar alteration in the legume. It is important to bear in mind that the measurements of the calyx-tube have been taken along the abaxial (dorsal) side of the calyx: owing to the oblique orifice of the tube this is often longer than that taken along the axial side.

*Corolla.* In most systematic treatments of *Astragalus*, the greatest length of the corolla, i. e. of the banner, has been used diagnostically, but I have found here that the length of the keel is much more constant and has other advantages. Not only does the banner, being arcuate-reflexed at anthesis, present greater difficulties in precise measurement, but the keel, which exactly enfolds the andrœcium and develops with it, has a narrower latitude of variation such as one might expect to find correlated with a reproductive organ. In a few of the varieties of *A. lentiginosus* there occur two sorts of flowers, one with the normal keel surpassed by the wings and another with a much elongated keel exerted from between the wings and sometimes equaling the banner: the latter condition, which I have called "carinate," has been observed in vars. *carinatus*, *variabilis*, and *australis*, but the reason for its occurrence is obscure. It should be noted that the length of the keel-petals as given in this paper includes the claws and is not restricted to the blades as in Jones' Revision. The shape of the keel and other petals is often characteristic, but the differences are so minute and difficult to describe that these points have not been found of great value as criteria. The color of the petals is commonly distinctive, although the varieties with purple corolla may occasionally throw off an albino sport, while the white-flowered varieties are often tinged with pink or bear a purple spot at the apex of the keel.

*Pubescence.* The pubescence of *A. lentiginosus* is inclined to be variable in density, but the quality of the hairs (short or long, appressed or spreading, straight or curly) is a valuable character. In nearly all the varieties some black hairs may occur on the calyx, pedicels, and axis of the raceme, sometimes in such abundance as to give a distinctive appearance to the whole plant. This character is most unreliable, however, and must be used with great caution: Rydberg described, both in this group and elsewhere, a number of fallacious species based primarily on the assumption that a nigrescent calyx is constant.

*Habit.* The various races of *A. lentiginosus* differ widely in appearance, depending on stature, disposition and size of the leaves, stems, internodes, and peduncles, and on the density and length of the racemes both in flower and fruit. Since these features have proved in most cases to be constant within reasonably narrow limits, they have been largely used as a basis of classification.

*Habitat and Distribution.* In spite of the fact that the inflated pods of most of the varieties of *A. lentiginosus* are perfectly adapted to wide distribution by wind, or perhaps for that very reason, each presents an almost uniformly continuous and often mutually exclusive area of distribution limited abruptly, it seems, by factors of soil and climate. Throughout the Basin regions of the western States, from the most arid Sonoran deserts to the bare screes of mountain peaks, the species is repeatedly met with under different guises, yet each race is typically developed only under certain more or less fixed conditions of temperature, altitude, and humidity. The entire complex is no doubt genetically unstable and responds readily to changes in environment, a fact especially evident in those varieties which are widely distributed. From personal observations of var. *Fremontii* and var. *araneosus* in the field I am led to believe that each, as defined in this paper, in reality embraces a large number of subsidiary races morphologically constant in the restricted area to which each is confined, and actually separable by minute characters of stature, pubescence, or other details. So constant are these minor strains, or biotypes, that with experience it is not infrequently possible to guess the approximate provenance of a given specimen without aid from the label, but to recognize these taxonomically is clearly undesirable and of no practical value. On the other hand, in the systematic treatment presented below, two closely related and similar varieties, when found to occupy distinct and disjunct territories, have been treated as separate units.

#### POISONOUS PROPERTIES

Information concerning the poisonous properties of *A. lentiginosus* has been available from several sources, and there seems to be no doubt that some, if not all, the races of the species are more or less harmful to stock. Jones (Rev. Astrag. 57) states that "various forms of *A. lentiginosus* have a bad reputation in

southern Utah." Paul-Louis Monnet (Explorations Botaniques 141, undated), writing of var. *Fremontii* in southwestern Nevada, records that it was there considered "un poison violent pour les bestiaux qui vivent dans le désert." Kearney and Peebles (Fl. Pl. Ariz. 487,—1942) state that *A. diphysus* is "known to cause loco disease." A letter from Mr. G. H. Vansell addressed to Miss Eastwood and filed in the herbarium of the California Academy with a specimen of var. *araneosus* from near Austin, Nevada, declares that this form was observed to be "definitely killing bees" and according to reports had caused "severe trouble among horses and cattle." Indications of damage to stock attributed to *A. lentiginosus* presumably all refer to the true loco disease, caused by the ingestion of poisonous alkaloids present in all parts of the plant. So far as is known, *A. lentiginosus* does not secrete large quantities of selenium (though sometimes occurring where free selenium is available in the soil) and lacks the characteristic odor, described by Jones as "snakelike" and by Trelease as "garlicky," which is commonly associated with the seleniferous species. In fact, experiments with cultures of *A. palans* conducted by Trelease showed (Scientific Monthly 54:21,—1942) that that plant is itself poisoned by selenium.

#### SYSTEMATIC TREATMENT

#### ASTRAGALUS § DIPLOCYSTIUM

Barneby, Proc. Calif. Acad. Sci. IV, 25: 166 (1944)

*Astragalus* ser. *Astragalus* § *Diphysi* Gray, Proc. Amer. Acad. 6: 192 (1863).

*Astragalus* ser. *Eu-astragalus* § *Lentiginosus* Sheld., Minn. Bot. Stud. 1: 168 (1894), pro max. parte.

*Cystium* Rydb., Bull. Torr. Bot. Cl. 32: 659 (1905); N. Amer. Fl. 24: 405, sequ. (1929), exclus. ser. *Platytropiis*; Amer. Journ. Bot. 17: 232 (1930). Non *Cystium* Stev., nec *Astragalus* subgen. *Cercidothrix* § *Cystium* Bge.

*Astragalus* § *Inflatii* Jones, Rev. Astrag. 123, sequ. (1923), quoad sp. ult., non aliorum.

*Astragalus* subgen. *Diphysus* Tidestr., Contrib. U. S. Nat. Herb. 25: 315 (1925).

Annual or commonly perennial caulescent herbs of diverse aspect, prostrate and densely caespitose or erect and open, pubescent with simple, basifixed hairs or glabrate: *stipules* briefly adnate (exceptionally through half

their length) to the petiole or nearly free, the lower often reflexed, herbaceous or membranous: *calyx* tubular or tubular-campanulate, usually oblique at the orifice and more or less gibbous dorsally at base, ruptured by the turgescient ovary, ebracteolate: *banner* arcuate-reflexed at anthesis: *keel-petals* obtuse but not truncate, the blades mostly lunate, surpassed by or sometimes surpassing the wings: *legume* very variable in shape, size, texture and pubescence, bladdery-inflated or merely turgid, globose to lanceolate in outline, terete or didymous, slightly compressed or obcompressed, commonly sulcate along either or both sutures, the body usually sharply differentiated from the laterally flattened, triangular, rarely terete and filiform-tubular, sterile beak, completely (rarely incompletely) bilocular by dorsal introversion of the valves as a double partition or septum produced across the entire width of the cavity (rarely halfway) at the center of the pod, the beak usually unilocular, the ventral suture filiform or more often produced inwards as two narrow wings which meet and partially enfold the upper edge of the septum proper: *ovules* few or numerous, seldom all developing: *seeds* compressed, notched at the hilum, smooth.

A single species: *A. lentiginosus* Dougl. ex Hook., sensu ampliatisimo Jones, l. c. 1923.

Following the conclusions outlined in the introduction, *A. lentiginosus* is here accepted as a polymorphic aggregate of forty varieties, which may be keyed out as follows.

#### ARTIFICIAL KEY TO THE VARIETIES OF *A. lentiginosus*

1. Flowers small, the keel not exceeding 8 mm. in length.
  2. Pods distinctly woody or coriaceous in texture.
    3. Legume strigose, the valves dull.
      4. Ventral suture of the pod sulcate: pod ovoid to lanceolate, broadest below the middle where abruptly incurved.....1. var. *typicus*
      4. Ventral suture acute: pod obliquely ellipsoid, broadest at the middle, regularly falcate.....2. var. *carinatus*
    3. Legume glabrous, the valves shining.
      5. Pods 7—15 mm. long: plants from over 7000 feet in the mountains of Nevada.
        6. Stems 5—15 cm. long: leaflets somewhat conduplicate, 4—9 mm. long.....3. var. *scorpionis*
        6. Stems 2—3 dm. long: leaflets flat and thin, 7—19 mm. long.....4. var. *tremulorum*
      5. Pods 15—25 mm. long: plants of alkaline plains, widely distributed.....5. var. *salinus*
  2. Pods papery or membranous, usually diaphanous.
    7. Beak of the pod, when differentiated from the body, triangular or deltoid, not tubular-filiform.

8. Beak of the pod straight or ascending.
9. Leaves 6 cm. long or more, if less, then some of the leaflets well separated or over 12 mm. long.
10. Leaflets all flat.
11. Calyx-teeth less than half as long as the tube.
12. Flowers white or ochroleucous, the wings sometimes tinged with pink and the keel purple-tipped.
13. Leaflets subglabrous, at least above.
14. Fruiting raceme dense, cylindric or globose, about half as long as the leaf: stems prostrate, 25—40 cm. long, often branched:  
W. Nevada.....8. var. *floribundus*
14. Fruiting raceme rather loose, about equaling the leaf: stems ascending, 5—30 cm. long, simple: widely distributed.....5. var. *salinus*
13. Leaflets pubescent on either side: racemes loose  
.....6. var. *macrolobus*
12. Flowers purple.
15. Pods glabrous or if pubescent then fine-strigillose with short straight hairs and the racemes over 5 cm. long: widespread in S. Nevada and adjacent California.....7. var. *Fremontii*
15. Pods pubescent with longer incumbent hairs: raceme 1—3 cm. long: local in the San Gabriel Mts. of S. California.....13. var. *antonius*
11. Calyx-teeth half as long as the tube: racemes commonly loose and surpassing the leaves.....6. var. *macrolobus*
10. Leaflets conduplicate.
16. Stems 2.5—4 dm. long: racemes very dense in fruit, many-flowered.....8. var. *floribundus*
16. Stems 7—15 cm. long: racemes few-flowered and loose in fruit.....10. var. *semotus*
9. Leaves 2—5 cm. long, the leaflets conduplicate and crowded, 5—10 mm. long.
17. Calyx-teeth 1.5 mm. long or more.....11. var. *ineptus*
17. Calyx-teeth 1 mm. long or less.
18. Leaflets glabrate above, ciliate.....12. var. *sierræ*
18. Leaflets densely sericeous on either face.....13. var. *antonius*
8. Beak of the pod declined.....9. var. *albifolius*

7. Beak of the pod filiform-tubular, appearing like a persistent style.
19. Pods ovoid, the body 9—12 mm. long: leaflets 7—10 pairs.....  
.....14. var. *charlestonensis*
19. Pods globose, the body 6—8 mm. long: leaflets 4—7 pairs.....  
.....15. var. *kernensis*
1. Flowers larger, the keel 8.5 mm. long or more.
20. Racemes short and dense, not exceeding 4 cm. in fruit.
21. Keel exserted, exceeding the wings.....2. var. *carinatus*
21. Keel equaling or commonly shorter than the wings.
22. Pods strongly inflated, more than 6 mm. in greatest diameter, or, if less, then sub-globose and not exceeding 13 mm. in length.
23. Flowers whitish or ochroleucous, rarely pink-tinged or the keel purple-tipped, but never purple throughout.
24. Pods coriaceous or very firmly chartaceous.
25. Legume not exceeding 13 mm. in length, glabrous.....3. var. *scorpionis*
25. Legume over 2 cm. long, or, if shorter, then strigose.
26. Calyx-teeth 1 mm. long, one-fourth the length of the tube..19. var. *tehatchapiensis*
26. Calyx-teeth 2 mm. or more long, about half the length of the tube.....  
.....16. var. *platyphyllidius*
24. Pods membranous.....17. var. *toyabensis*
23. Flowers always purple.
27. Calyx loosely black-pubescent.....32. var. *cæsariatus*
27. Calyx merely strigose.
28. Leaves much exceeding the internodes: stems not exceeding 4 dm.
29. Pods pubescent even in age: calyx-teeth 0.75—1 mm. long.
30. Peduncles much exceeding the leaves: pods 15 mm. long or less.....  
.....18. var. *idriensis*
30. Peduncles surpassed by the leaves: pods 2—2.5 cm. long.....  
.....19. var. *tehatchapiensis*

29. Pods glabrous, at least in age, or if pubescent then the calyx-teeth over 1.5 mm. long.
31. Racemes very shortly pedunculate, much surpassed by leaves: stems cespitose, prostrate, 5—15 cm. long.
32. Pods subglobose and abruptly short-beaked: septum produced to the apex.....20. var. *latus*
32. Pods obliquely ovoid, long-acuminate, the beak unilocular.....21. var. *chartaceus*
31. Racemes about equaling the leaves: stems 1.5—4 dm. long.
33. Pods chartaceous: peduncles widely spreading: local in the Grand Canyon, Arizona.....  
.....37. var. *oropedii*
33. Pods leathery: peduncles strict.
34. Legume broadly ovoid, broadest toward the middle, shortly and abruptly beaked, the sutures little curved: calyx white-strigose: herbage subglabrous: Arizona to New Mexico and Colorado south of the Colorado River.....23. var. *diphysus*
34. Legume ovoid-acuminate, broadest toward the base, or, if as above, then with an elongate ascending beak, the sutures commonly arcuate throughout: herbage canescent, at least in youth, rarely glabrous: Nevada and Utah.....22. var. *araneosus*
28. Leaves about equaling the internodes: stems prostrate, 5—7 dm. long.....24. var. *sesquimetalis*
22. Pods little inflated, lanceolate in outline, not exceeding 6 mm. at the greatest diameter, or three times longer than wide.
35. Petals white, pinkish or ochroleucous: pods ascending.
36. Keel about 13 mm. long: petals white or pinkish: racemes 7—12-flowered: plants of the Mogollon Plateau, Arizona.....39. var. *Wilsonii*
36. Keel 11—11.5 mm. long: petals ochroleucous: racemes (usually lax) 15—20-flowered: plants of the Salt River Canyon, Arizona.....40. var. *maricopa*
35. Petals purple: pods spreading.....36. var. *palans*
20. Racemes loose and open, or, even if rather dense in fruit, the axis exceeding 4 cm.

37. Pods strongly inflated, ovoid to subglobose, exceeding 7 mm. at the greatest diameter.
38. Legume coriaceous to firmly chartaceous, glabrous.
39. Peduncles shorter than the leaves: racemes not exceeding 6 cm. in length: flowers drying purple.....23. var. *diphysus*
39. Peduncles very stout and about equaling the leaves: racemes 7 cm. long or more: flowers drying violet.....  
.....38. var. *mokiensis*
38. Legume membranous or chartaceous, if firmer then strongly pubescent.
40. Whole plant variably pubescent, but the pod neither silvery-sericeous nor white-tomentulose.
41. Petals purple, purplish-pink, or lilac-tinged, but neither pure white nor ochroleucous.
42. Pods membranous to chartaceous, glabrous or minutely strigulose.
43. Leaves strigose beneath or glabrate: calyx strigose, if loosely so, then the corolla very pale.
44. Leaves more than 8 cm. long: leaflets strigose beneath, 1—2 cm. long.
45. Keel 12—15 mm. long: petals purple.....  
.....25. var. *australis*
45. Keel 10—11 mm. long: petals very pale....  
.....26. var. *yuccanus*
44. Leaves 6—8 cm. long: leaflets glabrous, 6—12 mm. long.....27. var. *vitreus*
43. Leaves villosulous beneath: calyx loosely pubescent: petals bright purple.....28. var. *Kennedyi*
42. Pods chartaceous to subcoriaceous, pubescent with incumbent or curly hairs: flowers always bright purple.
46. Calyx-tube not exceeding 5 mm. in length: stems canescent, erect or ascending.
47. Teeth of the calyx half as long as the tube: extra-Californian.....29. var. *stramineus*
47. Teeth of the calyx one-third as long as the tube: Mohave Desert of southern California.....30. var. *variabilis*
46. Calyx-tube 6 mm. long: stems glabrate, sinuous and prostrate.....32. var. *caesariatus*

41. Petals pale yellow, ochroleucous or pure white without trace of purple.
48. Pod loosely pubescent: herbage villosulous beneath: cis-montane California.....31. var. *nigricalycis*
48. Pod glabrous or minutely strigulose: herbage strigose beneath or glabrate: western Arizona....26. var. *yuccamus*
40. Whole plant, including the pod, silvery-sericeous or white-tomentulose.
49. Calyx-teeth not exceeding 1.75 mm. in length, or the keel 9 mm.....30. var. *variabilis*
49. Calyx-teeth 2—3 mm. long, and the keel at least 10 mm. long.....33. var. *Coulteri*
37. Pods not strongly inflated, nor exceeding 6 mm. in greatest diameter.
50. Herbage silvery-sericeous.....34. var. *borreganus*
50. Herbage green, strigose or glabrous.
51. Pods decidedly coriaceous.
52. Petals purple or violet.
53. Calyx short, the tube less than 4 mm. long, the teeth less than 1 mm. long.....35. var. *ursinus*
53. Calyx longer, the tube more than 4 mm. long, the teeth more than 1 mm. long.
54. Pods strongly ascending in very open racemes: petals drying violet.....38. var. *mokiaceensis*
54. Pods spreading, in rather compact racemes: petals drying purple or whitish.....36. var. *palans*
52. Petals white, pinkish, or ochroleucous: pods strongly ascending.
55. Keel about 13 mm. long: petals white or pinkish: racemes 7—12-flowered: plants of the Mogollon Plateau, Arizona.....39. var. *Wilsonii*
55. Keel 11—11.5 mm. long: petals ochroleucous: racemes (usually lax) 15—20-flowered: plants of the Salt River Canyon, Arizona.....40. var. *maricopa*
51. Pods thin-chartaceous to membranous.
56. Keel 10—11 mm. long: leaves 6—8 cm. long: S. Utah and N. Arizona.....27. var. *vitreus*
56. Keel 12 mm. long or more: leaves more than 8 cm. long: south of the Mogollon Plateau.....25. var. *australis*

## DESCRIPTIONS

## 1. var. TYPICUS Barneby

**Astragalus lentiginosus** Dougl. var. **typicus** Barneby, nom. nov.

*A. lentiginosus* Dougl. ex Hook., Fl. Bor.-Amer. 1: 151 (1831), sensu stricto; Don, Gen. Syst. 2: 257 (1832); T. & G., Fl. N. Amer. 1: 333 (1838); Walp., Repert. 1: 700 (1842); Gray, Proc. Amer. Acad. 6: 194 (1863); Gray, Bot. Calif. 1: 147 (1880), exclus. syn.; Wats., Bot. King Explor., Append. 435 (1871), pro parte, exclus. syn., non op. cit. 65; Wats., Bibl. Ind. 195 (1878), exclus. syn.; Macoun, Catal. Canad. Pl. 110, 507 (1883); Sheld., Minn. Bot. Stud. 1: 170 (1894); Jeps., Fl. Calif. 2: 356 (1936), exclus. syn.; Peck, Man. Pl. Oreg. 449 (1941); H. T. Rogers, Research Stud. State Coll. Wash. 10: 124 (1942); Abrams Ill. Fl. Pac. St. 2: 599 (1944), pro max. parte.

*A. lentiginosus* "typical" Jones, Rev. Astrag. 123 (1923).

*Tragacantha lentiginosa* (Dougl.) O. Kze., Rev. Gen. 2: 946 (1891).

*Phaca lentiginosa* (Dougl.) Piper, Contrib. U. S. Nat. Herb. 11: 368 (1906).

*Cystium lentiginosum* (Dougl.) Rydb., Bull. Torr. Bot. Cl. 40: 50 (1913); Fl. Rocky Mts. 491 (1917), pro parte; N. Amer. Fl. 24: 412 (1929).

*C. salinum* Rydb., Fl. Rocky Mts. 492, quoad pl. descript., non *Astragalus salinus* Howell.

*Astragalus lentiginosus* var. *scorpionis* Jones, Rev. Astrag. 124 (1923), pro parte.

Pods ovoid and inflated or sometimes lanceolate and merely turgid, abruptly incurved at the middle or a little below, broadest toward the base, leathery or very firmly chartaceous in texture, 1—2 cm. long, 3—9 mm. in greatest diameter, somewhat sulcate dorsally and ventrally, straw-colored at maturity and occasionally mottled, strigose with short appressed hairs: calyx sparingly strigose with white or commonly some black hairs, the tube 3—4 mm., the teeth 1.75—2.75 mm. long: banner narrow, about 10 mm., the wings 8 mm., the keel 6.5—7 mm. long: leaves 5—10 cm. long, petiolate, with 5—8 pairs of flat, obovate, oblong or broadly elliptic to suborbicular obtuse or retuse leaflets 7—15 mm. long, subglabrous or with a few scattered hairs on the margins and midribs: stems rather coarse, procumbent or ascending, 2—3 dm. long.

*Illustrations.* Pl. I, figs. 1—5. Jones, Rev. Astrag., pl. 23. Abrams, Ill. Fl., fig. 2878.

*Type-locality.* Subalpine ranges of the Blue Mountains of Northwest America (NE. Oregon), the type collected by David Douglas.

*Distribution.* Sterile plains and hillsides, commonly in sagebrush, from interior Washington and Oregon to Idaho and (according to Macoun and Sheldon) British Columbia.

*Exsiccata.* BRITISH COLUMBIA. Nicola Valley, Kamloops (fide Macoun, l. c.). WASHINGTON. Washington Territory, N. Transcontinental Survey, No. 715. Okanogan Co.: Coulee City, J. W. Thompson No. 9100 (NY, PO), Piper No. 3885 (G); N. of Dry Falls, Rogers No. 448 (CAS).

Adams Co.: Cow Creek, Columbia Valley, *Lyall in 1860* (G); Washtucna, *Cotton No. 975* (G). Benton Co.: Horse Heaven Hills S. of Prosser, *G. N. Jones in 1930* (PO). Lincoln Co.: Sprague, *Sandberg & Leiberger in 1893* (Br, UC). Yakima Co.: sine loc., *Henderson No. 2353* (G), *Brandegeer in 1893* (UC). Kittitas Co.: Vantage, *J. W. Thompson No. 13706* (F, G, NY, UC), *No. 11440* (CAS, G); Ellensburg, *Piper No. 2674* (G, NY). OREGON. Blue Mts., *Douglas* (G, a single pod ex herb. Hooker, isotype). John Day Valley, *Howell No. 264* (G). Morrow Co.: Boardman, *J. W. Thompson No. 4881* (G). Union Co.: sine loc., *Cusick No. 112* (G). Sherman Co.: DeMoss Springs, *Peck No. 9949* (F, NY). IDAHO. Sine loc., *Leiberger No. 132* (PO). Kelly's Hot Springs, *Mulford in 1892* (NY). Canyon Co.: Emmett, *Macbride No. 896* (F, G, NY, PO, UC). Bannock Co.: Pocatello, *Mrs. Soth No. 399* (NY). Blaine Co.: Hyndman Creek, *J. W. Thompson, No. 13616* (G).

The var. *typicus* is most characteristically developed in sagebrush areas of the Columbia River Valley, where the common form is that with the strongly inflated, obliquely ovoid pod. In much of the mature material from Idaho, however, the legume is merely turgid, narrowly ovoid or lanceolate in outline, though the plants differ in no other particular. As the variety passes southward it is sometimes difficult to separate from var. *carinatus* and var. *salinus*: for example, in *Thompson No. 13616* the pods are strigose but approach that of var. *salinus* in texture, while specimens of var. *carinatus* from Klamath Co., Oregon, resemble var. *typicus* in the atypically inflated legume.

The Macbride gathering from Emmett, Idaho, was distributed with a printed label under a binomial attributed to Gray, the determination having been verified by Aven Nelson. I cannot find that this combination was ever proposed by Gray, and it is perhaps a lapsus for *A. lentiginosus* var. *floribundus* Gray. This same specimen, as well as Brandegeer's collection from the Yakima region, was regarded by Jones as part of his var. *scorpionis*, but differs in its much greater stature, strigose pod, and northern, lowland habitat.

## 2. var. CARINATUS Jones

*Astragalus lentiginosus* Dougl. var. *carinatus* Jones, Rev. Astrag. 125 (1923).

*Cystium lentiginosum* Rydb., N. Amer. Fl. 24: 412 (1929), pro parte, ex syn. *C. cornutum* Rydb., l. c., pro parte, saltem in herb.

*A. lentiginosus* var. *cuspidocarpus* Jeps., Fl. Calif. 2: 356 (1936), pro parte, ex num. cit., non *A. cuspidocarpus* Sheld., sensu stricto, nec *A. lentiginosus* var. *cuspidocarpus* Jones, nec *A. missouriensis* var. *cuspidocarpus* Jones.

Pods obliquely lanceolate-ovoid, falcate, coriaceous, strigose, often mottled, less inflated than in the preceding, 11—17 mm. long: racemes 10—18-flowered, 1—3 cm. long, surpassed by the subtending leaf: calyx strigose with white and black hairs, the tube 2.5—3 mm., the teeth 1—1.75 mm. long; flowers whitish or purple-tipped, of two sorts, either "carinate" as in the type, with banner 9—12 mm., wings 8—9 mm. long, and a broad obtuse keel exerted from the wings 9—10 mm. long, or more commonly of normal proportions, with banner 8—9 mm., wings 7—8 mm., and included keel 6—7 mm. long: leaves (2.5) 5—9 cm. long, petiolate, with 5—8 pairs of obovate, oblong or suborbicular flat leaflets (3) 5—10 mm. long, strigose on both surfaces or only beneath, commonly ciliate, occasionally nearly glabrous; stems 1—3 dm. long, prostrate or ascending.

*Illustrations.* Pl. I, figs. 6—12. Jones, Rev. Astrag., pl. 24.

*Type-locality.* Baker City, Oregon, on flats, the type collected by Jones in 1902.

*Distribution.* On sagebrush plains or in open forest of *Pinus ponderosa*, usually on volcanic substrata, from interior southern Oregon to adjacent California.

*Exsiccata.* OREGON. Baker Co.: \*Baker City, Jones in 1902 (PO, type). Malheur Co.: \*Harper Ranch, Leiberg No. 2110 (G, NY, PO, UC). Harney Co.: base of Steens Mt., Howell No. 379 (G). Klamath Co.: north of Keno, Peck No. 9421 (G); Barclay Spring, Applegate No. 3553 (G). CALIFORNIA. Siskiyou Co.: Montague, K. Brandegee in 1887 (UC); Yreka, Greene No. 848 (G); Grenada Station, Heller No. 8062 (F, G, NY, UC). Modoc Co.: sine loc., M. S. Baker in 1893 (UC); \*Lake Shore, Austin & Bruce No. 2210 (UC); Egg Lake, M. S. Baker in 1893 (UC), Nutting (PO). Lassen Co.: Harvey Valley, J. T. Howell No. 12437 (CAS, PO); Chat, Jones, 18 June 1897 (PO); Pine Creek, Baker & Nutting (UC); W. of Susanville, Ripley & Barneby No. 5724 (CAS, RB).

The var. *carinatus* is one of the most puzzling and ill-defined races and perhaps should be altogether united with var. *typicus*, from which it differs essentially only in its regularly falcate legume devoid of ventral sulcus. Much variation exists in the cited material, especially in the size and proportions of the flower. The type from Baker City, Oregon, has the relatively broad and long, curiously exerted keel described and figured by Jones, but this is decidedly unusual: only two other specimens, marked above with an asterisk, bear this same peculiarity and it cannot be considered diagnostic. Jones seems to have reached the same conclusion (in spite of his choice of varietal epithet), as in his description he cited a collection from Chat, California, yet neither of the two specimens from that locality at Pomona bears "carinate" flowers. Leiberg No. 2110, with abnormally large corollas, very broad banner, and exerted purple-tipped keel, is referred

here only with doubt, in spite of the carinate condition of the flower: it is without fruit and could as well belong to var. *platyphyllidius*. Another troublesome collection is *J. T. Howell No. 12437*, distributed as "var. *sierræ*?" and in the short leaves and small leaflets indeed resembling that variety, but the legume is typical of var. *carinatus*.

The literature dealing with this race is rather confusing. Rydberg, perhaps not having seen the type of var. *carinatus*, reduced the name to synonymy with *Cystium lentiginosum*: at the same time, however, he annotated such plants as *Austin & Bruce No. 2210* and *Heller No. 8062*, to my mind inseparable from var. *carinatus*, as *Cystium cornutum* Rydb., although they by no means correspond with either the type or the description of that species. Jepson disposed of the name in the same manner, but the actual plants he referred to *A. lentiginosus* var. *cuspidocarpus* Jones, a name which, as shown by Rydberg (*Bull. Torr. Bot. Club* 52: 145,—1925) is wholly untenable in this context. *Astragalus cuspidocarpus* Sheld., upon which Jones' variety was founded, is, when restricted to its type, a species with unilocular pods allied to *A. cibarius* Sheld., and not at all related to *A. lentiginosus*. Jones was originally deceived by the distribution as *A. cuspidocarpus* of a specimen, *Leiberg No. 171*, which does belong to the *A. lentiginosus* complex and which afterwards became the type of *Cystium platyphyllidium* Rydb. Later, in his Revision of *Astragalus*, Jones partially rectified this error by reducing his var. *cuspidocarpus* (as to the plant understood by him, i. e. the Leiberg element) to *A. lentiginosus* var. *diphysus*, and by referring *A. cuspidocarpus* Sheld. *sens. strict.* to a variety of *A. missouriensis* Nutt. The combination *A. lentiginosus* var. *cuspidocarpus*, however, having been founded on Sheldon's species, must always remain an exact synonym of that species, however erroneously it may have been applied. Apart from nomenclature, Jepson's var. *cuspidocarpus* is a mixture, as may be inferred from the synonymy and cited material (cf. vars. *idriensis* and *platyphyllidius*).

### 3. var. SCORPIONIS Jones

*Astragalus lentiginosus* Dougl. var. *scorpionis* Jones, *Rev. Astrag.* 124 (1923), *sensu restricto*.

*Cystium scorpionis* (Jones) Rydb., *N. Amer. Fl.* 24: 411 (1929).

Pods ovoid with ascending beak, not much inflated, coriaceous, glabrous, castaneous or brightly mottled, 7—15 mm. long, 4—6 mm. high, shallowly

sulcate ventrally: racemes 1—2.5 cm. long, on peduncles shorter than the leaves: calyx sparingly strigose, usually with some black hairs, the tube 3—4 mm., the teeth 1—1.25 mm. long: petals white or purple-tinged, the narrow banner over 9 mm., the wings 8—10 mm., the keel 7—8.5 mm. long: leaves 4—9 cm. long, petioled, with 7 pairs of obovate to oblong, obtuse or acute, rather distant and often conduplicate leaflets 4—9 mm. long, pubescent below with a few straight appressed hairs: stems ascending, rather stout, 5—15 cm. long.

*Illustrations.* Pl. I, figs. 18—24. Jones, Rev. Astrag., pl. 24.

*Type-locality.* Morey Peak, Nevada, the type collected by C. A. Purpus.

*Distribution.* Exposed gravel ridges and mountain peaks between 9000 and 11,300 feet altitude, in the mountains of west-central Nevada.

*Exsiccata.* NEVADA. Nye Co.: Morey Peak, Purpus No. 6365 (PO, type); top of ridge, about 2 miles N. of Toyabe Dome, Hitchcock & Martin No. 5599 (NY, PO). Mineral Co.: Mt. Grant, Wassuk Range, Archer No. 7115 (NY, UN).

I follow Rydberg in excluding from Jones's var. *scorpionis* the northern plants with strigose pods cited after the type in the original description: these are believed to be inseparable from var. *typicus*, although resembling var. *scorpionis* in the little-inflated pod. The var. *scorpionis* is closely related to the next, differing chiefly in its low stature, small leaflets, and commonly smaller pod and may prove to be merely an ecological form from high and exposed gravelly ridges. Good flowering material is still a desideratum.

#### 4. var. TREMULETORUM Barneby

**Astragalus lentiginosus** Dougl. var. **tremuletorum** Barneby, var. nov., præcedenti verosimiliter arcte affinis et forsan nil nisi proles umbrosus vel e solo humidiori ortus, sed imprimis caulibus elongatis, foliolisque subduplo longioribus planis, adspectu valdè absimilis.

Pod obliquely ovoid to oblong-lunate, coriaceous and glabrous, about 15 mm. long: racemes rather laxly 7—10-flowered, 1—2.5 cm. long, on peduncles much shorter than the leaves: calyx sparingly strigose with mixed black and white hairs, the tube 3 mm., the teeth 1.75 mm. long: petals whitish, the banner about 10 mm., the wings 9 mm., the keel about 7 mm. long: leaves 7—10 cm. long, petiolate, crowded, with 6—8 pairs of oblanceolate, obovate or elliptic, obtuse or often emarginate, flat leaflets 7—19 mm. long, glabrous or with a few scattered hairs on the margins and midribs: stems diffuse, very leafy, 2—3 dm. long.

*Illustration.* Pl. I, figs. 13—17.

*Type.* Meadow, 8500 ft., upper Lamoille Canyon, Ruby Mts., Elko Co., Nevada, P. A. Munz No. 16324 (Pomona College Herbarium No. 254608).

*Distribution.* Mountains of central and northern Nevada, between 8000 and 10,000 feet.

*Exsiccata*. NEVADA. Elko Co.: Lamoille Canyon, Ruby Mts., *Munz No. 16324* (PO, type, CAS); S. side of Sherman Ridge, S. end of Ruby Mts., *Hitchcock & Martin No. 5630* (NY); East Humboldt Mts., *Jones in 1897* (PO). Nye Co.: 7 miles N. of Toyabe Dome, *Hitchcock & Martin No. 5619* (NY, PO).

The var. *tremuletorum* is probably not more than a luxuriant shade form of var. *scorpionis*, differing in the much longer stems, broader and longer, bright green, flat and thin leaflets, and in the often more inflated pod. The type has falcate pods, but in otherwise similar material from the Ruby Mts. the pods are ovoid with upturned beak. In general appearance var. *tremuletorum* somewhat resembles slender specimens of var. *latus*, to which Jones referred his own collection, but it can be immediately separated by the small size and pale coloring of the flowers. A field-note attached to Prof. Hitchcock's specimen from the Toyabe Mts., to the effect that the plant was found growing among aspens, hints that the plant may be mesophytic, and has also suggested the varietal name.

5. var. SALINUS (Howell) Barneby

*Astragalus lentiginosus* Dougl. var. *salinus* (Howell) Barneby, comb. nov.

*A. salinus* Howell, *Erythea* 1: 111 (1893); Sheld., *Minn. Bot. Stud.* 1: 169 (1894); Peck, *Man. Pl. Oreg.* 451 (1941); Abrams, *Ill. Fl. Pac. St.* 2: 599 (1944).

*A. diphysus* Porter in Hayden, *Rep. U. S. Geol. Surv.* 5: 481 (1872), quoad num. cit.; Parry, *Amer. Nat.* 9: 270 (1874), quoad num. cit., non Gray.

*A. lentiginosus* var. *latus* Jones, *Proc. Calif. Acad. Sci.* II, 5: 675 (1895), pro parte, non alibi.

*A. lentiginosus* var. *floribundus* Jones, *Contrib. W. Bot.* 8: 3 (1898), pro parte, non Gray.

*Phaca inepta* Rydb., *Mem. N. Y. Bot. Gard.* 1: 246 (1900), quoad pl. cit., non *A. ineptus* Gray.

*Cystium ineptum* Rydb., *Bull. Torr. Bot. Club* 32: 659 (1906), pro max. parte, exclus. syn.

*Astragalus ineptus* Coult. & Nels., *Man.* 285 (1909), pro parte, non Gray.

*Cystium salinum* (Howell) Rydb., *Fl. Rocky Mts.* 492, 1063 (1917); N. Amer. *Fl.* 24: 411 (1929), exclus. syn. "*A. lentiginosus* var. *chartaceus*."

*C. heliophilum* Rydb., *Fl. Rocky Mts.* 491, 1063 (1917).

*Astragalus lentiginosus* var. *ineptus* Jones, *Rev. Astrag.* 124 (1923), pro parte, i. e. "a form with broad leaflets. . ."

*A. heliophilus* (Rydb.) Tidestr., *Contrib. U. S. Nat. Herb.* 25: 325 (1925).

Pods variable in shape and size, much inflated, obliquely ovoid to obpyriform or subglobose, but always with a well-defined straight or upturned unilocular lanceolate or triangular beak, the valves membranous-diaphanous

or somewhat firm in texture, glabrous, smooth and shining, usually not mottled, more or less sulcate on either suture, 1.5—2.5 cm. long, about half as broad as high: racemes rather loosely 10—25-flowered, about equaling the leaves: calyx sparingly strigose, the tube 2.5—3 mm., the teeth 1—1.5 mm. long: petals white, ochroleucous, or purple-tinged, the banner 9—12 mm., the wings 7.5—11 mm., the keel 5.5—7.75 mm. long: leaves as in var. *typicus*, the leaflets 5—8 pairs, glabrate with ciliate margins and midribs or sparingly strigose above, below, or on either face: stems numerous, ascending, 1.5—3 dm. high.

*Illustrations.* Pl. I, figs. 42—45. Abrams, Ill. Fl., fig. 2877.

*Type-locality.* Saline soils of SE. Oregon, the type collected by Thomas Howell.

*Distribution.* Alkaline flats and about depressions on sagebrush plains, from interior Oregon to southwestern Montana, southward to northeastern California, northern Nevada, and western Utah.

*Exsiccata.* OREGON. Crook Co.: Bear Buttes, *Leiberg No. 798* (G). Harney Co.: Harney Valley, *Howell No. 799* (F, ND, UC, probably parts of the type-collection); Wagontire, *J. W. Thompson No. 12167* (G); Narrows, *J. W. Thompson No. 12061* (CAS); Burns, *Jones No. 25440* (LA, PO). Malheur Co.: Harper's Ranch, *Leiberg No. 2256* (PO, UC); Malheur region, *Cusick No. 1942* (F, in part, UC); summit of Buck Mt., *Cusick No. 2618* (F, ND, NY, PO, UC); Beulah, *Leiberg No. 2301* (UC). IDAHO. Blaine Co.: Ketchum and Guyer Hot Springs, *Nelson & Macbride No. 1281* (F, G, NY, PO, UC). Twin Falls Co.: Castleford, *Nelson & Macbride No. 1710* (NY). Lincoln Co.: between Owinza and Besslyn stations, *Eggleston No. 22053* (G); Shoshone, *Nelson & Macbride No. 1172* (G). Custer Co.: Mackay, *Nelson & Macbride No. 1575* (F, G, PO, UC). Owyhee Co.: 23 miles SW. of Marsing, *Ripley & Barneby No. 6147* (CAS, RB). MONTANA. Madison Co.: Stinking Water Creek, *Hayden No. 5 in 1871* (G). Beaverhead Co.: sine loc., *Tweedy No. 203* (NY); Lima, *Shear No. 3430* (NY, type of *Cystium heliophilum*), *No. 4683* (NY), *No. 558S* (NY), *Jones in 1908* (PO). NEVADA. Elko Co.: Mountain City, *Nelson & Macbride No. 2199* (G, NY); Wells, *Jones No. 25441* (CAS, LA, PO), *L. S. Rose No. 32372* (CAS); Cobre, *Ripley & Barneby No. 5519* (RB). Humboldt Co.: Quinn River Crossing, *Griffiths & Morris No. 141* (NY). Co. undetermined: Humboldt Plains, *A. Gray in 1872* (G). Lincoln Co.: Deer Lodge, *Train No. 2524* (UN); Geyser Ranch, *Ripley & Barneby No. 6326* (CAS, RB). UTAH. Beaver Co.: Frisco, *Jones No. 1813* (G, NY, PO). Iron Co.: Iron Mt., *Ripley & Barneby No. 4374* (PO, RB); Cedar City, *Parry No. 48* (G, NY, in part, mixed with *A. Wardii* Gray); Escalante Desert, *Ripley & Barneby No. 4969* (PO, RB). CALIFORNIA. Lassen Co.: Susanville, *Eastwood & Howell No. 8335* (PO). Siskiyou Co.: Laird's Landing to Bray, *Peirson No. 3602* (RB).

The var. *salinus* is one of the most widely distributed of all the forms of *A. lentiginosus*, and I judge it to be the most primitive of its immediate group, perhaps representing the original type from

which the others are derived. Not only is it the central race which connects all the varieties with small, pale flowers, but also it is possible to trace from var. *salinus* a gradual progression or sequence of variation through var. *floribundus* to the high altitude races of the south (var. *ineptus* and var. *sierræ*) and thence, through var. *tehachapiensis* to var. *idriensis* and var. *cæsariatus*: through var. *macrolobus* to var. *Fremontii* and its relatives in the southwestern deserts: and through var. *platyphyllidius* to vars. *latus*, *diphysus*, and *palans*.

As might be expected in a race covering so large an area, considerable variation exists in the material accepted as belonging to var. *salinus*, and it is probably an aggregate of several more local populations marked by trivial but nevertheless more or less constant characters. Thus in southwestern Montana and adjacent Idaho the pubescence of the leaflets is more copious (*Cystium heliophilum sensu stricto*): in northern California both pod and flower are inclined to be larger and the latter of thicker texture: and in its isolated occurrence in southwest Utah the individual plants are more robust, the flowers are distinctly ochroleucous with purple-tipped petals, and the pods are somewhat coriaceous and often mottled. All these, however, have in common the characteristic shiny, glabrous pod with ventral suture either straight (except in the beak which is nearly always upturned) or convex, and I can find no reliable basis for further segregation.

The var. *salinus* has been variously disposed of in the literature. First reported by Hayden in 1872 from Montana as *A. diphysus* Gray, it was described as a species in 1893 from Oregon material as *A. salinus* Howell. Jones (1895) promptly reduced this to his *A. lentiginosus* var. *latus*, three years later to var. *floribundus* Gray, and finally (1923), as a "form . . . intergrading with the type," to var. *ineptus* (Gray) Jones. Nelson, and Rydberg (as *Phaca* or *Cystium*), for long confused it with *A. ineptus* Gray, but discovering the error, Rydberg (1917) redescribed it under the name *Cystium heliophilum*, at the same time applying the epithet *salinus*, combined in *Cystium*, to var. *typicus* nob., and it is only in his final monograph (1929) that *C. salinum* corresponds with the original species of Howell. I have also referred here certain plants such as *Leiberg* No. 2301 and *Griffiths* &

*Morris No. 141* which Rydberg annotated as *Cystium platyphylidium*.

6. var. **MACROLOBUS** (Rydb.) Barneby

**Astragalus lentiginosus** Dougl. var. **macrolobus** (Rydb.) Barneby, comb. nov.

*Cystium macrolobum* Rydb., N. Amer. Fl. 24: 408 (1929), exclus. syn.

*C. vulpinum* Rydb., op. cit. 409.

*Astragalus lentiginosus* Wats., Bot. King Explor. 65 (1871), quoad num. cit., non Dougl.

*A. lentiginosus* var. *Fremontii* Rothrock, Rep. Geogr. Surv. (Wheeler Exped.) Bot. 93 (1878), non aliorum.

Pods membranous, ovoid to narrowly ovoid-acuminate, usually rather long-beaked, 1.5—2.5 cm. long, glabrous or strigillose: racemes 12—25-flowered, commonly rather lax in fruit, 3—7 cm. long, on peduncles of about the same length: calyx copiously pubescent with loosely ascending or incumbent white or black and white hairs, rarely glabrate, the tube 3—4 mm., the teeth 2—3 mm. long: petals ochroleucous with purple-tipped keel, rarely purple throughout, the banner 9—12 mm., the wings 7—9.5 mm., the keel 6—8 (8.5) mm. long: leaves ascending, 4—11 cm. long, with 4—9 pairs of obovate to oblong, obtuse, truncate or emarginate leaflets 0.5—1.5 (2) cm. long, silky- or curly-pubescent on either face, often less so above, or occasionally glabrate and ciliate: stems several, ascending, 1—2.5 dm. long, strigose, from a short-lived perennial tap-root.

*Illustration.* Pl. I, figs. 37—41.

*Type-locality.* West Humboldt Mts., Nevada, the type collected by Sereno Watson.

*Distribution.* Dunes, sandy valleys, and river-banks, along the Humboldt River and its tributaries from Elko County west to the region of the Carson Sink, Nevada.

*Exsiccata.* NEVADA. Elko Co.: Wells, *Jones in 1881* (PO); SE. of Elko, *Ripley & Barneby No. 5561* (RB); between Elko and Wells, *Eastwood & Howell No. 278* (CAS, PO). Lander Co.: Grass Valley, *Watson No. 254* in part (NY, type of *Cystium vulpinum*, G). Humboldt Co.: Humboldt Lake, *Jones No. 3846* (NY, and two sheets in herb. PO labelled "East of Humboldt" and "Rose Creek"); Rose Creek, *Jones in 1882* (PO, one plant with purple flowers); Winnemucca, *Ripley & Barneby No. 5603* (CAS, RB). Pershing Co.: West Humboldt Mts., *Watson No. 254* in part (NY, type of *Cystium macrolobum*); Humboldt House, *Ripley & Barneby No. 4548* (CAS, PO, RB). Churchill Co.: Carson Desert, *Watson No. 254* in part (NY). Washoe Co.: Truckee River gorge E. of Reno, *Ripley & Barneby No. 4455* (RB); W. of Reno, *Mason No. 4601* (UC). Co. undetermined: Elko to Winnemucca: *Mrs. E. C. VanDyke in 1930* (CAS, flowers purple).

*Cystium macrolobum* and *C. vulpinum* seem to be trivial variants of a single race, although in Rydberg's treatment they are quite widely separated on the fallacious character of pubescence

in the legume. The type of *C. macrolobum* has exceptionally long calyx-teeth and the crisp but fine indumentum of *C. vulpinum* appears at first sight peculiar. Nonetheless among my own collections (*Ripley & Barneby No. 4548*) from the Humboldt House, a locality at the base of the West Humboldt Mts. and type station of *C. macrolobum*, there are specimens which combine these two outstanding features, while the pods vary from pubescent to glabrous, and the calyces may bear all white or some black hairs. Rydberg himself could not distinguish them: for example, *Jones No. 3846* (NY), referred by him to *C. vulpinum*, has the pod glabrous from the beginning and agrees perfectly with *C. macrolobum*. *Abrams & McGregor No. 204* (Frazier Borax Mine, in the mountains of Ventura Co., Calif.), on the basis of which Rydberg reported *C. vulpinum* from California, is in all probability a hybrid: in any case it does not belong here, in spite of a superficial resemblance (cf. var. *tehachapiensis*). The synonym of *C. macrolobum*, "*A. diphysus* Wats., Bot. King . . . in part," quoted by Rydberg in the original description, cannot be correct. The type of the species, *Watson No. 254* in herb. Torrey., to which this reference apparently belongs, was distributed as *A. lentiginosus*, and is referred to under that name and number in Watson's account of the expedition.

Considerable variation has been noted in var. *macrolobus*. The material from Elko County is somewhat depauperate, with subcapitate or very short racemes, but with typical calyx and pubescence, while the collections from Washoe County combine the loose racemes and calyx of the type with green and glabrate herbage. Purple flowers have been seen only in part of Jones's gathering from Rose Creek and in that of Mrs. VanDyke. This race is of peculiar interest in that it approaches var. *Fremontii* (to which *C. vulpinum* was reduced by Jepson, Fl. Calif. 2: 357,—1936, in syn.), and forms a passage between the montane and northern races with densely racemose, small, white flowers and the purple-flowered forms with elongate inflorescence of the deserts to the south.

7. var. FREMONTII (Gray) Wats.

*Astragalus lentiginosus* Dougl. var. *Fremontii* (Gray) Wats., Bot. King Explor. 66 (1871), quoad nomen, exclus. num. cit.; Gray, Bot. Calif. 1: 147 (1880); Jones, Contrib. W. Bot. 8: 4 (1898); Rev. Astrag. 127

- (1923), pro parte; Munz, Man. S. Calif. 269 (1936), pro parte; Jeps., Fl. Calif. 2: 356 (1936), pro parte, exclus. descr. & num. cit. plur.
- A. Fremontii* Gray ap. Torr., Pac. R. R. Rep. 4: 80 (1857), exclus. var.; Proc. Amer. Acad. 6: 194 (1863); Sheld., Minn. Bot. Stud. 1: 169 (1894), exclus. syn.; Tidestr., Contrib. U. S. Nat. Herb. 25:325 (1925); Tidestr. & Kitt., Fl. Ariz. & New Mex. 216 (1941).
- A. eremicus* Sheld. ap. Cov., Contrib. U. S. Nat. Herb. 4: 86 (1893); Minn. Bot. Stud. 1: 140 (1894).
- A. Coulteri* var. *Fremontii* (Gray) Jones, Proc. Calif. Acad. Sci. II, 5: 670 (1895).
- A. lentiginosus* var. *Coulteri* Jones, Rev. Astrag. 127 (1923), quoad syn. cit., vix ulterius, non *A. Coulteri* Bth.
- A. Coulteri* Jeps., Man. Calif. 568 (1925), pro parte, non Bth.
- Cystium Fremontii* (Gray) Rydb., N. Amer. Fl. 24: 407 (1929).
- C. eremicum* (Sheld.) Rydb., op. cit. 409.
- C. griseolum* Rydb., op. cit. 411.
- Astragalus Fremontii* subsp. *eremicus* (Sheld.) Abrams, Ill. Fl. Pac. St. 2:597 (1944).

Pods ovoid with a short triangular beak, much inflated, papery-translucent, shining, glabrous or sparsely strigillose, 1.5—2.5 (3) cm. long: racemes 15—30-flowered, lax in flower, dense or much elongate in fruit, 5—10 cm. long, commonly surpassing the leaves: calyx rather copiously strigose or silky with black or white, mostly appressed or occasionally spreading hairs, rarely glabrate, the tube 2.5—3.5 mm., the subulate teeth 0.75—1.75 (2) mm. long: petals purple, very unequal, with wings commonly much exceeding the keel, the banner 8—12 mm., the wings 6.5—9 mm., the keel 6—7 (exceptionally 7.5) mm. long: leaves 5—8 cm. long, petiolate, with 5—8 pairs of obovate to oblanceolate, obtuse or retuse leaflets 5—17 mm. long, very variable in pubescence, with either both faces glabrous, both faces more or less silky-strigose or subhirsutulous, or with the upper glabrous and the lower sparingly strigose: stems erect or ascending, simple, canescent to glabrate, (0.6) 1—3 dm. high.

*Illustrations.* Pl. I, figs. 46—50. Jones, Rev. Astrag., pl. 25, exclus. fig. a. Abrams, Ill. Fl. fig. 2871.

*Type-locality.* Banks of the Rio Virgin (Nevada), the type collected by Frémont in 1844.

*Distribution.* Most abundant on open sandy deserts associated with *Larrea*, but occurring also on alkaline clay lake-beds, in rocky canyons, and bare stony slopes of the pinyon-belt, from southern Nevada westward to Inyo, Mono, and San Bernardino counties, California.

*Exsiccata.* NEVADA. Clark Co.: Rio Virgin, *Frémont, 2nd Exped. No. 424* (G, type, NY); Kyle Canyon, Charleston Mts., *Clokey No. 7176* (*Pl. Exsicc. Gray. No. 723*), *Ripley & Barneby No. 3413* (CAS, RB); Erie, *Tidestrom No. 8866* (NY); Good Springs, *Jones in 1905* (PO). Lincoln Co.: Meadow Valley Wash, *Jones in 1904* (PO); Caliente, *Ripley & Barneby No. 3507* (RB); Highland Range, *Ripley & Barneby No. 3499* (PO, RB); White Sage Valley, *Train No. 2437* (NY); Pahroc

Range, *Purpus* in 1898 (PO) ; 20 miles N. of Pioche, *Eastwood & Howell* No. 7330 (CAS) ; Crystal Springs, *Ripley & Barneby* No. 4401 (RB) ; 25 miles E. of Groom, *Train* No. 2380 (UN). Nye Co. : between Sharp P. O. and Nyala, *Jaeger* in 1938 (PO) ; Currant, *Bentley* No. 20 (PO) ; NE. of Warm Springs, *Eastwood & Howell* No. 9453 (CAS, RB) ; Frenchman Flat, *Ripley & Barneby* No. 3464 (PO, RB) ; Spotted Range, *Ripley & Barneby* No. 3434 (CAS, RB). Esmeralda Co. : Lida, *Tidestrom* No. 9817 (G, NY) ; Klondyke, *Ripley & Barneby* No. 3655 (RB) ; Goldfield, *Heller* No. 9613 (NY, CAS) ; Gold Mt., *Purpus* No. 5954 (PO, UC), No. 5985 (PO, UC). Mineral Co. : Candelaria, *Shockley* No. 220 (G, type of *Cystium griseum*, ND), No. 271 (G, cotype). CALIFORNIA. Mono Co. : Devernois Ranch, White Mts., *Peirson* No. 12458 (RB). Inyo Co. : Cedar Flat, White Mts., *Duran* No. 3025 (CAS, G, PO, UC) ; White Mts., *Purpus* No. 5795 (PO, UC) ; N. of Big Pine, *Keck* No. 544 (UC) ; Westgard Pass, *Hoffmann* No. 10024 (SB), No. 10026 (SB), No. 15002 (SB) ; Darwin, *Ferris* No. 7908 (PO, UC) ; Darwin Mesa, *Ferris & Bacigalupi* No. 8063 (PO, UC), *Hall & Chandler* No. 7097 (PO, UC) ; Shepherd's Canyon, Argus Mts., *Jones* in 1897 (G, NY, PO), *Hall & Chandler* No. 7073 (PO, UC) ; Maturango Peak, *Purpus* No. 5450 (G, PO, UC) ; Keeler, *Ripley & Barneby* No. 3768 (PO, RB) ; Olancha, *Hall & Chandler* No. 7349 (PO, UC) ; Little Lake, *Hall & Chandler* No. 7355 (UC), No. 7356 (PO, UC), No. 7357 (PO), No. 7358 (UC) ; Haiwee, *Feudge* No. 1872 (PO) ; Pleasant Canyon, Panamint Mts., *Hall & Chandler* No. 6934 (PO, UC) ; Dante's Point, C. L. *Hitchcock* No. 12333 (PO, UC) ; Surprise Canyon, J. T. *Howell* No. 3923a (CAS) ; Daylight Pass, *Gilman* No. 6 (PO) ; Greenwater, S. of Death Valley, *Munz* No. 16544 (CAS, PO). San Bernardino Co. : Cove Spring, Old Dad Mts., *Jones* in 1926 (PO) ; Halloran Spring E. of Baker, *Ripley & Barneby* No. 4286 (PO, RB) ; Cima, K. & T. S. *Brandege* in 1915 (PO, UC) ; Barnwell, K. *Brandege* in 1911 (UC) ; Valley Wells, *Ripley & Barneby* No. 3298 (PO, RB) ; NW. of Fenner, *Hoffmann* No. 21805 (SB) ; Coliseum Mine, Clark Mts., *Alexander* No. 478 (UC) ; Mountain Pass, *Eastwood & Howell* No. 8914 (CAS) ; Tecopa Pass, Kingston Range, *Alexander & Kellogg* No. 2368 (UC) ; Fourth of July Canyon, New York Mts., *Alexander & Kellogg* No. 1329 (UC).

The var. *Fremontii*, while always recognizable by the small purple flowers, is considerably polymorphic and includes several minor ecological races, separable on somewhat fluctuating criteria of stature and pubescence. In general there appears to be a gradual progression westward from Jones's curiously glabrous collection from the Meadow Valley Wash in southeast Nevada, through the rather inconspicuously strigose-canescens type, to the populations with hirsutulous (*Cystium griseum*) or appressed-silvery (*Astragalus eremicus*) herbage of southwest Nevada and Owens Valley. In the last, the pod, with rare exceptions glabrous through-

out the rest of the range, is almost consistently strigillose, but I can find no satisfactory cleavage between these races. The type of *Cystium griseolum* Rydb. is a depauperate individual from rather high altitude (6000—6500 feet), with somewhat spreading and tangled pubescence, short peduncles, and condensed racemes, which is linked to the commoner phase by the dwarf, predominantly annual race in western Nye and southern Esmeralda counties, Nevada (cf. *Ripley & Barneby No. 3655*). Rydberg erroneously described the flowers as "white tinged with rose," in spite of Shockley's note on the label stating that the petals, when fresh, were "light magenta, variable in shade," and the isotype in herb. Greene. bears obviously purple flowers. This montane form is also represented by *Duran No. 3025* and by several gatherings from the White Mts. *Astragalus eremicus* Sheld., of which I have not seen the type, was very minutely described by Sheldon, and is readily identified with the silvery-canescens form with minutely strigulose legume repeatedly met with on the alkaline meadows and mesas about Lone Pine, the type-locality, Olancho, and Darwin.

The literature dealing with var. *Fremontii* is rather difficult to disentangle, as the name, in various combinations, has been made to cover widely divergent concepts, or the plant has been entirely submerged in var. *Coulteri*. Thus Watson (1871) confounded it with the white-flowered var. *macrolobus*, while Jones stated its distribution as "common from Hawthorne, Nevada, . . . to Mexico," and doubtless included both var. *Kennedyi* (e loc.) and var. *variabilis*, as shown by his figure of a plant from Victorville under this name (pl. 25). Jepson (1925) regarded *A. Coulteri* as embracing all the southern California desert races, though later (1936) he admitted var. *Fremontii* to the flora of the state in a much more extended sense than admitted here, for specimens both of var. *variabilis* and of var. *antonius* are cited.

The var. *Fremontii*, as here restricted, forms a natural unit intermediate between vars. *macrolobus*, *Kennedyi*, and *variabilis*. From the first it differs in the purple coloring and shorter calyx-teeth, and from the other two in the noticeably smaller corolla. An occasional specimen with white petals has been seen growing with the ordinary form.

## 8. var. FLORIBUNDUS Gray

*Astragalus lentiginosus* Dougl. var. *floribundus* Gray, Proc. Amer. Acad. 6: 524 (1865); Jones, Contrib. W. Bot. 8: 3 (1898), exclus. syn.

*A. lentiginosus* Wats., Bot. King Explor. 65 (1871), pro parte, ex num. cit.; Sheld., Minn. Bot. Stud. 1: 170 (1894), pro parte, non Dougl.

*A. lentiginosus* var. *ineptus* Jones, Rev. Astrag. 124 (1923), pro max. parte, non *A. ineptus* Gray.

*Cystium floribundum* (Gray) Rydb., N. Amer. Fl. 24: 411 (1929).

*C. ormsbyense* Rydb., op. cit., p. 412.

Pods membranous and shining, ovoid-acuminate to subglobose, 1—2 cm. long, strigose or glabrous, occasionally mottled, gathered into dense cylindrical or subspherical clusters on short divergent peduncles: racemes 15—20-flowered, (1.5) 3—4 cm. long, equaling or sometimes shorter than the subtending leaf: calyx white-strigose, the tube 2.5—3.5 mm., the acute teeth 0.5—1.5 mm. long: petals white, the banner 8.5—10 mm., the wings 7.5—8.5 mm., the keel 6—7 mm. long: leaves 3—6 cm. long, with about 7 pairs of oblong, oblanceolate or obovate, glabrous or sparingly strigose, obtuse or acute leaflets, typically broad and flat, but in the upper leaves often narrow and conduplicate, distant: stems commonly much branched, rarely simple, prostrate or ascending, 2.5—4 dm. long.

*Illustrations.* Pl. I, figs. 30—36. Jones, Rev. Astrag., pl. 23 (as var. *ineptus*).

*Type-locality.* Near Carson City, Nevada, the type collected by Dr. C. L. Anderson in 1864.

*Distribution.* In sandy soil of sagebrush valleys, sometimes by roadsides, along the eastern base of the Sierra Nevada, from Ormsby County, Nevada, to Lake County, Oregon.

*Exsiccata.* NEVADA. Ormsby Co.: Carson City, *Anderson in 1864* (G, type, NY), *Anderson No. 157* (G), *Jones in 1897* (PO); Eagle Valley, *C. F. Baker No. 1275* (NY, type of *Cystium ormsbyense*, F, ND, PO, UC); Dayton to Carson, *Eastwood No. 14831* (CAS); Empire City, *Jones No. 2990* (G, NY, PO, UC). Lyon Co.: Silver City, *Ripley & Barneby No. 4068* (PO, RB). Washoe Co.: Lemmon Valley, *Kennedy No. 2072* (G, PO, UC); base of Peavine Mt., *K. Brandegee in 1913* (UC); N. of Reno, *Train No. 7* (UN); Reno, *Brandegee in 1888* (UC); Clark's, E. of Reno, *Saarni No. 118* (UC); Truckee Pass, *Watson No. 258* in part (G). CALIFORNIA. Sierra Co.: Sierra Valley, *Bolander in 1872* (G), *Lemmon No. 137* (F). Lassen Co.: Chat, *Jones, 19 June 1897* (PO); Doyle, *Ripley & Barneby No. 5678* (CAS, RB). OREGON. Lake Co.: SE. of Paisley, *Hitchcock No. 6762* (NY).

For a race of such limited geographic range, var. *floribundus* is unexpectedly variable and difficult to define, being intermediate in many respects between the vars. *ineptus*, *salinus*, and *albifolius*. The typical phase is nearly glabrous throughout, with broad, flat leaflets and rather long-acuminate pods, but this passes into plants with some or all of the leaflets conduplicate, or the whole plant

may be strigulose and the legume subglobose with short-triangular tip. The latter extremes, represented by *Baker No. 1275* and *Ripley & Barneby No. 4068*, is *Cystium ormsbyense* Rydb., but cannot, I find, be separated by any constant character. Rydberg himself annotated only one other specimen beside the type as *C. ormsbyense*, viz. *Jones No. 2990* (NY), which has glabrous (!) pods, at the same time referring another part of the same collection to *C. floribundum*: on the other hand, he determined the Bolander gathering from Sierra Valley, which has strigulose pods, as *C. salinum*, but the criterion of pubescence, even when strictly applied, is valueless in this case.

I am inclined to regard var. *floribundus* as a robust, lowland derivative of the alpine var. *ineptus*, which it resembles in its short leaves and peduncles, in this respect finding an interesting parallel in var. *albifolius*: while sometimes agreeing with the latter in general habit, it may be separated on the character of the pubescence and by the straight or upturned, never declined, beak of the legume. From var. *salinum*, another close relative, it differs in the dense racemes, short subsessile leaves, and elongate internodes.

#### 9. var. ALBIFOLIUS Jones

*Astragalus lentiginosus* Dougl. var. *albifolius* Jones, Rev. Astrag. 124 (1923); Munz, Man. S. Calif. 270 (1935); Jeps., Fl. Calif. 2: 356 (1936).

*Cystium albifolium* (Jones) Rydb., N. Amer. Fl. 24: 413 (1929).

*Astragalus albifolius* (Jones) Abrams, Ill. Fl. Pac. St. 2: 598 (1944), non *A. albifolius* Freyn & Sint. (1893).

Pods ovoid to subglobose with a short triangular declined beak, membranous-papery, strigose, 1—1.5 cm. long, in dense cylindric clusters: racemes densely 15—20-flowered, 1—2 cm. long, on peduncles about equaling the subtending leaf: calyx strigose, the tube 3 mm., the teeth 1.5—2 mm. long: petals white or purplish (rarely bright purple), the banner 8—9 mm., the wings 7—8 mm., the keel about 6 mm. long: leaves widely spreading at least the uppermost subsessile, 3—9 cm. long, with 7—8 pairs of narrowly oblong, oblanceolate or oval, discrete leaflets 5—15 mm. long, mostly conduplicate, canescent on both faces (more strongly so above) with closely appressed, short hairs: stems 3—10 dm. long, prostrate, flexuous, branched or simple.

*Illustrations.* Pl. I, figs. 25—29. Jones, Rev. Astrag., pl. 23. Abrams, Ill. Fl., fig. 2874.

*Type-locality.* Lone Pine, Owens Valley, California, the type collected by M. E. Jones.

*Distribution.* Alkaline flats and saline meadows, on the deserts at the foot of the Sierra Nevada, from Inyo County south to Los Angeles County, California.

*Exsiccata.* CALIFORNIA. Sine loc., *Hasse* (NY), *Pringle No. 14 in 1882* (G), *Lemmon No. 69 in 1875* (NY). Inyo Co.: Lone Pine, *Jones* (PO, type, G, NY); Big Pine, *Purpus No. 5760* (PO, UC); Kern Co.: Muroc, *Hoffmann in 1929* (SB). Los Angeles Co.: Lancaster, *K. Brandegee in 1905* (PO, UC), *Elmer No. 3627* (NY, PO), *Davidson No. 3521* (LA) and *in 1893* (LA, ND), *Feudge No. 1133* (PO), *Ripley & Barneby No. 5853* (CAS, RB), *No. 5859* (CAS, RB).

Jones called his var. *albifolius* a "remarkable variation," but when compared with his material of var. *floribundus* from Carson City, Nevada, it will be seen nearly to approach that puzzling race, and it is probably another derivative of the alpine var. *ineptus* modified by similar ecological stimuli. The striking character of the declined beak to the pod, unique as far as I have observed in *A. lentiginosus*, was overlooked by Jones and Rydberg. In flower the plant is readily recognized by the long, prostrate, flexuous branches, relatively short, spreading, subsessile, canescent leaves, and by the condensed, shortly pedunculate racemes. The habital similarity between this variety and var. *sesquimetralis*, also a halophyte, is striking, though the flowers and legumes are very different.

#### 10. var. SEMOTUS Jepson

*Astragalus lentiginosus* Dougl. var. *semotus* Jeps., Fl. Calif. 2: 357 (1936).

Pods ovoid, membranous, strigose, about 15 mm. long, in rather loose clusters much surpassed by the leaves: racemes 1—2 cm. long, rather lax: calyx white-strigose, the tube 3.5—4 mm., the teeth 1.5—2 (or perhaps more) long: petals whitish, the banner 11—12 mm., the wings about 9.5 mm., the keel 8 mm. long: leaves 5—9 cm. long, erect, with 6—10 (or 13, ex char.) pairs of remote, conduplicate, oblanceolate to obovate leaflets 3—9 mm. long, strigose-canescens or green and strigulose below, glabrate above, ciliate: stems procumbent, cespitose, about 1 dm. long.

*Illustration.* Pl. II, figs. 5—6.

*Type-locality.* Campito Mountain, White Mts., Inyo County, California, the type, *W. L. Jepson No. 7280*, not seen.

*Distribution.* White Mts. of Nevada and California to the Inyo Mts., and (doubtfully) the east face of the Sierra Nevada in Inyo County, California.

*Exsiccata.* NEVADA. Esmeralda Co.: Chiatovitch Creek, *Duran No. 2776* (F, G, Br, NY, PO, UC). CALIFORNIA. Inyo Co.: Silver Canyon near Laws, *K. Brandegee in 1913* (PO), *Heller in 1906* (Br); Waucoba Peak, *Alexander & Kellogg No. 2511* (UC); Rock Creek Lake Basin, *Peirson No. 9155* (RB).

I have not seen the type of var. *semotus* and my judgment of the race has been formed mainly by study of *Duran No. 2776*, cited in the original description. It appears to differ from var. *ineptus*, to which it is very closely related, in the much longer, filiform leaf-rachis, in the remote leaflets, and in the more closely appressed pubescence of straighter hairs. Jepson described the calyx-teeth as " $\frac{1}{2}$  to  $\frac{3}{4}$  as long as the tube": in the Duran specimens they are half as long, but in Mrs. Brandegee's plant, otherwise similar, they are considerably shorter. The same is true of Peirson's gathering from the Sierra, which in addition has but six or seven pairs of leaflets and should perhaps with greater justice be referred to the next.

11. var. *INEPTUS* (Gray) Jones

- Astragalus lentiginosus* Dougl. var. *ineptus* (Gray) Jones, Rev. Astrag. 124 (1923), pro parte; Jeps., Fl. Calif. 2: 357 (1936), pro max. parte.
- A. ineptus* Gray, Proc. Amer. Acad. 6: 525 (1865); Hoover, Leaf. W. Bot. 3: 256 (1943); Abrams, Ill. Fl. Pac. St. 2: 599 (1944), pro parte.
- A. lentiginosus* Wats., Bot. King Explor. 66 (1871), pro parte, quoad syn.; Gray, Bot. Calif. 1: 147 (1880), quoad formam; Smiley, Univ. Calif. Pub. Bot. 9: 257 (1921), pro max. parte; Hall & Hall, Yosemite Fl. 145 (1912), non Dougl.
- A. lentiginosus* var. *Fremontii* Wats., Bibl. Ind. 196 (1878), pro parte, quoad syn.
- A. Fremontii* Sheld., Minn. Bot. Stud. 1: 169 (1894), pro parte, quoad syn.
- A. lentiginosus* var. *floribundus* Jones, Contrib. W. Bot. 8: 3 (1898), pro parte, non Gray.
- Phaca inepta* (Gray) Rydb., Mem. N. Y. Bot. Gard. 1: 246 (1900), quoad nomen.
- Cystium ineptum* (Gray) Rydb., Bull. Torr. Bot. Club 32: 659 (1906), quoad nomen.
- C. ineptum* (Gray) Rydb., op. cit. 40: 50 (1913), quoad nomen; N. Amer. Fl. 24: 413 (1929), sensu stricto.

Pods membranous, ovoid, nearly straight or with slightly ascending beak, 10—17 mm. long, strigose (exceptionally glabrous), sometimes mottled: racemes rather loosely 10—15-flowered, 1—2 cm. long, the pedicels filiform: calyx loosely pubescent with curved hairs, the tube 3—4 mm., the acute teeth 1.5—2 mm. long: petals whitish or ochroleucous, or the wings tinged with pink, the banner 11 mm., the wings about 10 mm., the keel 8 mm. long: leaves 3—5 cm. long, on slender petioles, crowded, with 8—10 pairs of obovate-oblongate, conduplicate, and contiguous (or at least closely approximate) leaflets 3—9 mm. long, 2—4 mm. wide, pubescent with spreading or curved hairs below, strongly ciliate, commonly glabrate above at least along the midrib: stems numerous, densely cespitose, prostrate, 1—2 dm. long.

*Illustrations.* Pl. II, figs. 1—4. Abrams, Ill. Fl., fig. 2879.

*Type-locality.* Dry rocky mountain near Sonora Pass, the type collected by Brewer in 1863.

*Distribution.* Exposed gravel slides or sandy banks along the easterly crest of the Sierra Nevada, between 7000 and 11,400 feet altitude, from Alpine County south to Inyo County, California.

*Exsiccata.* CALIFORNIA. Alpine Co.: Sonora Peak, *Wiggins No. 9312* (PO, UC); White Mt., *Gifford No. 750* (UC). Mono Co.: near Sonora Pass, *Brewer No. 1878* (G, type, UC); Sonora Pass, *Wiggins No. 9255* (PO, UC), *Peirson No. 11648* (PO), *Eastwood & Howell No. 7533* (CAS), *Ripley & Barneby No. 4077* (CAS, RB); Mono Pass, *Congdon in 1895* (UC); Virginia Lakes Basin, *Peirson No. 11169* (RB); Devil's Gate, *Ripley & Barneby No. 5810* (CAS, RB); Long Valley, *J. T. Howell No. 14399* (CAS); Hilton Creek, *Peirson No. 10743* (RB, UC); N. shore of Mono Lake, *Peirson No. 10758* (RB, UC). Tulare Co.: Bonita Meadow, *Hall & Babcock No. 5201* (UC). Inyo Co.: Bishop Creek, *Dearing & Dearing No. 562* (SB); Inconsolable Range, *Peirson No. 8544* (UC).

*Astragalus ineptus*, as to the plant itself, has been much misunderstood by modern botanists, while the name has been widely and improperly applied to several diverse races of *A. lentiginosus*. First described from flowering material collected by Brewer, it was reduced by Watson first to *A. lentiginosus* (1871) and then to its var. *Fremontii* (1878). The earlier reduction was followed by Gray (1880), who regarded it as "a narrow-leaved and pubescent form," and more recently by Hall (1912) and Smiley (1921), while the second was copied by Sheldon into his Preliminary List (1894). Jones, having at first (1898) referred it to var. *floribundus* Gray, later (1923) published the combination *A. lentiginosus* var. *ineptus* and reduced var. *floribundus* to that, but his concept seems always to have been *floribundus* in great part. Rydberg took up the name and combined it with *Phaca* (1900), then twice with *Cystium* (1905 and 1913), but applied it to *A. salinus* Howell (for which he later substituted *Cystium heliophilum*), and he was followed by Aven Nelson who treated as *A. ineptus* two different races from Montana and Wyoming (var. *salinus* and var. *platyphyllidius*). Not until 1929 did Rydberg restrict his *C. ineptum* to the plant from the Sierra Nevada. Jepson (1936), if one may judge from the cited distribution and altitude of occurrence, seems to have included in his var. *ineptus* some material which I regard as var. *floribundus*.

The var. *ineptus* in exactly typical form is found at great altitudes, and it is only in material gathered between 9,000 and 11,400

feet that the spreading pubescence and short peduncles are observed to be constant. As the plants descend the eastern face of the Sierra, the hairs become more appressed (*Peirson No. 10743*), or the racemes elongate and surpassing the leaf (*Peirson No. 10758*), or the stems elongate and the pods glabrous (*Howell No. 14399*), and thus appear to intergrade with var. *floribundus*. As I have seen it on exposed gravel ridges above Sonora Pass it forms a depressed, caespitose plant about a foot in diameter and an inch or two high, the numerous racemes of ochroleucous blossoms barely emerging from the crowded, ascending leaves.

12. var. SIERRÆ Jones

*Astragalus lentiginosus* Dougl. var. *sierræ* Jones, Rev. Astrag. 124 (1923); Munz, Man. S. Calif. 269 (1936), pro max. parte; Jeps., Fl. Calif. 2: 357 (1936).

*Cystium sierræ* (Jones) Rydb., N. Amer. Fl. 24: 412 (1929).

*Astragalus sierræ* (Jones) Tidestr., Proc. Biol. Soc. Wash. 50: 21 (1937).

*A. ineptus* Abrams, Ill. Fl. Pac. St. 2: 599 (1944), pro parte, non Gray.

Pods ovoid with a nearly straight triangular beak, papery-membranous, mottled, strigose, 15—20 mm. long: racemes 8—15-flowered, 1—2 cm. long: calyx strigose, the tube 4 mm., the rather obtuse, deltoid teeth 1 mm. long: petals whitish or the upper ones tinged with pink, the banner 11 mm., the wings about 10 mm., the keel 8 mm. long: leaves 2—4 cm. long, with slender petioles and 7—9 pairs of obovate, conduplicate, ciliate leaflets more or less strigose-canescens to glabrate below, glabrous above: stems numerous, matted, prostrate, very leafy, 1—3 dm. long.

*Illustrations.* Pl. II, figs. 10—12. Jones, Rev. Astrag. pl. 23.

*Type-locality.* In gravelly soil, Bear Valley, California, the type collected by Jones.

*Distribution.* In stony meadows or open pinewoods of the Arid Transition Zone, in the San Bernardino Mountains of southern California, alt. about 6000 feet.

*Exsiccata.* CALIFORNIA. San Bernardino Co.: sine loc., *Parry & Lemmon No. 91* in 1876 (G, NY); Bear Valley, *Parish No. 2350* (F, NY), *Parish & Parish No. 1496* (F, G), *No. 1867* (F, ND, NY), *Abrams & McGregor No. 735* (NY), *Jones in 1900* (PO, type), *Davidson No. 2198* (LA); Bear Lake, *Jones in 1926* (NY, PO), in 1934 (PO, UC), *Ewan No. 1418* (SB), *Munz No. 10468* (PO); Big Meadows, *Fudge No. 1132* (PO); Baldwin Lake, *Peirson No. 4558* (PO), *Ripley & Barneby in 1936* (Kew Gardens); Holcomb Valley, *Pierce in 1922* (PO); Sugarloaf Peak, *Holmes in 1933* (LA).

The var. *sierræ* is very closely related to the preceding, which it exactly resembles in habit, and to which Abrams has lately referred it, but the pubescence is commonly less copious and more closely appressed, while the calyx-teeth are obtuse and decidedly

shorter. Munz (1935, l. c.) admitted to the var. *sierræ* a plant of very similar aspect from the mountains of Ventura Co., California, here treated as var. *tehachapiensis*: it is, no doubt, another close relative of the *ineptus-sierræ* group, but the flowers are larger and more brightly colored, the pods are decidedly coriaceous in texture with a more deeply intruded ventral suture, and the leaflets are not conduplicate. In the San Gabriel Mts., adjacent to the west, var. *sierræ* passes into

13. var. ANTONIUS Barneby

*Astragalus lentiginosus* Dougl. var. *antonius* Barneby, var. nov., præcedenti manifeste arctæque affinis, sed habitu sæpissime laxiori, internodiis foliisque duplo longioribus, foliolis semotis plerumque expansis et pube sericea appressiuscula utrinque strigoso-canescens, racemis longius pedunculatis necnon floribus paulo minoribus saturatius purpureo-tinctis absimilis.—*A. lentiginosus* var. *Fremontii* Jones ex I. Jtn., Plant World 22: 108 (1919); Jeps., Fl. Calif. 2: 356 (1936), pro parte, ex num. cit.

Pods in shape and texture exactly as in the last, more loosely racemose, 14–24 mm. long: racemes 10–15-flowered, 1–3 cm. long, on rather long, straight peduncles, surpassing the leaves: calyx canescent with ascending hairs which may be all white or with an admixture of black, the tube 3–3.5 mm., the subulate teeth 0.5–0.9 mm. long: petals distinctly purple, the narrow banner 9–9.5 mm., the wings 8–8.5 mm. long, the obtuse, nearly straight keel 7–7.5 mm. long: leaves ascending, 4–8 cm. long, with 6–9 pairs of flat or very rarely conduplicate, elliptic or obovate, obtuse or emarginate leaflets 4–11 mm. long, canescent on both faces with straight, rather loosely appressed, silvery hairs: stems 1.5–3 dm. long, usually with well-developed internodes.

*Illustration.* Pl. II, figs. 7–9.

*Type.* Swartout Valley, San Bernardino Co., California, *J. B. Feudge No. 990* (Pomona College Herbarium No. 145409).

*Distribution.* Valleys and slopes of Mount San Antonio (Old Baldy), east end of San Gabriel Mountains, in San Bernardino and Los Angeles counties, California, between 5000 and 8500 feet.

*Exsiccata.* CALIFORNIA. San Bernardino and Los Angeles Cos.: Swartout Valley, *Feudge No. 990* (PO, type); Swartout Canyon, *Hall No. 1485* (PO, UC); Blue Ridge, Swartout Valley, *Munz No. 7681* (PO); Lone Pine Creek, *Munz No. 4598* (PO); Prairie Fork of San Gabriel River, *I. Johnston No. 1655* (PO, UC); Old Baldy Mt., *Parish No. 1918* (F, ND, UC); Pinyon Ridge, *Margaret Stason in 1927* (UC).

Imperfect specimens of var. *antonius* were determined by Jones as *A. lentiginosus* var. *Fremontii*, which they superficially resemble, but the real affinity, as indicated by annotations of Munz in herb., is doubtless with the preceding. Material from the upper slopes of the Blue Ridge (*Munz No. 7681*) at 8450 feet altitude

is almost as condensed as var. *sierra*, with short leaves and conduplicate leaflets, but can still be separated on the character of the pubescence. The prevailing habit is much more lax, however, and the leaflets are commonly flat and remote. In this form it is easily confounded with the pubescent phase of var. *Fremontii*, but the racemes are fewer-flowered and shorter, the calyx-teeth and flower relatively smaller, and the habitat is quite different. This is another of the forms by which the varieties of *A. lentiginosus* are so closely interlocked as to make specific or even sub-specific segregation of major groups within the complex quite impracticable.

14. var. CHARLESTONENSIS (Clokey) Barneby

*Astragalus lentiginosus* Dougl. var. *charlestonensis* (Clokey) Barneby, comb. nov.

*A. kernensis* Jeps. subsp. *charlestonensis* Clokey, Madroño 6: 218 (1942).

Pods broadly ellipsoid to subglobose, the body 9—12 mm., the filiform beak 1—2 mm. long, the valves papery, strigose, mottled: racemes 2—6-flowered, about 1 cm. long in fruit, on slender peduncles 2.5—5 cm. long: calyx strigose with white or some black hairs, the tube 3—4 mm., the teeth about 1 mm. long: petals narrow, white or ochroleucous, the banner 10—12 mm., the wings 9—10 mm., the purple-tipped keel 7—8 mm. long: leaves 3.5—5 cm. long, shortly petiolate, with 7—10 pairs of narrowly obovate to elliptic, obtuse, rather distant and rarely conduplicate leaflets 3—7 mm. long, strigose-hirsutulous below, glabrous above: stems cespitose, prostrate, slender, sparingly strigose, 5—15 cm. long from a stout perennial tap-root.

*Illustrations.* Pl. II, figs. 13—15. Clokey, op. cit., pl. 27, figs. k—o.

*Type-locality.* Charleston Peak, Clark Co., Nevada, the type collected by Ira W. Clokey and Russell Bean.

*Distribution.* Known only from limestone screes of Charleston Peak, at about 10,000 feet altitude.

*Exsiccata.* NEVADA. Clark Co.: Charleston Peak, *Clokey & Bean No. 7375* (F, PO, RB, and widely distributed, type-collection); *ibid.*, west slope, *Jaeger in 1926* (PO).

This variety and the next are closely related and should perhaps be accepted as a species distinct from *A. lentiginosus*, but the sole diagnostic character lies in the beak of the legume. In all other forms of the species this organ, when clearly defined from the body of the pod, is triangular or deltoid-acuminate in outline and usually somewhat compressed: in var. *charlestonensis* and var. *kernensis*, on the other hand, the beak is tubular-filiform and has the appearance of a persistent style. Clokey (l. c., 1942) stated that *A. kernensis* and its subspecies could be distinguished from *A. lentiginosus* by the narrow intrusion of the ventral suture

of the legume. An exactly similar intrusion, however, may be observed even in the typical race of *A. lentiginosus*, and it is especially well marked in var. *tehachapiensis* and several others. The flowers, pubescence, and stipules, as well as the general habit, are all closely similar to those of var. *ineptus*, and in an alliance such as § *Diplocystium*, where the pod is so extraordinarily polymorphic and variable, I hesitate to segregate a species on carpological structure alone.

15. var. **KERNENSIS** (Jeps.) Barneby

***Astragalus lentiginosus*** Dougl. var. **kernensis** (Jeps.) Barneby, comb. nov.

*A. kernensis* Jeps., Man. Calif. 569 (1925); Fl. Calif. 2: 357 (1936).

*A. lentiginosus* var. *latus*, "a form with tiny flowers . . ." Jones, Rev. Astrag. 125 (1923).

*Cystium kernense* (Jeps.) Rydb., N. Amer. Fl. 24: 413 (1929).

*Astragalus ineptus* Abrams, Ill. Fl. Pac. St. 2: 599 (1944), pro parte, quoad syn. cit., non Gray.

Pods globose with a filiform beak, papery-membranous, sparingly strigose-hirsutulous, sometimes mottled, the body 6—8 mm., the beak 1—3 mm. long: racemes 3—6-flowered, about 1 cm. long in fruit, on peduncles shorter than the subtending leaf: calyx white-strigose, the tube about 4 mm., the teeth 1—1.5 mm. long: petals narrow, whitish or the wings tinged with pink, the banner 9—11 mm., the wings 7—8 mm., the keel 6—7 mm. long: leaves 2—5 cm. long, with 4—7 pairs of obovate, obtuse to emarginate, commonly conduplicate leaflets 3—7 mm. long, pubescent beneath and ciliate with rather coarse hairs, glabrous above: stems very slender, ascending, canescent with loosely appressed hairs, 6—10 cm. long.

*Illustration.* Pl. II, figs. 16—18.

*Type-locality.* Volcano Creek, Tulare Co., California, the type, *W. L. Jepson No. 4930*, not seen.

*Distribution.* Whitney Plateau in the high Sierra Nevada of Tulare County, California, at about 8000 feet altitude.

*Exsiccata.* CALIFORNIA. Tulare Co.: Monatchy Meadows, *Purpus No. 1871* (PO, UC); Volcano Creek, *Hall & Babcock No. 5432* (UC), *Peirson No. 2000* (CAS).

The var. *kernensis*, the smallest and most delicate of the varieties of *A. lentiginosus*, is very local, being confined to that area of endemism in the southern Sierra Nevada to which also belong *Abronia alpina* Bdg. and *Oreonana Clementis* (Jones) Jeps. It seems, like the preceding, to have been longer isolated than its near relatives, and furnishes an excellent example of the geographical subspecies of some modern taxonomists. Jones referred the only specimen known to him to var. *latus*, an incomprehensible

determination which he followed up by reducing *A. kernensis* to *A. lentiginosus* sensu stricto (cf. Contrib. W. Bot. 18: 44,—1933), while it has recently been referred by Abrams to var. *ineptus*.

16. var. PLATYPHYLLIDIUS (Rydb.) Peck

*Astragalus lentiginosus* Dougl. var. *platyphyllidius* (Rydb.) Peck, Man. Pl. Oreg. 449 (1940), nomen; Madroño 6: 135 (1941).

*A. lentiginosus* var. *cuspidocarpus* Jones, Proc. Calif. Acad. Sci., II, 5: 673 (1895); Jeps., Fl. Calif. 2: 357 (1936), pro parte, ex syn.; non *A. cuspidocarpus* Sheld., nec *A. missouriensis* var. *cuspidocarpus* (Sheld.) Jones.

*A. ineptus* A. Nels., Erythea 6: 54 (1898), ex num. cit., non Gray.

*A. lentiginosus* Jones, Contrib. W. Bot. 8: 3 (1898), pro parte, non Dougl.

*A. lentiginosus* var. *diphysus* Jones, Rev. Astrag. 125 (1923), pro parte, non *A. diphysus* Gray.

*Cystium Merrillii* Rydb., N. Amer. Fl. 24: 410 (1929).

*C. platyphyllidium* Rydb., l. c.

*C. cornutum* Rydb., op. cit., 412, quoad typum, exclus. syn.

*Astragalus Merrillii* (Rydb.) Tidestr., Proc. Biol. Soc. Wash. 50:21 (1937).

*A. araneosus* Abrams, Ill. Fl. Pac. St. 2: 598 (1944), non Sheld.

Pods highly variable in outline, length and inflation, ovoid or ovoid-acuminate to lanceolate-acuminate or subglobose, 1.5—3 (4) cm. long, usually with a more or less upturned, laterally flattened beak, the valves coriaceous, strigose or glabrous: racemes 10—12-flowered, the axis 1.5—3 cm. long, on peduncles about half as long as the subtending leaf: calyx strigose with black hairs, the tube 5—8 mm., the narrow acute teeth 2.5—4 mm. long: petals white or the keel purple-tipped, the banner 13—17 mm., the wings 11—14 mm., the keel 10—13 mm. long: leaves petiolate, with 6—9 pairs of broadly elliptic, obovate or suborbicular, obtuse or emarginate leaflets 6—16 mm. long, essentially glabrous or with a few scattered hairs on the margins and midribs: stems 1.5—3 dm. long, rather coarse, stramineous, subglabrous, ascending.

*Illustrations.* Pl. II, figs. 39—46. Jones, Rev. Astrag., pl. 24, fig. d (dubie). Abrams, Ill. Fl., fig. 2876.

*Type-locality.* Pine Creek, Gilliam Co., Oregon, the type collected by J. B. Leiberger.

*Distribution.* Volcanic mesas and sagebrush plains, often in alkaline soil, from northeastern California through interior Oregon and northern Nevada to southern Idaho, southwest Wyoming, and northern Utah.

*Exsiccata.* CALIFORNIA. Lassen Co.: Eagle Lake, Jones in 1897 (PO); Hidden Valley near Susanville, Ripley & Barneby No. 5744 (CAS, RB). Modoc Co.: Goose Lake, Austin No. 253 (UC); E. side of Warner Mts., Mrs. Manning (NY). OREGON. Gilliam Co.: Pine Creek, Leiberger No. 171 (NY, type, G). Grant Co.: Humphrey Ranch, Henderson No. 5095 (G). Lake Co.: Crump Lake, Ripley & Barneby No. 6049 (CAS, RB). Harney Co.: Silvies River, near mouth of Emigrant Creek, Peck No. 3136

(G); Lower Steens Mt., *Cusick No. 1978* (F, G, NY, UC); Hoffman's Ranch, Wildhorse Creek, *Henderson No. 8781* (CAS); Wagontire, *Ripley & Barneby No. 6070* (RB); Alvord Ranch, *Jones No. 25406* (PO). Co. undetermined: John Day Valley, *Howell No. 265 in 1880* (G); Muddy Station, John Day Valley, *Howell in 1885* (NY, type of *Cystium cornutum*, F, UC); "Mudy," *Howell No. 384* (G); Anderson Ranch, *Howell in 1885* (F). NEVADA. Elko Co.: near Deeth, *Heller No. 9250* (F, NY); Cave Creek P. O., *Mason No. 4788* (UC); Glencoe, *Jones in 1891* (PO). Washoe Co.: SW. of Vya, *Ripley & Barneby No. 6014* (RB). IDAHO. Owyhee Co.: House Creek, *Nelson & Macbride No. 1781* (G, in part, NY). Bannock Co.: Soda Springs, *Payson & Payson No. 1703* (G, NY). Blaine Co.: Arco, *Payson & Payson No. 3104* (G). WYOMING. Sweetwater Co.: Leucite Hills, *Merrill & Wilcox No. 680* (NY, type of *Cystium Merrillii*, G); 35 miles N. of Point of Rocks, *A. Nelson No. 7061* (G, in part). Sublette Co.: 25 miles W. of Big Piney, *Payson & Payson No. 2657* (F, NY, PO, UC). Uinta Co.: Evanston, *A. Nelson No. 2978* (NY), *No. 4842* (NY, PO), *No. 5385* (PO). UTAH. Summit Co.: Kimballs, *Mrs. Clemens in 1908* (F; G).

Into var. *platyphyllidius*, as will be seen from the synonymy, have been combined three Rydbergian *Cystia*, the reduction of which calls for some discussion. *Cystium Merrillii* was separated from *C. platyphyllidium* by Rydberg on the dimensions of the calyx and the length of the corolla, the former being supposed to have the tube 7—8 mm. long and 3—4 mm. wide, as opposed to 4—5 mm. long and 3 mm. or less wide, and the corollas were described as "about 1.5 cm. long" and "10—12 mm. long" respectively. It seems that the measurements of the calyx of *C. Merrillii* were taken exclusively from the type, in which this organ is abnormally inflated: in any case no other specimen among those determined as *C. Merrillii* by Rydberg bears a calyx of such proportions, as may be seen by comparison with *A. Nelson No. 2978*, where the tube does not exceed 5 mm. in length. That Rydberg's description was prepared exclusively from the type-sheet becomes almost certain when such a specimen as *Payson & Payson No. 2657*, also named by Rydberg, is found to have a legume not 3 cm. long as described for the species, but scarcely half that length. The description of *C. platyphyllidium*, in contrast to that of *C. Merrillii*, does not even cover the type-specimen, *Leiberg No. 171*. No flowers remain, so it is impossible to check absolutely the length of the corolla, but the persistent calyx is about 9 mm. long (the tube 5.5 mm., the teeth nearly 4 mm., as opposed to 4 mm. and 2 mm. in the description), and the banner can scarcely have been

less than 15 mm. long, certainly not as little as "about 10 mm." Thus there seems to be no appreciable difference between the normal flower (in contradistinction to that described from an abnormal type) of *C. Merrillii* and the typical flower (as opposed to that described from diverse elements) of *C. platyphyllidium*, and the essential difference between the two is reduced to one of comparative inflation in the pod. Rydberg's real intentions in regard to *C. platyphyllidium* are not revealed by study of material named by him: they include such dissimilar plants as *Leiberg No. 2301* (flowers as described for the species, but pods papery and quite typical var. *salinus*) and *Heller No. 9250* (like the type but with very much larger flowers than described).

*Cystium cornutum*, the third species proposed by Rydberg, is separated (l. c.) quite widely from the others on the criterion of the pubescent or "sparingly strigulose" pod, and this is, indeed, the sole character in which the types of *C. platyphyllidium* and *C. cornutum* differ. The author himself found difficulty in distinguishing them. For example, there exists in the Gray Herbarium an interesting collection, *Howell No. 384* from "Mudy" (i. e. probably Muddy Station in the John Day Valley, Oregon), gathered on May 12, 1885. Perhaps Rydberg took this for an isotype of *C. cornutum*, although that collection was made the following day: in any case he determined the plant as *C. cornutum*, in spite of the fact that the legume is glabrous! Another example of the practical value of this same character is furnished by *Cusick No. 1978*, which may bear either glabrous (F) or strigulose (G, ND) pods. It seems entirely mystifying, also, that Rydberg could describe a species as having "pods fully 2.5 cm. long" and corolla "about 15 mm. long," and simultaneously determine under that name plants with flowers not exceeding 1 cm. and pods 13—15 mm. long. Examples of this are *Heller No. 8062* and *Austin & Bruce No. 2210* (var. *carinatus*), or *Peck No. 9949* (var. *typicus*).

Confusion about this race goes back further than Rydberg, the types of both *Cystium platyphyllidium* and *C. cornutum* having been discussed and determined by earlier authors. Thomas Howell's collection from John Day Valley was cited by Sheldon as belonging to his species *A. araneosus*, and the description of the flower as white, a character derived from this specimen but alien to the type, was incorporated by Rydberg into his account of

*Cystium araneosum* in the N. American Flora. At the same time Sheldon identified *Leiberg No. 171* as belonging to his *A. cuspidocarpus*, a species unrelated to *A. lentiginosus*, and this gave rise to Jones's combination *A. lentiginosus* var. *cuspidocarpus* which, although repudiated by the author, has since reappeared in Dr. Jepson's Flora of California. In the Revision of *Astragalus*, Jones treated var. *platyphyllidius* as a form of var. *diphysus*, erroneously quoting as a synonym *A. ammolotus* Greene, a name proposed to replace the already superfluous *A. elatiocarpus* Sheld. Professor Peck has recently recognized *C. cornutum* and *C. platyphyllidium* as separate varieties of *A. lentiginosus*, a disposition which I have failed to understand. He also published the combination under which the plant is treated here as "*A. lentiginosus* var. *platyphyllidium*," apparently not having realized the adjectival nature of the second epithet.

While I regard *C. platyphyllidium* and *C. cornutum* as exactly synonymous, the race segregated as *C. Merrillii* might be considered distinct on the dimensions of the pod, which is as a rule considerably more inflated, ovoid rather than lance-ovoid, and perhaps slightly less firm in texture. Nevertheless the pod of *Henderson No. 8781* from Harney County, Oregon, where var. *platyphyllidius* is not uncommon, is every bit as turgid as in the plant from Wyoming, and I can find no constant criterion correlated with distribution. As interpreted here, var. *platyphyllidius* is easily recognized by its large white flowers, partially black-strigose calyx with long teeth, the broad, thick, glabrous leaflets, and coriaceous pods. These, however, vary in outline between the extremes exhibited by *Henderson No. 8781* (ovoid, much inflated, 3 cm. long and with septum 7 mm. deep), *Henderson No. 5095* (lanceolate, to 4 cm. long, with septum only 2 mm. deep), and *Payson No. 2657* (subglobose, 13—15 mm. long, the septum about 5 mm. deep), but the texture of the valves is always leathery. A few specimens show signs of intergradation with var. *salinus* and var. *carinatus*. A similar form with papery pods may be distinguished as

#### 17. var. TOYABENSIS Barneby

*Astragalus lentiginosus* Dougl. var. *toyabensis* Barneby, var. nov., præcedenti persimilis, et præter legumen membranaceum subdiaphanum, nec coriaceum, atque foliola angustiora, apice minute apiculata, fere omnino congruens.—*A. diphysus* Wats., Bot. King Explor. 65 (1871), pro parte,

non aliorum. *Cystium platyphyllidium* Rydb., N. Amer. Fl. 24: 410 (1929), pro parte.

Pods obliquely ovoid, membranous, glabrous, 2 cm. long: racemes dense, about 3 cm. long: calyx black-strigose, the tube 5 mm., the teeth 2.5—4 mm. long: petals white, the banner 13—17 mm., the wings 11—15 mm., the keel 10—12 mm. long: leaflets 10—20 mm. long, 4—8 mm. wide, rounded and minutely apiculate at apex: otherwise as the preceding.

*Illustration.* Pl. III, figs. 1—4.

*Type.* Toyabe Mountains, Nevada, *Sereno Watson No. 253* (Gray Herbarium).

*Distribution.* Known only from the neighborhood of the type-locality.

*Exsiccata.* NEVADA. Nye (? or Lander) Co.: Toyabe Mts., *Watson No. 253* (G, type, NY), *Tidestrom No. 10851* (G).

This variety differs from var. *platyphyllidius* chiefly in the membranous texture of the pod, and in the somewhat narrower, apiculate leaflets. The type was named *A. diphysus* by Watson, and was referred by Rydberg to his *Cystium platyphyllidium*. Further material is needed to establish the validity of this entity.

#### 18. var. IDRIENSIS Jones

*Astragalus lentiginosus* Dougl. var. *idriensis* Jones, *Contrib. W. Bot.* 10: 63 (1902); *Rev. Astrag.* 124 (1923).

*Cystium idriense* (Jones) Rydb., N. Amer. Fl. 24: 414 (1929).

*Astragalus lentiginosus* var. *cuspidocarpus* Jeps., *Fl. Calif.* 2: 357 (1939), pro parte.

*A. idriensis* (Jones) Abrams, *Ill. Fl. Pac. St.* 2: 599 (1944), pro parte.

Pods obliquely ovoid-lunate, with upturned beak or strongly incurved, the ventral suture prominent, the valves not much inflated, leathery, strigose, mottled, 12—14 mm. long: racemes about 10-flowered, 1—2 cm. long, on peduncles about 5 cm. long which conspicuously exceed the leaves: calyx strigose with mixed white and black hairs, the tube 4—4.5 mm., the obtuse teeth 0.5—0.75 mm. long: petals purple, the banner 12—14 mm., the wings 10—11 mm., the keel 9—10 mm. long: leaves 2—4 cm. long, spreading, the upper subsessile, with 8—9 pairs of flat, emarginate, ciliate leaflets, 5—9 mm. long, glabrous above and sparingly strigose beneath: stems rather slender, prostrate, about 2 dm. long, numerous from a stout woody tap-root.

*Illustrations.* Pl. II, figs. 19—23. Jones, *Rev. Astrag.*, pl. 24, and pl. 72 (section incorrect). Abrams, *Ill. Fl.*, fig. 2880.

*Type-locality.* New Idria, California, the type collected by Alice Eastwood in 1893.

*Distribution.* San Carlos and Santa Lucia ranges in Monterey and San Benito counties, California.

*Exsiccata.* CALIFORNIA. San Benito Co.: New Idria, *Eastwood in 1893* (PO, type, CAS, UC). Monterey Co.: *Tassajara Hot Springs, Elmer No. 3288* (PO, fragments).

This rare variety has recently been reduced by Jepson (l. c.) to his var. *cuspidocarpus* of interior northern California (cf. var. *carinatus*), and it must be admitted that the pods, with their acute ventral suture, are undeniably similar. Nonetheless the larger purple flowers, shortly racemose on peduncles much exceeding the leaves, and the longer calyx with proportionately shorter, obtuse teeth, suffice to distinguish var. *idriensis*. It is much more closely related to var. *tehatchapiensis*, from which it differs essentially only in the long peduncles and shorter pod. Indeed it would seem from the range cited by Abrams (l. c.) for *A. idriensis* that he included there a part of the material referred below to var. *tehatchapiensis*.

Rydberg's statement that the type locality was not given in the original publication is incorrect; it is clearly stated in the opening sentence of the description.

19. var. *TEHATCHAPIENSIS* (Rydb.) Barneby

*Astragalus lentiginosus* Dougl. var. *tehatchapiensis* (Rydb.) Barneby, comb. nov.

*Cystium tehatchapiense* Rydb., N. Amer. Fl. 24: 414 (1929).

*Astragalus Fremontii* Heller, Muhlenb. 2: 84 (1905), e num. cit., non Gray.

*A. lentiginosus* var. *nigricalycis* Munz, Man. S. Calif. 270 (1935), pro parte, e syn. cit.; Jeps., Fl. Calif. 2: 357 (1936), pro parte, non Jones.

*A. lentiginosus* var. *sierræ* Munz, op. cit. 269, pro parte, non Jones.

*A. tehachapiensis* (Rydb.) Tidestr., Proc. Biol. Soc. Wash. 50: 21 (1937); Abrams, Ill. Fl. Pac. St. 2: 598 (1944).

*A. idriensis* Abrams, op. cit. 599, pro parte, non *A. lentiginosus* var. *idriensis* Jones, sens. strict.

Pods obliquely ovoid-acuminate, incurved or with ascending beak, leathery, strigose, mottled, 2—2.5 cm. long: racemes 10—15-flowered, subcapitate or in fruit 1—2 cm. long, on peduncles about equaling the leaves: calyx strigose with all black or some white hairs, the tube 4—5 mm., the obtuse, subulate to triangular teeth 0.75—1 mm. long: petals purple or the wings pale, the banner 12—15 mm., the wings 10—14 mm., the keel 9—11 mm. long: leaves 4—5 cm. long, on short petioles, with 8—10 pairs of flat, obovate-emarginate to obcordate leaflets 5—10 mm. long, glabrate on either face or the margins and midribs commonly strigose-ciliate with scattered hairs: stems numerous, 1.5—2 dm. long, subglabrous to strigulose, leafy, prostrate from a stout perennial tap-root.

*Illustrations.* Pl. II, figs. 24—29. Abrams, Ill. Fl. fig. 2873.

*Type-locality.* Tehachapi (sic), Kern County, California, the type collected by A. A. Heller in 1905.

*Distribution.* Meadows and brushy slopes in the mountains about the head of the San Joaquin Valley, California.

*Exsiccata*. CALIFORNIA. Kern Co.: Tehachapi, Heller No. 7833 (NY, type, F, G, UC), Eastwood No. 3247 (CAS, NY in part), K. Brandegee in 1905 (UC), Jones in 1903 (PO, UC); N. side of Tehachapi Pass, Munz No. 8917 (PO); Tehachapi Valley, Davy No. 2184 (UC). Ventura Co.: Lockwood Valley, Hoffmann No. 6982 (SB), No. 10864 (SB); Cuddy Valley, Hall No. 6317 (UC); Mt. Pinos, Hall No. 6460 (UC); Seymour Creek, Mt. Pinos, Munz No. 6968 (NY, PO, UC); Chuchupate Camp, Mt. Frazier, Epling & Wheeler No. 1818 (PO, UC). Santa Barbara Co.: San Rafael Mts., H. C. Ford in 1889 (G).

This variety is rather unstable in the size of the flower, and perhaps contains two minor races. The typical element, restricted to the Tehachapi region, has the calyx-tube 5 mm. long with very obtuse teeth, all the petals purple, and the keel 10—11 mm. long. In the material from about Mt. Frazier, on the other hand, the calyx-tube rarely exceeds 4 mm. in length, with rather more acute teeth and fewer black hairs, the petals are paler, and the keel varies between 9 and 10 mm. The latter form much resembles var. *sierræ* Jones, and was referred there by Munz (l. c.), but it differs in the flat leaflets, longer petals, and the coriaceous texture of the larger and more arcuate pod. The same thing was apparently included by Abrams in his *A. idriensis* (q. v.), another close relative. The plants from Tehachapi were originally determined by Heller (l. c.) and Jones (in herb.) as var. *Fremontii*, but since Rydberg's segregation of *Cystium tehachapiense* the name at least has been reduced by Munz (as an intergrade) and by Jepson (altogether) to var. *nigricalycis* Jones. It can be separated from the former by its larger flower and leathery legume, from the latter by its merely strigose and never villosulous calyx, and from both by the subcapitate racemes and prostrate stems. It seems to be much more closely related to var. *idriensis* and var. *sierræ*, both montane races of caespitose habit, but the length of the peduncle and texture of the pod will serve to distinguish it. Rydberg's spelling of the trivial "*tehachapiense*" was evidently intentional, and must be retained in the new combination, although both Jepson and Tidestrom have corrected it to "*tehachapiense*." It is probable that the pod-section figured by Jones as var. *Coulteri*, fig. a, on Plate 25 of the Revision of *Astragalus*, in reality illustrates this variety.

From the mountains of Ventura County we have also three interesting collections which apparently represent hybridization between var. *nigricalycis* and var. *tehachapiensis*. These plants

agree with the latter in the dimensions of the flower and prostrate habit, but the petals are ochroleucous, the leaves and stems longer, the pubescence much more copious throughout, while the pod is less coriaceous and canescent. To this form belongs *Abrams & McGregor No. 204* (G, NY) from the Frazier Borax Mine, which was mistaken by Rydberg for *Cystium vulpinum* (var. *macrolobus* (Rydb.) Barneby) and led him to report that race from California. Another gathering is *Hall No. 6455* (UC) from North Fork, Mt. Pinos, while the third is a single individual discovered by the writer on the south side of Mt. Pinos at about 6000 feet, *Ripley & Barneby No. 4086* (PO, RB).

. 20. var. **LATUS** (Jones) Jones

*Astragalus lentiginosus* Dougl. var. *latus* (Jones) Jones, Rev. Astrag. 125 (1923), exclus. pl. Purpusiana.

*A. diphysus* var. *latus* Jones, Zoe 3: 287 (1893); Proc. Calif. Acad. Sci. II, 5: 675 (1895), exclus. syn.

*A. latus* (Jones) Jones, Zoe 4: 272 (1894); Sheld., Minn. Bot. Stud. 1: 169 (1894).

*A. arancosus* Tidestr., Contrib. U. S. Nat. Herb. 25: 325 (1925), pro parte, ex syn., non Sheld.

*Cystium latum* (Jones) Rydb., N. Amer. Fl. 24: 415 (1929).

Pods broadly ovoid to subglobose, with a short-triangular straight or moderately upturned beak, coriaceous, glabrous, 1—2.5 cm. long, with septum produced into the very apex and thus completely bilocular: racemes 5—10-flowered, 1—2 cm. long, on slender, arcuate peduncles a half shorter than the leaves: calyx sparingly black-strigose, the tube 5.5—7.5 mm., the linear-lanceolate teeth 2—3.5 mm. long: petals purple, the banner 15—18 mm., the wings 11.5—16 mm., the keel 10.5—13.5 mm. long: leaves 5—9 cm. long, with 6—8 pairs of broadly elliptic, obovate or suborbicular, obtuse or emarginate, flat leaflets, 6—11 mm. long, glabrate and sparingly ciliate: stems prostrate, 5—10 cm. long, from a slender, branched caudex and strong perennial root.

*Illustrations.* Pl. II, figs. 30—34. Jones, Rev. Astrag. pl. 24.

*Type-locality.* Schell Creek Range (later precised as Aurum), Nevada, the type collected by Jones in 1891.

*Distribution.* Mountains of White Pine County, Nevada.

*Exsiccata.* NEVADA, White Pine Co.: Aurum, *Jones in 1891* (PO, type), *in May, 1893* (F, NY, PO, UC), and *July, 1893* (G, NY, PO); Schellbourne, *Jones in 1891* (PO); Ward Mt., Egan Range, about 8000 ft., *Ripley & Barneby No. 4020* (CAS, RB).

With its short stems, shortly beaked pods, and large purple flowers, var. *latus* is a distinct and conspicuous plant. Jones first described it as a variety of *A. diphysus* Gray, but after renewed

study in the field raised it to specific rank, only to return it first to its original status and finally to varietal position under *A. lentiginosus*. At one period he included (1895) in this variety *A. salinus* Howell, and in the Revision (1923) mysteriously referred here a collection of var. *kernensis* (Jeps.) Barneby. In his very detailed and complete description of the plant in 1894 he erroneously described the apex of the pod as "not two-celled," but I have found that the septum is always produced into the beak of the pod, and it is so portrayed in Jones's figure. The statement (Jones, 1923) that this variety is "rather common in eastern Nevada" is not supported by the material available in herbaria.

#### 21. var. CHARTACEUS Jones

*Astragalus lentiginosus* Dougl. var. *chartaceus* Jones, Proc. Calif. Acad. Sci. II, 5: 673 (1895).

*A. lentiginosus* var. *diphysus*, "a form intergrading with the var. *latus*," Jones, Rev. Astrag. 125 (1923).

*Cystium salinum* Rydb., N. Amer. Fl. 24: 411 (1929), pro parte, e syn., non *A. salinus* Howell.

Pods obliquely ovoid to lance-ovoid, long-acuminate, 2—2.5 cm. long, coriaceous, glabrous, not mottled, the apex unilocular: racemes subcapitate, 1—2 cm. long in fruit, on peduncles about half as long as the subtending leaf: calyx sparingly strigose, the tube 6.5 mm., the teeth about 2 mm. long: petals apparently purple, the banner 16 mm., the wings 14.5 mm., the keel 13 mm. long: leaves 4—6 cm. long, with 5—6 pairs of glabrous or minutely puberulent leaflets 6—12 mm. long: stems slender, flexuous, prostrate, about 1 dm. long.

*Illustrations*. Pl. II, fig. 35. Jones, Rev. Astrag. pl. 24 (as var. *diphysus*, fig. 2a).

*Type-locality*. Ephraim, Utah, the type collected by Jones.

*Distribution*. Known only from the type-collection.

*Exsiccata*. UTAH. Sanpete Co.: Ephraim, Jones No. 5627m (PO, type).

The var. *chartaceus* is something of a puzzle, for it is known only from a single very mature specimen without fresh flowers. I have presumed, nevertheless, from traces of pigment in the fallen petals that they were originally purple. From var. *latus*, which it resembles closely in habit, var. *chartaceus* differs in the long-acuminate, not abruptly apiculate, legume, and the somewhat shorter leaves with fewer leaflets, but with further knowledge these may well prove not to be diagnostic. The habitat of var. *chartaceus*, described by Jones as "clay land in the Sanpete Valley about 6000 feet," is unlike that of var. *latus*, a native of

sweet soil in mountain valleys. It seems that Rydberg never studied authentic material of the variety, for he could hardly have confused it with *A. salinus* Howell, a plant with small white flowers and papery legume.

22. var. *ARANEOSUS* (Sheld.) Barneby

***Astragalus lentiginosus*** Dougl. var. ***araneosus*** (Sheld.) Barneby, comb. nov.

*A. araneosus* Sheld., Minn. Bot. Stud. 1: 170 (1894), sensu strict.

*A. palans* var. *araneosus* (Sheld.) Jones, Proc. Calif. Acad. Sci. II, 5: 675 (1895), quoad nomen, exclus. num. cit.

*Cystium araneosum* (Sheld.) Rydb., Bull. Torr. Bot. Cl. 40: 50 (1913); Fl. Rocky Mts. 492 (1917); N. Amer. Fl. 24: 410 (1929).

*Astragalus lentiginosus* var. *palans* Jones, Rev. Astrag. 126 (1923), pro parte, quoad formam cit., non alibi.

*A. lentiginosus* var. *diphysus* Jones, l. c., pro parte.

*Cystium diphysum* Rydb., op. cit. (1929), p. 414, pro parte, e loc. cit., non sensu strict.

Pod: long-acuminate, narrowly ovoid or if broadly so then with an elongate unilocular beak, often much incurved, broadest below the middle, (1.5) 2—3 (4) cm. long, the valves coriaceous, glabrous or very rarely strigulose in youth, mottled: racemes 10—18-flowered, 2.5—3.5 cm. long in fruit, about equaling the leaf: calyx commonly black-strigose, or at least with some black hairs, the tube 4.5—6 mm., the teeth 1—3 mm. long: petals purple, the banner 15—18 mm., the wings 12—14.5 mm., the keel 11.5—13 mm. long: leaves 6—11 cm. long, with 7—11 pairs of obovate, elliptic to oblanceolate, obtuse or emarginate leaflets 7—18 mm. long, glabrous above, canescent-strigose, strigulose or rarely glabrate below: stems commonly strigose, 1.5—3.5 dm. long, ascending from a stout perennial root.

*Illustrations.* Pl. III, figs. 11—14. Jones, Rev. Astrag., pl. 24 (as var. *diphysus*, figs. a, b).

*Type-locality.* Frisco, Utah, the type collected by Jones in 1880.

*Distribution.* Sagebrush valleys and foothills, often in alkaline soil, from southern Utah northward along the Sevier to Great Salt Lake, and westward into central and northern Nevada.

*Exsiccata.* UTAH. Sine loc.: *Ward in 1875* (G), *Siler in 1877* (G). Iron Co.: Cedar City, *Eastwood & Howell No. 9331* (CAS); S. of Cedar City, *Blood No. 4412* (F, G, UC), *Maguire & Blood No. 4411* (F, PO, UC), *Ripley & Barneby No. 4367* (RB); Parowan, *Eastwood & Howell No. 9340* (CAS, RB). Beaver Co.: Frisco, *Jones No. 1807* (F, G, NY, PO, type collection of *A. araneosus*); Milford, *Jones in 1880* (NY, PO), *Rydberg & Carlton No. 6267* (NY); Beaver, *Vansell in 1940* (CAS, RB). Piute Co.: Kingston, *Jones No. 5322d* (PO); Marysvale, *Jones No. 5338m* (NY, PO); Sevier River Canyon, *Eastwood & Howell No. 622* (CAS, NY, PO); Bryce Junction to Manti, *Nelson & Nelson No. 2915* (NY, UC); N. of Bryce Canyon cutoff, *C. L. Hitchcock No. 2957* (F). Sevier Co.: Glenwood, *Ripley & Barneby No. 4761* (RB); Fish Lake Mt., *Cottam*

No. 4518 (PO); Fish Lake Valley, *Purpus* No. 5860 (PO). Wasatch Co.: Midway, *Eastwood & Howell* No. 519 (CAS). Salt Lake Co.: Salt Lake, *Wootton in 1906* (PO). Tooele Co.: Desert Mt., E. of Detroit, *Jones in 1891* (PO, UC). Co. undetermined: Fort Hamilton, *Jones* No. 5209 (F, PO). NEVADA. Elko Co.: Pilot Peak near Montello, *Ripley & Barneby* No. 4616 (RB); N. of Wendover, *Train* No. 3810 (UN); Wendover, *Eastwood & Howell* No. 358 (CAS). White Pine Co.: Baker, *Ripley & Barneby* No. 3575 (CAS, RB); Ely, *Ripley & Barneby* No. 3541 (CAS, RB); Shoshone, *Ripley & Barneby* No. 3535 (RB); Aurum, *Jones in 1893* (PO); Centerville, *Jones in 1893* (PO). Eureka Co.: W. of Eureka, *Ripley & Barneby* No. 6234 (CAS, RB). Lander Co.: Kingston Canyon, *Goodner & Henning* No. 229 (UN); Austin, *Jones in 1882* (PO), *Ripley & Barneby* No. 4540 (RB); SE. of Austin, *Vansell in 1942* (CAS). Nye Co.: Pancake Range, *Ripley & Barneby* No. 3652 (RB).

As more fully stated in discussion of the next, var. *araneosus* is somewhat doubtfully distinct from var. *diphysus*, but as a rule it can be distinguished by the characters given in the key. Although occasional specimens occur with glabrous herbage (e. g., those from Austin, Nevada), or the pod shortly beaked (*Ripley & Barneby* No. 4761), or the calyx entirely white-strigose, the other criteria are in each case valid. The tendency toward curvature of the legume is especially marked in part of Jones's gathering from Detroit, Utah, but the upper suture is nearly always concave throughout. Only in Jones's specimens from Aurum do the pods exceed 3 cm. in length.

*Astragalus araneosus* was described from a mixture, the cotype being a specimen of var. *platyphyllidius* which later formed the basis of *Cystium cornutum* Rydb., and Sheldon's statement that the flowers were white was derived from the latter element. Rydberg (1929, l. c.) repeated this error, and placed his *C. araneosum* far from its nearest allies: apparently he never realized its true identity, for he referred most of the available material to *C. diphysum*. Jones (passim) regarded the extreme and typical forms as intergrades between vars. *diphysus* and *palans*, and the material in his herbarium is determined under either name.

### 23. var. DIPHYSUS (Gray) Jones

*Astragalus lentiginosus* Dougl. var. *diphysus* (Gray) Jones, Proc. Calif. Acad. Sci. II, 5: 673 (1895), pro max. parte; Rev. Astrag. 125 (1923), exclus. syn. et fig. omn.

*A. diphysus* Gray, Mem. Amer. Acad., ser. nov., 4: 34 (1849); Proc. Amer. Acad. 6: 193 (1863); Bot. Ives Exped. 10 (1860); Walp. Ann. 2: 396 (1851-2); Torr. & Gray, Pac. R. R. Rep. 44: 80 (1857), non op. cit.

2: 120 (1855); Wats., Bot. King 435 (1871), non op. cit. 65; Brandege, Bull. U. S. Geol. Geogr. Surv. 2: 234 (1876); Rothrock, Rep. Geogr. Surv. (Wheeler Exped.) Bot. 93 (1878), pro parte; Sheld., Minn. Bot. Stud. 1: 171 (1894); Coult. & Nels., Man. Rocky Mt. Bot. 284 (1909); Woot. & Standl., Contrib. U. S. Nat. Herb. 19: 361 (1915); Tidestr. & Kitt., Fl. Ariz. & N. Mex. 217 (1941), pro parte; Kearn. & Peeb., Fl. Pl. Ariz. 487 (1942), pro parte, exclus. syn.

*A. diphyus* var. *albiflorus* Gray (1849), l. c.; vix Bot. Ives Exped. 10 (1860).

*Tragacantha diphyssa* (Gray) O. Kze., Rev. Gen. 944 (1891).

*Astragalus MacDougali* Sheld., Minn. Bot. Stud. 1: 169 (1894); Tidestr. & Kitt., l. c.; Kearn. & Peeb., l. c.

*A. lentiginosus* var. *MacDougali* (Sheld.) Jones, Proc. Calif. Acad. Sci. II, 5: 673 (1895); Rev. Astrag. 124 (1923).

*Cystium diphysum* (Gray) Rydb., Bull. Torr. Bot. Club 32: 659 (1905); Fl. Rocky Mts. 491 (1917); N. Amer. Fl. 24 (1929), pro parte, exclus. loc.

*C. MacDougali* (Sheld.) Rydb., op. cit. (1929), p. 415.

Pods variable in shape and size, typically much inflated, obliquely ovoid but with nearly straight sutures and slightly upturned beak, sulcate on either suture, or, not uncommonly, less inflated, subglobose to rather narrowly ovoid and rarely arcuate, 1—2.5 (3) cm. long, the valves coriaceous, glabrous, often mottled: racemes 10—20-flowered, commonly short and dense, 2—4 cm. long in fruit, or rarely looser and up to 6 cm. long, on slightly longer peduncles: calyx strigose with white, very rarely a few black, hairs, the tube 4—6 mm., the teeth 1.25—2.5 mm. long: petals purple, the banner 13—17 mm., the wings 11—13.5 mm., the keel 10—12.5 mm. long: leaves 5—10 (14) cm. long, petiolate, with 8—10 pairs of oblanceolate, obovate or elliptic leaflets 7—18 mm. long, glabrous on either face or with a few scattered hairs beneath: stems spreading or ascending, often flexuous, glabrous or sparingly strigulose, 2—4 dm. high.

*Illustrations.* Pl. III, figs. 5—10. Clements, Rocky Mt. Flrs., ed. 3, pl. 29, fig. 25 (1928). Jones, Rev. Astrag., pl. 23 (as var. *MacDougali*), not pl. 24 (as var. *diphyus*). Rydb., Amer. Journ. Bot. 17: tab. XVI, fig. v (1930).

*Type-locality.* Plains around Santa Fe, New Mexico, the type collected by Fendler in 1847.

*Distribution.* Arid plains, dunes, and talus slopes, from central New Mexico in the Rio Grande Valley and southwestern Colorado westward across northern Arizona to Yavapai and Coconino counties.

*Exsiccata.* COLORADO. SW. Colorado, *Brandegee No. 1283* (UC). NEW MEXICO. Santa Fe Co.: Santa Fe, *Fendler No. 146* in 1847 (G, type, F. NY), *No. 147* (G, type of var. *albiflorus*), *Dr. Edwards in 1849* (NY), *Heller & Heller No. 3541* (G, ND, NY), *Arsène No. 17074* (F). San Miguel Co.: Santa Fe to Glorieta, *Eggleston No. 19996* (G, NY). Bernalillo Co.: Albuquerque, *Bigelow in 1883* (NY), *Herrick in 1894* (NY), *Kammerer No. 39* (NY). Sandoval Co.: 39 miles N. of Albuquerque,

*Wiegand & Upton No. 3626* (F). Socorro Co.: Magdalena, *Eggleston No. 16208* (G, NY), *No. 16201* (NY), *Diehl No. 392* (PO); W. of Magdalena, *Eggleston No. 14325* (G). McKinley Co.: Satan Pass, *Ripley & Barneby No. 5279* (RB). Co. undetermined: Mexican Springs, *Babcock No. 14312* (G). ARIZONA. Apache Co.: Holbrook to St. Johns, *Eggleston No. 15718* (G, NY). Navajo Co.: Holbrook, *Zuck in 1897* (NY), *Ward in 1901* (NY), *Ripley & Barneby No. 5240* (RB); Holbrook to Winslow, *Mrs. Fred Stone No. 393* (NY), *Peebles No. 11996* (CAS, SAC); Winslow, *Peebles & Fulton No. 9589* (SAC). Coconino Co.: Dennison, *Rusby in 1883* (F, NY); 35 miles E. of Flagstaff, *Wiegand & Upton No. 3628* (F); Meteor Crater, *Ripley & Barneby No. 5238* (RB); Flagstaff to Holbrook, *Nelson & Nelson No. 3125* (NY, UC); 20 miles E. of Flagstaff, *Peebles & Smith No. 13964* (NY, SAC), *Nelson & Nelson No. 2126* (NY, UC); Flagstaff, *MacDougal No. 144* (F, G, NY, PO, UC); Wupatki Ruins, *Peebles & Parker No. 14631* (NY); S. of Cameron, *McKelvey No. 4482* (G); Cameron to Navajo Bridge, *Nelson & Nelson No. 3858* (UC), *Peebles No. 13011* (SAC); Aztec Ruins, Little Colorado, *Purpus No. 1905* (UC); Cedar Ridge, *Ripley & Barneby No. 4871* (RB); Grand Falls, *E. G. Smith No. 12009* (SAC), *No. 12007* (SAC); Leupp, *Peebles & Fulton No. 9563*, *No. 9567* (SAC); 50 miles S. of (Lee's) Ferry, *Jones in 1890* (PO). Yavapai Co.: Ash Fork, *Rusby No. 570* (G, UC), *No. 571* (NY). Banghart's Ranch, *Rusby No. 570* (G, UC, type collection of *A. MacDougal*); Chino Valley, *Loomis No. 6904* (SAC).

The var. *diphysus* is very closely related to var. *australis* and var. *araneosus*: indeed it is often difficult, without indication of locality, to separate individual specimens, and the three should perhaps be united. In general (though exceptions exist) var. *diphysus* differs from var. *araneosus* in the less curved, more abruptly beaked and never long-acuminate legume, in the lack of black hairs on the calyx, and in the commonly glabrous stems and herbage. The var. *australis*, on the other hand, has much looser racemes, chartaceous-membranous, never leathery, pods, and often larger flowers. Vague and unsatisfactory though they be, these three races are well separated geographically, but the same cannot be said of var. *MacDougal*, here reduced to var. *diphysus*. In New Mexico and northeastern Arizona the pods of var. *diphysus* are commonly much inflated and about 2 cm. long; but farther west, and particularly in the poor soil of volcanic mesas about Flagstaff, the entire plant becomes depauperate, the flower is smaller, and the pod is sometimes less than 1 cm. in length and globose-apiculate, or narrowly ovoid and somewhat curved. This is *A. MacDougal* Sheld. and at its smallest extreme (e. g. *MacDougal No. 144*) it appears distinct: however, speci-

mens of an intermediate character in the size of both flower and legume (and these not correlated) are more numerous than those of typical dimensions, and, particularly near Holbrook, they occur together. North of Flagstaff occur plants with small, narrowly ovoid pods disposed in loose racemes (e. g. *McKelvey No. 4485*, *Ripley & Barneby No. 4871*) which seem to approach var. *palans*, and Kearney & Peebles (l. c.) cite a similar gathering (*Jones, S. of (Lee's) Ferry*) as *A. mokiensis*.

The name *A. diphysus*, in various combinations, has been used very loosely in the literature to cover much wider concepts than are admitted here. By various authorities it has been applied to var. *platyphyllidius*, var. *araneosus*, var. *salinus*, var. *australis*, var. *yuccanus*, and others: more detailed citations will be found under these varieties and in the text. *Astragalus diphysus* var. *albiflorus* Gray was an albino form found growing with the type near Santa Fe, though according to Jones (*Contrib. W. Bot. 8: 4, —1898*) some of the material so named by Gray belongs to a form of *A. Pattersonii* Gray: I have not verified this point.

24. var. *SESQUIMETRALIS* (Rydb.) Barneby

***Astragalus lentiginosus*** Dougl. var. *sesquimetalis* (Rydb.) Barneby, comb. nov.

*Cystium sesquimetricale* Rydb., N. Amer. Fl. 24: 414 (1929).

Pods rather narrowly ovoid, gently falcate with ascending beak, 2—2.5 cm. long, coriaceous, strigose, mottled: racemes dense, 2—3 cm. long, on peduncles of about the same length: calyx white-strigose, the tube 4—5 mm., the subulate teeth 2—2.5 mm. long: petals purple, the banner about 14 mm., the wings 11.5—12 mm., the keel 10 mm. long: leaves spreading, sessile, 4—5 cm. long and shorter than the internodes, with 5—8 pairs of oblanceolate to oblong leaflets 12—15 mm. long, 4—5 mm. wide, strigose on either face or glabrate above: stems very elongate, 5—7 dm. long, prostrate, flexuous.

*Illustration.* Pl. II, figs. 36—38.

*Type-locality.* Soda Springs, Nevada, the type collected by Shockley in 1882.

*Distribution.* Known only from the type station.

*Exsiccata.* NEVADA. Esmeralda Co.: Soda Springs, *Shockley No. 278* (G, type, NY, fragments, ND, UC).

This variety is similar in aspect to vars. *albifolius* and *floribundus*, but differs in the much larger, purple flower, and in the longer coriaceous pod, while it is unique in the great length of the stems and relatively long internodes. Field-notes made by

Shockley indicate that the plants were found "in alkaline soil" (UC), "moist ground" (G), or "creeping among grasses" (ND), and they are described as "spreading on the ground, 5 feet in diameter." It appears to be a remarkable race, one which in another section of *Astragalus* would deserve, in fact, specific status: more collections, however, are needed.

25. var. AUSTRALIS Barneby

**Astragalus lentiginosus** Dougl. var. **australis** Barneby, var. nov., var. *yuccano* Jones necnon var. *diphyso* (Gray) Jones manifeste affinis, sed ab hoc racemo laxiori fructifero saltem 8 cm. longo, leguminisque valvulis tenuioribus, membranaceo-chartaceis nec coriaceis, ab eo floribus evidentius purpureo-tinctis, carina longiori 12—15 mm., nec 10—11.5 mm. tantum, longa, et legumine longius acuminato magis arcuato et sæpissime minus inflato, diversa.—*A. lentiginosus* var. *palans* Jones, Contrib. W. Bot. 17: 27 (1930), non alibi.

Pods membranous to thinly chartaceous, obliquely and sometimes narrowly ovoid, commonly much curved, strongly or but little inflated, glabrous or rarely pubescent, 13—20 mm. long: racemes lax from the beginning, many-flowered, 8—12 cm. long in fruit, the peduncles usually stout and of about the same length: calyx strigose with white hairs, the tube 4—5 mm., the teeth 1.5—2 mm. long: petals pale purple (the color rather fugacious), the banner 14—16 mm., the wings 13—15 mm., the keel 12—14 (15) mm. long: leaves 8—12 cm. long, with 9—13 pairs of obovate to oblong leaflets (7) 10—21 mm. long, glabrous above and finely, sometimes copiously, strigose beneath: stems coarse, ascending from a stout perennial root, 3—6 dm. high.

*Illustration.* Pl. III, figs. 15—19.

*Type.* Near Robles, east side of the Baboquivari Mts., Pima County, Arizona, *Aven & Ruth Nelson No. 1537* (New York Botanical Garden).

*Distribution.* Sandy plains and desert washes, from southeastern Arizona and southwestern New Mexico to northern Sonora and Chihuahua.

*Exsiccata.* ARIZONA. Pima Co.: Robles, *Nelson & Nelson No. 1537* (NY, type, UC), *No. 1534* (NY, UC); between Ajo and Sells, *Nelson & Nelson No. 1370* (UC); Sells, *Buss in 1937* (SAC); Sells to Tucson, *Loomis No. 903* (SAC); Papago Reservation, *Jones No. 26183* (G, LA, PO); Coyote Mts., *Ripley & Barneby No. 4244* (RB, PO), *Harrison & Kearney No. 3752* (SAC); Tucson, *Jones No. 28255* (PO). Pinal (? Pima) Co.: Oracle to Tucson, *Peebles No. 6881* (NY). Graham Co.: Tanque, *Eggleston No. 19867* (G). Greenlee Co.: Duncan, *J. N. Rose No. 11736* (NY), *Davidson No. 146* (LA). Cochise Co.: San Pedro River near Fairbank, *Ripley & Barneby No. 4234* (RB); Bowie, *Eastwood No. 8599* (G); Chiricahua Mts., *Toumey in 1897* (PO, depauperate); Bernardino, *Leding 12L* (SAC). NEW MEXICO. Hidalgo Co.: near Steins, *Ripley & Barneby No. 4216* (RB); Lordsburg, *Davidson No. 1427* (LA). Doña Ana Co.: Peña Blanca, *Curtin No. 20* (F). SONORA. Boca Grande,

Capt. E. K. Smith (NY). CHIHUAHUA. Lake Gusman, Wright in 1852 (G).

The var. *australis* differs chiefly from var. *diphysus* in the greater development of all its parts, in the loose raceme evidently much surpassing the leaf, and in the chartaceous to thinly membranous texture of the legume. The shape of the latter is subject to a fluctuation in size and turgescence similar to that described for var. *diphysus*. For the most part the pod is ovoid and strongly inflated, then resembling that of var. *diphysus*, but averaging smaller and with a more abruptly upturned and proportionately longer beak. In southern Arizona, however, the inflation is commonly less marked and in the extreme form represented by Jones No. 28255 the pod is scarcely more than turgid, acuminate from the base, strongly falcate throughout, and not exceeding 15 mm. in length. A similar specimen, Jones No. 26183, reported by the collector (Jones, 1930, l. c.) as var. *palans*, is anomalous in bearing strigulose pods, and is unusually pubescent in the stems and herbage. The var. *australis* is also related to var. *yuccanus*, which it resembles in habit, pubescence, and a tendency to produce "carinate" flowers, with the keel prolonged to equal or surpass the wings, or even, on occasion, to attain the length of the banner: the larger flower, however, and the purple coloring of the petals will usually serve to distinguish it. The specimen from Sonora is referred here only with doubt, for it has no fruit. It is of historical interest in that it formed one of the three elements, all different, upon which Gray founded his *A. Arthu-Schottii* (var. *borreganus* Jones).

#### 26. var. YUCCANUS Jones

*Astragalus lentiginosus* Dougl. var. *yuccanus* Jones, Contrib. W. Bot. 8: 3 (1898); Rev. Astrag. 127 (1923), pro max. parte.

*Cystium yuccanum* (Jones) Rydb., N. Amer. Fl. 24: 407 (1929).

*Astragalus yuccanus* (Jones) Tidestr., Proc. Soc. Wash. 48: 40 (1935).

*A. Fremontii* var. *yuccanus* (Jones) Tidestr., in Tidestr. & Kitt., Fl. Ariz. & New Mex. 216 (1941).

*A. diphysus* Kearn. & Peeb., Fl. Pl. Ariz. 487 (1942), pro parte, e syn. cit., non Gray.

Pods subglobose or broadly ovoid with abruptly upturned triangular beak, bladderly-inflated, membranous, shining, glabrous or minutely strigulose, 17—25 mm. long: racemes lax, (6) 8—12 cm. long in fruit, on stout peduncles about equaling the subtending leaf: calyx rather loosely pubescent to merely strigose with white or some black hairs, the tube 3.75—4.5 mm., the teeth 1—1.5 mm. long: petals narrow, white, ochroleucous or

occasionally flushed with mauve, the banner 11.5—13.5 mm., the wings 11—12.5 mm., the keel 10.5—11.5 mm. long: leaves spreading, (6) 8—14 cm. long, with 7—10 pairs of elliptic to broadly obovate, emarginate leaflets 1—2 cm. long, glabrous above, strigose beneath with very fine white hairs or in youth, like the stems, canescent: stems erect or strongly ascending, 1.5—4 dm. high, from a winter-annual or short-lived perennial root.

*Illustrations.* Pl. III, figs. 34—37. Jones, Rev. Astrag., pl. 26.

*Type-locality.* Yucca, Arizona, the type collected by Jones in 1884.

*Distribution.* Sandy foothills and desert washes of western Arizona, from Mohave south to Pima and Maricopa counties.

*Exsiccata.* ARIZONA. Mohave Co.: Yucca, Jones No. 3886 (PO, type, F, G, NY), Ripley & Barneby No. 3380 (RB); Oatman to Kingman, Harrison & Kearney No. 7613 (F, NY, SAC); Kingman, Kearney & Peebles No. 11143 (SAC); Hackberry, Jones in 1884 (PO), in 1903 (PO). Yavapai Co.: Congress Junction, Jones in 1903 (PO). Maricopa Co.: Wickenburg, Palmer No. 589 (F, NY), Peebles No. 8474 (F, PO), Ripley & Barneby No. 4261 (RB), No. 4262 (PO, RB). Pima Co.: Gunsight Pass, Fosberg No. 904 (PO).

This variety, which in the past few years has been raised to specific rank by Tidestrom and reduced to synonymy with *A. diphyus* by Kearney and Peebles, is rather easily recognized by its ochroleucous or white flowers (occasionally tinged with mauve), the narrow banner which is very short in proportion to the keel, the loose racemes on their stout, rather strict, peduncles, and the subglobose, papery legume. In the area immediately north and east of Kingman, Arizona, are found plants with purple flowers and coriaceous pods which seem to approach or are perhaps the result of hybridization with var. *mokiensis* (q. v.), while to the southwest it is not clearly distinguished from var. *australis*. In the middle of its range, as in the open sandy valleys about Yucca and Oatman, the plants of var. *yuccanus* sometimes occur in enormous numbers, forming between the bushes of *Larrea* an almost pure association over hundreds of acres.

#### 27. var. VITREUS Barneby

*Astragalus lentiginosus* Dougl. var. *vitreus* Barneby, var. nov. legumine vesicario-inflato tenuiter membranaceo var. *salino* (Howell) Barneby, a quo floribus majusculis purpureo-tinctis differt, haud absimilis. A var. *diphyso* (Gray) Jones legumine haud coriaceo, racemoque laxo, a var. *Kennedyi* (Rydb.) Barneby floribus pallidis calycisque parce strigosi nec patule pubescentis dentibus brevioribus, necnon a var. *stramineo* (Rydb.) Barneby imprimis foliis utrinque glabratibus aliisque notulis recedit.

Pods ovoid and much inflated, with a very short triangular beak, or less inflated, lanceolate-ovoid, long-acuminate, and strongly arcuate, the

valves papery-membranous, shining, glabrous, not mottled: racemes 10—20-flowered, rather lax, 5—6 cm. long in fruit, on peduncles about as long: calyx strigose with rather scattered black or white hairs, the tube 4 mm., the teeth 1.25—1.5 mm. long: petals very pale but distinctly tinged or veined with purple, the banner 13—15 mm., the wings 11—12 mm., the keel 10—11 mm. long: leaves 6—8 cm. long, petiolate, with 7—8 pairs of dark green, oblong to obovate, emarginate leaflets 6—12 mm. long, sparingly ciliate, glabrous on either face or with a few scattered hairs beneath: stems ascending, rather slender, striate, sparingly strigose, 1.5—3 dm. high.

*Illustration.* Pl. III, figs. 30—33.

*Type.* In sand desert, 5 miles west of Leeds, Washington County, Utah, *Bassett Maguire & H. L. Blood No. 4413* (Pomona College Herbarium No. 211065).

*Distribution.* Badlands along the Virgin River in southwest Utah, and in adjacent Arizona.

*Exsiccata.* UTAH. Washington Co.: W. of Leeds, *Maguire & Blood No. 4413* (PO, type, UC); Leeds, *Vansell in 1940* (CAS, RB); E. of Leeds, *C. L. Hitchcock No. 3025* (F, PO); Washington, *Eastwood & Howell No. 9155* (CAS, RB); NE. of Washington, *Tidestrom No. 9385* (G); St. George, *Cottam, Stanton & Harrison No. 4018* (PO). ARIZONA. Coconino Co.: Kaibab, *Jones No. 25443* (PO). Mohave Co.: W. of Fredonia, *Peebles & Parker No. 14687* (SAC); Pipe Springs, *Peebles No. 13071* (SAC).

The affinities of var. *vitreus* are not immediately apparent, for it combines the facies of the northern representatives of *A. lentiginosus* with some of the characters of the southerly forms. In habit and in the legume it resembles var. *salinus*, but the flowers are much larger and at least purple-tinged: in this last respect it approaches var. *diphysus* (from which it differs in the membranous pod and lax racemes) or var. *Kennedyi* (from which the glabrous herbage and sparsely strigulose calyx immediately distinguish it). Perhaps it is most nearly related to var. *stramineus*, which it resembles in the proportions and pale coloring of the petals, but the pubescence is entirely different and the pod of a much thinner texture.

With one exception the material at hand is very uniform, and the broadly ovoid, strongly inflated pods with their ventral suture nearly straight or a little convex are constant in size and outline. The Hitchcock collection, however, bears narrowly ovoid-acuminate, less inflated pods, which are arcuate and gradually acuminate almost from the base, and the ventral suture is concave. At first sight this appears very distinct, but it differs in no other detail from the prevailing form of var. *vitreus*: analogous examples of

fluctuation in the inflation of the pod have been remarked in many of the varieties of *A. lentiginosus*.

28. var. *KENNEDYI* (Rydb.) Barneby

*Astragalus lentiginosus* Dougl. var. *Kennedyi* (Rydb.) Barneby, comb. nov.

*Cystium Kennedyi* Rydb., N. Amer. Fl. 24: 407 (1929).

*Astragalus Fremontii* subsp. *eremicus* Abrams, Ill. Fl. Pac. St. 2: 597 (1944), pro parte, e syn. cit.

Pods rather narrowly ovoid-acuminate with long upturned beak, inflated, membranous, not mottled, (1.5) 2.5—3 cm. long: racemes 10—30-flowered, commonly very lax, 5—10 cm. long in fruit, on stout peduncles about as long: calyx loosely pubescent with white or often some black hairs, the tube (3.5) 4—5 mm., the teeth (1.5) 2—2.5 mm. long: petals bright purple, the banner 12—15 mm., the wings 11—12.5 mm., the keel (8) 10—11 mm. long: leaves 5—10 cm. long, with 7—10 pairs of oblong, oblanceolate or obovate leaflets 7—20 mm. long, woolly-pubescent (typically) on both faces with tangled pubescence of fine, curly hairs, or (exceptionally) glabrate above or on either surface: stems stout, erect, subtomentose to glabrate, (1) 2—5 dm. high.

*Illustration.* Pl. III, figs. 20—25.

*Type-locality.* Carson Sink Region, Nevada, the type collected by P. B. Kennedy.

*Distribution.* Alkaline dunes and sandy valleys, middle western Nevada.

*Exsiccata.* NEVADA. NW. Nevada, *Lemmon in 1875* (G). Washoe Co.: Pyramid Lake, *Kennedy No. 1019* (NY, UC), *Ripley & Barneby No. 4501* (RB), *K. Brandegee in 1913* (PO), *Lemmon No. 137½* (F); Romola Station, Pyramid Lake Road, *Mathias No. 1227* (UC); W. of Reno, *Mason No. 4602* (UC); Wadsworth, *K. Brandegee No. 14 in 1913* (PO), *Jones in 1930* (PO); N. of Wadsworth, *Archer No. 6195* (NY, UN); NW. of Wadsworth, *Hendrix No. 855* (UC). Ormsby Co.: Empire City, *Jones in 1881* (PO). Mineral Co.: N. end of Walker Lake, *Ripley & Barneby No. 4440* (RB); S. side of Walker Lake, *Heller No. 10915* (F, G, NY, UC); Hawthorne, *Jones in 1882* (PO); Mina, *Ripley & Barneby No. 4436* (RB). Churchill Co.: Carson Sink region, *Kennedy No. 1691* (NY, type, UC). Nye Co.: 20 miles W. of Tonopah, *Eastwood & Howell, No. 9482* (CAS, RB); W. of Rattlesnake, *Ripley & Barneby No. 4427* (PO, RB).

The var. *Kennedyi*, as typically developed in sandy, alkaline soil in the neighborhood of Pyramid and Carson lakes, is extremely distinct, differing from var. *Fremontii* in the much larger flowers, elongate calyx-teeth, tangled pubescence, and very loose racemes of long-acuminate pods. In the south, however, there is evidence of intergradation, and the last two collections cited are of an intermediate character, the racemes more con-

densed, the pubescence shorter or almost lacking, the flowers and calyx smaller. This race was first recognized by Rydberg as a species of *Cystium*, Jones having determined some of his collections as var. *diphysus*, others as var. *Fremontii*, and those of Mrs. Brandegee (which are decidedly depauperate) as var. *palans*.

29. var. *STRAMINEUS* (Rydb.) Barneby

*Astragalus lentiginosus* Dougl. var. *stramineus* (Rydb.) Barneby, comb. nov.

*Cystium stramineum* Rydb., N. Amer. Fl. 24: 409 (1929).

*C. Coulteri* Rydb., Fl. Rocky Mts. 419 (1917), pro parte, e loc. cit., non *A. Coulteri* Bth.

*Astragalus Coulteri* Tidestr., Contrib. U. S. Nat. Herb. 25: 325 (1925), pro parte; Tidestr. & Kitt., Fl. Ariz. & New Mex. 217 (1941), pro parte, e loc. cit., non Bth.

*A. Fremontii* Kearn. & Peeb., Fl. Pl. Ariz. 486 (1942), e num. cit.; non Gray.

Pods broadly ovoid with upturned beak, chartaceous, inflated, strigose, green or at length stramineous, mottled, 1—2 cm. long: racemes 15—18-flowered, lax and becoming 5—9 cm. long in fruit, on peduncles of about the same length: calyx white-strigose or -sericeous, the tube 3—4 mm., the teeth 1.5—2 mm. long: petals pale purple, quickly fading brownish, the banner 11—12 mm., the wings 9.5—10.5 mm., the keel 9—10 mm. long: leaves 5—8 cm. long, shortly petiolate, with 6—8 pairs of rather distant, oblong-obovate, emarginate leaflets 5—19 mm. long, green and glabrous or finely pubescent above, more or less canescent-strigose below, particularly in youth: stems erect or ascending from an annual or short-lived perennial root, canescent or at length merely strigose, flexuous, 1.5—4 dm. high.

*Illustration.* Pl. III, figs. 26—29.

*Type-locality.* Southeastern Utah, the type collected by Edward Palmer in 1870.

*Distribution.* Sandy valleys or on dunes, from southeastern Utah to northwestern Arizona and adjacent Nevada.

*Exsiccata.* UTAH. SE. Utah, *Palmer in 1870* (NY, type); S. Utah, *Bishop in 1874* (PO), *Palmer No. 116* (G, NY). ARIZONA. Mohave Co.: Beaver Dam, *Peebles & Parker No. 14767* (G, NY, SAC); Littlefield, *Eastwood & Howell No. 9037* (CAS); Mesquite to Littlefield, *Kearney & Peebles No. 13190* (SAC); Arizona strip, *Maguire & Blood No. 4414* (PO, UC), *No. 4415* (F, PO, UC). NEVADA. Clark Co.: Mesquite, *Ripley & Barneby No. 4295* (PO, RB).

The var. *stramineus* is a somewhat uncertain entity, partly owing to the fragmentary nature of the type, which is exactly matched only by Bishop's collection at Pomona. Both of these, from localities not precisely noted, have a rather curious pubescence made up of long, straight, silky hairs, and the upper surface

of the leaflets is glabrous. The more copious material from Arizona and Nevada, while essentially similar in the flower and legume, has a vesture of shorter hairs, and the leaflets are less obviously bicolored, and often sparingly pubescent above. Rydberg described the petals as white, but this is doubtfully correct. In the Bishop collection there are distinct traces of pigment still visible in the petals, and in the rest the color is pale when fresh and fugacious in the herbarium.

This variety is very similar to var. *variabilis* of the Mohave Desert in California, differing chiefly in the relative length of the calyx-teeth, paler flowers and somewhat different aspect of the plant itself. The areas of distribution of these two races are quite disjunct, being separated by a gap of at least two hundred miles. It has been treated by Tidestrom as *A. Coulteri* and by Kearney and Peebles as *A. Fremontii*, but it is probably more closely related to var. *vitreus* than to any other.

### 30. var. VARIABILIS Barneby

**Astragalus lentiginosus** Dougl. var. *variabilis* Barneby, var. nov., inter var. *Coulteri* (Bth) Jones, var. *Fremontii* (Gray) Wats. et var. *nigri-calycem* Jones fere exacte intermedia, sed a prima corollæ minoris carina 8—10 mm. tantum longa, a secunda corolla manifeste majori, a tertia petalis saturate purpureis nec ochroleucis facile separanda. Proles valde polymorpha, pube adspectuque variabilis.—*A. Arthu-Schottii* Gray, Proc. Amer. Acad. 6: 209 (1863), pro parte, exclus. typ.; op. cit. 7: 337 (1867), pro max. parte; Abrams, Ill. Fl. Pac. St. 2: 597 (1944), pro max. parte. *A. Coulteri*, *A. lentiginosus* var. *Coulteri*, *A. lentiginosus* var. *Fremontii* auct. calif. pro parte, non *A. Coulteri* Bth. nec *A. Fremontii* Gray sens. strict. *Cystium Arthu-Schottii* Rydb., N. Amer. Fl. 24: 409 (1929), pro max. parte, exclus. typ. cit. *C. pardalotum* Rydb., op. cit., 415.

Pods obliquely ovoid with upturned triangular beak, much inflated, membranous to rather firm in texture, sericeous to strigose with loosely appressed or incumbent hairs, never glabrous, 12—25 mm. long: racemes 12—30-flowered, (3.5) 5—12 cm. long and rather loose in fruit, surpassing the subtending leaf: calyx silvery-strigose, silky or hirsutulous-tomentose with all white, black and white, or all black hairs, the tube 3—4.5 mm., the teeth 0.75—1.75 mm. long: petals purple, the banner 10—14 mm., the wings 9—11.5 mm., the keel (shorter than, equaling or often exerted from between the wings) 7.5—10 (10.5) mm. long: leaves 5—9 cm. long, spreading, with 6—10 pairs of obovate or oblong leaflets 5—15 mm. long, densely silvery-canescens or white tomentose on both faces to green and strigose or glabrate above: stems commonly tomentose-canescens, at least in youth, rarely green and loosely strigose, ascending, coarse or rather slender, 1.5—4 dm. high, from an annual or short-lived perennial root.

*Illustrations.* Pl. IV, figs. 1—8. Jones, Rev. Astrag., pl. 25 (as var. *Fremontii*, a). Abrams, Ill. Fl., fig. 2870.

*Type.* Victor (now Victorville), San Bernardino Co., California, M. E. Jones in 1903 (Pomona College Herbarium No. 25684 and 25685).

*Distribution.* Sandy plains and desert washes of the Mohave Desert, California, from southern Inyo Co. southeast to Baker, San Bernardino Co., and westward to the head of the San Joaquin Valley.

*Exsiccata.* CALIFORNIA. San Bernardino Co.: Mohave River, *Frémont* (NY), *Palmer in 1876* (NY); Rock Spring, Mohave River district, *Palmer No. 104 in 1876* (UC); Mohave Desert, *Parish & Parish No. 4957* (NY). Dale Dry Lake, *Munz No. 15640* (CAS, PO); Windmill Tank, Little San Bernardino Mts., *C. L. Hitchcock No. 12235* (PO, UC); Warrens Well, *Munz & Johnston No. 5174* (PO); Keyes Ranch, *Jones in 1931* (PO), *Gilman No. A4* (PO), *No. A7* (PO), *Munz & Johnston No. 5272* (PO); Lucerne Valley, *Lefebure No. 487* (SB); Camp Cady, *Cooper* (G); Rabbit Springs, *Parish No. 4957* (NY); W. of Old Woman Well, *Ferris & Bacigalupi No. 8116* (UC); Old Woman Springs, *Ripley & Barneby No. 4276* (RB, PO); Barstow, *Jones in 1924* (PO), *Hall & Chandler No. 6839* (PO, UC), *Spencer No. 1424* (G), *No. 1962* (PO), *Parish No. 9668* (UC), *M. S. Baker No. 8870* (CAS), *Munz No. 2579* (PO), *Heller & Heller No. 2982* (NY), *Eastwood No. 17982* (CAS); Garlic Springs, *Munz & Keck No. 7903* (G, PO); Leach Spring, *Jaeger in 1940* (PO); Adelanto, *Parish No. 11823* (UC), *Clokey & Templeton No. 5756* (NY, PO); Copper Mt., *Spencer No. 1768* (G); N. of Hinkley, *Clokey & Anderson No. 6686* (F, LA, NY, PO); Barstow to Kramer, *Hoffmann No. 10869* (SB); Kramer Junction, *Constance & Mason No. 2112* (UC); E. of Victorville, *Jaeger in 1932* (PO), *Johnston in 1920* (PO), *Ripley & Barneby No. 3264* (RB), *Eastwood No. 18714* (CAS); Victorville (Victor), *Jones in 1903* (PO, type, UC), *in 1926* (PO), *Parish No. 9225* (PO), *Munz & Youngberg No. 15179* (PO), *Hall No. 6203* (PO, UC), *Feudge No. 76* (PO), *John Roos No. 487* (PO), *Mason No. 3067* (UC), *Ripley & Barneby No. 4282* (RB); Hesperia, *Spencer No. 368* (G, PO), *Munz No. 4445* (PO); Cajon Pass, *Cooper* (G). Los Angeles Co.: Palmdale, *Elmer No. 3641* (G, NY, PO), *Abrams & McGregor No. 516* (G, NY, PO); Pallett Creek, *Munz No. 6907* (PO). Kern Co.: Muroc, *Hoffmann No. 8499* (SB), *Crum No. 1809* (UC); Walker Pass, *Purpus No. 5723* (PO, UC); N. of Rosamond, *Abrams No. 11158* (F); Mohave, *Eastwood No. 3218* (CAS, G, NY); Rosedale, *Abrams in 1900* (PO); Ricardo, *Munz No. 12466* (F, PO, UC); N. of Ricardo, *J. T. Howell No. 4981* (CAS), *Hoffmann No. 9567* (SB); El Paso Range, *Abrams No. 11894* (PO). Inyo Co.: Intake, Cottonwood Creek, *Kerr No. 565-5* (CAS).

Form  $\beta$ . San Bernardino Co.: Lavic, *Munz, Johnston & Harwood No. 4166* (PO), *No. 4288* (PO); Ludlow, *Hall No. 6112* (UC); Baker, *Jones in 1934* (PO, UC); Afton Canyon, *Jaeger in 1940* (PO); Pisgah Crater, *Ripley & Barneby No. 5209* (RB).

Form  $\gamma$ . Inyo Co.: Salt Wells, *Hall & Chandler No. 6889* (G, PO, UC); Lone Pine, *Purpus No. 5741* (PO, UC), *Hall & Chandler No. 7177* (PO, UC); Lone Pine to Keeler, *Ripley & Barneby No. 3767* (RB); Keeler, *Ripley & Barneby No. 3768* (RB). Kern Co.: Walker Pass, *Purpus No. 5403* (G, UC), *Ripley & Barneby No. 3777* (PO, RB), *No. 3778* (RB, *fma. floribus albis*). San Bernardino Co.: Ophir Mine, *Slate Mts., Epling, Ellison & Anderson in 1930* (CAS, F, UC); SW. of Trona, *Gould No. 985* (NY); Trona, *Epling & Anderson in 1931* (CAS, UC).

Form  $\delta$ . Kern Co.: S. of Willow Springs, *Munz No. 10055* (NY, PO, UC); Rosamond to Mohave, *Abrams No. 11794* (PO, UC); Bakersfield, *Jones in 1906* (PO), *in 1934* (PO); 18 miles N. of Bakersfield, *Munz No. 9015* (PO, UC); SE. of Shafter, *Bracelin No. 867* (PO, CAS).

In restricting var. *Coulteri* to the race with large flowers endemic to the Colorado Desert, and admitting to var. *Fremontii* only those plants with short keel and glabrous or sparingly strigulose pod from the northern and far eastern Mohave Desert to Nevada, a large block of specimens of intermediate character from the intervening territory is left without a name, and it is for this highly polymorphic aggregate that the name var. *variabilis* is proposed. The disposition of this material has always presented a problem, and in any large herbarium sheets may be found filed both under var. *Coulteri* and var. *Fremontii*. The very earliest collection (*Frémont*), in flower only, was included by Gray in his *A. Arthu-Schottii*, the type of which, as I have attempted to show elsewhere (*Proc. Calif. Acad. Sci. IV, 25: 158* sequ.), belonged to var. *borreganus* Jones, and the first fruiting collection formed the basis of Gray's later description (1867, l. c.) of the pod of that species. In subsequent years both Gray and Watson, having this plant in mind, reduced *A. Arthu-Schottii* to synonymy with *A. Coulteri*, and since that time the limits of *A. Coulteri* and the point of its passage into *A. Fremontii* have become progressively more nebulous and difficult of definition. So vague, indeed, are the authorities dealing with this immediate race that I have not thought it worth while to list the references in the literature which, to greater or less extent, belong to var. *variabilis*. An example of this vagueness may be found in Jones's Revision. Here the range of *A. lentiginosus* var. *Coulteri* is given as "common on the Mohave and Colorado deserts, and Owens Valley," and that of var. *Fremontii* as "common from . . . Darwin and the Death Valley region to Mexico," indicating that both varieties occur throughout the entire desert region of

southern California. On plate 25 of the same volume at least part of the figures corresponding with these same two varieties were drawn from specimens collected at Tehachapi and Victorville respectively, and while neither could possibly portray the original *A. Coulteri* and *A. Fremontii*, at least the latter belongs to var. *variabilis*. Rydberg, to whom there was available a comprehensive suite of specimens from the western Mohave Desert, annotated them promiscuously as *Cystium eremicum* (e. g. *Eastwood No. 3281*, *Munz No. 10005*, etc.), *C. Coulteri* (the old Frémont gathering from the Mohave River), and *C. Arthu-Schottii* (*Parish No. 4957*, *Abrams & McGregor No. 516*, but not, surprisingly, the Frémont cotype of *A. Arthu-Schottii*), and on another specimen collected by Davidson erected a fourth species, *C. pardalotum*. This last was supposed to belong to the group *Diphysa* of *Cystium*, and to have glabrous pods and short dense racemes: from the fragments of the type in the New York Botanical Garden it is apparent that the pods are strigulose and the racemes lax. Jepson in his *Manual* (1925) referred all the desert forms (except, of course, var. *albifolius*) to *A. Coulteri*, but in his *Flora* (1936) all but *A. Coulteri sensu strictissimo* are shifted to var. *Fremontii*.

It might be argued that the var. *variabilis* should somehow be divided between the vars. *Fremontii* and *Coulteri*, and perhaps var. *nigricalycis*, to each of which it is about equally related. Nonetheless it does represent, at least in the center of its range, an entity demonstrably distinct from all three, and for this reason, apart from considerations of taxonomic convenience, it well merits recognition.

In the Victorville-Barstow region the typical form of var. *variabilis* is abundant and well defined, the pubescence and size of the corolla being intermediate between vars. *Coulteri*, *Fremontii*, and *nigricalycis*, but towards the periphery of its area it passes insensibly into three subsidiary forms which have been separated in the *Exsiccata* as  $\beta$ ,  $\gamma$ , and  $\delta$ . The form  $\beta$  from the central Mohave Desert has the sericeous vesture, even to the pods, of var. *Coulteri*, but still differs in the shorter calyx teeth and smaller flowers: the form  $\gamma$ , from Owens Valley south to Walker Pass, is again silky-villous throughout, with rather slender, flexuous stems from an annual root, and elongated, often

zigzag, racemes, and thus approaches the more pubescent phase of var. *Fremontii* which was recognized by Sheldon as *A. eremicus*: while form  $\delta$ , from both sides of the mountains in southern Kern County, is separable from var. *nigricalycis* only by the purple color of the corolla. These minor races, which form the links connecting var. *variabilis* on all sides with its nearest relatives, have not been considered worthy of taxonomic rank, though in a more elaborate classification they might be recognized as formæ.

The carinate condition of the flower, already observed in var. *carinatus*, in which the keel is elongated to equal or quite commonly to surpass the wings, has been collected only about Hesperia, Victorville, and Barstow. Even here it does not entirely replace the normal state, and is perhaps more frequent in years of heavy rainfall.

31. var. NIGRICALYCIS Jones

*Astragalus lentiginosus* Dougl. var. *nigricalycis* Jones, Proc. Calif. Acad. Sci. II, 5: 674 (1895); Rev. Astrag. 124 (1923); Munz, Man. S. Calif. 270 (1935); Jeps., Fl. Calif. 2: 356 (1936).

*A. lentiginosus* var. *Fremontii* Jones, Zoe 4: 272 (1894), non alibi.

*A. Fremontii* Heller, Muhlenb. 2: 84 (1905), e num. cit., non Gray.

*A. nigricalycis* (Jones) Abrams, Ill. Fl. Pac. St. 2: 598 (1944).

Pods ovoid with ascending beak, firm in texture but chartaceous, mottled, villosulous with white incumbent hairs, 2—3.5 cm. long: racemes 12—25-flowered, at first crowded, becoming lax and 5—8 cm. long in fruit, commonly surpassing the leaf: calyx villous with black (or very rarely white) hairs, the tube 4—5 mm., the teeth 1—2 mm. long: petals pale yellow or ochroleucous, the banner 13—15 mm., the wings 11—13.5 mm., the keel 9.5—12 mm. long: leaves 7—13 cm. long, with 9—11 pairs of green, oblong to obovate leaflets 8—20 mm. long, densely villous with spreading hairs on either surface or somewhat glabrate above: stems commonly white-villous-tomentose, coarse, flexuous, fistulose, 2—5 dm. high, diffuse.

*Illustrations.* Pl. IV, figs. 12—13. Jones, Rev. Astrag., pl. 23 and 24 (the septum faulty). Jepson, Fl. Calif. 2: fig. 209. Abrams, Ill. Fl., fig. 2872.

*Type-locality.* "Bakersfield," or as labelled on the type-sheet (PO), San Emigdio, Kern County, California, the type collected by Alice Eastwood in 1893.

*Distribution.* Plains and foothills of the San Joaquin Valley, California, along the Temblor Range from southwestern Fresno County south to Santa Barbara and Kern counties.

*Exsiccata.* CALIFORNIA. Kern Co.: San Emigdio, *Eastwood in 1893* (PO, type); mouth of San Emigdio Canyon, *Davy No. 1982* (UC); Bakersfield, *Eastwood in 1893* (UC, cotype), *Vasey in 1874* (G), *Davy No. 1714* (UC), *L. Benson No. 3337* (UC); Tejon Pass to Bakersfield.

*Munz No. 9002* (PO); SE. of Bakersfield, *Ora Clark No. 1846* (LA); S. of Bakersfield, *Munz No. 11652* (PO); Wheeler Ridge, *L. S. Rose No. 35655* (CAS); Grapevine, *Hilend & Newsom in 1927* (PO); Fort Tejon, *Wm. Kennedy in 1876* (F); Reed's Station, *L. S. Rose No. 37051* (LA); Wasco, *Munz No. 10110* (PO, UC); Taft, *Hoffmann in 1928* (SB), *Munz No. 13642* (PO, UC), *L. Benson No. 2956* (UC); Arvin, *Clokey No. 6680* (F, LA, NY, PO); W. of Blackwell's Corner, *Schreiber No. 2479* (UC); San Diego Canyon, Temblor Range, *Eastwood & Howell No. 4108* (CAS). Ventura Co.: Ozena P. O., *Chester Dudley in 1936* (CAS); between Ozena and Frazier Park, *Blanche Clear in 1940* (CAS). Santa Barbara Co.: base of Temblor Range, *Ferris No. 9073* (CAS); Cuyama Valley, *L. S. Rose No. 36062* (CAS, F, PO, UC), *Keck No. 2247* (CAS). San Luis Obispo Co.: Painted Rocks, Carriso Plain, *Eastwood in 1896* (G, NY). Kings Co.: N. of Devils Den, *J. T. Howell No. 5889* (CAS); Avenal, *Eastwood & Howell No. 2053* (CAS, G, NY). Fresno Co.: Zapato Chino, *Brandegee in 1893* (PO, UC); Oil City, *Heller No. 7587* (CAS, F, G, NY, UC), *Ripley & Barneby No. 3240* (RB); W. of Kerman, *Hoover No. 3287* (UC); Coalinga, *Constance No. 2087* (NY, UC); Alcalde, *Brandegee in 1890* (UC).

Throughout the greater part of its range the var. *nigricalycis* presents the two characters of black-villous calyx and ochroleucous flowers in constant association, and it is preferable to restrict the name to cover this form alone, although there are included above two specimens, *Munz No. 11652* and the Blanche Clear gathering, in which the calyx is white-hairy. In the Bakersfield region and on the desert side of the mountains in Kern County, plants occur which are scarcely separable from var. *nigricalycis* except for the fact that the petals are red or purple and that the calyx may be villous with either black or white hairs. Specimens corresponding with this form have been enumerated under var. *variabilis* as fma  $\delta$ . In a case of this nature where two races, more or less distinct in the middle of their ranges, are morphologically confluent at the point where their areas touch or overlap, the disposition of the intergrading material must always be artificial and a matter of opinion. But the existence of such intergrades cannot be said to invalidate either variety.

### 32. var. CÆSARIATUS Barneby

*Astragalus lentiginosus* Dougl. var. *cæsariatus* Barneby, Proc. Calif. Acad. Sci. IV, 25: 161 (1944).

Pods obliquely ovoid, somewhat arcuate, the ventral suture a little concave, and the dorsal strongly convex, abruptly acuminate and the beak upturned, the valves coriaceous, mottled, sparingly strigose-hirsutulous with

incumbent black and white hairs: racemes 15—20-flowered, at first crowded but at length laxer and 3.5—7 cm. long in fruit, on stout peduncles shorter than the leaves: calyx copiously but rather loosely black-strigose, the tube 6 mm., the lanceolate acute teeth 2.5 mm. long: petals brilliant purple, the broad banner 17—19 mm., the wings 14—15 mm., the keel 12—13 mm. long: leaves shortly petiolate or the upper sessile, 8—10 cm. long, with 11—13 pairs of obovate-cuneate to oblanceolate, truncate or emarginate leaflets 8—18 mm. long, glabrous above, ciliate and sparsely hirsutulous below with ascending or incumbent white or some black hairs: stems numerous from a heavy perennial root, flexuous, prostrate, glabrate, stramineous, 4 dm. long or more.

*Illustrations.* Pl. IV, figs. 8—11. Barneby, op. cit., pl. 17, figs. 29—30.

*Type-locality.* Temblor Range, above McKittrick, Kern Co., California, the type collected by H. D. Ripley and R. C. Barneby.

*Distribution.* Known only from the type-station, on grassy slopes in the foothills of the Inner Coast Range.

*Exsiccata.* CALIFORNIA. Kern Co.: Temblor Range, Ripley & Barneby No. 3243 (CAS, type, PO, RB).

The var. *cæsariatus* is in some degree intermediate between var. *nigricalycis* and var. *tehachapiensis*, and was described as most closely related to the latter, though differing in the larger, more deeply colored flower, much longer calyx-teeth, and more pubescent pod of rather different shape. I now believe that it is more justly placed next to var. *nigricalycis*, for the raceme is inclined to be lax in fruit, and the pubescence, while much less copious, is of a similar character. It may be quickly distinguished, however, by the larger purple corolla, more coriaceous legume, and prostrate stems. In nearly all the varieties of *A. lentiginosus* some nigrescent villi are found either on the calyx, bracts, or pedicels, but var. *cæsariatus* is unique in bearing black hairs on the rachises, petiolules, and even the leaflets of the upper leaves.

### 33. var. *COULTERI* (Bth.) Jones

*Astragalus lentiginosus* Dougl. var. *Coulteri* (Bth.) Jones, Contrib. W.

Bot. 8: 4 (1898); Rev. Astrag. 127 (1923), pro max. parte, exclus. syn.

*A. Coulteri* Bth., Pl. Hartw. 307 (1848); Gray, Proc. Amer. Acad. 6: 233

(1863); Bot. Calif. 1: 146 (1880), exclus. syn., non op. cit. 2: 442;

Wats., Bot. King Explor. 66, 435 (1871), exclus. syn.; Jeps., Man.

Calif. 568 (1925), pro parte; Fl. Calif. 2: 356, sens. strict., exclus.

syn.; Munz, Man. S. Calif. 270 (1935), exclus. syn.; Abrams, Ill. Fl.

Pac. St. 2: 597 (1944).

*Tragacantha Coulteri* (Bth.) O. Kze., Rev. Gen. 944 (1891).

*Cystium Coulteri* (Bth.) Rydb., Bull. Torr. Bot. Club 40: 50 (1913); Fl.

Rocky Mts. 491 (1917), pro parte, exclus. loc. plur.; N. Amer. Fl.

24: 408 (1929), sens. strict.

Pods obliquely ovoid with short ascending beak, about 2 cm. long, the valves firmly chartaceous or subcoriaceous, densely canescent, mottled: racemes 13—25-flowered, in fruit 6—9 cm. long, on stout, widely spreading, often flexuous peduncles of about the same length: calyx rather loosely silky-villous with straight hairs, white or sometimes nigrescent, the tube 4—5 mm., the teeth 2—3 mm. long: petals bright purple, the banner 14—15 mm., the wings 12—13 mm., the keel 10—11.5 mm. long: leaves 5—10 cm. long, with 7—10 pairs of oblong to obovate leaflets 5—15 mm. long, silvery-sericeous throughout or the lowest sometimes greenish but always densely pubescent: stems stout, flexuous, white-tomentose or -sericeous, 2—3 dm. high from a biennial or short-lived perennial root.

*Illustrations.* Pl. IV, figs. 14—17. Jones, Rev. Astrag. pl. 25 (exclus. fig. a). Abrams, Ill. Fl., fig. 2868

*Type-locality.* "Juxta Monterrey," according to the original publication, but certainly on the Colorado Desert in California: the type collected by Thomas Coulter.

*Distribution.* Colorado Desert, California. Often reported from Mexico, but no specimens have been seen from south of the Salton Sea.

*Exsiccata.* CALIFORNIA. Southern California, sine loc., Parry & Lemmon No. 87 in 1876 (F, G, NY, UC: the last is erroneously labelled "Mohave River District"), Parry No. 1 in 1876 (G), Lemmon No. 150 in 1876 (F). Riverside Co.: San Gorgonio Pass, Lemmon No. 589 (G); Banning, Gilman No. 47 (UC); Whitewater, Vasey in 1881 (F, ND, NY), Parish & Parish No. 25 (ND), Parish No. 6119 (F), No. 19189 (UC), Spencer No. 1501 (F), Hall No. 5757 (F, G, NY, PO, UC), Munz No. 2307 (PO), I. Johnston No. 1065 (NY, PO); Palm Springs, Jones in 1903 (PO), Eastwood No. 3116 (CAS, G, NY), Spencer No. 743 (NY), No. 1655 (G), Grant No. 6747 (CAS, UC), No. 6714 (PO, UC), Templeton & Clokey No. 1072 (LA), No. 4710 (PO), Ripley & Barneby No. 4271 (RB); Garnet Station to Edom, Abrams No. 11091 (F); Garnet, J. T. Howell No. 3439 (CAS), Ripley & Barneby No. 4271a (RB); Indian Wells, Munz & Keck No. 4963 (PO); Indio, Ora Clark No. 1734 (LA); Paloverde, Hall No. 5958 (UC); Boulder Well, Schellenger No. 17 (NY).

The type of *A. Coulteri*, in the herbarium of Trinity College, Dublin, has not been studied, but Bentham's admirable description leaves little doubt as to the identity of Coulter's plant. The indication of the type-locality as Monterey has a number of parallels, as remarked by Jepson (Fl. Calif. 2: 350): Coulter is known to have passed through the desert on his way to the Colorado River, and it was doubtless there that he first encountered *Dalea mollis* Bth., *Phaca Crotalariae* Bth., and *A. Coulteri*, all of which were erroneously labelled "Monterey." Since its publication the name *A. Coulteri* (or *A. lentiginosus* var. *Coulteri*) has almost universally been applied to wider concepts than are admitted here. Only Rydberg (sub *Cystio*), in the N. American Flora, and

Jepson (1936), have up to the present restricted it to the large-flowered, sericeous race endemic to the Colorado Desert, and of these two only Rydberg repudiated the long-established error of admitting as a synonym *A. Arthu-Schottii* Gray. This species, originally described from a mixture of var. *borreganus* and var. *variabilis*, and subsequently defined in the latter sense, was finally reduced by Gray to *A. Coulteri*, and this synonymy has persisted in the literature (cf. discussion of var. *borreganus*).

This handsome variety is very closely related to var. *variabilis*, but differs essentially in the relatively longer calyx-teeth, larger flowers, and, for the most part, in its silvery pubescence. On the other hand certain collections of var. *borreganus* from Imperial County, California, reveal in their somewhat atypically inflated legume another close affinity. Jones's statement (1923) that the var. *Coulteri* "is almost certainly a hybrid between *lentiginosus* and *aridus*" is completely without foundation.

#### 34. var. BORREGANUS Jones

*Astragalus lentiginosus* Dougl. var. *borreganus* Jones, Contrib. W. Bot. 8: 3 (1898); Rev. Astrag. 126 (1923).

*A. Arthu-Schottii* Gray, Proc. Amer. Acad. Sci. 6: 209 (1863), pro max. parte, non alibi; Barneby, Proc. Calif. Acad. Sci. IV, 25: 158 (1944).

*A. agninus* Jeps., Man. Calif. 577 (1925), Fl. Calif. 2: 355 (1936); Harrison & Kearney, Journ. Wash. Acad. Sci. 22: 227 (1932); Munz, Man. S. Calif. 270 (1935); Kearn. & Peeb., Fl. Pl. Ariz. 487 (1942); Abrams, Ill. Fl. Pac. St. 2: 597 (1944).

*Cystium Arthu-Schottii* (Gray) Rydb., N. Amer. Fl. 24: 407 (1929), saltem quoad typ. cit.

*C. agninum* (Jeps.) Rydb., op. cit. 408.

Pods lanceolate-acuminate to very narrowly and obliquely ovoid, falcate, subterete or a little obcompressed and shallowly sulcate ventrally, 1.5—2 cm. long, the valves membranous in texture, heavily strigose or sericeous, at times faintly mottled, the septum sometimes not quite reaching the ventral suture: racemes 15—35-flowered, lax and 6—12 (25) cm. long in fruit, on peduncles about equaling the leaf: calyx white-silky, villosulous or sericeous, often with some black hairs, the tube 3—3.5 mm., the teeth 0.75—1.5 mm. long: petals purple, the banner about 13 mm., the wings 10—12.5 mm., the broad keel 9.5—11.5 mm. long: leaves 6—15 cm. long, with 7—9 pairs of obovate, obtuse or emarginate leaflets 6—15 mm. long, silky-canescenscent on either face: stems copiously white- or silvery-pubescent, erect, flexuous, 1.5—3 dm. high, stout or slender, often solitary, from an annual or perhaps rarely biennial root.

*Illustrations.* Pl. IV, figs. 18—22. Jones, Rev. Astrag., pl. 25. Abrams, Ill. Fl., fig. 2869.

*Type-locality.* Borregos Springs, southeastern California, the type collected by Charles Orcutt.

*Distribution.* Sandy desert valleys of the lower Colorado Desert in California, adjacent Arizona and Sonora, northwards along the Colorado River to the borders of Nevada.

*Exsiccata.* CALIFORNIA or SONORA. Diluvial banks of the Colorado, Schott, Mex. Bound. Surv. 256 (G, type of *A. Arthu-Schottii*, NY); Colorado Desert near Fort Yuma, Schott in 1855 (NY). SONORA. Colorado Desert, Schott in 1855 (F); San Luis near Yuma, Harrison & Kearney, No. 8434 (F, SAC). ARIZONA. Yuma Co.: Harrison & Kearney No. 8431 (G), Beckett & Nobles No. 8695 (F, G, SAC); Yuma Desert, Nelson & Nelson No. 1288 (NY, UC); Yuma Mesa, Peebles & Harrison No. 5029 (SAC); Dome to Yuma, Kearney No. 3910 (SAC). CALIFORNIA. San Diego Co.: Borrego Springs (or Wells), Orcutt (PO, type of var. *borreganus*), Jepson No. 8883 (NY, type-collection of *A. agninus*, fragments), Eastwood No. 2680 (G), Brandegee in 1895 (UC, erroneously annotated "type of var. *borreganus*" by Jones), Jones in 1906 (F, NY, PO, UC). Imperial Co.: Yuma Road at Ogilby turn-off, Johansen & Ewan No. 7142 (PO); dunes E. of Brawley, Jones in 1926 (PO). San Bernardino Co.: Silver Lake, J. T. Howell No. 3586 (CAS); Kelso, K. & T. S. Brandegee in 1915 (UC); Nipton, Ripley & Barneby No. 3360 (CAS, PO, RB).

In a previous paper (l. c., 1944, sub *A. Arthu-Schottii*) I have attempted to give an account of the history of var. *borreganus*, and it will not be necessary to go over the same ground again. At that time I regarded the plant as a distinct species, but after further reflection I am persuaded that it is too closely related to var. *Coulteri* and var. *variabilis* to be kept apart from the *A. lentiginosus* complex. There are so many examples in § *Diplocystium* of a race with bladdery-inflated legume passing gradually into a close relative with the legume scarcely more than turgid, that the degree of inflation can no longer be regarded as specifically diagnostic. Moreover, there are specimens such as Johansen & Ewan No. 7142 which, while doubtless best referred here on the dimensions of the flower and the obviously annual root, combine a certain degree of inflation in the pod reminiscent of var. *Coulteri* or var. *variabilis* with the membranous texture of the pod proper to var. *borreganus*. Jones' statement, however, that "this shades directly into var. *Coulteri*" seems to be exaggerated, while his reduction (Contrib. W. Bot. 15:69, and op. cit. 18:44,—1933) of *A. agninus* to *A. aridus* Gray was an unlucky guess, prompted either by ignorance or malice.

35. var. *URSINUS* (Gray) Barneby

**Astragalus lentiginosus** Dougl. var. **ursinus** (Gray) Barneby, comb. nov.

*A. ursinus* Gray, Proc. Amer. Acad. Sci. 13: 367 (1878); Sheld., Minn. Bot. Stud. 1: 147 (1894); Rydb., Fl. Rocky Mts. 494 (1917); Tidestr., Contrib. U. S. Nat. Herb. 25: 325 (1925); Tidestr. & Kitt., Fl. Ariz. & N. Mex. 213 (1941).

*A. lentiginosus* var. *mokiacensis* Jones, Rev. Astrag. 126 (1929), pro parte, non *A. mokiacensis* Gray.

*Tium ursinum* (Gray) Rydb., N. Amer. Fl. 24: 398 (1929); Bull. Torr. Bot. Club 57: 408 (1931).

Pods strongly ascending, lance-oblong, abruptly acuminate, slightly arcuate, subterete and about 3 mm. in diameter, 10—13 mm. long, the valves leathery and glabrous, the septum produced only halfway across the cavity: racemes lax, 12—15-flowered, in fruit 4—6 cm. long, about equaling the peduncle: calyx sparingly strigose with black and white hairs, the tube 3—3.5 mm., the teeth about 0.75 mm. long: petals purple, the narrow banner 13—15 mm., the wings 11.5 mm., the keel 10 mm. long: leaves 6—9 cm. long, petiolate, with 7—8 pairs of obovate, obtuse or emarginate leaflets 5—11 mm. long, glabrous or with a few scattered hairs below: stems erect, flexuous, strigose, 1.5—3 dm. long.

*Illustration.* Pl. IV, figs. 31—33.

*Type-locality.* Bear Valley in the south-central part of Utah, the type collected by Palmer in 1877.

*Distribution.* Known only from the type-locality.

*Exsiccata.* UTAH. Iron or Garfield Co.: Bear Valley, Palmer in 1877 (G, type, NY).

The var. *ursinus*, although it has been more often confused with var. *mokiacensis* than with var. *palans*, is, nevertheless, at least as nearly related to the latter, and with further collections they may even prove to be confluent. As known at present only from the type, var. *ursinus* differs from var. *palans* in the smaller calyx with proportionately shorter teeth, as well as in the shorter, subterete and strongly ascending pod, characters all recognized by Rydberg in his revision of *Tium* (1931, l. c.). It also resembles some of the depauperate forms of var. *diphysus* such as *Peebles & Parker No. 14631*, but the same criteria will serve to distinguish it. *Astragalus ursinus* was always treated by Jones as a synonym of *A. mokiacensis*, except for a brief period when he described under this name an unrelated plant later recognized as *A. ensiformis* Jones. Eventually the two binomials became so identified in his mind, that in his review of Tidestrom's Flora of Utah and Nevada he actually criticized (Contrib. W. Bot. 15: 21,—1929) the author for reporting *A. ursinus* from Utah.

36. var. *PALANS* (Jones) Jones

*Astragalus lentiginosus* Dougl. var. *palans* (Jones) Jones, Contrib. W. Bot. 8: 4 (1898); Rev. Astrag. 125 (1923), pro max. parte, exclus. syn.

*A. palans* Jones, Zoe 4: 37 (1893); Sheld., Minn. Bot. Stud. 1: 152 (1894); Rydb., Fl. Rocky Mts. 495 (1917); Tidestr. & Kitt., Fl. Ariz. & N. Mex. 213 (1941); Kearn. & Peeb., Fl. Pl. Ariz. 486 (1942).

*A. palans* var. *araneosus* Jones, Proc. Calif. Acad. Sci. II, 5: 675 (1895), quoad num. cit., non *A. araneosus* Sheld.

*A. amplexus* Pays., Bot. Gaz. 60:378 (1915).

*Hamosa amplexa* (Pays.) Rydb., Fl. Rocky Mts. 496, 1063 (1917).

*Tium palans* (Jones) Rydb., N. Amer. Fl. 24: 397 (1929); Bull. Torr. Bot. Club 57: 406 (1931).

*T. amplexum* (Pays.) Rydb., op. cit. 1929, p. 398; 1931, l. c.

Pods spreading or rarely ascending, lanceolate or narrowly ovoid-acuminate, falcate or nearly straight, slightly compressed or obcompressed, sulcate dorsally and often also ventrally, the valves coriaceous to firmly chartaceous, rugose or smooth, strigulose or commonly glabrous, mottled or stramineous, the septum sometimes incomplete at the center of the pod: racemes 10—20-flowered, typically rather lax but not uncommonly condensed, 2—12 cm. long in fruit on peduncles 3—8 cm. long: calyx strigose with white or black hairs, the tube (4) 5—7 mm., the narrow, acute teeth 1.25—3 (4) mm. long: petals purple, the banner 15—17 mm., the wings 12—15.5 mm., the keel 11—14 mm. long: leaves shortly petiolate or the uppermost sessile, 5—9 cm. long, with 6—9 pairs of obovate to elliptic leaflets 5—15 mm. long, glabrate on either face or sparsely pubescent below: stems spreading or erect, flexuous, strigillose to glabrate, 15—30 cm. long.

*Illustrations.* Pl. IV, figs. 23—26. Jones, Rev. Astrag. pl. 25.

*Type-locality.* Montezuma Canyon, Utah, the type collected by Alice Eastwood in 1892.

*Distribution.* Along the Colorado River and its tributaries from the Grand Canyon to southern Utah and southwestern Colorado.

*Exsiccata.* COLORADO. Mesa Co.: Grand Junction, *Osterhout No. 6142* (PO). Montrose Co.: Long Park near Naturita, *Payson No. 335* (NY, isotype of *A. amplexus*). UTAH. Grand Co.: Thompson's Springs, *Purpus No. 6476* (UC). San Juan Co.: Montezuma Canyon, *Eastwood in 1892* (PO, type, CAS, G, UC); Bluff (or Bluffs), *Rydberg & Garrett No. 9914* (NY), *Jones in 1919* (PO), *Cottam No. 2555* (F), *Ripley & Barneby No. 5381* (RB); Goosenecks of the San Juan, *Cronquist No. 1104* (UC). Emery Co.: San Rafael Swell, *Jones in 1914* (PO). Washington Co.: Rockville, *Jones No. 5215e* (PO), *No. 5218* (F, G, UC), *No. 5218a* (PO). ARIZONA. Coconino Co.: Grand Canyon, *Macbride & Payson No. 945* (G); Grand View Trail, Grand Canyon, *Eastwood No. 5748* (F, G).

The var. *palans* is extremely variable in the length of the raceme, in the size of the flower and calyx, and in the development and curvature of the legume. The type has rather large corollas, lax racemes, and elongate pod curved into half a circle

on recurved pedicels, but this passes insensibly into forms with patent or ascending pedicels, short and claw-like or longer and merely lunate pods, sulcate on either or both sutures, condensed or loose racemes, small or large flowers, and leaflets strigose below or glabrous. *Astragalus amplexus* was described from a rather more pubescent state, but Rydberg's key characters of flower-size and pubescence do not hold. For example, in the Grand Canyon, plants otherwise similar may have either glabrous (*Eastwood No. 5748*) or strigose (*Macbride & Payson No. 945*) legumes, while the dimensions of the flower given by Rydberg (1929, p. 386) in his key to *Tium*, viz. "corolla 13 mm. long" for *T. palans* and "16 mm. long" for *T. amplexus*, are immediately corrected in his descriptions of the species (op. cit., 397, 398) to "about 2 cm. long" and "2 cm. long" respectively, the latter being more nearly correct in either case.

Although at first sight appearing quite distinct from *A. lentiginosus*, and so treated by all authorities except Jones, the var. *palans* is in reality closely allied to var. *diphysus* and var. *araneosus*. It is particularly suggestive to remark the manner in which var. *diphysus* of northern Arizona and eastwards and the pseudovicariant var. *araneosus* of Utah and Nevada are isolated from each other by a broad band of territory along the Colorado River, from the Grand Canyon nearly to its source, which is occupied to the exclusion of either by var. *palans*. Each of these varieties is widespread and fairly constant in the middle of its area, but as they approach the Colorado intermediates arise, and it is only by assuming an arbitrary dimensional limit to the inflation of the legume that either can be separated from var. *palans*. That this limit has been vague in the past is evidenced by Jones's treatment. At one point he identified his southern Utah collections of var. *palans* as *A. araneosus*, and reduced (1895, l. c.) the latter to a variety of *A. palans*. Subsequently, however, he treated *A. araneosus* as an intergrade between vars. *diphysus* and *palans*, and similar material in his herbarium is promiscuously determined as either one or the other.

### 37. var. OROPEDII Barneby

*Astragalus lentiginosus* Dougl. var. *oropedii* Barneby, var. nov., hinc leguminis glabri forma racemoque denso var. *diphyso* (Gray) Jones, illinc habitu, foliis glaucescentibus glabris ac caulibus elongatis var. *Wilsonii*

(Greene) Barneby comparanda, sed ab ea dentibus calycinis elongatis necnon leguminis pericarpio membranaceo, ab hac legumine inflato breviori floribusque purpureis manifeste minoribus diversa.

Pods spreading, obliquely ovoid, inflated, ventrally sulcate and with ventral suture prominently intruded, 1.3—2.5 cm. long, the valves membranous, glabrous, mottled, the nearly straight beak acuminate and unilocular: racemes 10—20-flowered, dense in both flower and fruit, 1—3 cm. long, on peduncles shorter than or rarely equaling the subtending leaf, the peduncles usually widely divergent at maturity: calyx strigose with mixed black and white hairs, the tube 4.5—5.5 mm., the narrow acute teeth (2.5) 3—5 mm. long: petals purple, the banner (12) 13—15 mm., the wings about 12 mm., the keel 10—11 mm. long: leaves sessile or very shortly petiolate, 5—10 cm. long, with 7—10 pairs of suborbicular, broadly oblong or ovate, obtuse to subacute leaflets 0.5—2 (2.5) cm. long, these glaucescent, flat and essentially glabrous, but sometimes (like the rachis) sparingly ciliate: stems rather slender, flexuous, glabrous except at the extremities, ascending or prostrate, (1) 2—3 dm. long.

*Type.* Kaibab Trail to Roaring Springs, Grand Canyon National Park, Coconino County, Arizona, 22 September 1938, fruct., *Eastwood & Howell No. 7064* (Herb. Calif. Acad. Sci. No. 262056). Also *ibid.*, 23 June 1933, flor., *Eastwood & Howell No. 1054* (Herb. Calif. Acad. Sci. No. 211208, cotype).

*Distribution.* Kaibab Plateau, Arizona, particularly about the North Rim of the Grand Canyon.

*Exsiccata.* ARIZONA. Coconino Co.: Kaibab Trail to Roaring Springs, *Eastwood & Howell No. 7064* (CAS, type), 1054 (CAS, cotype); Cliff Spring, 1 mile from Cape Royal, *Peirson No. 7428* (CAS); North Rim of Grand Canyon, *Eastwood & Howell No. 930* (CAS, PO); Jacob's Lake to Fredonia, *Peebles No. 13059* (SAC).

The var. *oropedii* is especially interesting in that it combines features on the one hand of vars. *palans* and *Wilsonii*, races characterized by a lanceolate, barely turgid legume, and on the other of vars. *diphysus* and *latus*, in which the pod is ovoid and strongly inflated. Having in mind the form of var. *mokiacensis* with inflated pod, I was at first reluctant to recognize in var. *oropedii* more than an aberrant, perhaps hybrid, form of var. *palans*, but the sum of characters presented by the material now before me suggests that it should be recognized as a distinct and rather well-defined variety. In habit, and especially in the ample, glabrous foliage, relatively short peduncles, and long, flexuous stems, var. *oropedii* most closely resembles var. *Wilsonii*, which occupies a similarly restricted area in the same life-zone to the south, and which I take to be its nearest relative: the purple flower is almost that of var. *palans*, which occurs also in the Grand

Canyon, but at a lower elevation: while in size and contour of the pod it approaches, or at least recalls, var. *diphysus* and var. *latus*, from which the membranous texture of the valves, different facies, as well as the longer calyx-teeth (in the first case) and unilocular beak of the pod (in the second) combine to distinguish it.

The var. *oropedii* might also be confused, especially in immature specimens, with var. *vitreus*: the dimensions of the petals and calyx, however, are quite different, and it occupies a distinct area in the Transition Zone far removed in altitude, if not in longitudinal distance, from the badlands along the Virgin River to which var. *vitreus* seems to be confined.

38. var. MOKIACENSIS (Gray) Jones

*Astragalus lentiginosus* Dougl. var. *mokiacensis* (Gray) Jones, Rev. Astrag. 126 (1923), pro max. parte, exclus. syn. cit.

*A. mokiacensis* Gray, Proc. Amer. Acad. 13: 367 (1878); Sheld., Minn. Bot. Stud. 1: 147 (1894); Tidestr. & Kitt., Fl. Ariz. & N. Mex. 213 (1941), exclus. syn.; Kearns & Peeb., Fl. Pl. Ariz. 486 (1942).

*Tium mokiacense* (Gray) Rydb., N. Amer. Fl. 24: 398 (1929); Bull. Torr. Bot. Club 57: 406 (1931).

Pods strigose or glabrous, woody or leathery, typically lanceolate in outline and abruptly cuspidate, scarcely inflated, straight or curved through the fourth part of a circle, 2—2.5 cm. long, 5—6 mm. in diameter, the septum mostly incomplete (sometimes traversing only half the width of the cavity), or, atypically, inflated and rather narrowly and obliquely ovoid with triangular-acuminate beak, 1 cm. or more in diameter, the valves thinner and the septum complete: racemes 12—18-flowered, lax and 7—12 cm. long in fruit, on stout, stramineous peduncles of about the same length: calyx strigose with white and some black hairs, the tube (4.5) 5—7 mm., the teeth 1—2.5 mm. long: petals purple, drying violet, the banner (14) 15—19 mm., the wings (13) 14—17 mm., the keel (12) 14—17 mm. long: leaves 1—12 cm. long, with 6—9 pairs of elliptic or obovate emarginate leaflets 8—20 mm. long, glabrous on either face or commonly only above, and strigose with fine white hairs beneath: stems coarse, glabrate or canescent in youth, 2—5 dm. high, erect from a perennial root.

*Illustrations.* Pl. IV, figs. 34—39. Jones, Rev. Astrag. pl. 25.

*Type-locality.* Mokiak Pass on the borders of Utah and Arizona, the type collected by Palmer in 1877.

*Distribution.* NW. Arizona and adjacent Nevada: also reported by Tidestrom and by Kearney & Peebles from SW. Utah.

*Exsiccata.* ARIZONA. Mohave Co.: Mokiak Pass, *Palmer No. 105* (G, type, NY, PO, fragments); Grand Canyon of the Colorado near Fort Mohave, *Lemmon No. 3116* (G); Peach Springs, *Lemmon No. 3326*

(G, PO, fragments, UC). NEVADA. Clark Co.: Mica Spring, *Jones No. 5058* (NY, PO, UC).

Form  $\beta$ . ARIZONA. Mohave Co.: Pipe Spring, *Jones No. 5272d* (PO); Chloride, *Jones in 1903* (PO); Peach Springs, *Jones in 1904* (PO), *Kearney & Peebles No. 11094* (PO, SAC), *Ripley & Barneby No. 3430* (CAS, RB).

Although *A. mokiensis* was first described more than sixty years ago, it remains very little known, and the material available is scanty. The type-collection, which Rydberg (1931) erroneously stated was without fruit notwithstanding Gray's careful description of the legume, bears strigose, lanceolate pods, shallowly sulcate ventrally and incompletely bilocular. This gathering is matched exactly only by the two obtained by Lemmon along the lower reaches of the Grand Canyon. Jones' material from Mica Spring, Nevada, is almost exactly similar, but has glabrous legumes and slightly shorter calyx. These were the only specimens of *Tium mokiense* known to Rydberg in 1931, and they are still the only ones which really match the type. On the plateau around Peach Springs, however, occurs a plant indistinguishable from var. *mokiensis* in habit, but with ovoid, inflated, completely bilocular pod and slightly smaller flower. The material belonging to this form has been enumerated above as form  $\beta$ , and the dimensions of the legume have been included in the description of the variety. Jones regarded it as var. *yuccanus* "intergrading towards var. *mokiensis*": in certain respects it is intermediate between the vars. *mokiensis* and *yuccanus* and may well represent hybridization between the two, but until it is better known it may be disposed of in an inconclusive manner.

The variety in its strict sense is very closely related to var. *palans*, var. *Wilsonii*, and var. *ursinus*, and all four should perhaps be united. The flowers, however, turn violet in the herbarium, rather than the reddish-purple of var. *palans*, and are usually larger and more loosely racemose: the peduncles are much longer and the petals more brightly colored than in var. *Wilsonii*: while both flowers, pods, and particularly the calyces, are all conspicuously longer than in var. *ursinus*.

The literature dealing with var. *mokiensis* is fairly straightforward, except for the fact that Jones always included in it *A. ursinus* Gray. Rydberg has suggested that this error arose from Gray's misdetermination of the Lemmon collections as

*A. ursinus*. This may be so, but it scarcely explains Jones' statement (Contrib. W. Bot. 15:21,—1929) that "*A. ursinus* . . . actually grows only in Arizona bordering the Grand Canyon," when the type of that species came from Utah.

39. var. *WILSONII* (Greene) Barneby

*Astragalus lentiginosus* Dougl. var. *Wilsonii* (Greene) Barneby, comb. nov.

*A. Wilsonii* Greene, Pitt. 3: 196 (1897); Kearns. & Peeb., Fl. Pl. Ariz. 486 (1942).

*Tium Wilsoni* (Greene) Rydb., N. Amer. Fl. 24: 398 (1929); Bull. Torr. Bot. Club 57: 406 (1931).

*Astragalus lentiginosus* var. *mokiacensis* Jones, Rev. Astrag. 126 (1923), pro parte, e syn. cit., non *A. mokiacensis* Gray.

*A. mokiacensis* Tidestr. & Kitt., Fl. Ariz. & N. Mex. 213 (1941), pro max. parte, e syn. & descr., non Gray.

Pods strongly ascending, lanceolate and gradually acuminate, slightly upcurved, subterete and either ventrally or dorsally sulcate, 2.5—3 cm. long, 4—6 mm. in diameter, coriaceous, smooth, glabrous or rarely strigulose, commonly mottled: racemes 7—12-flowered, rather dense even in fruit, on stout peduncles a little shorter than the leaf and 4—7 cm. long: calyx strigose with white or a few black hairs, the tube 6—6.5 mm., the teeth 1.5—3 mm. long: petals white or pinkish, the banner 16—19 mm., the wings about 15 mm., the keel about 13 mm. long: leaves sessile or the lower shortly petiolate, 8—11 cm. long, with 8—12 pairs of rather thin, ovate, elliptic or obovate, obtuse leaflets 8—25 mm. long, glabrous on either face: stems diffuse or prostrate, flexuous, nearly glabrous, 2.5—5 dm. long.

*Illustration.* Pl. IV, figs. 27—30.

*Type-locality.* "Northern Arizona," actually near Flagstaff, the type collected by Norman C. Wilson in 1893.

*Distribution.* In open pinewoods of the Mogollon Rim in Coconino and Yavapai counties, Arizona.

*Exsiccata.* ARIZONA. Coconino Co.: near Flagstaff, *Wilson in 1893* (ND, type), *MacDougal No. 140* (F, G, NY, PO, UC); Oak Creek, *Rusby in 1883* (NY); Walnut Canyon, *Purpus No. 23* (UC); Cosnino near Flagstaff, *Jones in 1884* (PO). Yavapai Co.: N. of Cottonwood, *Whiting No. 1058* (SAC).

The var. *Wilsonii* has been confused by Jones and Tidestrom with the preceding, which it resembles in the strongly ascending pod, and of which it may be a montane derivative, but its diffuse stems, pale flowers, and more condensed racemes are conspicuously different. In gross habit it is quite similar to var. *oropedii* from the pinewoods of the Kaibab Plateau to the north, but in

that race the legume is spreading, inflated, and membranous. Kearney & Peebles (l. c.) doubtfully included in their *A. Wilsonii* some material from Maricopa County, Arizona, treated below as a new variety.

40. var. *MARICOPÆ* Barneby

*Astragalus lentiginosus* Dougl. var. *maricopæ* Barneby, var. nov., legumine lineari-lanceolato coriaceo vix obliquo adscendenti var. *Wilsonii* (Greene) nob. manifeste affinis, sed caulibus strictioribus minus flexuosis, racemo plurifloro plerumque laxissimo, necnon corolla ochroleuca breviori diversa.—*A. Wilsonii* Kearn. & Peeb., Fl. Pl. Ariz. 486 (1942), pro parte.

Pods as in the preceding, about 2 cm. long, castaneous and not mottled: racemes (9) 15—20-flowered, when well developed 10—20 cm. long and lax in fruit, rarely shorter and 3—5 cm. long, on stout and rather strict peduncles 5—9 cm. long, shorter than the subtending leaf: calyx strigose with white or some black hairs, the tube 5—6 mm., the teeth 1.5—2 mm. long: petals ochroleucous, the banner 13—15 mm., the wings 12—13 mm., the keel 11—11.5 mm. long: leaves shortly petiolate, 7—15 cm. long, with 7—11 pairs of rather thick, subglaucescent, obovate to broadly elliptic, obtuse, truncate (rarely apiculate) leaflets 7—22 mm. long, essentially glabrous or with a few scattered hairs beneath when young: stems mostly erect, stout, not flexuous, 3—4 dm. high, glabrous.<sup>1</sup>

*Type.* Roadside near Tempe, Maricopa County, Arizona, *G. J. Harrison No. 1790* (U. S. National Herbarium No. 1870814).

*Distribution.* Lower reaches of the Salt River, Arizona.

*Exsiccata.* ARIZONA. Maricopa Co.: near Tempe, *Harrison No. 1790* (U. S. Nat. Herb.); Cave Creek Dam, *Peebles, Harrison & Kearney No. 3684* (SAC); Fish Creek, *Peebles, Harrison & Kearney No. 5238* (SAC).

In the shape and texture of the legume the var. *maricopæ* resembles the preceding very closely, but the long open raceme of smaller ochroleucous flowers, as well as the stout, erect stems distinguish it immediately. The gathering from Fish Creek, however, shows some transition toward var. *Wilsonii* in general habit, though still differing in the size and color of the corolla. When in flower alone it might be taken for a very glabrous form of var. *yuccanus* Jones, thereby revealing another of the manifold cross-relationships between the races of *A. lentiginosus* with strongly inflated and uninflated pods.

<sup>1</sup> Material of var. *maricopæ*, kindly communicated by Mr. Peebles from the herbarium of the U. S. Field Station, Sacaton, Arizona, was received after completion of the plates, and it has been found impossible to insert an illustration.

## EXCLUDED NAMES AND SPECIES

ASTRAGALUS BAJAENSIS Sheld., Minn. Bot. Stud. 1:169 (1894). This species was erroneously described as having bilocular pods, and was placed by the author in his § *Lentiginosus* between *A. latus* Jones and *A. Fremontii* Gray. As observed by Jones (Contrib. W. Bot. 10:62,—1902), the plant is closely allied to *A. Hornii* Gray, and the legume, though inflated, is wholly devoid of septum.

ASTRAGALUS BOISEANUS A. Nels., Bot. Gaz. 53:233 (1912). *Cystium boiseanum* (A. Nels.) Rydb., Bull. Torr. Bot. Club 40:50 (1913). *A. eremiticus* var. *spencianus* Jones. *Astragalus boiseanus*, a plant with stipitate pods and closely related to *A. eremiticus* Sheld., was at one time referred by Rydberg to his genus *Cystium*. In a subsequent paper Rydberg (Bull. Torr. Bot. Club 57:400,—1931) explained that he mistook *A. boiseanus* for that race of *A. lentiginosus* for which he proposed instead the name *Cystium heliophilum*, but which he eventually recognized as *A. salinus* Howell (*A. lentiginosus* var. *salinus* (Howell) Barneby).

ASTRAGALUS BRYANTII Barneby, Proc. Calif. Acad. Sci. IV, 25:156, pl. 17, figs. 10—18 (1944). In the original publication it was suggested that *A. Bryantii* was most closely related to *A. mokiensis* Gray (var. *mokiensis* (Gray) Jones), an opinion which may or may not be correct. The pod, however, is strongly compressed, a condition not met with elsewhere in § *Diplocystium*, and until the species is better known I prefer to exclude it from the section.

ASTRAGALUS CUSPIDOCARPUS Sheld., Minn. Bot. Stud. 1:147 (1894). *A. lentiginosus* var. *cuspidocarpus* (Sheld.) Jones, quoad nomen. *A. missouriensis* var. *cuspidocarpus* (Sheld.) Jones. *Xylophacos cuspidocarpus* (Sheld.) Rydb. The cotype of this species, *Leiberg No. 171*, is a collection of *A. lentiginosus* var. *platyphyllidius* (Rydb.) Peck, a part of which served as the type of *Cystium platyphyllidium* Rydb., but the typical element of the species bears a unilocular pod similar to that of *A. cibarius* Sheld. Jones's combination *A. lentiginosus* var. *cuspidocarpus* referred only to the Leiberg element, to which the name cannot be validly applied. This point is more fully dealt with in the text under var. *carinatus* and var. *platyphyllidius*.

ASTRAGALUS DIAPHANUS Dougl. ex Hook., Fl. Bor.-Amer. 1: 151 (1831). *A. drepanolobus* Gray, Proc. Amer. Acad. 19: 75 (1883). *A. lentiginosus* var. *diaphanus* (Dougl.) Jones, Proc. Calif. Acad. Sci. II, 5: 675 (1895); Rev. Astrag. 123, pl. 23 (1923).

*Astragalus diaphanus* Dougl., partly on account of the inadequate description and partly because of the lack of authentic material in this country, has always remained obscure to American botanists. Gray, to whom the plant was unknown at the time of his Revision in 1863, having studied the type in England in 1868, reduced the species (Bot. Calif. 1: 147,—1880) to *A. lentiginosus*, a disposition followed by Watson and others. In 1894, Sheldon (Minn. Bot. Stud. 1: 168) revived the name, placing it without comment in his § *Lentiginosus*. In the following year, Jones (1895, l. c.), without further investigation of the facts, reduced *A. diaphanus* to varietal status under *A. lentiginosus*, only to submerge it altogether (Contrib. W. Bot. 8: 3,—1898) with that species, and finally, in the Revision of *Astragalus*, to reinstate it as a variety. In 1927, Rydberg (Bull. Torr. Bot. Club 54: 21) suggested that in reality *A. diaphanus*, far from being a form of *A. lentiginosus*, was an earlier synonym of the very different *A. drepanolobus* Gray; not having seen the type, however, he prudently placed the name as a doubtful synonym of *Hamosa drepanoloba* (Gray) Rydb., and it was treated thus in the North American Flora.

In response to my enquiries for information, Mr. N. Y. Sandwith of the Royal Herbarium at Kew kindly undertook to study and report on the type of *A. diaphanus* which is preserved there among the Hooker collections, and after careful consideration of the literature and comparison of the Douglas specimens of the species both with the type of *A. lentiginosus* and an isotype of *A. drepanolobus*, he concluded that Rydberg's supposition was indeed correct, and that all but a small part of the type of *A. diaphanus* belongs to *A. drepanolobus*. From Mr. Sandwith's copious notes, a copy of which has been deposited in the Herbarium of the California Academy of Sciences, it appears that the type-sheet of *A. diaphanus* contains three elements, which were separated and annotated by Gray. One of these, in flower only and not closely agreeing with Hooker's description, was correctly

identified by Gray as *A. lentiginosus* and matched with a fruiting specimen of the same collected in Oregon by Burke. The second, also in flower, and the third, from which the description of the pod must have been prepared (and hence best regarded as the actual type), are both *A. drepanolobus*. Against the fruiting specimen Gray wrote in pencil, "Not identified. May keep the name," but in the twelve years which elapsed between his study of the type of *A. diaphanus* and his reduction of it to *A. lentiginosus*, his analysis of the elements seems to have been forgotten. In the Gray Herbarium there are preserved two fragments under the name *A. diaphanus*, one being half of a pod from the Douglas collection, the other a small fruiting branch taken from the Burke gathering mentioned above. It seems evident that Gray's concept of *A. diaphanus* had gradually been transferred from the fruiting to the flowering element of the type-sheet, and thence to the quite different material from Oregon, thereby eliminating the essential *A. diaphanus* in favor of *A. lentiginosus*.

ASTRAGALUS LENTIGINOSUS var. CUSPIDOCARPUS Jones. Cf. *A. cuspidocarpus*.

ASTRAGALUS LENTIGINOSUS var. DIAPHANUS Jones. Cf. *A. diaphanus*.

ASTRAGALUS PEIRSONII Munz & McBurney, Bull. S. Calif. Acad. Sci. 31:67 (1932). This species, like *A. bajaensis* above, was described as an ally of *A. Coulteri* Bth., on the supposition that the pod was bilocular. In reality the septum is lacking, and the affinities of the species lie with the series *Candidissimæ* of Rydberg's *Phaca*. Jones (Contrib. W. Bot. 18:37,—1933) reduced *A. Peirsonii* to *A. Coulteri*, although it does not closely resemble that species even superficially.

ASTRAGALUS PLATYTROPIS Gray, Proc. Amer. Acad. 6:526 (1865). *Cystium platytrope* (Gray) Rydb., Bull. Torr. Bot. Club 40:50 (1913). This species was described as a relative of *A. lentiginosus*, and was referred by Rydberg to *Cystium*, although Jones had already suggested that its true place in the genus was elsewhere. In a previous note (Proc. Calif. Acad. Sci. IV, 25:166,—1944) I have attempted to show that it differs from the rest of § *Diplocystium* in several important morphological particulars, and have proposed for it a separate section, § *Orocystium*.

ASTRAGALUS ROTHROCKII Sheld., *Minn. Bot. Stud.* 1:174 (1894). At one period Jones (*Proc. Calif. Acad. Sci.* II, 5:673,—1895) reduced this species to *A. MacDougalii* Sheld., but later (*Rev. Astrag.* 156,—1923) recognized its true relationship to *A. prælongus* Sheld., from which it appears at best to be not more than varietally distinct.

CYSTIUM BOISEANUM (A. Nels.) Rydb. Cf. *Astragalus boiseanus*.

CYSTIUM PLATYTROPE (Gray) Rydb. Cf. *Astragalus platytropis*.

### INDEX TO SYNONYMY

(New names appear in **bold-face** type, synonyms in *italic* type. Numbers correspond with the numbered varieties of *A. lentiginosus*, those in bold-face type referring to the essential entry in the text. ES stands for Excluded Species.)

- |                                     |   |
|-------------------------------------|---|
| Astragalus                          | <i>lentiginosus</i> 1, 6, 8, 11, 16.        |
| <i>agninus</i> 34.                  | var. <i>albifolius</i> 9.                   |
| <i>albifolius</i> 9.                | var. <b>antonius</b> 13.                    |
| <i>amplexus</i> 36.                 | var. <b>araneosus</b> 22.                   |
| <i>araneosus</i> 16, 20, 22.        | var. <b>australis</b> 25.                   |
| <i>Arthu-Schottii</i> 30, 34.       | var. <i>borreganus</i> 34.                  |
| <i>bajaensis</i> ES.                | var. <i>cæsariatus</i> 32.                  |
| <i>boiseanus</i> ES.                | var. <i>carinatus</i> 2.                    |
| <i>Bryantii</i> ES.                 | var. <b>charlestonensis</b> 14.             |
| <i>Coulteri</i> 7, 29, 30, 33.      | var. <i>chartaceus</i> 21.                  |
| var. <i>Fremontii</i> 7.            | var. <i>cornutus</i> 16.                    |
| <i>cuspidocarpus</i> 2, 16, ES.     | var. <i>Coulteri</i> 7, 30, 33.             |
| <i>diaphanus</i> ES.                | var. <i>cuspidocarpus</i> 2, 16, 18, ES.    |
| <i>diphysus</i> 5, 17, 23, 26.      | var. <i>diaphanus</i> ES.                   |
| var. <i>albiflorus</i> 23.          | var. <i>diphysus</i> 16, 21, 22, 23.        |
| var. <i>latus</i> 20.               | var. <i>floribundus</i> 5, 8, 11.           |
| <i>drepanolobus</i> ES.             | var. <i>Fremontii</i> 6, 7, 11, 13, 30, 31. |
| <i>eremicus</i> 7.                  | var. <i>idriensis</i> 18.                   |
| <i>Fremontii</i> 7, 11, 19, 29, 31. | var. <i>ineptus</i> 5, 8, 11.               |
| subsp. <i>eremicus</i> 7.           | var. <b>Kennedyi</b> 28.                    |
| var. <i>yuccanus</i> 26.            | var. <b>kernensis</b> 15.                   |
| <i>heliophilus</i> 5.               | var. <i>latus</i> 5, 15, 20.                |
| <i>idriensis</i> 18, 19.            | var. <i>MacDougalii</i> 23.                 |
| <i>ineptus</i> 5, 11, 16.           | var. <i>macrolobus</i> 6.                   |
| <i>kernensis</i> 15.                | var. <b>maricopæ</b> 40.                    |
| subsp. <b>charlestonensis</b> 14.   | var. <i>mokiensis</i> 35, 38.               |
| <i>latus</i> 20.                    | var. <i>nigricalycis</i> 19, 31.            |

- var. *oropedii* 37.  
 var. *palans* 22, 25, 36.  
 var. *platyphyllidius* 16.  
 var. *salinus* 5.  
 var. *scorpionis* 1, 3.  
 var. *semotus* 10.  
 var. *sesquimetalis* 24.  
 var. *sierræ* 12, 19.  
 var. *stramineus* 29.  
 var. *tehatchapiensis* 19.  
 var. *toyabensis* 17.  
 var. *tremuletorum* 4.  
 var. *typicus* 1.  
 var. *ursinus* 35.  
 var. *variabilis* 30.  
 var. *vitreus* 27.  
 var. *Wilsonii* 39.  
 var. *yuccanus* 26.  
*MacDougali* 23.  
*Merrillii* 16.  
*missouriensis*  
   var. *cuspidocarpus* ES  
*mokiensis* 38.  
*nigricalycis* 31.  
*palans* 36.  
   var. *araneosus* 22, 36.  
*Peirsonii* ES.  
*platytropis* ES.  
*Rothrockii* ES.  
*salinus* 5.  
*sierræ* 12.  
*tehatchapiensis* 19.  
*ursinus* 35.  
*Wilsonii* 39.  
*yuccanus* 26.  
*Cystium*  
   *agninum* 34.  
   *albifolium* 9.  
   *araneosum* 22.  
   *Arthu-Schottii* 30, 34.  
   *boiseanum* ES.  
   *cornutum* 2, 16.  
   *Coulteri* 29, 33.  
   *diphysum* 22, 23.  
   *eremicum* 7.  
   *floribundum* 8.  
   *Fremontii* 7.  
   *griseolum* 7.  
   *heliophilum* 5.  
   *idriense* 18.  
   *ineptum* 5, 11.  
   *Kennedyi* 28.  
   *kernense* 15.  
   *latum* 20.  
   *lentiginosum* 1, 2.  
   *MacDougali* 23.  
   *macrolobum* 6.  
   *Merrillii* 16.  
   *nigricalyce* 31.  
   *ormsbyense* 8.  
   *pardalotum* 30.  
   *platyphyllidium* 16, 17.  
   *platytrope* ES.  
   *salinum* 1, 5, 21.  
   *scorpionis* 3.  
   *sesquimetræle* 24.  
   *sierræ* 12.  
   *stramineum* 29.  
   *tehatchapiense* 19.  
   *vulpinum* 6.  
   *yuccanum* 26.  
*Hamosa*  
   *amplexa* 36.  
*Phaca*  
   *inepta* 5, 11.  
   *lentiginosa* 1.  
*Tium*  
   *amplexum* 36.  
   *mokiense* 38.  
   *palans* 36.  
   *ursinum* 35.  
   *Wilsonii* 39.  
*Tragacantha*  
   *Coulteri* 33.  
   *diphysa* 23.  
   *lentiginosa* 1.

FIGURES OF *ASTRAGALUS LENTIGINOSUS*

(Leaves and racemes x ½. Pods, flowers, and sections x 1)

## PLATE I

Fig. 1—5. Var. *typicus* Barneby. 1, leaf and raceme; 2 and 3, vertical section of pod; 4, cross section of pod; 5, flower.

Fig. 6—12. Var. *carinatus* Jones. 6, leaf and raceme; 7, vertical section of pod; 8, cross section; 9, pod; 10 and 11, flowers; 12, leaflet. All from the type except figures 9 and 10.

Fig. 13—17. Var. *tremuletorum* Barneby. 13, leaf and raceme; 14 and 17, vertical section of pod; 15, cross section; 16, flower. All from the type except figure 17.

Fig. 18—24. Var. *scorpionis* Jones. 18 and 19, leaf and raceme; 20 and 22, vertical section of pod; 21 and 24, flowers; 23, stipules x 1½. Figures 18 and 24 from the type.

Fig. 25—29. Var. *albifolius* Jones. 25, leaf and raceme; 26, pod; 27, vertical section of pod; 28, cross section; 29, flower (from type).

Fig. 30—36. Var. *floribundus* Gray. 30, leaf and raceme; 31 and 34, flowers; 32, leaf; 33, pod; 35, vertical section of pod; 36, cross section. Figures 35 and 36 from the type; figures 33 and 34 from the type of *Cystium ormsbyense*.

Fig. 37—41. Var. *macrolobus* (Rydb.) Barneby. 37, leaf and raceme; 38, vertical section of pod; 39, cross section; 40, flower (from type of *Cystium vulpinum*); 41, flower (from type of *C. macrolobum*).

Fig. 42—45. Var. *salinus* (Howell) Barneby. 42, leaf and raceme; 43, section of pod; 44 and 45, flowers.

Fig. 46—50. Var. *Fremontii* (Gray) Wats. 46 and 47, leaf and raceme; 48, vertical section of pod; 49 and 50, flowers. Figure 50 from the type of *C. griseolum*.

## PLATE II

Fig. 1—4. Var. *inceptus* (Gray) Jones. 1, leaf and raceme; 2, vertical section of pod; 3, cross section; 4, flower.

Fig. 5 and 6. Var. *semotus* Jeps. 5, leaf and raceme; 6, flower.

Fig. 7—9. Var. *antonius* Barneby. 7, leaf and raceme; 8, vertical section of pod; 9, flower. All from the type.

Fig. 10—12. Var. *sierræ* Jones. 10, leaf and raceme; 11, vertical section of pod; 12, flower. All from the type.

Fig. 13—15. Var. *charlestonensis* (Clokey) Barneby. 13, leaf and raceme; 14, vertical section of pod; 15, flower. All from the type.

Fig. 16—18. Var. *kernensis* (Jeps.) Barneby. 16, leaf and raceme; 17, vertical section of pod; 18, flower.

Fig. 19—23. Var. *idriensis* Jones. 19, leaf and raceme; 20, pod; 21, cross section; 22, flower; 23, vertical section of pod. All from the type except figure 23.

Fig. 24—29. Var. *tehachapiensis* (Rydb.) Barneby. 24, leaf and raceme; 25, vertical section of pod; 26, pod; 27, cross section of pod; 28 and 29, flowers. Figure 29 from the type.

Fig. 30—34. Var. *latus* Jones. 30, leaf and raceme; 31, vertical section of pod; 32, cross section of pod; 33, pod; 34, flower. All from the type except figure 33.

Fig. 35. Var. *chartaceus* Jones. 35, vertical section of pod (from the type).

Fig. 36—38. Var. *sesquimetralsis* (Rydb.) Barneby. 36, leaf and raceme; 37, vertical section of pod; 38, flower. All from the type.

Fig. 39—46. Var. *platyphyllidius* (Rydb.) Peck. 39, leaf and raceme; 40—42, vertical section of pod; 43 and 44, flowers; 45 and 46, calyx. Figures 39 and 45 from the type; figures 40 and 43 from the type of *Cystium cornutum*; figures 41 and 44 from the type of *C. Merrillii*.

(Explanation of Plates III and IV on page 147.)

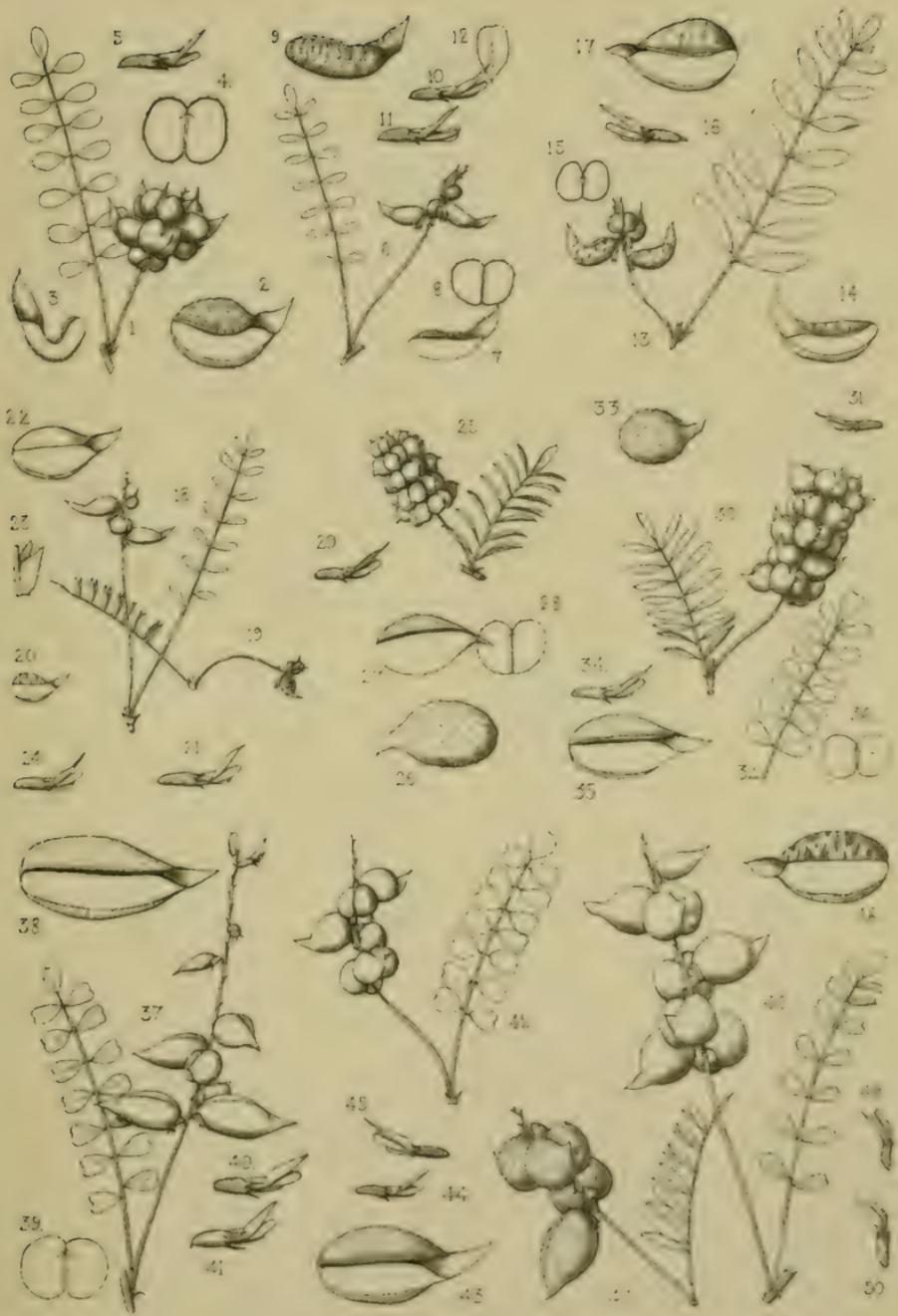


PLATE I.

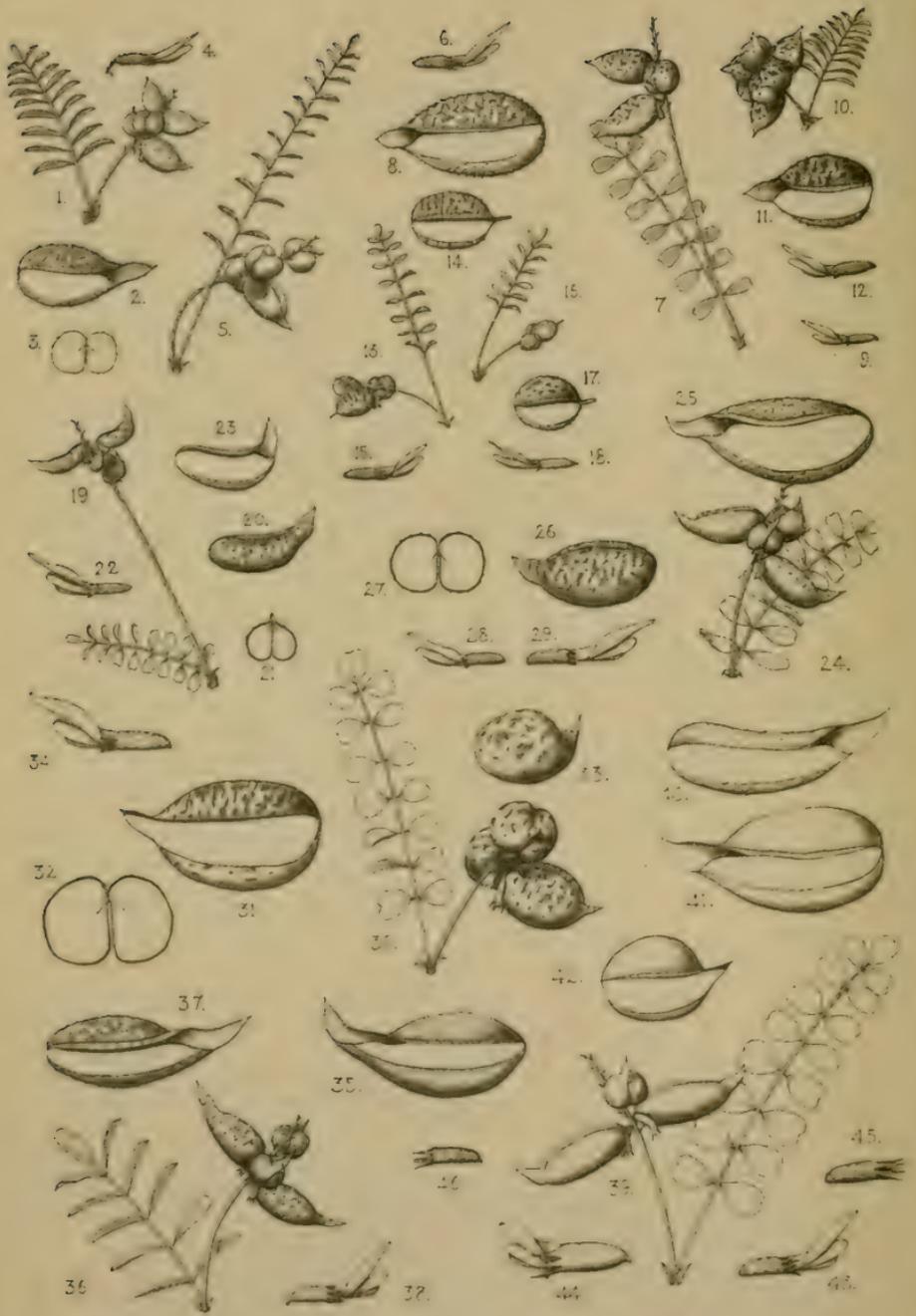


PLATE II

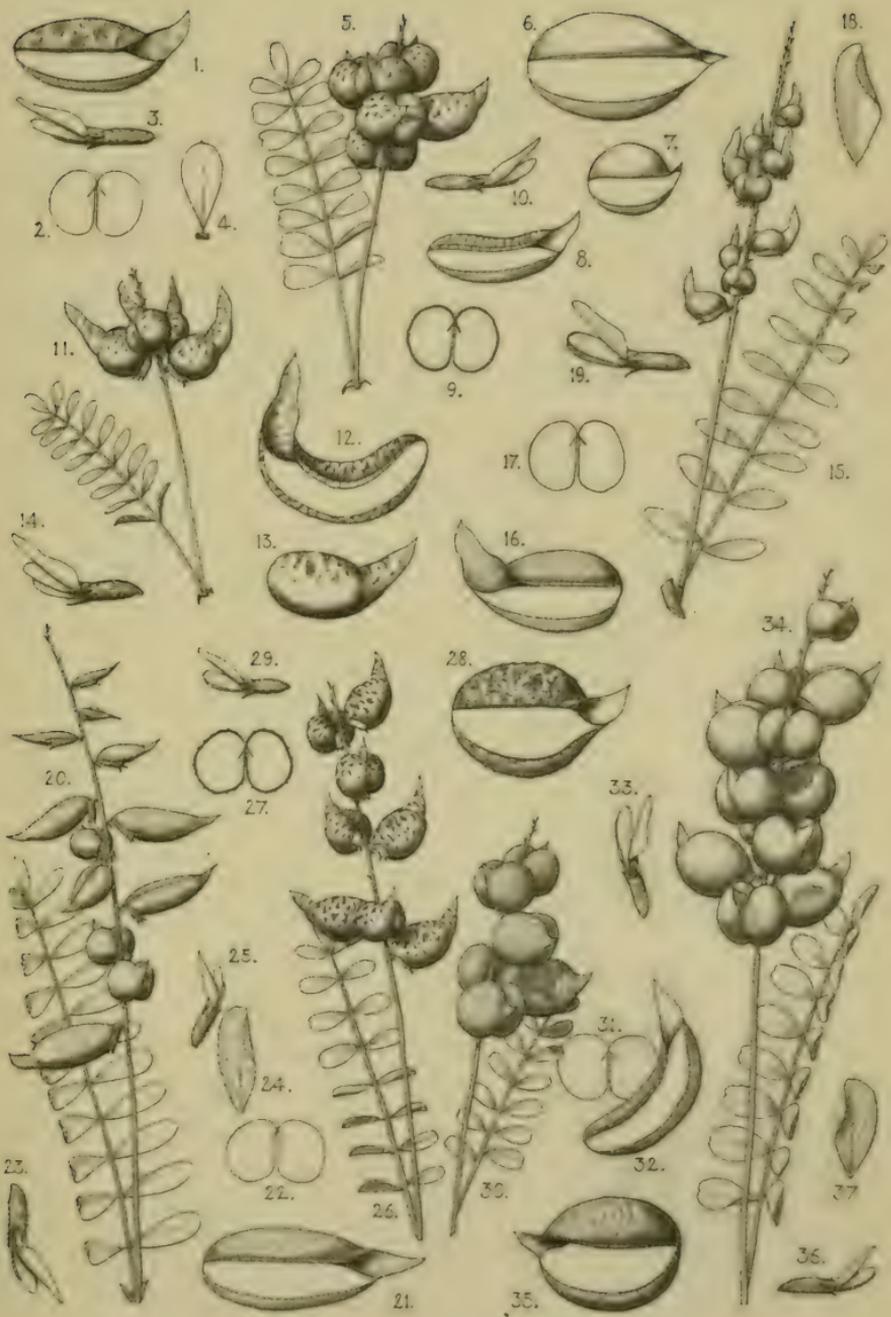


PLATE III.

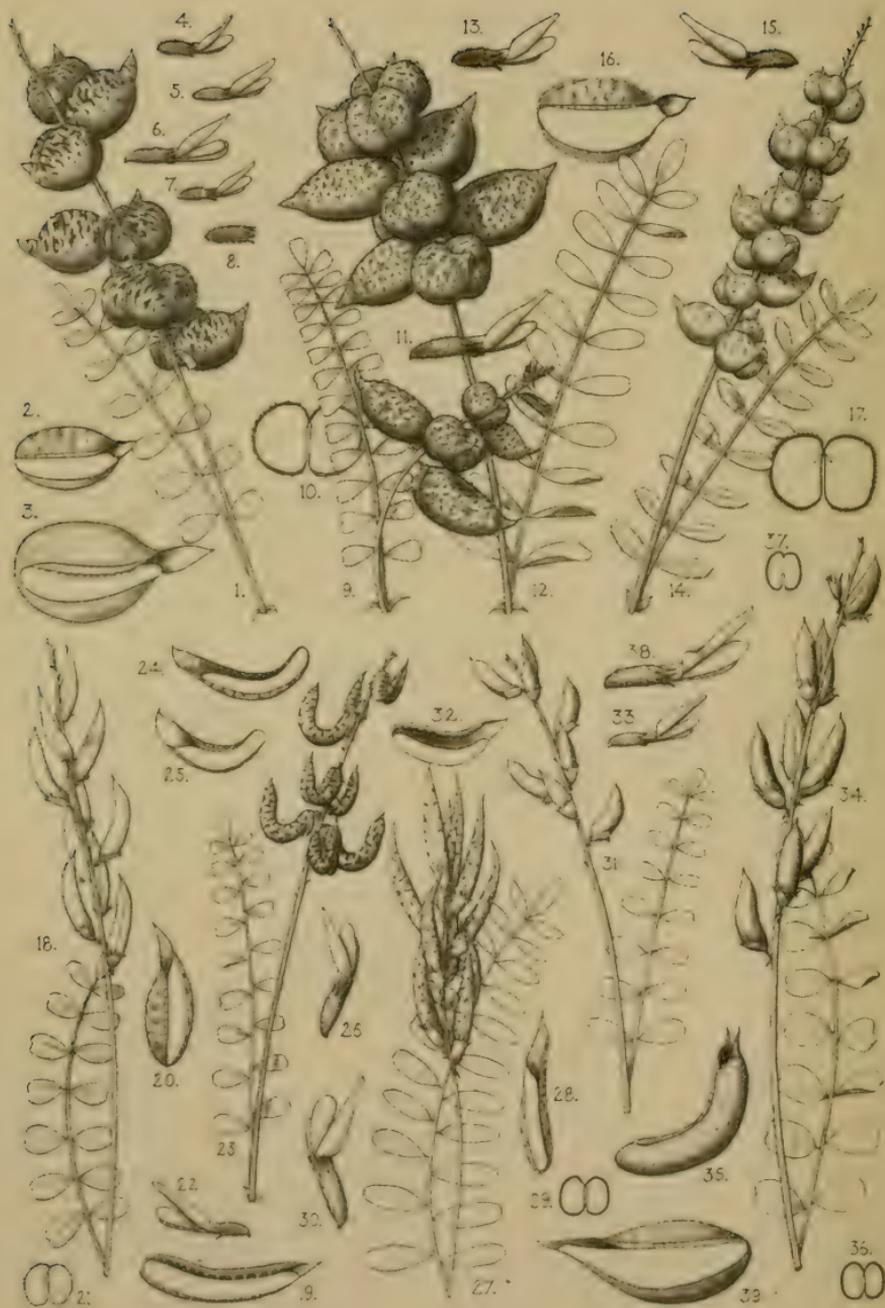


PLATE IV.

## FIGURES OF ASTRAGALUS LENTIGINOSUS

(Leaves and racemes x  $\frac{1}{2}$ . Pods, flowers, and sections x 1)

## PLATE III

Fig. 1—4. Var. *toyabensis* Barneby. 1, vertical section of pod ; 2, cross section ; 3, flower ; 4, leaflet. All from the type.

Fig. 5—10. Var. *diphysus* (Gray) Jones. 5, leaf and raceme ; 6—8, vertical section of pod ; 9, cross section of pod ; 10, flower. Figures 5 and 10 from the type.

Fig. 11—14. Var. *araneosus* (Sheld.) Barneby. 11, leaf and raceme (from the type) ; 12, vertical section of pod ; 13, pod ; 14, flower.

Fig. 15—19. Var. *australis* Barneby. 15, leaf and raceme ; 16, vertical section of pod ; 17, cross section ; 18, leaflet ; 19, flower. Figures 16 and 17 from the type.

Fig. 20—25. Var. *Kennedyi* (Rydb.) Barneby. 20, leaf and raceme ; 21, vertical section of pod ; 22, cross section ; 23 and 25, flower ; 24, lower surface of leaflet. All from type except figures 20 and 25.

Fig. 26—29. Var. *stramineus* (Rydb.) Barneby. 26, leaf and raceme ; 27, cross section of pod ; 28, pod (from the type) ; 29, flower.

Fig. 30—33. Var. *vitreus* Barneby. 30, leaf and raceme ; 31, cross section of pod ; 32, pod ; 33, flower. Figures 30 and 31 from the type.

Fig. 34—37. Var. *yuccanus* Jones. 34, leaf and raceme (from the type) ; 35, pod ; 36, flower ; 37, lower surface of leaflet.

## PLATE IV

Fig. 1—8. Var. *variabilis* Barneby. 1, leaf and raceme ; 2 and 3, vertical section of pod ; 4—7, flowers ; 8, calyx. Figure 1 from the type ; figure 5 from the type of *Cystium pardalotum*.

Fig. 9—11. Var. *cæsariatus* Barneby. 9, leaf and raceme ; 10, cross section of pod ; 11, flower. All from the type.

Fig. 12 and 13. Var. *nigricalycis* Jones. 12, leaf and raceme ; 13, flower (from the type).

Fig. 14—17. Var. *Coulteri* (Bth.) Jones. 14, leaf and raceme ; 15, flower ; 16, vertical section of pod ; 17, cross section.

Fig. 18—22. Var. *borreganus* Jones. 18, leaf and raceme ; 19 and 20, vertical section of pod ; 21, cross section ; 22, flower. Figure 19 from the type of *A. agninus* ; figure 22 from the type of *A. Arthu-Schottii*.

Fig. 23—26. Var. *palans* (Jones) Jones. 23, leaf and raceme ; 24 and 25, vertical section of pod ; 26, flower. Figures 23 and 26 from the type.

Fig. 27—30. Var. *Wilsonii* (Greene) Barneby. 27, leaf and raceme ; 28, vertical section of pod ; 29, cross section ; 30, flower. All from the type except figure 27.

Fig. 31—33. Var. *ursinus* (Gray) Barneby. 31, leaf and raceme ; 32, vertical section of pod ; 33, flower. All from the type.

Fig. 34—39. Var. *mokiaccensis* (Gray) Jones. 34, leaf and raceme ; 35, pod ; 36 and 37, cross section ; 38, flower (from the type) ; 39, vertical section of pod.

## NEW WESTERN PLANTS—VI

BY ALICE EASTWOOD

Some time before his death, A. A. Heller sent to the Herbarium of the California Academy of Sciences two manzanitas to which he had given specific names which he had planned to publish in this journal. One of these from Amador County I have taken the liberty of naming in his honor; the other retains the characteristic specific name on his label.

**Arctostaphylos Helleri** Eastwood, spec. nov. Procumbens (?), omnino glabra, ramis gracilibus; foliis oblongis vel suborbiculatis, circa 15 mm. longis, 8—10 mm. latis, apice acutis obtusisve et mucronatis, basi obtusis; petiolis gracilibus, 3—4 mm. longis; floribus roseis, in racemis vel paniculis parce ramosis, pedicellis erectis, circa 2 mm. longis; bracteis subulatis, minutis, circa 1 mm. longis; sepalis 5, orbiculatis, minute ciliatis, circa 0.75 mm. diametro; corolla circa 3 mm. longa; staminibus 5 mm. longis, antheris et filamentis æquilongis, lata basi filamentorum ciliata; ovario glabro, 1 mm. longo; fructu ignoto.

Type: Herb. Calif. Acad. Sci. No. 300047, collected by A. A. Heller, No. 15859, Jan. 29, 1941, about three miles southeast of Ione, Amador County, California, in a very dense growth of other manzanitas, especially *A. viscida* Parry. It is related to the group which includes *A. Hookeri* G. Don, *A. franciscana* Eastwood, and *A. densiflora* M. S. Baker. The flowers are smaller than those of any other species of this genus. The leaves are dull and rather thick. Without the fruit it cannot be definitely placed in this small group and its habit is uncertain.

**Arctostaphylos laxiflora** Heller, spec. nov. Erecta, divaricate ramosa, glabra; foliis oblongis vel orbiculatis apice obtusis et mucronulatis vel paulum emarginatis, pallido-viridibus vix glaucis, maximis 40 mm. longis, 30 mm. latis, basi obtusis, petiolis circa 1 cm. longis; floribus roseis in paniculis laxifloris glabris, divaricate ramosis, ramis aliquis 1 dm. longis; pedicellis filiformibus, 2—4 mm. longis; bracteis ovatis acuminatis brevioribus pedicellis; sepalis orbiculatis glabris, circa 2 mm. diametro; corolla circa 9 mm. longa; antheris circa 1 mm. longis, brevioribus filamentis et cornibus, basi lata filamentorum villosa; ovario glabro; fructu ignoto.

Type: Herb. Calif. Acad. Sci. No. 279926, collected by A. A. Heller, No. 15493, February 6, 1940, east of Paradise, Butte County, California, on Neal Road near the junction of the first road east of the Bille Road, at an old sawmill site in the Transition Life Zone. This belongs near *A. Manzanita* Parry of which it

may be a variation. It differs in the smooth pale green leaves and the laxly flowered, long-branched, smooth panicles.

**Arctostaphylos nitens** Eastwood, spec. nov. Fruticosa, divaricate ramosa; caulibus senioribus glabris, fuliginosis asperisque, caulibus junioribus glanduloso-villosis; foliis viridissimis, oblongis vel oblongo-ovatis, apice acutis, basi obtusis truncatisve, maximis circa 3 cm. longis, 10—12 mm. latis, coriaceis, supra nitentibus et minute reticulatis, infra leviter et minute glanduloso-puberulis, petiolis circa 5 mm. longis, planis, costatis, glanduloso-puberulis et leviter glanduloso-villosis; paniculis nutantibus, subsessilibus; bracteis foliaceis, nitentibus, aliquando puberulis et villosis, lineari-lanceolatis, infimis 15 mm. longis, longioribus supremis, pedicellis glabris, brevioribus bracteis; sepalis orbiculatis glabris; corollis 7 mm. longis, pallide roseis vel albis; ovario leviter villoso.

Type: Herb. Calif. Acad. Sci. No. 315577, collected April 9, 1941, along the roadbank near top of hill south of bridge over Chetco River, Curry County in the southwest corner of Oregon, by Milo S. Baker, No. 9938.

This manzanita is at once noticeable among the foliaceous-bracted group by the glossy very green leaves which become brittle when dry. The reticulation is fine and conspicuous. In old leaves it is even somewhat rugose on the upper surface. The lower surface appears smooth with the glandular indument apparent under a lens. The bark surface of old branches is not smooth and glossy as is general in this genus but is rough but not shreddy and in color a dull blackish-brown. The glandular hairs and underlying puberulence are more or less evident on the young stems, petioles, and inflorescence. In my key to the genus (Leaf. West. Bot. 1: 108—113), this species comes next to *A. intricata* Howell from which it differs in the bright green and glossy leaves, the flowers 7 mm. long, and the indument glandular-puberulent and somewhat glandular-hairy.

**Lupinus Noldekæ** Eastwood, spec. nov. Caules perennes, supra ramosi, graciles, tenuiter adpresse sericei; foliolis 5 vel 6, linearibus, conduplicatis, maximis circa 3 cm. longis, 1—2 mm. latis, acutis tenuiter adpresse sericeis; petiolis gracilibus æquilongis vel paululum longioribus foliolis; stipulis discretis, attenuatis, 2—3 mm. longis; racemis superantibus folia et longioribus pedunculis, laxe et subverticillate floridis; bracteis plerumque persistentibus, æquilongis pedicellis, gracilibus, attenuatis; floribus circa 11—13 mm. longis, albis; tubo calycis 3 mm. longo, 2 mm. lato, calcare 2 mm. longo, labio inferiore deltoideo, obtuso, 3 mm. longo, circa 2 mm. lato, labio superiore 1 mm. longo latoque, truncato sed dentibus duobus separatis; vexillo albo, brunneo-maculato, obovato, 10 mm. lato, 13 mm. longo, dorso sericeo, reflexo; alis sericeis prope apicem; carina ciliata, tecta alis.

Type: Herb. Calif. Acad. Sci. No. 280932, collected July, 1938, by Anita Noldeke, near Hot Creek, Mono County, California. Miss Noldeke notes that the flowers are "very fragrant and delicate."

This dainty white-flowered lupine is related to *L. calcaratus* Kellogg by the shape and color of the flower, but in this the flower is more slender and the inflorescence more open. The very narrow leaflets, slender branching habit, and denser indument mark it as distinct. The Herbarium of the California Academy of Sciences is indebted to Miss Noldeke for many specimens from that little-known region of Mono County. It is a pleasure to name this lupine in her honor.

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## STUDIES IN PHACELIA—IV

BY JOHN THOMAS HOWELL

CONCERNING THE TYPE LOCALITY OF PHACELIA LEIBERGII. One of the species in *Phacelia* sect. *Microgenetes* that has not been generally accepted is *P. Leibergii* Brand (Das Pflanzenr. IV. 251 : 128) but in my revisional study of the section I have found it to represent a distinct specific unit intermediate between *P. bicolor* Torr. and *P. glandulifera* Piper. From an excellent series of specimens loaned to me by Prof. M. E. Peck I was able to work out the distribution of the species as it occurs in central and middle eastern Oregon but I was puzzled by the collection data accompanying the type specimen which was loaned to me from Rocky Mountain Herbarium by Prof. C. L. Porter. The type, *Leiberg No. 321*, as well as numerous isotypes, is labelled as follows: "Plain bet. [between] Pineville and Bear Buttes, 1110 m.," Washington, June 25, 1894, but neither Pineville nor Bear Buttes could be located in that state in an attempt to fix the region of the type locality. The puzzle resolved itself at last when I recently borrowed, through Dr. J. M. Greenman, the Missouri Botanical Garden specimens in sect. *Microgenetes*. Among the specimens of *P. Leibergii* is one collected by Leiberg on June 25, 1894, on "Sandy plains, alt. 1110 m., between Prineville and Bear Butte, Crook County, Oregon." Without doubt this specimen is part of the type collection and furnishes the correct data. Another specimen which is probably part of the type collection of *P. Leibergii*

is in the Washington State College Herbarium loaned to me by Prof. Marion Ownbey, but in this there is a slight variation in the data which read: "Pumice desert south of Prineville, June, 1894." From those two specimens it seems clearly evident that the type collection of *P. Leibergii* was not made in Washington as originally stated (Brand, l. c.) but rather in central Oregon not far distant from stations where Prof. Peck has more recently collected the species.

**SOME CIRCUMSTANTIAL EVIDENCE.** A collection of *Phacelia bicolor* Torr. reputedly made by J. G. Lemmon and wife in 1884 at Fort Mohave, Arizona, has been the basis for tentatively including the species in the flora of that state (Kearney and Peebles, Flow. Pl. and Ferns Ariz., p. 734). In my study of *Phacelia* sect. *Microgenetes* I have examined specimens of this collection in the University of California Herbarium and in the United States National Herbarium and, from a detail of the latter, it seems to me quite evident that the plant did not come from Arizona. An extraneous leaf which adheres to the base of the right hand plant of the specimen in the United States National Herbarium and which was obviously pressed when the *Phacelia* was pressed is the leaf of *Purshia tridentata* (Pursh) DC. If the inference is correct that this leaf and the phacelia came from the same place, then the phacelia did not come from Fort Mohave. Although *Purshia* is known in the Arizona mountains farther east, it is as certain that the phacelia did not come from the mountains of Arizona as it is certain that the purshia did not grow in the Sonoran desert along the lower Colorado River. Also it is quite unlikely that the collection was made in the Mohave Desert as has been suggested by Kearney and Peebles (l. c.) because in this Lemmon collection the filaments are puberulent while in all collections that I have examined from the Mohave Desert the filaments are glabrous. Moreover the purshia in the Mohave region is *Purshia glandulosa* Curran, a species with glandular-pitted leaves that are quite different from the leaf adhering to the plant of *Phacelia bicolor*. Rather, there is every reason to believe that this collection of *Phacelia bicolor* including the purshia leaf was made in northeastern California or northwestern Nevada where both it and *Purshia* are known to grow and where Lemmon collected abundantly.

**SOME DISTRIBUTIONAL NOTES.** Among many hundreds of

specimens that I have examined during the past year in my revisional study of *Phacelia* sect. *Microgenetes*, about eight collections seem to represent records of species in states of the United States and Mexico from which the species have not been reported in the literature. These are listed briefly as follows:

*PHACELIA AFFINIS* Gray. Heretofore known from Lower California, California, Nevada, Arizona, and Utah, this species may now be reported from New Mexico: Peloncillo Mts., Hidalgo County, *Ripley & Barneby No. 4218a* (CAS\*).

*PHACELIA GLANDULIFERA* Piper. The only collections of this species that I have seen from Wyoming (where it has been confused with *P. Ivesiana* Torr.) are two specimens collected by Prof. Aven Nelson well over forty years ago: Point of Rocks, Sweetwater County, *A. Nelson in 1898* (RM); Granger, Sweetwater County, *A. Nelson No. 4696* (M). Although *P. glandulifera* is very common in southern Idaho and northern Nevada, no specimen of it has been seen from Utah.

*PHACELIA IVESIANA* Torr. All specimens that I have seen from Idaho that have been referred to this species have proved to be *P. glandulifera* Piper except one: 13 miles west of Glenn's Ferry, Elmore County, *Davis No. 1939* in part (UI). The other part of the collection is *P. glandulifera*.

I cannot find that *P. Ivesiana* has been reported from New Mexico but it may be recorded from that state on the basis of the following collection: Ojo Caliente, about 13 miles southwest of Zuñi Pueblo, McKinley County, *Hodge in 1919* (US).

*PHACELIA NEGLECTA* M. E. Jones. Heretofore this species has been reported from Lower California as *P. pachyphylla* Gray, a Californian species which to the present is not known south of the international boundary. The Lower Californian collection of *P. neglecta* is *Orcutt No. 2035* from west of Indian Wells (US). No collection of *P. neglecta* has been seen from Sonora, Mexico, but it must grow there since the species has been collected in the Organ Pipe Cactus National Monument in Arizona less than a mile north of the international boundary: 1 mile north of Sonoyta, Pima County, *McDougall No. 93* (UA).

\* The following symbols indicate the institutions where specimens herein cited have been seen: CAS, California Academy of Sciences; M, Missouri Botanical Garden; RM, Rocky Mountain Herbarium, University of Wyoming; UA, University of Arizona; UI, University of Idaho, Southern Branch; US, United States National Herbarium.

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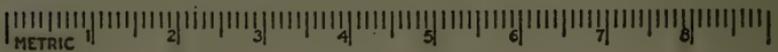
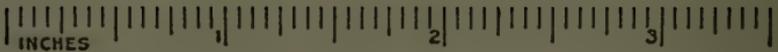
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THE WILD FLOWER GARDENS OF SAN FRANCISCO  
IN THE 1890'S

BY ALICE EASTWOOD

In Dr. Behr's reminiscences of the San Francisco flora, published in the second volume of *Zoe* in 1891 and dating back to the early 1850's, several species were listed that had disappeared by 1892. In that year in the same volume of *Zoe*, Katharine Brandegee published a list of species collected in 1892 in San Francisco by members of the California Botanical Club which had been founded the preceding year. This list numbered 585 species of flowering plants, ferns, and fern allies. Those recorded by Dr. Behr and no longer to be found were marked by an asterisk. They were the small unidentified pines on Lone Mountain; the box-elder, *Acer californicum*; California laurel, *Umbellularia californica*; marestalk, *Hippuris vulgaris*; large-flowered dogwood, *Cornus Nuttallii*; buck-bean, *Menyanthes trifoliata*; pitcher sage, *Sphacele calycina*; stream orchis, *Epipactis gigantea*; cotton grass, *Eriophorum gracile*; grape-fern, *Botrychium* sp.; lady-fern, *Asplenium Filix-fœmina* (*Athyrium*).<sup>1</sup> *Alsine palustris* (*Arenaria paludicola* Rob.), named by Dr. Kellogg in 1862, was also listed as probably extinct. However, the record of a specimen in the Gray Herbarium collected by Henry N. Bolander led to its rediscovery in a marshy place near Fort Point now covered with army barracks and before that by an airfield. The specimen in the California Academy of Sciences that I collected there in 1899 was destroyed in the 1906 disaster but a duplicate was preserved in the herbarium of Miss Evelina Cannon to whom I often gave duplicates. Her herbarium was presented to the academy after the great fire by her niece, Miss Carrington, and in it are her specimens collected in San Francisco in the 1890's.

In the 1890's, the open country everywhere around San Francisco was a beautiful wild flower garden in the spring. In the region near Lake Merced the wild flowers were so thick that it was impossible to avoid stepping on them. There were California poppies, nemophilas, violets, cream-cups, owls-clover, mouse-ear

<sup>1</sup> These plants were collected near the Russ Garden, along the border of extensive marshes. The garden was owned by the Russ family and was situated on the south corner of Sixth and Harrison streets. It was opened in 1853 as a popular resort where many nationalities gathered on Sundays and danced.

chickweed, Indian paintbrush, clovers, etc. The yellow violet, *Viola pedunculata*, was especially common, known to the children as Johnny-jump-up. Today, new roads, golf links, vegetable fields, and human habitations have driven them away and it is doubtful if a single native flower persists. A solitary madrone grew in a gulch leading to the lake, the sides of which were covered with dense chaparral. *Ceanothus incanus* formed a thicket together with hazel, manzanitas, low oaks, and other shrubs. Climbing over them was the Dutchman's-pipe, *Aristolochia californica*.

The Bay View Hills near South San Francisco was the home of some flowers not found elsewhere in the city. These were the climbing nemophila, *Nemophila aurita*; the white flax-flowered gilia, *Linanthus liniflorus*; islay cherry, *Prunus ilicifolia*; the tall larkspur, *Delphinium californicum*; the stinging phacelia, *Phacelia malvaefolia*. On the rocky summit, now known as Bay View Park, were rock cress, *Arabis blepharophylla*; the downy-leaved paintbrush, *Castilleja foliolosa*; pennyroyal, *Monardella villosa*, and later, several composites and eriogonums. In the meadow below was a garden similar to that at Lake Merced. In some places near Visitacion Valley the ground was white with the pelican-flower, *Orthocarpus versicolor*, and in other places the areas were pink-tinged from owls-clover, *Orthocarpus densiflorus*. These common names were given to these flowers by Dr. Kellogg, the latter because each flower formed the face of an owl. Everywhere golden poppies and amsinckias glorified the landscape.

On the hills back of Ingleside, then known as Sunset Heights, and on the hills rising from the Mission, a great many flowers could be found. The Potrero Hills, too, were then covered with flowers. The white *Fritillaria liliacea* grew there and in a wet place Miss Cannon discovered a long-lost species, *Sanicula maritima*. At Hunters Point, now entirely covered by a housing project, this fritillaria was found a few years ago by Lewis S. Rose, and I found the fragrant *Dodecatheon bernalinum* there in 1916. This was still on Bernal Heights a few years ago.

Twin Peaks still has the low blue-flowered lupine, *Lupinus collinus*, a few clumps of *Iris Douglasiana* and *I. longipetala*, but in the 1890's, the tiny yellow-flowered *Bæria gracilis* monopolized the ground in places and the golden slopes could be seen from the windows of the California Academy of Sciences on Market Street

before the erection of the Emporium building. Some other relics of the 1890's may yet be on those hills. The Mission Bells are occasionally found there, and other species, such as footsteps-of-spring, *Sanicula arctopoides*, other species of the Parsley Family, the pink-flowered *Sidalcea*, and, of course, buttercups, *Ranunculus californicus*, everywhere.

The San Bruno Hills south of Visitacion Valley were noted for the great beds of *Iris longipetala*. Homes are replacing them now. Some plants are still left but unless a tract is preserved by some lover of this beautiful flower, soon all will be gone.

Colma Canyon was a favorite haunt of the Botanical Club. The white sessile-flowered trillium grew there, besides columbine, meadow rue, fringe-cups (*Tellima*), California saxifrage, baby-blue-eyes (*Nemophila insignis*), cream cups (*Platystemon*), bleeding heart (*Dicentra formosa*), and the tiny white-flowered *Meconella*. In some places the sluggish creek was covered with the dainty water-fern, *Azolla*. On the adjacent hills, the hummingbird sage, *Salvia spathacea*, was common. These hills were clothed with native shrubs. Besides the oaks, hazel, and poison oak, there were manzanitas, shad-brush (*Amelanchier*), twin-berry (*Lonicera Ledebourii*), ocean spray (*Holodiscus*), oso-berry (*Osmaronia*), the two thimble berries (*Rubus parviflorus* and *R. spectabilis*), blackberry vines, and other shrubs, but no ceanothus. These may still be there as it is a dairy ranch with no trespassers permitted.

In the early 1890's, the Presidio was as beautiful a wild flower garden as Lake Merced but the pines, cypresses, and eucalyptus have destroyed most of the flowers and any that might have survived have probably been smothered by the fig marigold, *Mesembryanthemum*. In olden times a low form of *Zigadenus Fremontii* whitened the ground, the blue violet as well as the yellow was common, as were also two species of *Orthocarpus* not found in any other part of San Francisco; and a dark red onion and clumps of the blue Douglas iris loved rocky ridges. Besides there were the flowers common elsewhere. However, the yellow-flowered bush lupine, the blue-flowered Chamisso lupine, and the broad clumps of *Ceanothus thyrsiflorus* still hold their own. Not long ago, Lewis S. Rose even added a species of the fern allies known as quillwort, *Isoetes Nuttallii*. This had never

before been found in the San Francisco area and is not a common plant. The wax myrtle too, may yet be growing along Lobos Creek or Mountain Lake.

Another attractive excursion was along the railroad track that once went to Sutro Heights *via* Lands End. Except for the wild currant which was abundant in the spring, this area was better for summer and fall. The pink and yellow sand verbenas, the San Francisco willow-herb, *Angelica Hendersoni*, cow-parsnip (*Heracleum lanatum*), golden rod, lizard leaf (*Eriophyllum*), *Baccharis*, and the heather-leaved *Ericameria*, all were common.

The sands, forming dunes in many places, are still extensive as always, though they too are being replaced by rows and rows of homes. However, the franserias, artemisias, seaside daisies, beach morning glory, cakile, wallflower, gilies, eriogonums, castilleja, and many less conspicuous are still to be found. A survey of these and other unoccupied areas in San Francisco may discover many unsuspected relicts. Open spots amid the trees in Sutro Woods back of the University of California Hospital may shelter some and on the upper slopes of Mt. Davidson a few may still persist.

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### MARIN COUNTY MISCELLANY—III

BY JOHN THOMAS HOWELL

In these days when transportation to more distant places is necessarily so much curtailed, the hills and valleys of Marin County, California, continue to furnish fruitful fields for botanical excursions near home. Trips to Inverness Ridge on Point Reyes Peninsula, to the hills northeast of San Rafael, to the marshes bordering San Francisco Bay, and to Mt. Tamalpais, have disclosed a number of interesting plants, several of which will be noted here. First we shall record the discovery of several alien plants which, although they are perhaps as yet too narrowly established to be admitted to the naturalized flora of California, occur spontaneously and may become increasingly aggressive.

✓   ✓   ✓

STENOTAPHRUM SECUNDATUM (Walt.) Kuntze. I have found St. Augustine Grass, which apparently has not been reported for California heretofore, at two widely separated stations in Marin County: as a sidewalk weed at Fairfax where undoubtedly it has

escaped from cultivation as a lawn grass; and on the ridge west of Mill Valley along the road to Muir Woods. Although it is indigenous to broad subtropical and tropical regions from southeastern United States to Argentina, this distinctive grass was flowering in temperate Marin County, and, from the note communicated by Mrs. M. K. Bellue, California seed-analyst, it may be expected in other parts of California. Mrs. Bellue writes: "We pass on vegetative material of *Stenotaphrum secundatum* for propagation quite frequently and it is now offered in flats extensively in southern California. It has been used in Elysian Park, Los Angeles, since 1918 or before, and it seems to seed at Huntington, Los Angeles County, where it covers acres." Outside of Marin County, I have seen it only in Strawberry Canyon, Alameda County, where a small patch flourishes below the University of California Botanic Garden.

CYPERUS DIFFORMIS L. This sedge, which is a common Old World weed in California rice fields (cf. Leaflet West. Bot. 1: 104, —1934), has been found in a springy spot on the south side of Mt. Tamalpais above Muir Woods. It may be noted that, from the point of view of plant distribution, it is much easier to remark on the migration of this weed from Asia to California over thousands of miles of ocean than to speculate on the conveyance of the plant from the interior valleys of California to an obscure spring on Mt. Tamalpais.

POLYGONUM PATULUM Bieb. *P. Bellardi* Boiss. Fl. Orient. 4: 1034, not Allioni; *P. exsertum* J. T. Howell, Leaflet West. Bot. 1: 38, not Small. Plants of this erect-stemmed knotweed have been found in the salt marshes bordering San Francisco Bay below Kentfield. For many years I realized that the plants which I had reported as *P. exsertum* from other salt marshes in the bay region were misdetermined and I am grateful to Dr. J. F. Brenckle who verified in 1941 my tentative redetermination. I originally reported the plant in California from Solano, Napa, and Santa Clara counties, so it is not surprising that it should turn up in Marin County. The plant is native to the Mediterranean region of the Old World and apparently has not been reported as *P. patulum* for western North America.

LOTUS ULIGINOSUS Schkuhr. This attractive European pea was found growing vigorously on flats between Mill Valley and

the Almonte salt marshes. Concerning it, Mrs. Bellue has sent me an interesting note which she is allowing me to publish here: "Seed of *Lotus uliginosus* has been imported for several years and the plant utilized to a considerable extent for forage. It came through the customs under the names of *L. major* and *L. villosus*, and has been tried out in a number of soil conservation nursery stations. Some seedsmen also carried it." By more conservative European botanists the plant has been called *L. corniculatus* L. var. *major* Ser. or subsp. *uliginosus* Pers., names included in synonymy by Hegi (Fl. Mit.-Eur. IV, 3: 1372).

*Lotus uliginosus* is a showier plant than *L. corniculatus*: Hegi describes the inflorescence as 2- to 5-flowered in the latter and at least 10-flowered in the former. Specimens of *L. corniculatus* have come to us from several stations in California, although for the Pacific states Abrams cites it only from Portland, Oregon (Ill. Fl. 2: 553). The Californian collections of *L. corniculatus* have been seen from Siskiyou County (north of Yreka, *Winblad in 1941*), Solano County (Grizzley Island, *Alexander & Kellogg in 1940*), and Tulare County (near Springfield, *Winblad in 1939*). *Lotus corniculatus* is apparently widespread in the eastern United States but I have seen no reference to the American occurrence of *L. uliginosus*.

VICIA LUTEA L. In May, 1944, this Old World vetch was found locally but abundantly naturalized in the canyon of Salmon Creek by Dr. Hans Leschke and me. Although the corolla is generally yellow, it is sometimes bluish or purplish and in our plant the banner was creamy-white veined with rose. In spite of variation in corolla color the plant is unmistakable because of the peculiar pustulate-based hairs of the legumes. Mrs. Bellue has written that seed of "*V. lutea* is one of the incidental seeds commonly found with the commercial seed of vetch. We usually think of it in imported seed, but it also occurs in domestic. It is probably distributed here where vetch and oats are used for hay." As in the preceding, no American reference has been seen for *V. lutea*, a plant which may well become widely naturalized.

/ / /

QUERCUS DUMOSA NUTT. IN MARIN COUNTY. The discovery of the California Scrub Oak at two stations in Marin County is of more than usual interest because of the rarity of the species in

the Coast Ranges north of San Francisco Bay. Although writers have generally remarked on the abundance of the species in the chaparral belt in southern California, they have not specially noted its occasional occurrence to the northward. Out of 167 collections of *Quercus dumosa* in the herbaria at the University of California and the California Academy of Sciences, only 17 collections were from north of San Francisco Bay and an analysis of this number indicates the Napa-Lake County area as the center of North Coast Range distribution. The numbers of specimens seen from each of the North Coast Range counties are: Lake 8, Napa 4, Marin 2, Sonoma 1, Glenn 1, and Mendocino 1. In Marin County, I found *Quercus dumosa* as small trees in the Tan Bark Oak-Madroño forest on the north side of Mt. Tamalpais above Ross and as shrubs in the chaparral near the head of Black Canyon in the San Rafael Hills.

ARCTOSTAPHYLOS VISCIDA PARRY IN MARIN COUNTY. Of even greater phytogeographic significance than the occurrence of the California Scrub Oak in Marin County is the discovery of the White Manzanita in the San Rafael Hills northeast of San Rafael. Since the nearest locality where it has been reported heretofore is on the east side of Howell Mt. in the Napa Range (cf. Jepson, Fl. Calif. 3:45), this record represents not only a noteworthy extension of range in miles but also a critical floristic occurrence. In the San Rafael Hills, *Arctostaphylos viscida* is associated with other trees and shrubs of the Upper Sonoran Zone not commonly recorded from Marin County, namely, *Quercus dumosa* Nutt., *Q. Douglasii* H. & A., and *Arctostaphylos Manzanita* Parry. While the occurrence of these four plants on the Marin County Peninsula is indicative of the unusual floristic diversity found in this relatively restricted region, the fact that three of the species have not been found on Mt. Tamalpais immediately to the southwest indicates the critical distributional differences frequently found between closely adjacent areas in the county.

A NEW FORM OF ARCTOSTAPHYLOS CUSHINGIANA EASTWOOD. Whereas it may be suspected that geologic rearrangements more than ecologic differences are responsible for the isolated occurrence of *Arctostaphylos viscida* Parry in Marin County in the San Rafael Hills, I should judge from field observations that ecologic conditions alone are responsible for the segregation and

preservation of a form of the Cushing Manzanita in localized situations on Inverness Ridge. There, restricted to abrupt exposed rocky slopes of granitic hogbacks, a low-growing small-leaved form of *A. Cushingiana* is found, a form so different from the usual woodland or chaparral form of the species as to be entirely misleading. But since in these exposed surroundings even the Bishop Pine (*Pinus muricata* D. Don) is dwarfed to a tenth its normal size, it may be presumed that the conditions are too severe for the survival of the erect broad-leaved form of *A. Cushingiana* and that the habitat has "selected" that form which actually thrives under such rigorous conditions. In less exposed situations in the vicinity, the normal form of *A. Cushingiana* grows and between it and the subprostrate dwarf are numerous intermediates in habit and foliage. Although the extreme in variation is very distinctive, it can scarcely be considered more than a form botanically for the reason that it is so closely related to the usual type both geographically and morphologically. It is of interest to speculate on the origin of this form which exhibits a habit so different from that found in the species. The fact that prostrate *A. Uva-ursi* (L.) Spreng. grows less than a mile away suggests the possibility of hybridization<sup>1</sup>; but there is nothing more than the unusual habit to prompt such a thought, for in every other character the subprostrate manzanita seems entirely like *A. Cushingiana*.

The low manzanita with the associated pygmy pine was found in March, 1944, by Dr. Hans Leschke and me near the head of Second Valley west of Inverness as we were making a traverse of Inverness Ridge southward from the Point Reyes Lighthouse Road. It had been known several years earlier from a station to the south near the head of First Valley, where, I believe, it was discovered by Miss Beryl Schreiber. Plants from the latter station have been cultivated successfully by Mr. Louis L. Edmunds as the Huckleberry Manzanita at Danville, Contra Costa County,

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<sup>1</sup> An interesting plant, undoubtedly a hybrid, was found at one of the stations where the subprostrate form of *A. Cushingiana* grew. At this place, the pygmy manzanita was associated with *A. virgata* Eastw. as well as *A. Cushingiana*. The suspected hybrid was low but suberect, about 3 dm. tall, with stems, leaves, and inflorescences densely hirsutulous-glandular (*J. T. Howell No. 20768*). The indument was that of *A. virgata* but the small leaves and the stump-sprouting base corresponded to these features in the low form of *A. Cushingiana*. The little plant was like a pygmy *A. glandulosa* Eastw., a species which, as it occurs typically and extensively on Mt. Tamalpais, might possibly be a long-established hybrid-derivative of *A. virgata* and *A. Cushingiana*, both of which are also typical on the mountain.

and it promises to be valuable horticulturally. In recognition of its distinctive habit, the formal botanical name for the plant can appropriately be *repens*.<sup>2</sup>

## CARTHAMUS IN CALIFORNIA

BY JOHN THOMAS HOWELL

The earliest record of the spontaneous occurrence of a species of *Carthamus* in California is given by Greene in 1897 in *Flora Franciscana*, p. 475, where he reports *C. lanatus* L. (under the generic name *Centrophylum*) from South San Francisco. Besides *C. lanatus*, two other species have been reported as weeds in California: in 1931 I reported the weedy occurrence of *C. tinctorius* L. near Bethany in San Joaquin County (Madroño 2: 22), and, in 1940 Robbins reported the occurrence of *C. nitidus* Boiss. in San Luis Obispo and Tuolumne counties (Univ. Calif. Agric. Exp. Sta. Bull. No. 637, p. 90). The safflower, *C. tinctorius*, is distinct enough with its entire or merely spinulose leaves and no taxonomic problem is concerned with its identity; but the identity of the distaff thistles in California is more critical.

Two rather distinctive types of plants are represented by the California distaff thistles, the one in which the upper leaves and involucre bracts are broad and relatively short, the other in which the leaves and involucre bracts are narrow and elongate. To the former belongs the plant originally collected near San Francisco that was reported as *C. lanatus*, to the latter the plant collected in other California stations that has been generally reported as *C. nitidus*. The San Francisco plant corresponds well with the rather considerable suite of Eurasian specimens of *C. lanatus* in the herbarium of the California Academy of Sciences and the plant is undoubtedly correctly referred to that species. Since no Old World specimens of *C. nitidus* have been available for comparison, the California plant that has been referred to that species has been compared with Boissier's original description (*Fl. Orient.*

<sup>2</sup> *Arctostaphylos Cushingiana* Eastw. fma. *repens* J. T. Howell, fma. nov., a forma typica per caules subprostratos radicanes graciliores et folia minorabundens; haud glandulosa.

Types collected on granitic ridge west of Inverness, Inverness Ridge, Marin County, Mar. 26, 1944, *J. T. Howell No. 19353* (flowers, Herb. Calif. Acad. Sci. No. 324000), and June 4, 1944, *J. T. Howell No. 19537* (fruit, Herb. Calif. Acad. Sci. No. 323998). Also in the Academy herbarium are the following: specimen from plants cultivated by Louis L. Edmunds; specimen from plant intermediate between *A. Cushingiana* and fma. *repens*, *J. T. Howell No. 19354*. As in typical *A. Cushingiana*, fma. *repens* stump-sprouts after fires.

3:708) and it does not agree. In *C. nitidus* the stems are white and shining, the innermost involucre bracts are pectinate-ciliate above, and the flowers are purplish, whereas in the Californian plant the characters of these parts are different and indicate a close relation to *C. lanatus*.

A survey of all the specimens of *Carthamus* in Herb. Calif. Acad. Sci. furnished a clue which, it would seem, has led to the identity of the second Californian type. A specimen in Herb. A. Prager. from Almeria in southern Spain that is determined as *C. baticus* (Boiss. & Reut.) Nym. seems exactly like the Californian material; and, since the Spanish specimen comes not far from the type-locality of the species, it may be accepted as representative of that plant. The Spanish plant, which was originally described by Boissier and Reuter as *Kentrophyllum baticum* (Pugill. Pl. Nov. 65), was said by its authors to be very closely related to *K. lanatum*, differing in the more divaricate branches, the narrower few-flowered head, the strongly spreading elongate involucre bracts, and the nigrescent achenes. Since the Californian weed is distinguished by these very characters it is undoubtedly referable to the Spanish distaff thistle.

Because of the close relationship between *C. lanatus* and *C. baticus*, I have sought to determine how the latter species is accepted by more recent workers on the flora of Spain and of Algeria where the plant is indigenous. Whereas in Index Kewensis *C. baticus* is given as a synonym of *C. lanatus*, Knoche in Flora Balearica (2: 502,—1922) in synonymy under *C. lanatus* indicates indirectly that the two are separable. Probably the proper systematic position of the plant is given by Battandier in Flore de l'Algérie where he treats the entity as *Kentrophyllum lanatum*  $\beta$  *baticum*. (1888-90, p. 508). I have not been able to find this combination in *Carthamus*; but since this Californian study is not the place to propose a nomenclatural change in so critical a taxonomic problem belonging to an exotic flora, I shall apply to the Spanish distaff thistle in California the specific name, *C. baticus* (Boiss. & Reut.) Nym.

In summary, the species of *Carthamus* adventive or naturalized in California, as represented in the California Department of Agriculture Herbarium (CDA) and in the California Academy of Sciences (CAS), are:

*C. BÆTICUS* (Boiss. & Reut.) Nym. Sonora, Tuolumne Co., *Shirrad* in 1927, 1928 (CDA); Jackson, Tuolumne Co., *J. T. Howell* in 1945 (CAS); San Luis Obispo, San Luis Obispo Co., *Saunders* in 1932 (CDA), *Fetters* in 1937 (CDA); San Diego, San Diego Co., *Fehlman* in 1938 (CDA).

*C. LANATUS* L. South San Francisco, San Mateo Co., *Cannon* in 1894 (CAS); Larkin and Francisco streets, San Francisco, *Eastwood* in 1920 (CAS).

*C. TINCTORIUS* L. Bethany, San Joaquin Co., *Keithley* in 1930 (CAS); Antelope Valley (in 1929 acc. Munz, Man. S. Calif. Bot. 584); also in Kings, Tulare, San Benito, and Sacramento counties acc. Robbins (l. c.).

In this study I wish to acknowledge the interest and coöperation of Mrs. Margaret K. Bellue of the California Department of Agriculture who loaned me the department specimens for study and who allowed me to examine the correspondence concerning *Carthamus* in the department files.

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## THE INTRODUCTION OF SPARTINA ALTERNIFLORA TO WASHINGTON WITH OYSTER CULTURE

BY THEO. H. SCHEFFER

It will be of interest to biologists in general to consider the exotic species of plants and animals that may be introduced into our Pacific coastal bays and inlets with the recent extension of oyster culture. From limited knowledge of the broader subject, we shall not attempt here any list or classification but shall deal only with one of the higher plants which apparently has come with the oyster spat into Willapa Bay, Washington. We refer to a species of cordgrass, *Spartina alterniflora* Lois., native on the Atlantic and Gulf coasts from Newfoundland to Texas.

The occurrence of this plant in Willapa Bay was first brought to our attention about seven years ago by an oyster grower living on the Long Beach peninsula, who had noticed the little "green islands" in the curve of a small bay partly encircled by a spit. In this situation the patches of *Spartina* were all but covered by water at the higher tides, giving the novel appearance that had attracted the oysterman's attention. Our investigation at that time

and during the following two or three years discovered no flowering plants but the species was spreading well by rootstocks. There were now several acres in the stand which had developed from the small clumps first noticed, as reported, "about 1911." The eastern oyster was introduced into this locality about 1907 and there were subsequent plantings, the spat having been procured near Providence, R. I.

Early endeavors to determine the species from the sterile plants failed, so it was not certain whether the plants represented *S. leiantha* Benth. of the Pacific coast but not reported north of San Francisco Bay or *S. alterniflora* of the Atlantic coast. In the fall of 1941, the refuge manager at Willapa National Wildlife Refuge collected some flowering plants and the determination was readily made as *S. alterniflora*.

So far we have not located other stands of this plant on the Washington coast, but there are two or three likely spots to be investigated. Not only is the field open to all beach combers who have the inspiration to follow up these matters but lasting honors await those who would track the more recent introductions of the Japanese oyster spat.

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## A GENUS NEW TO NORTH AMERICA

BY C. V. MORTON AND J. T. HOWELL

In the summer of 1944, we independently studied and identified material of an unusual aquatic weed which was collected by Mr. Loren L. Davis of the U. S. Department of Agriculture at the Biggs Rice Field Station, Butte County, California. The plant strongly suggested the genus *Elatine* in habit but it differed in seed structure and other characters. It has proved to be *Dopatrium junceum* (Roxb.) Buchanan-Hamilton (ex Benth. Scroph. Indicae 31,—1835), which was based on *Gratiola juncea* Roxb. (Pl. Coromand. 2: 16, pl. 129,—1798).

The small genus *Dopatrium* Buch.-Ham., of the *Scrophulariaceae*, tribe *Gratiroleae*, is strictly Old World in distribution. It is related to *Gratiola* from which it is distinguished technically by the dehiscence of the capsule, which is loculicidal only, rather than loculicidal and septicidal. The species *D. junceum* was described from India, but it is widespread through Asiatic and Malaysian

regions from Japan and China to Australia. In Jepson's Manual of the Flowering Plants of California it will key to *Gratiola cbractata* Benth., from which it is at once distinguished by its dimorphic flowers (the lower subsessile, the upper slender-pedicellate), the very short calyx-lobes (these about half as long as the capsule, rather than exceeding the capsule as in *Gratiola*), the violet corollas of the uppermost flowers, and by the reduced, bract-like stem-leaves.

An interesting and noteworthy detail exhibited by the material which we studied is the dimorphism of the flowers, those in the submerged lower axils being cleistogamous with abortive corollas, those in the emergent upper axils being open with small pale violet corollas. The former flowers are subsessile or nearly so, while the latter are borne on filiform pedicels that usually exceed the flower in length. In spite of the fact that Asiatic material examined by us discloses the cleistogamous flowers in the lower axils, we have seen no mention of the floral dimorphism in the floras of those regions where the plant is indigenous.

Concerning the occurrence of this interesting weed, Mr. Davis has written as follows:

I have observed this weed growing in the rice section for about five years but gave it no special notice since it does not appear to cause any trouble. The practice here is to submerge the dry land, after seeding the rice, to a depth of about 4 to 6 inches and the water is held continuously at this depth until harvest about September 15. The weed germinates and makes a rapid growth under this continuous submergence. On land that has been flooded on May 1, I have seen the flower by the latter part of June and plants with flowers can be found until the water is drained in September. I have not observed this plant growing in a thick stand of rice. It grows where the rice is thin, and here at the station is very thick in the alley-ways between plots. Apparently sunlight is necessary for its growth.

Although all of the material on which our observations and determination rest was collected by Mr. Davis, the specimen received in Washington was from Mrs. M. K. Bellue of the California Department of Agriculture and the specimen received in San Francisco was from Dr. Katherine Esau, University of California at Davis. To Mr. Davis, Mrs. Bellue, and Dr. Esau we wish to express our appreciation for the specimens and their helpful interest.

NEW VARIETIES OF TWO WELL-KNOWN  
CALIFORNIAN PLANTS

BY ALICE EASTWOOD

The first is a variation in the common California Laurel or Bay, *Umbellularia californica* (H. & A.) Nutt. This species was named from specimens collected by Archibald Menzies who accompanied Vancouver as physician and botanist on his voyage of discovery in 1792. In the fall of that year he was in San Francisco and Monterey so that it is uncertain where the collection was made. However, it might have been San Francisco as Dr. H. H. Behr, who came to California in 1852, records large trees of laurel fringing the shores of the Presidio from Fort Point inland (Zoe 2: 2-6,—1892). In the list of plants indigenous to San Francisco, published in the same volume of Zoe by Katharine Brandegee, the reference is to Dr. Behr's reminiscences only. From Oregon in the north to San Diego County in the south and extending into the Sierra Nevada, the trees show a similarity in every way except for differences in habit due to exposure. The color of the fruit is either yellow or purple in trees growing side by side.

In this new variety, which seems to be local in that area in Fresno County where the rare shrub *Carpenteria* flourishes, the lower surface of the leaves and the branches of the panicle are clothed with a fine white down which is entirely absent from trees elsewhere. No difference is apparent in the flowers, fruits, or shape of leaves, but this difference in indument is at once noticeable in the bicolored leaves.

As it seems a geographical variation only, the name *Umbellularia californica* var. *fresnensis*<sup>1</sup> is appropriate. The following specimens from Fresno County are in the herbarium of the California Academy of Sciences: No. 281134 from above Trimmer Springs, collected by Inez Whilton Winblad, May 16, 1937; No. 136199 collected at Big Sandy Creek near Prather by Julia McDonald, April 5, 1915. Miss McDonald's great-niece, Mrs. Loraine Byrd Prather, is now living in Miss McDonald's old

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<sup>1</sup> *Umbellularia californica* (H. & A.) Nutt. var. *fresnensis* Eastwood, var. nov., differt a *U. californica* typica: pagina inferiore foliorum et ramis paniculae tenuiter tomentosis. Type in flower, Feb. 18, 1945, Herb. Calif. Acad. Sci. No. 323837; in fruit, Sept. 25, 1944, No. 323838; both collected at Big Sandy Creek, Prather, Fresno County, California, by Mrs. Loraine Byrd Prather.

home at Prather. From her, fine specimens in both flower and fruit have been recently received and will be taken as the types of the variety. Mrs. Prather was eager to help and our thanks are due to her.

. . .

The second is a peculiar variation in *Linanthus dichotomus* Benth. This species, by the way, is the type of the genus *Linanthus* and was collected by David Douglas "in California," actual locality unknown. As it is a common species in California and its characters are well known the peculiarity of the plants growing in Napa and Lake counties has been noted by collectors in the field only as it is not evident in herbarium specimens. During the day, in typical plants, the flowers are almost invisible, the dull pink color of the edge of the corolla-lobes convolutely folded in the closed flower completely conceals what is within. In the late afternoon these lobes unfold and the flowers spring open so that soon their pure radiant beauty covers the earth like new-fallen snow, suggesting the common name Evening Snow, which came to me when I first saw the plants in Kern County in 1893. This was near the San Emigdio Ranch where, through the kindness of William S. Tevis, I made my collecting headquarters. The odor was so disagreeable that the common name among the children was "pig-pens."

Some time ago we received from Mrs. Rodney Hazel of Lakeport, California, a specimen of *Linanthus dichotomus* which, she wrote, was open at mid-day and exhaled a pleasing fragrance. The characteristics were so different from those given in Jepson's Manual and Miss Parson's Wild Flowers of California that she was uncertain and sent it to me to settle the doubt. An inspection of the specimens in the herbarium of the California Academy of Sciences revealed two other collections noted as open at mid-day: specimens collected by J. T. Howell on upper St. Helena Creek, Napa County, May, 1940, No. 15459; Eastwood & Howell No. 5541, near Putah Creek north of Middletown, Lake County, May 15, 1938. The varietal name *meridianus* seems to be appropriate.<sup>2</sup>

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<sup>2</sup> *Linanthus dichotomus* Benth. var. *meridianus* Eastwood, var. nov., differt: corolla patente ad meridiem et odore suave. Type: No. 280901, Herb. Calif. Acad. Sci., collected on upper St. Helena Creek, May 19, 1940, by J. T. Howell, No. 15459.

SOME NOTEWORTHY CALIFORNIAN PLANT  
COLLECTIONS

BY JOHN THOMAS HOWELL

Among the most interesting plants of the southern Sierra Nevada are those which recur at high elevations in the mountains of southern California and which are more or less restricted to the two regions. An addition to the considerable list of these plants is *Calyptridium Parryi* Gray which has been known from the sierras of southern California (cf. Leaflet West. Bot. 3: 265) but which may now be reported from the Sierra Nevada: end of the Mt. Whitney road, Inyo County, *Mark Kerr in 1937*.

A new California station for a rare but widely distributed western plant, *Calyptridium roseum* Wats., is indicated by the following collection: in volcanic sand, Smoke Creek northeast of Viewland, Lassen County, *Ripley & Barneby No. 5767*. (Cf. Leaflet West. Bot. 3: 265).

*Sedum Purdyi* Jepson, a rare and distinctive species confined to the Californian part of the Klamath Mountains, has recently been treated in a taxonomic and genetic study by Clausen and Uhl (Madroño 7: 175-177) who state that the highest altitude at which the plant is known to them is 617 meters (about 2000 feet). I have made two collections of the species at considerably higher elevations and these I cite here, not only to record the higher elevations but also to indicate two additional stations for a species known perhaps from not more than a dozen collections: between Big Flat and Caribou Gulch in canyon of the South Fork of Salmon River, el. 5000 feet, Salmon-Trinity Alps, Siskiyou County, *J. T. Howell No. 13565*; between Sky High and Marble valleys, el. 5600 feet, Marble Mts., Siskiyou County, *J. T. Howell No. 15142*.

In 1937, Lester Rowntree collected *Hemieva ranunculifolia* (Hook.) Raf. in Caribou Basin in the Salmon-Trinity Alps, Siskiyou County, California. The only other Californian collection of this plant recorded in the literature is one by Mrs. R. M. Austin on Spanish Peak, Plumas County, in the northern Sierra Nevada in 1878. These two Californian collections indicate a floristic relation between the Klamath Mts. and the northern Sierra Nevada that antedates the origin of the Cascade Range

in the late Tertiary. North of California, this plant ranges to Alberta and British Columbia, but, according to Peck (Man. Higher Pl. Ore., p. 372), its only occurrence in Oregon is in the Wallowa Mts. As will be noted in my remarks on *Veronica Cusickii* a couple of paragraphs below, this pattern of distribution from California to northeastern Oregon is probably floristically significant.

*Cryptantha circumscissa* (H. & A.) Jtn. is a plant widespread through high arid valleys and on Basin slopes of western North America and only rarely does the range of the species or its variety *hispida* (Macbr.) Jtn. extend to the Pacific slope of the Sierra-Cascade crest. A noteworthy occurrence of var. *hispida* on the west slope of the Sierra Nevada, however, is to be recorded from Kaiser Peak near Huntington Lake in northern Fresno County where the plant was found at an elevation of about 10,000 ft. by Mr. Henry M. Pollard on July 31, 1943. This collection not only extends the known range of the variety northward along the west slope of the Sierra from southern Tulare County but the elevation at which it was found approaches the altitudinal limit for the species. The only specimen of either the species or the variety that I know from a higher station is one collected by Mr. Frank W. Peirson in the Rock Creek Lake Basin in northeastern Inyo County at 10,400 ft. (Peirson No. 9485).

In August, 1944, Mr. Allan L. Chickering collected specimens of *Veronica Cusickii* Gray near Needle Peak, Placer County, at an elevation of 8500 ft. This is the first record of the Cusick Speedwell from the Sierra Nevada to come to my attention\* and it is especially interesting since otherwise the plant has been known in California only from the Klamath Mountains in Siskiyou County (cf. Jepson, Man. Fl. Pl. Calif. 933). To the northward *V. Cusickii* is not uncommon in the Cascade Range in Washington, but in Oregon it is known only from the mountains in the northeastern part (cf. Peck, Man. Higher Pl. Ore. 660) and Rydberg (Fl. Rocky Mts. & Adj. Plains 782) reports it from Idaho. The distribution of an occasional species or of a closely related group of species from the Sierra Nevada and Klamath Mts. in California to the mountains of northeastern

\* Shortly after writing this I learned that *Veronica Cusickii* had been collected in the Sierra Nevada in 1937 by Mr. Frank W. Peirson: along edge of open plateau southwest of Woods Lake, Alpine County, July 23, 1937, Peirson No. 12100. Mr. Peirson writes that "the plants grow in sandy or gravelly areas and not in wet locations by streams as does *V. alpina*."

Oregon and Idaho is not a usual distributional pattern, but it is notably exemplified in the distribution of the *Phacelia Pringlei* complex (cf. Howell, a revision of species related to *P. Douglasii*, *P. linearis*, and *P. Pringlei*, ms.). Moreover, the western distribution of *Stellaria obtusa* Engelm. which has recently been reported from the southern part of the Klamath Province in California (Leafl. West. Bot. 3:192) may also be related to this pattern, since apparently the stellaria is not known to occur otherwise south of the mountains of northeastern Oregon. I believe that the occurrence of the chickweed in the northern Sierra Nevada is to be expected.

One of the most remarkable members of the *Compositæ* in western America, *Dimeresia Howellii* Gray, is to be reported from California on the basis of plants collected by Marion Ownbey and Fred G. Meyer (No. 2136) in a dry gravelly streambed, Cedar Pass, Warner Mts., Modoc County, July 1, 1940. This small annual herb is not only congested in habit but its heads are reduced to only two involucre bracts and two flowers. The genus, which is monotypic, was referred by Gray to the *Inuloideæ* (Syn. Fl. 1, pt. 2: 448), but Peck has recently treated it as a distinct tribe, *Dimeresia* (Man. Higher Pl. Oreg., 702, 1941). According to Peck (op. cit., 743), the plant is distributed through eastern Oregon from "northeastern Baker Co. to the Steen, Pueblo and Warner Mts.," but I have seen no report of it from the southern part of the Warner Mts. in California.

Dr. S. F. Blake has written that he collected *Micropus amphibolus* Gray "on rocks near Petrified Forest, Sonoma County, in 1927." This distinctive species, which has been known from relatively few restricted collections, has recently been reported from Lake County, California (Leafl. West. Bot. 4: 16).

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SCIRPUS TUBEROSUS IN CALIFORNIA. *Scirpus tuberosus* Desf., a plant of North Africa and southern Eurasia from the Mediterranean to India, was first reported introduced in North America in New York and Alabama (Beetle, Am. Jour. Bot. 29: 85—86,—1942). California may now be added with the following localities reported: south of Willows, Glenn Co., *Eastwood & Howell No. 2736* and *Beetle No. 3060*; north of Gridley, Butte Co., *Cloyd No. 3A*.—A. A. Beetle, Division of Agronomy, University of California, Davis.

## STUDIES IN ROSACEÆ, TRIBE POTENTILLEÆ

BY JOHN THOMAS HOWELL

## 1. A RECONSIDERATION OF THE GENUS PURPUSIA

*Purpusia saxosa*, representing a new genus and species, was described by T. S. Brandegee in 1899 (Bot. Gaz. 27: 446, 447) from a white-flowered, *Potentilla*-like plant collected by C. A. Purpus in southern Nevada. Brandegee related the genus to *Potentilla* and *Chamærhodos*: from the former it differed in its "long calyx tube and no bractlets," from the latter "in its terminal style and position of the stamens," and from both "in its peculiar stipitate receptacle." Certainly it would appear that *Purpusia* need not be confused with *Chamærhodos*, but from *Potentilla* in its broad sense *Purpusia* can scarcely be excluded in view of further studies on recent collections, although as a genus it has continued to be recognized by all workers who have had occasion to deal with it.

Although I was convinced of the generic distinctness of *Purpusia* in 1930 when I published the description of *P. arizonica* Eastw., I began to have doubts as to its validity in 1938, not only when I mistook *Potentilla (Ivesia) Baileyi* (Wats.) Greene for *Purpusia* in the course of Nevada field work, but also when I detected there was no essential difference between the receptacle of *Purpusia* and that of certain species in *Potentilla* subgen. *Ivesia*. In 1940 in a specimen of *Purpusia arizonica* received from Miss Annie M. Alexander and Miss Louise Kellogg, I discovered a number of flowers with 1, 2, or even 3 bractlets, and, on examining other specimens of both *Purpusia arizonica* and *P. saxosa*, I have found that nearly all plants (including those of the type of *P. saxosa*) have an occasional flower 1- to 3-bracteolate. The hypanthium of *Purpusia saxosa* is usually distinctive both in its length and in its vase-like shape, but the hypanthium of *P. arizonica* is morphologically indistinguishable from the broadly campanulate or hemispheric hypanthia found in certain potentillas. And now in a second remarkable plant collected by Miss Alexander and Miss Kellogg in the Kingston Range in southern California in 1941, we have a plant in which the hypanthium is merely patelliform to almost disciform, a hypanthium as shallow as the shallowest in *Potentilla*.

While in the past the elongate ebracteolate hypanthium has furnished *Purpusia* with important useful characters of secondary value, the status of the genus has rested chiefly on the character of the stalked receptacle, although an entirely comparable structure has also been known in a few species of *Potentilla* subgen. *Ivesia*, notably in *Potentilla nubigena* Greene (*Ivesia pygmaea* Gray). However, in the Alexander and Kellogg plant from the Kingston Range even this supposedly diagnostic character of *Purpusia* disappears, for in that plant the pistilliferous tissue is scarcely elevated above the subdisciform hypanthium. The only criteria by which the plant can be regarded a *Purpusia* are its ebracteolate hypanthia and *Purpusia*-like habit, a habit, however, that is also shared by *Potentilla* (*Ivesia*) *Baileyi*. This striking resemblance between *Potentilla Baileyi* and *Purpusia* would appear to be too fundamental in details of foliage as well as habit to be interpreted merely as parallel responses induced by the same rigorous environmental conditions in two diverse groups, but rather I regard that the similarity indicates a direct relationship that is phyletic in character. Some may regard this connection between *Purpusia* and *Potentilla* subgen. *Ivesia* too close for separation, but I believe that the partial or complete suppression of bractlets demarks in *Purpusia* a group as distinct as other subgenera in *Potentilla*. This opinion may find expression in the following new name:

**Potentilla subgen. Purpusia** (T. S. Brandg.) J. T. Howell, stat. nov. *Purpusia* T. S. Brandg., Bot. Gaz. 27:446 (1899); Rydb., N. Amer. Fl. 22:291 (1908); Tidestr., U. S. Nat. Herb. Contrib. 25:269 (1925); Lemée Dict. Gen. Pl. Phanérog. 5:688 (1934); Kearney & Peebles Flower. Pl. Ariz. 403 (1942); McVaugh, Contrib. toward Fl. Nev. no. 22:57 (1942).

## 2. SYNOPSIS OF POTENTILLA SUBGEN. PURPUSIA

### KEY

- A. Hypanthium patelliform or nearly flat, densely pubescent within; receptacle not elevated; stamens 6—9.....1. *P. patellifera*
- A. Hypanthium campanulate to tubular, glabrous within; receptacle stipitate; stamens 5.....2. *P. Osterhoutii*
  - B. Receptacle and stalk generally 1—3 times as long as broad; petals yellow.....2a. *P. Osterhoutii* var. *typica*
  - B. Receptacle and stalk generally 4—5 times as long as broad; petals white or occasionally yellow.....2b. *P. Osterhoutii* var. *saxosa*

1. *Potentilla* (*PURPUSIA*) *patellifera* J. T. Howell, spec. nov. Herba perennis, caulibus foliisque tenuiter velutino-villosis et paulum glandulosis, confertis in caudice lignoso basibus persistentibus foliorum veterium vestito; caulibus 0.5—2 dm. longis, gracilibus, patentibus, quam folia basalia plerumque paulum longioribus; foliis basalibus (laminis petiolisque) 3.5—10 cm. longis, foliolis 1—4-jugis, obovatis vel rotundis, sessilibus vel breviter petiolulatis, palmato-lobatis, petiolis 1—5 cm. longis, foliis caulinis minoribus, foliis in inflorescentia ad bracteas foliaceas reductis; floribus paucis in panicula cymosa foliacea, pedicellis gracilibus, villosis, 0.5—2 cm. longis; hypanthio patelliformi vel subdisciformi, 1.5—2 mm. diametro, villosis extus, intus dense breviter villosis; bracteolis 0; sepalis anguste vel late ovatis, 3—4 mm. longis; petalis flavis, angustis, oblanceolatis vel ellipticis, 3 mm. longis, 0.5—1 mm. latis, acutis; staminibus 6—9, filamentis circa 1 mm. longis, antheris circa 1 mm. longis; pistillis 6—9, stylis ovarisque glabris; receptaculo humili, planiusculo, villoso, haud stipitato; acheniis ignotis.

Type: Herb. Univ. Calif. No. 667183, collected by Annie M. Alexander and Louise Kellogg, No. 2355a, June 20, 1941, in crevices of a rocky wall near summit of main ridge, Kingston Range, San Bernardino County, California. There is a duplicate in the Dudley Herbarium. Only one other collection has been seen, *Alexander & Kellogg No. 2355* (DS, UC, US),\* collected from crevices of a north-facing cliff in a spur canyon southeast of Tecopa Pass, Kingston Range.

As I have pointed out in the preceding section of this paper, *Potentilla patellifera* entirely breaks down the principal differences by which the genus *Purpusia* has been separated from *Potentilla*, but, with its ebracteolate flowers and distinctive habit, it is definitely referable to this relationship. From the only other species in the subgenus that I am recognizing, the present species differs not only in the shallow, hairy hypanthium and sessile receptacle, but also in the greater, if somewhat indefinite, number of stamens. In the numerous flowers that have been examined none has had less than 6 stamens and generally the number has been 7 to 9.

2. *Potentilla Osterhoutii* (A. Nels.) J. T. Howell, comb. nov. *Purpusia Osterhoutii* A. Nels., Amer. Jour. Bot. 21: 574 (1934). Stems more or less spreading from the simple or few-branched woody caudex, 0.5—2 dm. long, the stems equaling or a little exceeding the basal leaves; leaflets in 2—5 pairs, roundish to elliptical or oblanceolate, crenate to palmately lobed or divided; flowers few to numerous in a leafy-bracted cymose panicle; hy-

\*Institutions from which material has been examined are: California Academy of Sciences, CAS; Dudley Herbarium, Stanford University, DS; U. S. National Arboretum, NA; Rocky Mountain Herbarium, University of Wyoming, RM; University of California, UC; U. S. National Herbarium, US.

panthium campanulate to tubular, glabrous within; bractlets generally lacking, or occasionally 1—3; receptacle stipitate, 1—5 times as long as thick, villous-pubescent throughout or glabrous at base; petals yellow or white; stamens 5; pistils 6—13.

Crevices and ledges of limestone rocks and cliffs in desert mountains, 4000 to 10,000 feet, southern Nevada, northern Arizona, and southeastern California.

2a. Var. *typica* J. T. Howell, nom. nov. *Purpusia Osterhoutii* A. Nels., l. c. *Purpusia arizonica* Eastw. ex J. T. Howell, *Madroño* 2: 12 (1930). Non *Potentilla Osterhoutiana* Th. Wolf, *Biblioth. Bot.* 71: 200 (1908). Non *Potentilla arizonica* Greene, *Pitt.* 1: 104 (1887). Mostly finely glandular-pubescent; leaflets of basal leaves in 3—5 pairs, usually rather deeply lobed or divided; hypanthium with length equal to, or less than, the width, campanulate or hemispheric; receptacle 0.3—1.5 mm. long, 0.3—1 mm. in diameter; petals yellow; anthers roundish-ovate, about 1 mm. long.

Collections. ARIZONA, all from the Grand Canyon, Coconino County: Bright Angel Trail, *Osterhout No. 7103* (RM, type), *Goldman No. 2205* (US); on rim near Bright Angel, *Eastwood No. 5662* (CAS, type of *Purpusia arizonica*); El Tovar, *Eastwood No. 3778* (CAS); Grand View, *L. F. Ward in 1901* (US); Cliff Spring near Cape Royal, *Peirson No. 7427* (CAS), *Collom in 1940* (US); limestone ledges at Cape Royal, *Eastwood & Howell No. 954* (CAS); Pt. Sublime, *Collom No. 1318* (US).

NEVADA: cliffs at head of Frog Canyon, Grant Range, el. about 10,000 feet, Nye Co., *McVaugh No. 6068* (NA); Dead Man Springs, Desert Game Range, Clark Co., *J. C. Allen No. 38* (NA); Deadmans Canyon, Sheep Mts., Clark Co., *Alexander & Kellogg No. 1772* (CAS, DS, UC, US).

CALIFORNIA: head of Titus Canyon, Grapevine Mts., Inyo Co., *Gilman No. 1812* (CAS, US), *No. 1813* (US).

Although in the original description of *Purpusia Osterhoutii* Prof. Nelson noted particularly "the absence of hairs on the receptacle," the examination of the type disclosed the receptacle to be conspicuously and characteristically pilose.

2b. Var. *saxosa* (T. S. Brandg.) J. T. Howell, comb. nov. *Purpusia saxosa* T. S. Brandg., *Bot. Gaz.* 27: 447 (1899). Non *Potentilla saxosa* Lemmon ex Greene, *Pitt.* 1: 171 (1888). Velutinous-glandular with numerous elongate nonglandular as well as glandular hairs; leaflets of basal leaves usually in 2 or 3 pairs; hypanthium tubular-campanulate or vase-shaped, as long as wide or longer, in age more or less constricted above the swollen, truncate or rounded base; receptacle 1.25—2 mm. long, 0.3—0.5 mm. in diameter; petals white or yellow; anthers elliptic-ovate, 1—1.5 mm. long.

Collections. NEVADA: on rocks, Pahroc Range, 4000 to 5000 feet, *Purpus No. 6305* (UC, type; DS, US); crevices of dry calcareous boulders, south end of Pahroc Range, 15 miles east of Crystal Springs, Lincoln County, *Ripley & Barneby No. 4972* (CAS, "petals white"); crevices of canyon walls, 4 miles north of Caliente on road to Panaca, Lincoln Co., *Train No. 2476* (NA, "flowers yellow").

Although Brandegee clearly states that the type of *Purpusia saxosa* is *Purpus* No. 6134 collected in the Sheep Mountains, Nevada, I have been forced to conclude that these published data are erroneous and that the type is *Purpus* No. 6305 collected in the Pahroc Range, Nevada. Of the latter number there are two specimens at the University of California, the one in the Brandegee Herbarium indicated as type by an annotation label, the other noted in the hand of Mrs. Brandegee "n. gen. & sp.," and in the pocket of one of these sheets is a ticket bearing in Purpus' hand the words "Pahroc Range." Although Rydberg states in the North American Flora that *Purpusia saxosa* is known only from the type locality, the Sheep Mountains, he stamped the Pahroc specimen of *Purpus* No. 6305 in the U. S. National Herbarium "Examined for the North American Flora." A communication from Dr. Maguire states that the only *Purpus* collection of *Purpusia* at the New York Botanical Garden is No. 6305 and Dr. Lyman B. Smith has written that No. 6305 is represented in the Gray Herbarium but not No. 6134. From all this I have concluded that *Purpus* No. 6305 from the Pahroc Range should be regarded the type-collection of *Purpusia saxosa*.

Plants of the subgenus *Purpusia* as they grow in the Pahroc Range and around the Grand Canyon, respectively, exhibit sufficient divergence in habit, vestiture, and flowers to be differentiated as two closely related but distinct species. Other collections from southern Nevada, however, present intermediate phases between the extremes and Gilman's collections from the Death Valley region in California seem almost as near the Pahroc plants as any others. Although it has been necessary to treat the extremes of variation varietally in the light of present collections and knowledge, I cannot escape the feeling that, with increased field knowledge of the group, the type-species of the genus *Purpusia* (which because of nomenclatural priorities must herein be relegated to varietal status) will eventually be restored to full specific standing. Certainly as the matter now rests, var. *saxosa* is to me an excellent example of a true subspecies and our present plant might properly be treated as such except that I am yet to be persuaded of the general taxonomic usefulness of that category.

## 3. NOMENCLATURAL TRANSFERS TO POTENTILLA

In order to make available in *Potentilla* certain taxonomic propositions presented by Dr. D. D. Keck in his recent revision of *Horkelia* and *Ivesia* (Lloydia 1:75—142,—1938), the following transfers are listed. In most instances only the name-bringing synonym is given; fuller synonymy may be had by consulting Dr. Keck's paper.

## a. POTENTILLA subgen. HORKELIA

**Potentilla congesta** (Dougl.) Baill. var. **nemorosa** (Keck) J. T. Howell, comb. nov.

*Horkelia congesta* Dougl. subsp. *nemorosa* Keck, op. cit., 108.

**Potentilla daucifolia** Greene var. **laticor** (Keck) J. T. Howell, comb. nov.

*Horkelia daucifolia* subsp. *laticor* Keck, op. cit., 106.

**Potentilla Douglasii** Greene var. **capitata** (Lindl.) J. T. Howell, comb. nov.

*Horkelia capitata* Lindl., Bot. Reg. pl. 1997 (1837).

**Potentilla Douglasii** Greene var. **parviflora** (Nutt.) J. T. Howell, comb. nov.

*Horkelia parviflora* Nutt. ex Hook. & Arn., Bot. Beech. Suppl. 338 (1840).

**Potentilla Hendersonii** (Howell) J. T. Howell, comb. nov.

*Horkelia Hendersonii* Howell, Pacif. Coast Pl. Coll. 1887, 2 (1887).

**Potentilla Lindleyi** Greene var. **sericea** (Gray) J. T. Howell, comb. nov.

*Horkelia californica* C. & S. var. *sericea* Gray, Proc. Amer. Acad. 6: 529 (1865).

**Potentilla marinensis** (Elmer) J. T. Howell, comb. nov.

*Horkelia Bolanderi* Gray var. *marinensis* Elmer, Bot. Gaz. 41: 321 (1906).

**Potentilla Tilingii** (Reg.) Greene var. **flavescens** (Rydb.) J. T. Howell, comb. nov.

*Horkelia flavescens* Rydb., Mem. Dept. Bot. Columbia Univ. 2: 138 (1898).

## b. POTENTILLA subgen. IVESIA

**Potentilla Baileyi** (Wats.) Greene var. **setosa** (Wats.) J. T. Howell, comb. nov.

*Ivesia Baileyi* Wats. var. *setosa* Wats., Bot. King's Explor. 91 (1871).

**Potentilla lycopodioides** (Gray) Baill. var. **megalopetala** (Rydb.) J. T. Howell, comb. nov.

*Horkelia Gordonii* Hook. var. *megalopetala* Rydb., op. cit., 152.

**Potentilla lycopodioides** (Gray) Baill. var. **scandularis** (Rydb.) J. T. Howell, comb. nov.

*Horkelia scandularis* Rydb., op. cit., 150.

**Potentilla sericoleuca** (Rydb.) J. T. Howell, comb. nov.

*Horkelia sericoleuca* Rydb., op. cit., 144.

**Potentilla Tweedyi** (Rydb.) J. T. Howell, comb. nov.

*Ivesia Tweedyi* Rydb., N. Amer. Fl. 22: 288 (1908).

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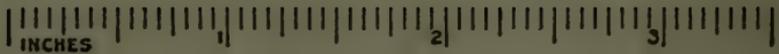
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SOME INTERESTING PLANTS OF  
MALHEUR COUNTY, OREGON

BY MORTON E. PECK

*Willamette University, Salem, Oregon*

The observations upon which the following notes are based were made chiefly on four collecting trips into Malheur County, namely, July 8–12, 1938, May 4–9, 1940, June 10–20, 1942, and June 1–11, 1943. A few are from earlier notes.

The flora of Malheur County is probably less known than that of any other section of Oregon. The southern half and much of the northern are mainly desert with only a few widely scattered ranches. Most of the population is in the northeastern part where there is extensive irrigation. The proximity to parts of Idaho and Nevada that have not been very thoroughly explored botanically should lend additional interest to the observations. Many of the species here included do not occur very far on our side of the border, and many others are sure to be added in the future. A thorough exploration of the remarkable canyon of the Owyhee River cannot fail to yield most interesting results.

A detailed account of the physical features of Malheur County would greatly enhance the value of these observations, but would call for more space than can here be allowed. It is hoped that the notes may at least stimulate further investigation of this neglected region.

*ALLIUM ANCEPS* Kell. In clayey soil 15 miles north of McDermitt and in a similar situation 15 miles south of Sheaville. Not otherwise known to us from Oregon except for specimens taken by Mrs. Lilla Leach on Hart Mt., Lake County, June 11, 1937.

*Allium nevadense* Wats. var. *macropetalum* Peck, var. nov., scapo robustiore plerumque brevior; folio scapo longiore; perianthio longiore 9–11 mm. longo; staminibus perianthium subæquantibus; cristis ovarii 1 mm. altis late rotundatis vel truncatis sæpe denticulatis.

Scape stouter than in the species and mostly shorter; leaf surpassing the scape; perianth-parts longer, 9–11 mm. long.; stamens nearly equaling the perianth; crests of the ovary 1 mm. high, broadly rounded or truncate, often denticulate.

Type: *Peck No. 21704*, in low sagebrush 17 miles north of McDermitt, Malheur County, Oregon, June 3, 1943. Differs

from the species especially in the relatively longer leaf and larger flowers. The variety occurs infrequently from Jordan Creek southward at least to the Nevada line.

*SALIX SESSILIFOLIA* Nutt. Specimens were collected in Owyhee Canyon a short distance above Rome. The species has an erratic distribution. Its regular range seems to be from the Umpqua Valley northward to Vancouver Island, but we have it from southern Lake County, and now from this isolated station.

*Eriogonum novonudum* Peck, spec. nov., suffrutescens; ramis ligneis circa 1 dm. longis decumbentibus copiose ramosis; foliis spatulatis vel anguste obovatis utrinque dense albo-tomentosis 2—3 cm. longis in petiolis multo longioribus, pedunculis 2.5—3.5 dm. altis glaberrimis glaucissimis; radiis umbellæ plerumque tribus 8—15 cm. longis prope erectis; involucris capitatis capitibus compositis capitulis 2—5, involucris anguste turbinatis 3—5 mm. altis lobis 6—8 latis rotundatis scariosis; floribus viridescenti-albis 3—3.5 mm. longis glabris segmentis omnibus similibus.

Plant suffrutescens, the main branches of the shrubby base about 1 dm. long, decumbent and copiously branched; leaves crowded at the base of the scape-like flowering stems and on very short sterile shoots, spatulate or narrowly obovate, densely white-tomentose on both faces, 2—3 cm. long, on petioles often more than twice as long; peduncles 2.5—3.5 dm. high, slender, glabrous and very glaucous, each bearing a 3-rayed umbel subtended by 3—5 small, scarios, connate bracts, the rays 8—15 cm. long and closely ascending, the involucre sessile or nearly so in 2—5 small, nearly sessile heads, forming the capitate cluster of the ray; involucre narrowly turbinate, 3—5 mm. high, with 6—8 broad, rounded, largely scarios, erect teeth, glabrous and distinctly ribbed; flowers dull greenish-white; perianth 3—3.5 mm. high, glabrous, the outer and inner segments essentially alike; stamens long-exserted; ovary and fruit glabrous.

Type: *Peck No. 21216*, on a sandy clayey slope 10 miles south of Adrian, Malheur County, Oregon, June 13, 1942.

This species is perhaps related to *E. nudum* Dougl., but differs in many respects, most conspicuously in the much more woody stem and the uniformly 3-rayed umbel with very long, closely ascending rays capped with the small, dense, compound heads. Several collections were made, all in the same general locality.

*Eriogonum ochrocephalum* Wats. var. *calcareum* (Stokes) Peck, comb. nov. *E. ochrocephalum* subsp. *calcareum* Stokes, Gen. Eriog. p. 92. A well-marked local variety. Our material was taken probably very close to the type-locality. The name, perhaps suggested by the original collector's field notes, is an unfortunate choice. The plant grows a few miles north of Harper on a series of rather high, steep hills of a pale gray, very soft,

somewhat chalk-like material, not in the least calcareous. A sample submitted to Professor Herman Clark, Department of Geology, Willamette University, was identified as tufaceous and diatomaceous, apparently from a deposit in an ancient lake bed.

*MIRABILIS BIGELOVII* Gray var. *RETRORSA* (Hel.) Munz. Plentiful locally on the nearly vertical walls of Owyhee Canyon, 10 to 15 miles below the great dam. We have no other Oregon record of this plant.

*ARENARIA BURKEI* Howell. Found sparingly on the white tufaceous hills 5 miles north of Harper. Rare in Oregon.

*CERATOCEPHALUS FALCATUS* (L.) Moench. It is worth noting that this Old-World species has become well established about McDermitt. It is plentiful in places and is steadily increasing from Wheeler County northward and along the Columbia River.

*BECKWITHIA ANDERSONII* (Gray) Jeps. A large colony was discovered on a high clayey slope 15 miles north of McDermitt.

*DRABA DOUGLASII* Gray. Plentiful locally on sterile stony ridges 15 to 20 miles north of Jordan Valley. It also occurs on the eastern slope of the Steens Mts. and on Stinking Water Mt. in eastern Harney County.

*PHYSARIA CHAMBERSII* Rollins. A good-sized colony was found on a sandy knoll just within the Idaho-Oregon line 20 miles north of Jordan Valley.

*LEPIDIUM MONTANUM* Nutt. var. *CANESCENS* (Thell.) C. L. Hitchc. One of the characteristic species of the low alkaline flats along McDermitt Creek just west of McDermitt. It was collected also along Crooked Creek 25 miles southwest of Rome. We have it from Narrows, Harney County, and from the southeastern part of the same county.

*DESCURAINIA PINNATA* (Walt.) Britt. vars. *FILIPES* (Gray) Peck, *HALICTORUM* (Cocker.) Peck, *PARADISA* (Nels. & Ken.) Peck, and *NELSONII* (Rydb.) Peck. From Vale and Ontario southward abundant intergradations between these four entities occur. They are distinct and not difficult of recognition when typically developed, but their boundaries are here quite lost. This fact was noted by Detling in his excellent treatment of the genus.

*STREPTANTHUS PILOSUS* Wats. From Harper and Adrian southward this species occurs rather infrequently, usually in

dwarf sagebrush, where it is often conspicuous by its tall, much-branched habit.

*STANLEYA PINNATA* (Pursh) Britt. One large colony was found on stony, clayey ground 5 miles south of Rome. It has been collected also in southeastern Harney County, but is rare in Oregon.

*CLEOMELLA HILLMANI* Nels. From Adrian southward to Rome, but especially in the Sucker Creek country, during May, many of the pale ochraceous-gray slopes of the high broken hills and ridges are mantled in bright yellow, often distinguishable at a distance of two or three miles. These fine displays of color are due mostly to a dense growth of *Cleome platycarpa* and *Cleomella Hillmani*, the former usually, but not always the more abundant. These peculiar deposits of Eocene clay, very viscid and slippery when wet, have usually a rather sparse covering of vegetation, but offer excellent collecting ground, as they are frequently the favorite habitat of rare and local plants.

*CLEOMELLA PLOCASPERMA* Wats. Moderately plentiful on the low alkaline flats west of McDermitt. It occurs in similar situations along the eastern base of the Steens Mts. and southward in Harney County.

*RIBES GOODDINGII* Peck. Found sparingly on the nearly vertical walls of Sucker Creek Canyon. This is the southernmost point known for the species.

*POTENTILLA PARADOXA* Nutt. On wet shores of Snake River in the extreme northeast corner of the county.

*LUPINUS UNCIALIS* Wats. A good-sized colony of this rare and most diminutive of lupines was found on a high gravelly slope 15 miles north of McDermitt. Evidently this is the first record of the species for Oregon.

*Astragalus Jessiæ* Peck, spec. nov., perennis humilis a basi ramosissima; caudice brevi ligneo; caulibus crassis rigidis 6—12 cm. longis adscendentibus et patentibus dense albo-strigosis; foliis 1—2 cm. longis dense utrinque strigosis, stipulis scariosis modo ad basin conjunctis ad apices longas acutas induratas abrupte contractis valde patentibus, foliolis 5—7 coactis 8—13 mm. longis anguste lanceolatis involutis rigidis in apices longas acutas induratas flavas excurrentibus; pedunculis brevissimis, floribus plerumque 3, pedicellis 1 mm. longis; calyce 4 mm. longo dentibus subulatis tubum paulo superantibus; corolla 5 mm. longa albida, carina apicem versus purpurea; legumine (immature) lanceolato-oblongo compresso dense strigoso, seminibus 2.

Stems several or many from a short woody caudex, stout, rigid, ascending and spreading, 6—12 cm. high, densely white-strigose; leaves 1—2 cm. long, pubescent like the stem, the scarious stipules slightly connate at base, abruptly contracted to strongly spreading, slender and pungent tips often 2—3 times as long as the body, the leaflets 5 or occasionally 7, crowded, 8—13 mm. long, surpassing the petiole, narrowly lanceolate, strongly involute, very stiff, drawn out to long, rigid, very pungent, yellow tips; peduncles mostly 3-flowered, very short, the pedicels about 1 mm. long; calyx 4 mm. long, the subulate lobes a little longer than the tube; corolla 5 mm. long, whitish, the keel purple-tipped; pod (immature) lance-oblong, compressed, densely strigose, 2-seeded.

Type: *Peck No. 21220*, from a high gravelly slope 10 miles south of Adrian, Malheur County, Oregon, June 13, 1942. This new member of the subgenus *Kentrophyta* differs from any other known to us in the stout, rigid, brittle stems, the bushy habit, and coarse, very pungent foliage. It inhabits an imperfectly known territory from which additional collections may be expected. It is named for Mrs. Jessie G. Peck, who discovered the colony from which the type was taken.

*Astragalus solitarius* Peck, spec. nov., perennis gracilis 3—5 dm. altus, caulibus solitariis vel paucis debilibus plantis vicinis sustentis sparse ramosis flexuosis pilis minutis incurvatis canescentibus; foliis cum petiolis 5—10 cm. longis, foliolis 7—13 utrimque canescentibus anguste linearibus obtusis remotis 1—2 cm. longis; pedunculis aliquantum robustis foliis multo longioribus; racemis laxe 10—15-floris; calyce nigro-crimino cylindrico-campanulato 3—4 mm. longo dentibus triangularibus brevissimis; corolla 7—8 mm. longa luteo-viridi purpureo-tincta; legumine angusto-oblongo valde compresso suturis utrisque exsertis dense puberulo prope recto vel valde arcuato deorsum curvato cum stipo 2—2.5 cm. longo, stipo 6—8 mm. longo.

Stems arising singly or in small clusters from a deep taproot, 3—5 cm. high, slender and weak, mostly supported by other vegetation, sparingly branched, flexuous, canescent with minute incurved hairs; leaves, including the petiole, 5—10 cm. long, the leaflets 7—13, canescent like the stem on both surfaces, narrowly linear, obtuse, remote, 1—2 cm. long; peduncles relatively stout, up to 2 dm. long including the raceme; racemes loosely 10—15-flowered; calyx black-hairy, cylindric-campanulate, 3—4 mm. long, the triangular lobes less than a third as long as the tube; corolla 7—8 mm. long, yellowish-green tinged with purple; pod narrowly oblong, strongly compressed, including the stipe 2—2.5 cm. long, the latter 3 times as long as the calyx, acute at both ends, densely puberulent with incurved hairs, nearly straight to decidedly arcuate and turned downward on the horizontally spreading pedicel.

Type: *Peck No. 21726*, among sagebrush, 15 miles north of McDermitt, Malheur County, Oregon, June 4, 1943. Plants widely scattered, very inconspicuous, growing close to the base

of the sagebrush clumps and supported by the branches. It belongs to the subgenus *Homalobus*, perhaps most nearly related to *A. stenophyllus* T. & G. from which it differs, however, in numerous characters.

*ASTRAGALUS ALVORDENSIS* Jones. On high sandy slopes near Rome and at Sheaville. Very local.

*ASTRAGALUS NUDISILIQUUS* Nels. Collected near Nyssa and also at Harper. The caudex, stems, and peduncles are sometimes elongated, the stems up to 2 dm., the peduncles up to 1 dm.; the flowers are often strongly purple-tinged and the pods up to 3 cm. long. The species, however, seems sufficiently well marked.

*ASTRAGALUS TETRAPTERUS* Wats. On a high dry slope near Rome and at Blue Mountain Pass, 25 miles north of McDermitt. Though far out of the usual range of the species, our specimens appear quite typical.

*ASTRAGALUS CINERASCENS* (Rydb.) Tidest. On sandy hills near Jordan Valley; otherwise apparently known only from the type-locality, near Harney Lake, Harney County.

*ASTRAGALUS GEYERI* Gray. On stony clayey slopes near Rome. Not noted elsewhere.

*ASTRAGALUS WEISERENSIS* (Jones) Abrams. Rather plentiful over about the northeastern fourth of the county.

*ASTRAGALUS MALHEURENSIS* Hel. Apparently rare. Two collections were secured, one near Vale and one in the extreme northeastern corner of the county.

*ASTRAGALUS MULFORDÆ* Jones. A single specimen was collected on a shady slope in Owyhee Canyon 10 miles below the Owyhee dam.

*TRIBULUS TERRESTRIS* L. This evil weed was first recorded from Oregon at Robinette, Baker County, in 1938. It has since appeared at Umatilla, Umatilla County, and at Ontario, Malheur County. It seems in a fair way to spread over much of eastern Oregon.

*SPHÆRALCEA COCCINEA* (Nutt.) Rydb. This occurs frequently from Jordan Valley southward. In the extreme southern part of the county, near McDermitt, numerous examples of what are apparently hybrids between this species and *S. Munroana* were found. Both were locally plentiful.

**Mentzelia mollis** Peck, spec. nov., annua humilis erecta 5—10 cm. alta; caule crasso ramoso pilis minutis vix scabris dense puberulo; foliis ad basin confertis oblongo-lanceolatis vel oblanceolatis obtusis plerumque integris vel obscure undulatis 3—5 cm. longis caule minus dense puberulis; floribus subsessilibus ad terminos ramorum foliis reductis subtentis; segmentis calycis lanceolatis acutis 4—6 mm. longis; petalis anguste obovatis flavis 10—12 mm. longis; staminibus 40—50, filamentis filiformi-subulatis; stylo staminibus multo longiore, stigmatate capitato; capsula (immatura) quadrilatera striata circa 2.5 cm. longa.

A low annual 5—10 cm. high; stem erect, stout, freely branched, dark colored, densely puberulent with fine glochidiate but only slightly scabrous hairs; leaves crowded below, oblong-lanceolate to oblanceolate, obtuse, nearly entire or obscurely undulate, rarely with 1 or 2 low teeth, sessile or on broad short petioles, 3—5 cm. long, less densely puberulent than the stem; flowers nearly sessile, mostly in small clusters at the ends of the branches, subtended but not at all concealed by reduced leaves; calyx-segments lanceolate or lance-ovate, acutish, 4—6 mm. long; petals narrowly obovate, clear yellow, 10—12 mm. long; stamens 40—50, a little shorter than the petals, the filaments filiform-subulate; style much surpassing the stamens, the stigma capitate; capsule (immature) 4-sided, longitudinally striate, about 2.5 cm. long.

Type: *Peck No. 20631*, on a clayey slope 1 mile north of Rockville, Malheur County, Oregon, May 7, 1940. An interesting addition to the section *Trachyphytum*, clearly distinguished by its low stout stem, nearly entire leaves, fine, hardly scabrous pubescence, and relatively large flowers. It is probably very local.

**ELÆAGNUS UTILIS** Nels. Not uncommon on low alkaline flats west of McDermitt. In Harney County it is found sparingly near Alvord Lake, along the east base of the Steens Mts., and southward to Nevada.

**ŒNOTHERA PALMERI** Wats. Rather plentiful in sandy soil a few miles west of Vale; apparently rare elsewhere.

**ŒNOTHERA MULTIJUGA** Wats. An abundant and very showy evening primrose, especially in the southern half of the county. It occurs as far north as Harper, and also near Fields, Harney County.

**ŒNOTHERA ALYSSOIDES** H. & A. var. **VILLOSA** Wats. A densely villous form of this variety was found in some abundance about 12 miles southwest of Vale. Its blooming period is considerably later than that of the species, from which it differs strikingly in appearance.

**PTERYXIA PETRÆA** (Jones) C. & R. Found in considerable abundance on the dry, nearly vertical walls of Owyhee Canyon 6 miles above Rome.

*CYMOPTERUS ACAULIS* (Pursh) Raf. Frequent on clay slopes of the lower Owyhee and Sucker Creek section.

*CYMOPTERUS WATSONI* (C. & R.) Jones. Collected in two localities, at Blue Mountain Pass and on a stony slope 15 miles north of McDermitt. The species has been known hitherto only from Nevada and Utah.

*ASCLEPIAS CRYPTOCERAS* Wats. Occurs sparingly on high dry hills from northern Malheur County southward. There is a record from Robinette, Baker County.

*PHLOX AUSTROMONTANA* Cov. Specimens were taken on high stony slopes a few miles north of McDermitt. The species is apparently rare and local in Oregon.

*GYMNOSTERIS NUDICAULIS* (T. & G.) Greene. Found in the valley of Malheur River near Harper, northward to Westfall and eastward to Vale. A few miles west of Vale it is very abundant and presents remarkable color variations, from nearly white to deep lavender and bright yellow. The smaller species, *G. parvula* (Rydb.) Hel., has a much wider range in Oregon, occurring as far west as northwestern Harney County.

*LANGLOISIA SETOSISSIMA* (Gray) Greene. Small colonies were found in various places on dry stony slopes in the lower Owyhee Canyon and the Sucker Creek section.

*COLLOMIA MACROCALYX* Eastw. Collected on a high clayey slope about 15 miles north of McDermitt. So far as we are aware this is the first record of this very distinct species since the discovery of the type.

*PHACELIA RATTANI* Gray. This plant has a remarkably erratic distribution in Oregon. We have it from the southwestern part of the state (Josephine County), from the canyon of the Deschutes River, Wasco County, and from Owyhee Canyon a few miles above Rome, but from no intermediate stations. It also occurs in Idaho and California.

*Salvia carnosa* Dougl. var. *gracilior* Peck, var. nov., erecta ramosissima 3 dm. alta ramulis ultimis tenuissimis; foliis permultis 7—15 mm. longis; bracteis 3—5 mm. longis apicem versus plumbeis vix ciliolatis.

Erect, copiously branched, about 3 dm. high, the ultimate branches almost filiform; leaves very numerous, including the petiole under 15 mm. long; floral bracts 5 mm. long or less, plumbeous toward the tip, scarcely ciliate.

Type: *Peck No. 21810*, on a dry rocky bank of Owyhee Canyon 6 miles above Rome, Malheur County, Oregon, July 9, 1943. Strikingly different from the ordinary form of the species, which occurs in the same neighborhood. The very slender branches, small leaves, and very small bracts are distinctive.

*VERONICA ANAGALLIS* L. Established along irrigation ditches about Ontario.

*APLOPAPPUS INTEGRIFOLIUS* Porter. A considerable colony of this large and conspicuous *Aplopappus* was found on a slightly moist slope 2 miles west of Brogan. A characteristic species of the Rocky Mountains, this is far out of its normal range.

*TOWNSENDIA WATSONI* Gray. This is the common *Townsendia* throughout Malheur County. The characters on which it is separated from *T. florifer* are mainly the more strongly spatulate cauline leaves, the shorter rays, and the very short outer pappus. The best of these, so far as our material shows, is the character of the pappus, though *T. florifer* often has the outer pappus not more than half as long as the inner. Specimens with typical *T. Watsoni* pappus sometimes have very long rays and the cauline leaves may approach those of otherwise typical *T. florifer*.

*Stylocline psilocarphoides* Peck, spec. nov., planta omnino laxe tomentosa erecta vel depressa parce vel copiose ramosa 3—5 cm. alta; foliis 4—8 mm. longis linearibus vel oblongis maxima ex parte sub capitulis congestis; capitulis sessilibus in capitibus globosis; floribus fertilibus 8—12; paleis amplectentibus exterius albo-tomentosis 3 mm. longis apicibus hyalinis brevibus acutis marginibus involutis supra medium late hyalinis; floribus staminiferis 2 vel 3 paleis hyalinis; pappo nullo.

A small annual herb, erect and proliferously branched with few filiform, naked branches, sometimes more or less depressed and more copiously branched, gray-tomentose throughout, 3—5 cm. high; leaves alternate or a few of the lower opposite, 4—8 mm. long, the lower cauline few, linear, the upper closely rosulate about the clusters of heads, mainly linear-oblong, acute or slightly acuminate, not mucronate; heads in small, dense, globose clusters; pistillate flowers 8—12 to a head, the enfolding scales white-woolly dorsally, about 3 mm. long, the acutish, scarios tips one-fourth as long as the body but continued as a hyaline wing down the margins to the middle; staminate flowers 2 or 3, often with as many minute neutral flowers, each subtended by an ovate or lanceolate scale equaling or shorter than the flower; pappus wholly wanting.

Type: *Peck No. 21730*, on a dry slope about 15 miles north of McDermitt, Malheur County, Oregon, June 4, 1943. This obscure little plant seems most closely related to *S. micropoides*,

from which it differs in the smaller size, the acute rather than mucronate leaves, the fewer flowers to a head, the smaller, less densely woolly pistillate scales with much shorter scarious tips that continue downward as a marginal wing, and in the complete absence of pappus. Two other collections have been made by the writer, both from Malheur County, namely, near Brogan, June, 1910 (*Peck No. 865*), and 8 miles west of Vale, May, 1941 (*Peck No. 20677*). Both were at first mistaken for a species of *Psilocarphus*, which the new species closely resembles superficially.

*DIMERESIA HOWELLII* Gray. This remarkable little plant is more widely distributed in Oregon than has generally been supposed. We have it from near Prairie City, Grant County, from Stinking Water Mountain and Steens Mts., Harney County, from the vicinity of Lakeview and of Adel, Lake County, and in 1943 we collected it on a high sandy slope 15 miles north of McDermitt, Malheur County.

*CHÆNACTIS MACRANTHIA* D. C. Eat. Collected once, near Adrian. It has also been found near Fields, Harney County.

*CHÆNACTIS CUSICKII* Gray. From near Adrian well to the south of Rome this species is to be met with, sometimes in immense abundance, on soft clay slopes.

*CREPIS RUNCINATA* T. & G. In Owyhee Canyon a few miles above Rome. The typical form of the species does not seem to have been previously found in Oregon.

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## TENTATIVE KEY AND DISCUSSION OF THE LUPINES WITH SPURRED CALYX

BY ALICE EASTWOOD

This most interesting group of lupines with spurred calyx extends from the Pacific Coast to the Rocky Mountains and from beyond the northern boundary of the United States to the southern. My aim has been to attempt a key to the species that have been definitely named as species and that have been variously treated as species or varieties of these species. It is not in any sense a revision, but notes are added in explanation and enti-

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Explanation of Plate. Sheet in Herb. Lindley, Cambridge University, England, on which are mounted the type-specimens of *Lupinus lepidus* Dougl. (left) and *L. laxiflorus* Dougl. (right). In the lower left hand corner are the data: "N. W. Coast Amer. Douglas 1826."

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ties that seem distinct are described as new species. It is to be expected that over so great an area, many species may occur and probably many more will be added with greater field knowledge and more ample collections. That taxonomists will ever agree is not to be expected.

The species fall into two groups, one in which the upper lip of the calyx is very short, is not concealed by the banner, and in the mature flower stands out separate from the banner though rarely the tips may be concealed. The spur is generally conspicuous. In the other, the flower has a different shape since the upper lip of the calyx is decidedly concealed by the banner. In this group, the spur is always short.

## TENTATIVE KEY

- |   |                             |
|---|-----------------------------|
| 1. Upper lip of calyx short not concealed by the banner, the tip sometimes hidden .....   | 2                           |
| 1. Upper lip of calyx definitely concealed by the banner.....   | 9                           |
| 2. Foliage bright green, flowers small, blue (rarely white).....  | 3                           |
| 2. Foliage not bright green but greenish, indument silvery or silky.....  | 4                           |
| 3. Both leaf surfaces lightly appressed-sericeous; upper part of keel ciliate .....   | <i>L. silvicola</i>         |
| 3. Upper leaf surface glabrous, lower slightly appressed-sericeous; lower part of keel ciliate.....   | <i>L. pseudoparviflorus</i> |
| 4. Flowers blue or purplish; spur small.....  | 5                           |
| 4. Flowers white or varicolored; spur prominent.....  | 6                           |
| 5. Racemes loosely flowered, flowers about 10 mm. long; keel slightly ciliate; leaflets narrow.....   | <i>L. laxiflorus</i>        |
| 5. Racemes more densely flowered, flowers 15 mm. or more long; keel long-ciliate about the middle; leaflets wider.....  | <i>L. arbustus</i>          |
| 6. Flowers white .....  | 7                           |
| 6. Flowers varicolored.....   | 8                           |
| 7. Racemes densely flowered, flowers about 15 mm. long, 4 mm. wide, upper part of banner and upper margin of wings sericeous.....   | <i>L. calcaratus</i>        |
| 7. Racemes loosely flowered, flowers about 12 mm. long, wings glabrous near upper edge; calyx 2 mm. wide; leaflets about 3 mm. wide .....                                 | <i>L. Noldeka</i>           |
| 8. Flowers about 15 mm. long, similar to those of <i>L. calcaratus</i> except in color; variations of.....  | <i>L. calcaratus</i>        |
| 8. Flowers 10 mm. long, with yellow blotch on standard turning purplish or rose; tips of the short teeth of the upper lip of the calyx often concealed by the banner..... | <i>L. proteanus</i>         |
| 9. Stems apparently not branching.....  | 10                          |
| 9. Stems branching.....   | 11                          |

10. Stems decumbent and leafy, with incipient branches; foliage with silvery-appressed pubescence; flowers small, blue.....*L. aduncus*
10. Stems erect; foliage greenish; flowers small, purplish, soon becoming tawny .....*L. wenatchensis*
11. Plants white with dense, appressed, silvery-silky indument.....12
11. Plants greenish, indument less silvery.....14
12. Branches corymbose; flowers about 15 mm. long; banner glabrous .....*L. Hendersoni*
12. Branches spreading; flowers smaller; banner sericeous.....13
13. Lower lip of calyx falcately spreading.....*L. caudatus*
13. Lower lip of calyx appressed to the standard.....*L. inyoensis*
14. Stems densely leafy, leaflets acute.....*L. Helli*
14. Stems not densely leafy, leaflets obtuse.....*L. Cutleri*

LUPINUS LAXIFLORUS Dougl., Bot. Reg. vol. 14, pl. 1140. This was described and illustrated by Lindley, who states that it was "found by Mr. Douglas in dry, open, gravelly plains, about the great rapids of the River Columbia, where it is very common, forming patches of considerable extent, occasionally acquiring a suffruticose habit. The flowers are blue mixed with pink." The specimen named and collected by Douglas at the herbarium at Kew is labelled as "very common at Fort Vancouver along with *L. arbustus*."

A photograph of the Douglas specimen in Lindley's herbarium, now at the Herbarium of Cambridge University, England, shows a plant quite different from the illustration. In this photograph, reproduced in the accompanying plate, the spur is small but distinct and the upper lip of the calyx is plainly visible apart from the banner. In Lindley's illustration, the calyx is not spurred and the upper lip of the calyx is completely hidden by the banner. In that illustration spreading hairs are depicted, while in the specimen, the pubescence is appressed except in the inflorescence. There are other differences not apparent in the illustrated plant. Agardh, in his Synopsis Generis Lupini, page 27, evidently examined Douglas' specimen, as his description agrees with my examination of the same. He describes the keel as ciliate, said to be naked in Lindley's description. In Flora Boreali-Americana (1:164), Sir William Hooker was so impressed by the differences that he named as var. *a* the specimen collected by Douglas and as var. *β* the illustration in the Botanical Register.

LUPINUS ARBUSTUS Dougl., Bot. Reg. vol. 15, pl. 1230. The illustration was made from a plant in the garden of the Royal

Horticultural Society but no specimen was preserved in Lindley's herbarium. The label on Douglas' specimen at Kew reads "under the shade of solitary pine and oak trees near Fort Vancouver and in the plains of the Multnomah" (Willamette River). The original description is as follows:

*L. arbustus*; perennis, floribus alternis pedicellatis bracteolatis, calycis labio superiore bifido: inferiore integro acuto, foliolis 7—13 obovato-oblongis utrinque sericeis, leguminibus 3—5-spermis. Douglas journ. ined.

Caulis teres, albus, glaber, subdecumbens, pedalis v. sesquipedalis. Foliola 7—13, oblonga, utrinque parce sericea; stipulis parvis, subulatis. Flores alterni, v. obscure verticillati. Pedicelli breves. Calyx villosus; labio superiore leviter bifido, obtuso, inferiore integerrimo, acuto. Bracteolæ minimæ, deciduæ. Vexillum obcordatum, cæruleum, medio purpureum, majusculum. Alæ et carina roseæ; hac ciliata. Legumen apice latius, 3—5-spermum; semina parva, alba. Douglas.

I made the following notes on the Douglas type at Kew: flowers about 18 mm. long; upper calyx-lip 5 mm. from spur to tip, lower 7 mm., entire calyx appressed-silky; keel long, ciliate about the middle; banner somewhat sericeous about the middle; petioles about 15 cm. long; leaflets 5 cm. long.

*Lupinus elegantulus* Eastwood, Leaf. West. Bot. 3:20. This is too near *L. arbustus*. Type-locality: Fandango Pass, Warner Mts., Modoc Co., California.

LUPINUS SILVICOLA Heller, Muhl. 6:81. Type-locality: Summit, Placer Co., California. This species extends from Placer, Eldorado, and Nevada counties to Sierra, Plumas, Shasta, and Modoc counties. Occasionally a white-flowered plant is seen amid the blue-flowered ones. It is the common lupine of middle elevations with spurred calyx, small flowers, and bright green leaves.

LUPINUS PSEUDOPARVIFLORUS Rydb., Mem. N. Y. Bot. Garden 1:232. Type-locality: Bridger Mts., Montana, in open woods at 2000 to 2300 m. Specimens in Herb. Calif. Acad. Sci. from Idaho, Montana, Wyoming, and the Wallowa Mts. in Oregon, represent this species. Although some are simple-stemmed and some are branching and the flowers vary somewhat in size, all agree in the characters in the key.

LUPINUS CALCARATUS Kell., Proc. Calif. Acad. Sci., 2:195, fig. 60. This was probably collected somewhere in Washoe Co., Nevada. A specimen in Herb. Calif. Acad. Sci. labelled by

Kellogg "Andrew Veatch Washoe lupine" may be the type as it agrees with the description. Specimens from Virginia City, Nevada, collected by Mary K. Curran (Katharine Brandegee) and identified as *L. calcaratus*, agree with the Andrew Veatch specimen. *M. E. Jones No. 8815* from Franktown, Nevada, is the same. I am considering these specimens as typical. *Lupinus variegatus* Heller is similar except in the variegated color of the flowers. Specimens from Oregon and Washington, called "harlequin lupines" by L. F. Henderson, are probably the same. The flowers vary in color through yellow, white, purple, or blue, generally bicolored. These may be the same as *L. multinctus* Nelson, the type of which I have not seen and the description of which is inadequate. In all these, the calyx is similar with the large spur, the banner is sericeous on the back, the wings sericeous near the upper edge, the flowers 12 to 15 mm. long, the keel ciliate, broad up to the top where it abruptly curves to the apex. Heller describes the banner and keel of *L. variegatus* as smooth but in an isotype in *Herb. Calif. Acad. Sci.* they are as sericeous as in *L. calcaratus*.

Typical *L. calcaratus* has simple stems. A minor variation occurs in Mono and Inyo counties, Calif., with branching stems and white flowers similar to those of the type.

*LUPINUS NOLDEKÆ* Eastwood, *Leafl. West. Bot.* 4:149. Type-locality: near Hot Creek, Mono Co., California. This dainty white-flowered lupine is related to *L. calcaratus* in the shape and color of the flowers, but in this the flower is more slender and the inflorescence more open. The very narrow leaflets, slender branching habit, and denser indument mark it as distinct. Miss Noldeke noted the fragrance of the flowers.

*Lupinus proteanus* Eastwood, spec. nov. *Caules cæspitiosi ex radice lignea, 4—5 dm. alti, leviter sericei, supra ramosi et foliacei, basi foliis paucis vel nullis longe petiolatis; foliolis viridescentibus adpresse sericeis supra et infra, anguste lanceolatis, 2—6 cm. longis, 3—6 mm. latis; petiolis foliorum superiorum circa æquilongis vel brevioribus foliolis; stipulis filiformibus, discretis; floribus circa 10 mm. longis, verticillatis in racemis aliquando densifloris; pedicellis brevioribus calycibus; bracteis plerumque persistentibus filiformibus, brevioribus calycibus; labio superiore calycis 2 mm. longo latoque, breviter bidentato, labio inferiore 3—4 mm. longo, in senectute reflexo, calcare 1 mm. longo; vexillo superante alas, primo aureo-maculato, in senectute cæsio-purpureo, roseo vel purpureo, circa 10 mm. lato, sericeo infra; alis leviter sericeis prope apicem; carina tecta alis, ciliata; leguminibus circa 3 cm. longis, 8 mm. latis, laxe et adpresse sericeis.*

Type: Herb. Calif. Acad. Sci. No. 216883, collected June 10, 1933, on the Victory Highway at Emigrant Pass, Eureka Co., Nevada, *Eastwood & Howell No. 231*. Other specimens from the same locality are *Ripley & Barneby No. 4669* (Herb. Calif. Acad. Sci. No. 302705) and *Lyman Benson No. 4682* (Herb. Pomona College). The species has also been collected by Eastwood and Howell near the junipers east of Wells, Nevada, *No. 334*, and on the Egan Range, 21 miles east of Ely, White Pine Co., Nevada, by Ripley and Barneby, *No. 3605*. On all the labels the coloring of the corolla with its conspicuous yellow spot that changes to a rosy or purplish shade is noted. The changes in the color of the flowers suggest the specific name.

LUPINUS ADUNCUS Greene, Pitt. 4:132. Type-locality: dry ravines among the sandy hills at Aztec, New Mexico; *C. F. Baker No. 433*. This is described as a low perennial with terminal racemes; flowers small in distinct whorls; keel of the corolla naked. *C. F. Baker's* specimen in the Pomona College Herbarium has been taken as typical as well as one with the same number in the Brandege Herbarium at the University of California. A close examination of the flowers of these typical specimens shows the keel of the corolla to be finely ciliate, not naked as described. The low decumbent habit, small flowers, and finely ciliate keel of the corolla differentiate it from *L. Helleri*. In the Dudley Herbarium at Stanford University the following specimens collected by *C. P. Smith* agree in general with typical *L. aduncus*: Aztec, N. Mex., *Nos. 3931, 3932*; Mancos, Colo., *Nos. 3934—3939*.

LUPINUS WENATCHENSIS Eastwood, Leaf. West. Bot. 3:174. Type-locality: alpine slopes of Wenatchee Mt., alt. 6800 ft. In this lupine several simple stems arise from a perennial woody root. The small, dark purplish flowers are in densely flowered racemes and soon become tawny.

LUPINUS HENDERSONI Eastwood, Leaf. West. Bot. 2:266. Type-locality: Alvord Ranch, east Steens Mts., Harney Co., Oregon. This is similar to *L. caudatus* Kell. but the flowers are much larger, the spur of the calyx more conspicuous, and the standard smooth on the back.

LUPINUS CAUDATUS Kell., Proc. Calif. Acad. Sci. 2:197, fig. 61. An unnamed specimen in Herb. Calif. Acad. Sci. labelled with *Dr. Kellogg's* large label, bearing only the words "Carson

Valley," may be the type. It is a poor specimen. However, several specimens collected by Mary K. Curran (Katharine Brandegee) from Virginia City, Carson, and Franktown, and others from the same county collected by Walter Bryant, M. E. Jones, A. A. Heller, and P. B. Kennedy agree and are undoubtedly typical. All are white with the dense, appressed, silvery-silky indument, branching stems, standard satiny-pubescent along the middle line of the back, and ciliate keel.

*LUPINUS INYOENSIS* Heller, Muhl. 2<sup>o</sup>: 211. Type-locality in the Sierra foothills west of Bishop, Inyo Co., California, at McGee's Meadows. Type: Herb. Calif. Acad. Sci. No. 707, *Heller No. 8312*. This is very much like *L. caudatus*, the most noticeable distinction being in the lower lip of the calyx. In *L. caudatus* it is falcately spreading from the flower, in *L. inyoensis* it is appressed to the flower.

*LUPINUS HELLERI* Greene, Pitt. 4: 134. Type-locality: a canyon one mile southeast of Santa Fe, New Mexico; *Heller No. 3557*. This has been included under *L. aduncus* Greene, from which it differs in erect branching stems, larger flowers, and conspicuously ciliate keel of the corolla. A duplicate of Heller's collection in Herb. Calif. Acad. Sci. agrees with Greene's description. It is without distinct branches, though showing incipient ones, and has the flowers as described. Several specimens in the Dudley Herbarium collected in the region adjacent to Santa Fe by C. P. Smith (*Nos. 4056—4060, 4062, 4063*) show flowers which agree with the type but the stems all branch above. Besides these specimens from New Mexico, the following from Colorado in the Dudley Herbarium agree with *L. Helleri* in branching stems and similar flowers: Dolores, Montezuma Co., *C. P. Smith Nos. 3940, 3941*; Ignacio, La Plata Co., *C. P. Smith No. 3927*; Durango, Silverton road, *C. P. Smith Nos. 2928, 2929*; also doubtfully, from Wagon Wheel Gap, Mineral Co., *Hitchcock et al. No. 4125*; highway near Poncho Pass, Saguache Co., *C. P. Smith Nos. 3904—3906*.

*Lupinus Cutleri* Eastwood, spec. nov. Caules perennes alti et subrobusti, supra ramosi, villosi villis densis brevibus diffusis; foliolis 6—9 æquilongis petiolis, oblanceolatis, obtusis, mucronulatis, 4—5 cm. longis, 5—7 mm. latis, viridibus, supra prope glabris, infra densissime adpresse sericeis, petiolis et foliis junioribus densissime sericeis; floribus 12 mm. longis, 3 mm. inter vexillum et alas, verticillatis in racemis 1—3 dm. longis, æquilongis pedunculis; bracteis caducis, æquilongis alabastris; pedicellis

divaricatis, circa 3 mm. longis; tubo calycis 3 mm. longo, calcare brevissimo, obtuso; labio superiore ovato, 4 mm. lato longoque, bidentato, tecto vexillo; labio inferiore ovato acuto, paulo longiore; vexillo reflexo, circa 11 mm. lato, medio dorsi sericeo; alis 7 mm. latis, 11 mm. longis cum stipite, sericeis prope apicem et infra; carina medio 4 mm. lata, abrupte acuminata, apice purpurea, laxe ciliata ex basi ad acumen, tecta alis.

Type: Herb. Calif. Acad. Sci. No. 271410, collected June 12, 1938, 18 miles north-northwest of Fort Defiance, Apache Co., Arizona, by Hugh C. Cutler, *No. 2141*, in whose honor it is named. The species has been collected also in the Lukachukai Mts., Apache Co., Arizona, at an elevation of 7250 ft., *Peebles No. 14384*.

The type was distributed as *L. aduncus* Greene, but the species is nearer *L. Helleri* Greene. The flowers are much larger than those of *L. aduncus* and the pubescence and habit are different. The broad oblanceolate leaflets, obtuse at apex, with a different indument, conspicuously differentiate it from *L. Helleri*. The type-specimen seems to be a branch of a large plant.

/ / /

The following have been described as variants:

LUPINUS LAXIFLORUS var. COGNATUS C. P. Sm. in Jepson Man. Fl. Pl. Calif., p. 527. Type-locality: Wallowa Mts., Oregon; *Cusick No. 3187*.

LUPINUS LAXIFLORUS f. THEIOCHROUS Robinson in Piper Fl. Wash., p. 358. Type-locality: Rattlesnake Mts., Yakima Co., Washington; *Cotton Spur prominent*.

LUPINUS LAXIFLORUS var. LYLEIANUS C. P. Sm. Spec. Lup. sig. 7, p. 105. Type-locality: head of Sheep Creek, Wallowa Co., Oregon; *Lyle Calyx not spurred*.

LUPINUS LAXIFLORUS var. ELMERIANUS C. P. Sm., *ibid.*, p. 106. Type-locality: Paradise, Wallowa Co., Oregon; *Applegate No. 6483*. Calyx unknown.

LUPINUS LAXIFLORUS var. DURABILIS C. P. Sm., Amer. Journ. Bot. 13: 529. Type-locality: Priest River Range, Bonne Co., Idaho; *Leiberg No. 2731*. Keel naked; calyx scarcely spurred.

LUPINUS LAXIFLORUS var. VILLOSULUS C. P. Sm., *ibid.*, p. 530. Type-locality: Clover Mts. near Deeth, Elko Co., Nevada; *Heller No. 9098*. Keel ciliate; calyx spurred.

LUPINUS CAUDATUS var. SUBTENELLUS C. P. Sm., Bull. Torr. Bot. Club 51: 304. Type-locality: Paulina Lake, Deschutes Co., Oregon; *Leiberg No. 591*. Calyx not spurred.

LUPINUS CAUDATUS var. RUBRICAULIS (Greene) C. P. Sm., Contrib. Dudley Herb. 1: 29. (*L. rubricaulis* Greene Pl. Baker. 3: 35.) Type-locality: Crested Butte, Gunnison Co., Colorado; *C. F. Baker No. 342*. Calyx not spurred.

LUPINUS CAUDATUS var. SUBMANENS C. P. Sm. Spec. Lup. sig. 7, p. 106. Type-locality: Antone Creek, 2 miles east of Anthony Lake, Baker Co., Oregon; *Lyle*. Spur short.

LUPINUS INYOENSIS var. ERIOCALYX C. P. Sm. in Jepson Man. Fl. Pl. Calif., p. 527. Type-locality: east of the Minarets, Madera Co., California; *Congdon*. Calyx villous, spurred.

LUPINUS INYOENSIS var. DEMISSUS C. P. Sm., Bull. Torr. Bot. Club 51: 304. Type-locality: Wallowa Mts., Baker Co., Oregon; *M. E. Peck* No. 5329.

## A NEW CAREX FROM COLORADO

BY F. J. HERMANN

*Bureau of Plant Industry, Soils and Agricultural Engineering,  
U. S. Department of Agriculture*

Two collections of a sedge from the Uncompaghre Plateau of western Colorado, referred to the writer for determination by Professor H. D. Harrington of the Colorado A. and M. College, prove to represent a new species of the complex section *Ovales*.

*Carex stenoptila* Hermann, spec. nov. Dense cæspitosa e rhizomatibus crassis; culmi rigidi, 1.7—7.5 dm. alti, foliis bis longiores basi obtuse superne acute triangulares, sub capitulis scabridi; folia frondosa 2—6 ad basim culmi aggregata, lamina 5—25 cm. longis, 1—3.5 mm. latis, vaginis per teneris non artis; spicæ 7—10 gynæcandræ oblongo-ovoideæ vel ovoideæ, 6—10 mm. longæ, 3—5 mm. latæ, sessiles, in capitulum terminale 12—19 mm. longum, 8—13 mm. latum confertæ, bracteis squamiformibus; squamæ cuneato-oblongæ vel oblongo-lanceolatæ, 3.5 mm. longæ perigynia haud occultantes; perigynia plano-convexa, oblongo-lanceolata vel anguste ovato-lanceolata, 4.5—5 mm. longa, 1—1.5 mm. lata, membranacea, straminea, prominenter sed tenuiter multistriata utrinque, peranguste marginata, ad basim sessilem valde spongiosam contracta, in rostrum tenue serrulatum circa 1.5 mm. longum apice ferrugineum teres haud hyalinum sensim attenuata; achænia oblonga, 1.5 mm. longa, 0.8 mm. lata, substipitata.

Densely cespitose from stout, brown rootstocks, the culms 1.7—7.5 dm. high, stiff, about twice the length of the leaves, obtusely triangular and smooth below, sharply triangular and scabridous above; leaves with well-developed blades 2 to 4 to a fertile culm, clustered toward the base, the blades flat or somewhat canaliculate, erect, usually 5—25 cm. long, 1—3.5 mm. wide, scabridulous toward the attenuate apex, the sheaths loose, ventrally white-hyaline, very thin and early ruptured, prolonged 1—2 mm. at the throat beyond the base of the blade; spikes 7—10, usually 8 or 9, aggregated into an oblong to suborbicular head 12—19 mm. long, 8—13 mm. wide, obtuse to acutish at the apex, rounded at the base, the perigynia 10—25, ascending; bracts scale-like; scales cuneate-oblong to oblong-lanceolate, pale to dark chestnut-brown, the pale yellowish-brown midvein conspicuous, obtuse to acute, 3.5 mm. long, not concealing the perigynia; perigynia plano-

convex, oblong-lanceolate to narrowly ovate-lanceolate, 4.5—5 mm. long, 1—1.5 mm. wide, membranaceous, stramineous, with 5—7 slender raised nerves on both faces, very slightly if at all dilated over the achene, very narrowly wing-margined, narrowed toward the rounded, sessile base, very spongy at the base and along the sides of the achene, the body serrulate on the margins above, gradually tapering into a slender beak about 1.5 mm. long, obliquely cut dorsally, dark brown, very shallowly bidentate, serrulate below, smooth and terete but not at all white-hyaline at the tip; achenes lenticular, oblong, 1.5 mm. long, 0.8 mm. wide, tapering to the substipitate base, glossy, yellowish-brown; style straight, slender, jointed 0.3 mm. above the achene, at length deciduous; stigmas two.

COLORADO: dry ground, Sneezeweed Camp, alt. 9500 ft., Uncompahgre National Forest, Montrose County, August 16, 1940, *David Costello No. 4500* (type, Herbarium of Colorado A. and M. College), and *David Costello No. 4501* (Herbarium of Colorado A. and M. College, U. S. National Arboretum Herbarium), same data except plants from moist habitat.

*Carex stenoptila* is perhaps most closely related to *C. abrupta* Mack., a montane species of Washington, Oregon, Nevada, and California, from which it is readily distinguished by its larger (4.5 to 5 mm., rather than 3.75 to 4 mm. long), conspicuously spongy, very narrowly margined, and non-hyaline-tipped perigynia. The somewhat boat-shaped, almost wingless perigynia suggest those of *C. leporinella* Mack., another species of approximately the same geographic range as *C. abrupta*, but from that it differs not only in its non-hyaline-tipped and much longer beak but also in the very spongy base of the perigynia and in the short pistillate scales which do not conceal the perigynia.

The two collections made by Dr. Costello are of markedly different aspect, the type-collection (*No. 4500*), having few culms only 17 to 24 cm. high with comparatively stiff leaf-blades 5 to 11 cm. long, representing the dry soil phase of the species. In the specimens from a moist habitat (*No. 4501*), the culms are much more numerous, 53 to 75 cm. long with lax leaf-blades 15 to 25 cm. long. The beaks of the perigynia are not conspicuous in the somewhat over-mature heads of this collection as they are in the type.

Another plant showing affinity with species of the Pacific States rather than Rocky Mountain relatives has recently been described from the Uncompahgre Plateau. This is *Arctostaphylos coloradensis* Rollins (*Rhodora* 39: 463,—1937), allied to *A. nevadensis* Gray, ranging from middle California northward.

NOTE ON THE DISTRIBUTION OF *CHAMÆSARACHA NANA*. According to Jepson (Man. Fl. Pl. Calif., p. 893), the distribution of *Chamæsaracha nana* (Gray) Gray is given as the eastern slope of the Sierra Nevada in California from Nevada County northward to southern Oregon at elevations of 5000 to 6000 feet. In June, 1938, Miss Anita Noldeke collected specimens of this species at the south end of Long Valley, Mono County, California, at 7000 feet elevation. The nearest station to this that I know of is over 100 miles to the north in the Lake Tahoe district of western Nevada. I collected the plant in that region in 1938 on the north side of Slide Mt. at an elevation of 7500 feet; and Smiley reports a collection by Kennedy from Mt. Rose at 9000 feet (U. C. Publ. Bot. 9:321). Although several collections have been seen from the west slope of the northern Sierra Nevada, it would seem that farther south the plant is found mostly to the eastward. In July, 1943, however, I found it locally abundant on the west side of Donner Pass in Placer County, California, perhaps not far from the place where Kellogg originally found it (cf. Gray, Proc. Amer. Acad. 10:62).—J. T. Howell.

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A CORRECTION. In a contribution to the literature of *Astragalus* (Leaflet West. Bot. 3:98,—1942), the writer had occasion to refer to the species first described as *Diholcos micranthus* Rydb., and, in accordance with the recent monographic review of *Astragalus* subgen. *Diholcos* of Prof. Porter (Amer. Journ. Bot. 26:690, sequ.,—1939), the name *A. haydenioides* Porter was used. It should be remarked that this combination is antedated by *Astragalus Diholcos* Tidestr., Proc. Biol. Wash. 50:20 (1937), also proposed to replace *D. micranthus*.—R. C. Barneby.

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CULBERTSON PAINTBRUSH AT FROG LAKE. One of the attractive Indian paintbrushes of the Sierra Nevada in California is *Castilleja Culbertsonii* Greene, which has apparently been reported only as far north as southern Tuolumne County. In July, 1943, I found this subalpine species at Frog Lake on the southeastern slope of Castle Peak in Nevada County (No. 18787), a northward extension of range of about 110 miles.—J. T. Howell.

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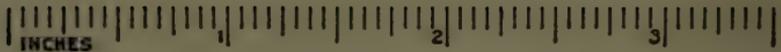
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## NOTEWORTHY PLANTS OF IDAHO

BY C. L. HITCHCOCK AND J. W. THOMPSON

*University of Washington, Seattle*

Among the collections made in Idaho in recent years by Hitchcock and Muhlick (cited herein as *H. & M.*) and by Thompson, occasional specimens are to be found that merit notation. There follow a few of these:

*RM*    *POA RUPICOLA* Nash. This species, previously once reported for the state, was collected several times, as shown by the following collections, the determination of several of which has been verified by Mrs. Agnes Chase: *Hitchcock & Martin No. 5809*, 5 miles nw. of Mt. Borah, Custer Co.; *H. & M. No. 10151*, Middle Spangle Lake, Blaine Co.; *H. & M. No. 10884*, near Castle Peak, White Cloud Range, Custer Co.; *H. & M. No. 11201*, Leatherman Pass, near Mt. Borah, Custer Co. Three of these four collections were made on limestone talus. *H. & M. No. 10242*, Bald Mt., Elmore Co., was identified as *P. rupicola* by Mrs. Chase. In our opinion it is intermediate to *P. Leibergii* Scribn.

*RM*    *POA PATTERSONII* Vasey. *J. W. Thompson No. 14083*, Boulder Creek Canyon, Blaine Co.; *H. & M. No. 11146*, Leatherman Pass, near Mt. Borah, Custer Co. These are the first two collections of the species from Idaho according to Mrs. Chase.

*RA*    *LEWISIA KELLOGGII* K. Brandg. In 1937, Mr. Thompson made two collections of a white-flowered *Lewisia* in the Sawtooth Mts., *No. 13995*, from alpine granitic slopes of high ridge near Stanley Lake, Custer Co., July 28, 1937, and *No. 13750*, from granitic slopes of Gold Fork Lookout, Valley Co., July 9, 1937. Since no such plants were known to have been reported from Idaho, it was thought the collections represented a new species, but the material was so difficult to study that an effort was made to collect fresh material. In 1944, the plant was collected in abundance on the summit of the divide to the north of Dog Creek, about 4 miles n. of Pine, Elmore Co., June 4, *H. & M. 8690*. In these specimens the flowers are solitary, with 2 sepals and 2 denticulate bracts juxtaposed, the petals mostly 6 or 7 and about 15 mm. long, the stamens 10—16 (mostly 14), the styles 4 (or 3), united about  $\frac{1}{3}$  length, the capsule thin and membranous

and splitting upward by 4 valves, and seeds about 2 mm. long, black and shining, and finely and evenly reticulate-tuberculate.

Through the kindness of J. T. Howell this material has been compared with material of *L. Kelloggii* from California (*Howell No. 15551*, from El Capitan Trail, Mariposa Co., and *Eastwood No. 14655*, near Long Valley, Plumas Co.). The California and Idaho plants are identical. Thus we have a species known through collections only from central Idaho and the middle Sierra Nevada of California: either *L. Kelloggii* is an old species on its way to extermination, or (and this we suspect) it is such an evanescent plant that collectors have missed it in the northern Sierra and the desert ranges of Oregon and northern Nevada.

LEWISIA PYGMÆA (Gray) Robinson var. ARIDORUM Bartlett. In describing this variety Bartlett stressed not only such characters as the glandular calyx and bracts and the glandular-apiculate petals, but also the flower-color, namely, white as compared with red in the species. In 1944 Hitchcock and Muhlick made several collections of the plant in Idaho, e. g., Ryan Peak, *H. & M. No. 10649*, and Castle Peak area, *H. & M. No. 10916*, noting that wherever the plant grew, individuals with red, white, and greenish-white flowers occurred together, in that order of abundance. Surely, then, the type of var. *aridorum*, *Suksdorf No. 5725*, from Mt. Adams, Washington, cannot be considered unique because of the flower color. A collection from the Devil's Bedstead, Blaine Co., Idaho, July 28, 1936, *Thompson No. 13579*, has stipitate-glandular sepals and bracts, the glands being dark red to yellow and the petals are stipitate-glandular at tip. Since there is but one hair at the tip, they might more correctly be called glandular-apiculate. Thompson's collection, therefore, is referable to var. *aridorum*, and it would appear that this case more or less parallels *L. Kelloggii*. However, we feel that var. *aridorum* is merely the extreme glandular phase of the species and doubt that it is a significant variation. We believe additional plants of such a nature will be found if specimens are examined in the field where their characteristics can more easily be observed.

CALTHA CHELIDONII Greene vel aff. *H. & M. 10942*, cirque at nw. base of Mt. Borah, Custer Co. Although it would seem to match Greene's type in many particulars, there is some doubt as to the identity of this peculiar plant which may be described as follows:

Plants 3—10 cm. tall; blades 1.5—3 cm. long, cordate-ovate to ovate-lanceolate, bases truncate to sagittate or auriculate, rather thick and fleshy, bright green; flowering stems 1 or 2, usually bearing a single leaf and two flowers, but the pedicels of flowers and the leaf attached so close to the caudex that they are concealed by the sheathing stipules of the basal leaves, the pedicels simulating scapes 3—10 cm. long; flowers about 2 cm. broad, the sepals about 1 cm. long, linear-oblong, rounded to slightly emarginate, about 8 in number, bright canary-yellow, slightly purplish on back, with 3 principal nerves; stamens about 30; pistils about 12, the fairly mature follicles slightly over 1 cm. long; ovules about 4.

*THALICTRUM ALPINUM* L. *H. & M. No. 11187*, wet meadow (but not a bog) at head of West Fork Pahsimeroi River, e. base of Mt. Borah, Lost River Mts., Custer Co., at 10,000 ft. elev. We believe this to be the first report of the species for Idaho.

*DRABA OREIBATA* Macbr. & Pays. This plant was previously represented with certainty only by the type-collection. The plants of that collection, *Macbride & Payson No. 3135*, were immature and (as now known) fragmentary. In 1944, the species was found in abundance in crevices of limestone about 10 miles n. of Leslie, Idaho, in Pass Creek Gorge, Butte Co., at about 6501 ft. elev., *H. & M. No. 8840*. The plants formed dense cushions several inches in diameter. In habit the plant differs materially from *D. subalpina* Goodman & Hitchcock, its nearest ally, since that species, occurring on sandy soil or shale, is not nearly so heavily matted. There are other significant differences in leaf and fruit characters, so there can be no doubt that *D. subalpina* and *D. oreibata* are distinct species.

*DRABA ARGYRÆA* Rydb. and *DRABA SPHÆROCARPA* Macbr. & Pays. When Hitchcock treated these two species in 1941 (*Univ. Wash. Pub. Biol. 11: 80*), there were but eleven collections available in herbaria. Seven additional collections were made in 1944, and in all cases *D. argyræa* was found to be in rock crevices only, *D. sphærocarpa* always on sand or gravelly talus. The two species were sometimes growing side by side, but more often one species only would be found in a given locality. *Draba argyræa*: *H. & M. No. 9796*, near Elk Lake, S. Fork Payette River near head, Boise Co.; *H. & M. No. 10207*, 6 miles s. of Atlanta, Elmore Co.; *H. & M. No. 10506*, 7 miles nw. of Alturas Lake, Blaine Co. *Draba sphærocarpa*: *H. & M. No. 9633*, on peak 3.5 miles sw. of Stanley Lake, Custer Co.; *H. & M. No. 9685*, inlet to Stanley Lake; *H. & M. No. 9798*, near Elk Lake, Boise Co.;

*H. & M. No. 9883*, bank of Baron Creek, 3 miles s. of Sacajawea Hot Springs, Boise Co.

*R.M.* *DRABA LANCEOLATA* Royle. This white-flowered species was collected twice in the vicinity of Mt. Borah, *H. & M. No. 10948* and *No. 11157*. First collected in Idaho by Macbride and Payson, it is very rare in the state where it is known only from the Lost River Mts.

*P.* *LESQUERELLA MONTANA* (Gray) Wats. A collection from summit of grade between Dickey and Challis, Custer Co., Idaho, June 3, 1944, *H. & M. No. 8922*, is apparently closest to this species. The silicles are oblong, about 8 mm. long, very decidedly wing-margined (more so than in any other collection seen) and about 16-seeded; the styles are scarcely 2 mm. long (shorter than recorded for the species).

*T.M.* *LESQUERELLA CONDENSATA* A. Nels. Several collections of this species have been made in Idaho: 2 miles e. of Dickey, Custer Co., on gravelly limestone mesa, June 3, 1944, *H. & M. No. 8903*; gravelly wash, Salmon River bank, about 20 miles s. of Challis, Custer Co., June 15, 1944, *H. & M. No. 8995*; roadside 2 miles e. of Gilmore, Lemhi Co., June 25, 1944, *H. & M. No. 9299*; dry rocky point 6 miles n. of Gilmore, Lemhi Co., May 17, 1941, *R. J. Davis No. 3130*. In most cases there is an intergradation between the species proper and the var. *lavis* Pays.

*J.M.* *PHYSARIA GEYERI* (Hook.) Gray var. *PURPUREA* Rollins. Two collections of this plant were made in Idaho, one from sandy banks above Silver Creek, about 8 miles ne. of Myer's Cove, Lemhi Co., July 1, 1944, *H. & M. No. 9467*. These plants had yellow petals that turned rose or purplish as they aged, most silicles had 2 (but occasionally 3) ovules in each locule. The other collection, from hard, packed soil in canyon 3 miles directly w. of Challis, Custer Co., July 3, 1944, *H. & M. No. 9523*, was similar, but the petals were yellow and did not redden as they aged. It is doubted, therefore, that the distinction in color, purple as compared with yellow, will prove constant.

*P.M.* *GROSSULARIA NEGLECTA* Berger, N. Y. Agr. Exp. Stat. Tech. Bull. 109:106 (1924). Two collections made in 1944, namely, *H. & M. No. 8842*, from Pass Creek Gorge in Lost River Mts. about 10 miles n. of Leslie, Butte Co., and *H. & M. No. 9309*, from near head of Spring Canyon, about 8 miles se. of Gilmore,

Lemhi Mts., Lemhi Co., as well as *Hitchcock et al. No. 3785*, Lost River Mts., 7 miles n. of Dickey, Custer Co., are referable to this species.

Berger's original description might well be augmented somewhat by our observations of these plants. They are low spreading shrubs mostly about 1 foot (to 3 ft.) in height. The cream-colored petals are about 1 mm. long, broadly ovate in outline, but abruptly narrowed to a tiny claw,  $\frac{1}{2}$  to  $\frac{2}{3}$  length of the yellow-greenish (or pinkish-tinged) sepals. The ovary as well as the hypanthium and sepals are often rather conspicuously hairy with very soft straight slender hairs. The bracts are glandular-hairy and the pedicels are hairy. It is one of the most common gooseberries of the Lost River and Lemhi mountains, forming matted growths on many of the slopes. To one who ordinarily calls all species of this relationship by the generic name *Ribes*, *Grossularia neglecta* seems almost a misnomer.

*RM* *HOLODISCUS DUMOSUS* (Nutt.) Heller. *H. & M. No. 10398*, on lava flow, 8 miles nw. of Pine, Elmore Co. The leaves of this plant are deeply cut to the base and contrast sharply with those of *H. & M. No. 10885*, from S. Fork Salmon River, Custer Co., the latter collection having smaller leaves that are toothed at apex only. It would key to *H. microphyllus* Rydb. var. *typicus* Ley (Bull. Torr. Bot. Club 70:283,—1943), whereas the former collection is almost surely *H. dumosus* var. *typicus* Ley (ibid., p. 281), although that author did not report the species for Idaho.

*RM* *POTENTILLA OVINA* J. M. Macoun. Although we can find no reference to its occurrence in the state, this species with finely dissected leaves is the most common subalpine *Potentilla* on most of the peaks in central Idaho and is represented by the following collections, all made on limestone: *H. & M. No. 8844*, Pass Creek Gorge, 10 miles n. of Leslie, Butte Co.; *H. & M. No. 10962*, cirque at nw. base of Mt. Borah, Custer Co.; and *H. & M. No. 9308*, 8 miles se. of Gilmore, Lemhi Mts., Lemhi Co.

*WM* *POTENTILLA VIRIDESCENS* Rydb. The following collection is thought to represent the first record of this species for Idaho: *H. & M. No. 10316*, 1 mile ne. of Little Trinity Lake, Elmore Co.

*ASTRAGALUS TENUIFOLIUS* Nutt., T. & G. Fl. N. Amer. 1:352 (1838). *H. & M. No. 10854*, dry open ridge north of peak immediately east of Castle Peak, Custer Co., elev. about 11,000 ft.

The plants of this collection are scarcely 10 cm. tall and fit well the description of the species. Two other collections, however, *H. & M. No. 10986*, 1 mile w. of Mt. Borah, Custer Co., elev. 10,600 ft., and *H. & M. No. 9280*, 3 miles west of Leadore, in the Lemhi Mts., Lemhi Co., will, in general, fit *A. tenuifolius* also, the plants being less than 10 cm. tall, but the leaves vary so much in width that some of the plants would have to be referred to *A. divergens* Blank., Mont. Agric. Coll. Stud. 1:73 (1905). Two additional collections, *H. & M. No. 8997*, 20 miles s. of Challis, along Salmon River, Custer Co., elev. about 5500 ft., and *H. & M. No. 9457*, 3 miles s. of Cabin Creek Ranger Station, Lemhi Co., elev. 5500 ft., include plants mostly over 2 dm. tall (corollas over 10 mm. long). They would key to *Homalobus strigosus* (Coulter & Fischer) Rydb. in the key in the North American Flora (24:268). There surely can be little basis for the maintenance of these phases as distinctive species, and from our field observations we believe Jones was correct (Rev. Astrag. 74,—1923) in treating these variants as subspecific in nature and in noting that "all the varieties intergrade."

ASTRAGALUS RECLINATUS Cronquist. *H. & M. No. 11310*, along ditches near hay fields at May, Custer Co., Aug. 20, 1944. Although there are minor discrepancies between our plants and the specimens which Cronquist collected, the two collections are surely conspecific. May and Dickey (type-locality) have similar elevations and are located in parallel valleys separated by the Lost River Mts. The soil in both places is rather alkaline, being chiefly of limestone origin. Our plants differ as follows, the comparable characters of the type are shown in parentheses: stems 2 mm. thick (1 mm.); leaflets mostly 3, rarely 5, the terminal one as much as 45 mm. long and 9 mm. broad (mostly 20—30 mm. long and 3—5 mm. broad), the lateral ones mostly 20—30 mm. long (mostly 10—20 mm. long); flowers dirty-white, not at all purplish, only the buds showing any purple color (whitish with a trace of purple). This plant is one of several collected by us in Idaho which apparently will not fit any niche already carved for it by Rydberg or M. E. Jones.

OXYTROPIS PARRYI Gray. *H. & M. No. 10880*, rocky summit of peak immediately to west of Castle Peak, White Cloud Range, Custer Co., elev. 11,000 ft. So far as we know, this species, like

the next following, has not previously been reported for Idaho.

*OXYTROPIS NANA* Nutt. *H. & M. No. 11024*, head of Mahogany Creek, about 2 miles nw. of Mt. Borah, Custer Co., elev. 10,000 ft.

*COLLOMIA DEBILIS* (Wats.) Greene. Several collections of this interesting plant were made, all having flowers with included anthers. One collection, *H. & M. No. 10586*, from fine limestone talus slides on west base of Mt. Ryan, Boulder Mts., Custer Co., has practically all leaves trifid, and unquestionably belongs under the var. *trifida* Payson. Three other collections, *H. & M. No. 10488*, from above Alpine Lakes, Blaine Co., *H. & M. No. 10985*, from 1 mile w. of Mt. Borah, and *H. & M. No. 11267*, west base of Mt. Mogg, Lemhi Mts., have at least half of the leaves entire and would key to var. *integra* in Payson's treatment (*Univ. Wyo. Publ. Sci. Bot.* 1: 79—87,—1924), but there is so much variation in the lobing of the leaves that we question whether the two varieties can be maintained other than arbitrarily. Of these three collections, *No. 10985* is grayish-pubescent, the others are much less hairy. A fifth collection is not identifiable by means of Payson's key and appears to merit varietal distinction as follows:

*Collomia debilis* (Wats.) Greene var. *dentata* C. L. Hitchc., var. nov. Planta 2—5 dm. lata, decumbens, viscida; foliis sæpe oblanceolatis, acutis, 2.5—3.5 cm. longis, 6—9 mm. latis, petiolatis, laminis 4- vel 5-serrato-dentatis, bidentatis, vel integris; corollis cæsiis, infundibuliformibus, paucè glandulosis, tuba lobi circa duplo longiore; staminibus corolla 1—3 mm. brevioribus; stylis exsertis 2—3 mm.

Plants forming dense mats as much as 6 dm. in diameter from thick deep tap-roots, viscid throughout, leaves mostly oblanceolate, acute 2.5—3.5 cm. long, 6—9 mm. broad, narrowed to slightly winged petioles  $\frac{1}{2}$  to  $\frac{2}{3}$  length of blades, the lower usually distinctly serrate-dentate at apex with 3 to 5 teeth, the upper ones entire or 2-toothed near tip, narrower than lower leaves; corollas 20—26 mm. long, pale lavender, funnellform, slightly glandular without, the lobes about  $\frac{1}{2}$  length of tube, very slightly erose; stamens 1—3 mm. shorter than corolla, inserted 10—12 mm. from base of corolla; styles exserted 2—3 mm.

Type: from granitic talus about 10 miles s. of Gibbonsville, Lemhi Co., Idaho, June 17, 1944, *Hitchcock & Muhlick No. 9058* (*Univ. of Wash. Herb.*).

This plant would key to var. *Ipomæa* in Payson's key, were the stamens exserted. However, it differs from that variety not only in that particular, but also in the peculiar dentate leaves

and the lavender corolla (as contrasted with reddish-pink). Payson's plant is an alpine, whereas var. *dentata* was collected in the Arid Transition Zone at an elevation much lower than any other specimen of this species that I have seen.

MERTENSIA CAMPANULATA A. Nels. About 16 miles n. of Mountain Home, Elmore Co., in a meadow beside the Mountain Home-Dixie Road, several acres of a robust *Mertensia* were seen. These plants, collected as *H. & M. No. 8647*, have proved to be Dr. Nelson's species which is therefore considerably more widespread than reported by Williams (Ann. Mo. Bot. Gard. 24: 68,—1937): "Blaine and Camas Counties, Idaho." Our field notes slightly modify and somewhat augment previous descriptions of the plant: "plants in large clumps 2 to 3 ft. wide, corollas blue, reddish-blue, or the limb blue and the tube red; flowers markedly drooping."

PEDICULARIS HALLII Rydb. *H. & M. No. 9179*, gravelly, dry meadow land about 6 miles n. of Wisdom, Beaverhead Co., Montana, June 21, 1944. The corollas are more nearly magenta than "purple" and the entire plant is arachnoid-pilose ("stem glabrous to inflorescence" according to Rydberg's description), although the calyx is decidedly more hairy than the foliage. This is apparently the first record of the plant for Montana, although it was one of the most noticeable and abundant plants along the Big Hole River. It was also collected in Idaho, where it has not been reported before: *H. & M. No. 11191*, meadow land overlying limestone at 10,000 ft. elev. at head of W. Fork Pahsimeroi River, Lost River Mts., Custer Co., August 16, 1944. The plants of this collection are so nearly glabrous, even to the calyx, that they appear to be varietally distinct from the Montana collection.

AGOSERIS PUMILA (Nutt.) Rydb. *H. & M. No. 10989*, from open limestone knolls at head of Rock Creek, west base of Mt. Borah, Custer Co., elev. 10,600 ft. Although the involucre of these plants are only 12—15 mm. long and no more than 1 cm. broad, the specimens appear to be a very much dwarfed form of this species.

TOWNSENDIA SPATHULATA Nutt. *H. & M. No. 10977*, in talus at summit of saddle between Rock and Mahogany creeks, 1 mile w. of Mt. Borah, Custer Co., at 10,000 ft. elev. Not only did Larsen (Ann. Mo. Bot. Gard. 14: 22,—1927) not list this

species for Idaho, but her description to include these plants must be emended as follows:

Biennials or short-lived perennials from slender tap-roots, rather uniformly grayish-hirsute or pilose with 3—7-celled hairs as much as 2 mm. long; caudex crowned with rosette of 25—100 spatulate, rounded leaves 2—3 cm. long and 2—4 mm. broad; cauline leaves linear-oblongate, rounded to acute, somewhat narrower than basal leaves, usually equaling lateral heads and surpassing the central one; plants with single, sessile, central head and 2—8 lateral heads on spreading peduncles 1—3 cm. long, the central head 2—3 cm. broad, exclusive of rays, its involucre bracts 12—15 mm. long, about 1 mm. broad, long-attenuate, the outer ones greenish, scarcely at all scarious-margined, the inner ones with narrow scarious and more or less pinkish margins, somewhat ciliate-lacerate, all with tips more or less curved and twisted, ligules 12—18 mm. long, 2—2.5 mm. broad, rounded and entire or cleft into 2—4 teeth about 1 mm. long, bluish-violet, uniformly short stipitate-glandular on back, the lateral heads similar but only 1—1.5 cm. broad; achenes about 3.5 mm. long, the faces grayish-strigillose with short thick simple hairs about 0.4 mm. long, these neither glochidiate nor bidentate; pappus of about 20 scabrid-barbellate awns nearly twice as long as achenes.

Since the hairs of the achenes are simple, these plants will key nowhere in Larsen's key. Because of this, material was sent to the New York Botanical Garden where Dr. Cronquist kindly confirmed the identification.

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The following species were identified by others and reported as unusual:

*RA* ALLIUM SIMILLIMUM Henderson. *H. & M. No. 8621*, 6 miles s. of Lowman, Boise Co.; *H. & M. No. 8738*, summit of Dog Mt., 4 miles nw. of Pine, Elmore Co.; *H. & M. No. 9640*, high ridge sw. of Stanley Lake, Custer Co.; *H. & M. No. 10156*, Middle Spangle Lake, 17 miles n.-ne. of Atlanta, Elmore Co.; *H. & M. No. 10595*, south base of Ryan Peak, Boulder Mts., Custer Co. These collections, determined by Marion Ownbey, represent great extension of range.

The following two species of willows were identified by Dr. C. R. Ball. The quoted comments are his:

*KAL* SALIX BRACHYCARPA var. SANSONI Ball. *H. & M. No. 11133*, boggy meadow land at junction of East and West forks of Pahsimeroi River, north side of Lost River Mts., elev. about 8000 ft. "Rare in Idaho."

911 SALIX FARRÆ Ball. *H. & M. No. 11172*, in wet meadow land at head of West Fork of Pahsimeroi River, north side of Lost River Mts., elev. about 10,000 ft. Matted shrubs 0.5—2 ft. high, well browsed by deer. "Probably the first record for Idaho, although I have not checked all records. Occurs commonly in the mountains of southern Alberta and British Columbia and has been found in Wallowa Co., Washington, and in Glacier and Yellowstone National parks."

218 RANUNCULUS ORESTERUS L. Benson. *H. & M. No. 8507*, 2 miles w. of McCall, Valley Co. Dr. Benson, who identified the plant, reports that this is but the third collection of the species.

VACCINIUM OCCIDENTALE Gray. *H. & M. No. 9832*, shores of Elk Lake, near source of S. Fork Payette River, Boise Co. According to J. H. Schultz, who made the determination, this is the first report of the species for the state.

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## STUDIES IN CAREX—I

BY JOHN THOMAS HOWELL

### 1. SPECIES NEW TO IDAHO

In the course of general field work in the mountains of Idaho during the summer of 1944, C. L. Hitchcock and C. V. Muhlick obtained a large and varied collection of *Carex* which was referred to me for determination. More than 130 numbers were collected representing 50 species, a truly remarkable collection since it represents well over a third of the *Carex* flora of the state. In the recent enumeration of Idaho carices by R. J. Davis (Contributions towards a Flora of Idaho, Leaflet No. 10, pp. 1—35), 121 species are listed for the state. Among the Hitchcock and Muhlick collections are several which are not on Davis' list and which represent new records for Idaho. For the determination of several of these and for his valued opinion on critical species in the *Atratae* and *Acutae*, I am very grateful to Dr. F. J. Hermann.

C. VERNACULA Bailey (?). Determined by F. J. Hermann. Margin of Upper Norton Lake, elev. about 9000 ft., Smoky Mts., Blaine Co., *No. 10713*. The vegetative parts of this puzzling plant are reminiscent of species of the *Vulpinæ* but, as Dr. Her-

mann points out, the perigynia are quite like those of *C. vernacula*. Further collections will be needed to determine the exact identity of the plant.

*C. EASTWOODIANA* Stacey. Dry ground at head of East Fork of Pahsimeroi River, elev. about 10,300 ft., Lost River Mts., Custer Co., *No. 11076*. This species was reported from Idaho at the time it was published (Leafl. West. Bot. 2:122,—1938), but it was omitted by Dr. Davis from his list.

*C. SCIRPOIDEA* Michx. Cirque at northwest base of Mt. Borah and at head of Rock Creek, elev. about 11,500 ft., Lost River Mts., Custer Co., *No. 10957*.

*C. GARBERI* Fern. var. *BIFARIA* Fern. Determined by F. J. Hermann. Willow Creek about 4 miles from Boise-Lowman highway cut-off, Boise Co., *No. 10044*.

*C. FLAVA* L. Boggy meadow bordering Elk Lake at head of South Fork of Payette River, Boise Co., *No. 9792, 9793*. In the Idaho plants the perigynia are only 4 mm. long although they are generally considerably longer (cf. 4.5—6 mm. as given by Mackenzie, *N. Amer. Fl.* 18:307).

*C. PELOCARPA* Hermann. Determined by F. J. Hermann. Moist places on talus, west base of Ryan Peak, elev. about 11,000 ft., Boulder Mts., Custer Co., *No. 10581*; cirque at northeast base of Mt. Borah and at head of Rock Creek, elev. about 11,500 ft., Lost River Mts., Custer Co., *No. 10941, 10955*; near seepage on steep slide, head of East Fork of Pahsimeroi River, elev. about 10,300 ft., Lost River Mts., Custer Co., *No. 11090*.

Because of their superficial resemblance to *C. nova* Bailey, I had referred these collections to that species before sending them to Dr. Hermann. His notes on the differentiation of *C. nova* and *C. pelocarpa* are as follows: "*C. nova* can generally be recognized by the stiffly erect culms which are roughened above and by the mainly pale stramineous perigynia which are muricate to almost ciliate-scabrous on the upper margin"; while in *C. pelocarpa* "the flexuous culms are not roughened below the heads, the perigynia are not stramineous and are smooth on the upper margins, and the achenes are relatively long-stipitate." With these notes it is now clear that the Idaho collections referred to *C. nova* by Stacey (cf. Leafl. West. Bot. 2:15, 91) are really *C. pelocarpa*: Devil's Bedstead, Sawtooth Mts., 8000 ft., Blaine

Co., *Thompson No. 13555*; Boulder Creek Canyon, Sawtooth Mts., 9000 ft., Blaine Co., *Thompson No. 14058*. The Oregon collection referred by Stacey (*ibid.*, p. 15) to *C. nova* (*Peck No. 18493* from the Wallowa Mts.) needs further study; in it the culms are roughened and the perigynia are stramineous, but the upper margin of the perigynia is only granular-roughened instead of muriculate.

C. CHIMAPHILA Holm. Small meadow just below upper Frog Lake, below north base of Castle Peak, White Cloud Range, Custer Co., *No. 10832*.

## 2. SPECIES NEW TO NEVADA

In 1944, H. D. Ripley and R. C. Barneby collected two carices in White Pine County in eastern Nevada that were not listed for the state by F. J. Hermann in his 1940 enumeration (*The genus Carex, Contrib. toward a Fl. of Nev. No. 17*). They grew in alkaline clay along warm water streams at Monte Neva Hot Springs and were part of a remarkable localized flora that has been recently described by Ripley (*Quart. Bull. Alp. Gard. Soc. 13: 34, 35,—1945*).

CAREX SCIRPIFORMIS Mkze. *Ripley & Barneby No. 6287*. This collection contains only staminate material, but from the relatively broad white-hyaline margin of the scales it cannot be referred to *C. scirpoidea* Michx., *C. stenochlæna* (Holm) Mkze. or *C. curatorum* Stacey, species of *Scirpinæ* with culms aphyllopodic. The occurrence of *C. scirpiiformis* in Nevada is of special interest not only because it represents a new station for a rare species, but also because it represents a notable extension of range southward from southwestern Montana.

CAREX GARBERI Fern. *Ripley & Barneby No. 6286*. The discovery of the typical form of this species in Nevada is even more remarkable than the discovery of its associate, *C. scirpiiformis*. In western America, *C. Garberi* has been represented only by var. *bifaria* Fern. which has been reported there from British Columbia, Alberta, Washington, and Idaho. The species, heretofore, has been known from regions adjacent to the Great Lakes, the westernmost station being on Isle Royale, Michigan (cf. Fernald, *Rhodora 37: 254,—1935*). I am grateful to Dr. Hermann for verifying my determination.

NOMENCLATORIAL RECOMBINATIONS IN  
TRIFOLIUM AND OPUNTIA

BY LYMAN BENSON

*Pomona College, Claremont*

Alice Vaughn, Amer. Midl. Nat. 22: 575-579 (1939), has shown that *Trifolium involucreatum* Ort., Hort. Reg. Bot. Matrit. 33 (1797), is a Mexican species and that it does not occur in the western United States. This plant is *T. Ortegæ* Greene, Pittonia 3: 186 (1897), based upon *T. involucreatum* Ort., and the work of Vaughn confirms the earlier study of Greene.

Joseph Ewan, Leafl. West. Bot. 3: 222-224 (1943), has presented evidence that *T. Wormskjoldii* Lehm., Ind. Sem. Hort. Ham. 17 (1825), is a name of uncertain application. *Trifolium Willdenovii* Spreng., Syst. 3: 208 (1826), is the earliest specific name available for the species occurring on the Pacific Coast and in the southern Rocky Mountain region. Therefore the following recombination is proposed for a variety occurring in the mountains of Arizona and New Mexico:

*Trifolium Willdenovii* Spreng. var. *longicaule* (Woot. & Standl.) L. Benson, comb. nov. *T. longicaule* Woot. & Standl. Contr. U. S. Nat. Herb. 16: 141 (1913). *T. Wormskjoldii* Lehm. var. *longicaule* L. Benson, Amer. Jour. Bot. 28: 363 (1941). Leaflets mostly cuneate-obovate; stipules entire or nearly so; peduncles pilose; involucre reduced and cleft nearly to the base, much shorter than the calyces. Meadows in the yellow pine belt of the Rocky Mountain forests (cf. L. Benson, Amer. Jour. Bot. 29: 491-500,—1942) at 6500 to 8000 feet elevation or along streams at lower levels; mountains of eastern Arizona and eastward to the White and Sacramento mountains, New Mexico; particularly well known from the Santa Catalina Mountains, Pima County, Arizona (cf. various collections including *L. Benson No. 9009*, Pomona, Univ. Ariz.).

The corresponding characters of *Trifolium Willdenovii* var. **typicum** L. Benson, nom. nov. (based upon *T. Willdenovii* Spreng. Syst. 3: 208,—1826; in turn based upon *T. involucreatum* Willd. in L. Sp. Pl., ed. 4, 3: 1372,—1800, not Lam. in 1778, not Ort. in 1797) are as follows: leaflets approximately elliptic-obovate, but usually acute at both ends, rarely more than a few of them cuneate-obovate; stipules lacinate; peduncles glabrous or rarely hairy; involucre cleft and parted, usually two-thirds to four-fifths as long as the calyces. Var. *typicum* occurs in the mountains of Arizona and New Mexico as well as on the Pacific Coast.

*Opuntia erinacea* Engelm. & Bigel. var. **xanthostema** (K.

Schum.) L. Benson, comb. nov. *O. rhodantha* K. Schum., Monatschr. Kakteenk. 6: 111 (1896), nom. subnud.; Gesamtbeschr. Kakt. 735 (1898), cf. Croizat, Cact. & Succ. Jour. 16: 88, 89 (1944). *O. xanthostema* K. Schum., loc. cit. (spelling apparently intentional). *O. rhodantha* var. *xanthostema* Rehder, Jour. Arn. Arb. 7: 149 (1926). *O. erinacea* var. *rhodantha* L. Benson, Proc. Calif. Acad. Sci., ser. 4, 25: 249 (1944). The single validly published varietal epithet among the many invalidly published ones (those in trade lists and popular articles) was overlooked in the previous publication.

## A NEW SPECIES OF ASCLEPIAS FROM NEVADA

BY R. C. BARNEBY

*Asclepias Eastwoodiana* Barneby, spec. nov. foliis tomentoso-marginatis, corollæ forma, totoque habitu *A. involucreta* Engelm. manifeste affinis, sed foliis multo latioribus, umbellis plerumque nudis exinvolucratis, corollæ limbo saturate purpureo, coronaque antheras haud attingenti (nec eas superanti), cucullis abruptius truncatis necnon corniculo introflexo incluso diversa.

Herba perennis humilis paucicaulis e caudice lignea tortuosa subterranea oriens, præter foliorum margines albo-ciliatas sparse puberula vel glabrescens; caulibus plerumque simplicibus flexuosis adscendentibus 1—2 dm. altis, angulatis striatisque, inferne nudis, minute puberulis; foliis oppositis vel haud raro internodio brevissimo separatis subalternis, integerrimis, inferioribus suborbicularibus vel latissime ovatis, apice retusis truncatisve mucronatis, lamina 1—3 cm. longa secus petiolum circa dimidio breviorum decurrenti, in folia media ovato-acuminata 2.5—4.5 cm. longa brevius petiolata ac summa anguste lanceolato-acuminata breviora subsessilia sensim abeuntibus, omnibus glaucescentibus pallidis, utraque facie glaberrimis vel secus nervum medianum subtus prominulum minute puberulis, margine hinc inde undulata villis crispulis incurvis albociliata; umbellis 6—11-floris, unica terminali et 1—3 in foliorum summorum axillis sessilibus, vel pedunculo 0.5—2 cm. longo gracili gestis; pedicellis filiformibus rectis 1.5—2 cm. longis purpureo-tinctis puberulis, bractea minuta subulata decidua suffultis; calycis laciniis anguste ovatis acutis 2—3 mm. longis, hirsutulis ciliatisque; corolla purpureo-violascenti, in laciniis 5 ovato-acuminatas scarioso-marginatas 4—5.5 mm. longas profunde fissa; columna 0.3—0.6 mm. longa; coronæ cucullis subquadratis, 1.5—2 mm. altis, a tergo obtusissime angulato-convexis, marginibus superioribus concavo-truncatis in auriculam deltoideo-acuminatam ad antheras accumbentem productis, primum albis demum purpurascens, corniculo subulato incurvo albo incluso; antheris 2—2.5 mm. longis coronam breviter sed manifeste superantibus, late scarioso-marginatis appendiculatisque; folliculis ignotis.

NEVADA: low alkaline clay hills in the valley of the Reese River, 6 miles northwest of Austin, Lander Co., alt. 5800 ft., 11

June, fl. *Ripley & Barneby No. 6196*. Type in Herb. Calif. Acad. Sci. No. 320832. Toquima Range, between Belmont and Manhattan, Nye Co., alt. 6900 ft., *No. 3690*. In desert, northeast of Goldfield on the Esmeralda-Nye county line, *Rives & McKenzie No. 22* (Herb. Univ. Nevada, Reno).

In general habit and in structure, as well as in the white-margined leaves, *Asclepias Eastwoodiana* is closely related to *A. involucrata* Engelm., differing at first sight in the purple coloring of the corolla and in the broader leaves, the lowest being sub-orbicular or very broadly ovate, obtuse or mucronate. Furthermore the hoods are smaller and more abruptly truncate, surpassed by (rather than, as in *A. involucrata*, surpassing) the anthers, while the horn which, in the latter, is curved centripetally towards the axis of the flower and exerted, is in ours curved backwards and included in the fold of the hood. In *A. involucrata* the umbel is commonly terminal and solitary, prominently involucrate by a whorl of 2—5 linear or narrowly lanceolate leaves; a terminal sessile umbel subtended by a pair of leaves occurs occasionally in *A. Eastwoodiana* also, but the stems normally bear one or more lateral umbels in the upper axils, either sessile or pedunculate, and the inflorescence, in any case, is conspicuously exerted beyond the upper leaves. It should be borne in mind that *A. involucrata* has been reported to range no farther north or west than southern Utah, so that *A. Eastwoodiana*, known at present from a narrow strip of territory in central Nevada, appears to be geographically isolated from its commoner relative. In the broad leaves and purple flowers *A. Eastwoodiana* somewhat resembles *A. Ruthiæ* Maguire of the Navajo Basin, but the form of the corolla and the pubescence are quite different.

*Asclepias involucrata* and *A. Ruthiæ*, as I have observed them in Arizona, Utah, and New Mexico, occur normally, perhaps exclusively, on dunes or in open valleys where the soil is deep and sandy. In contrast to this the Nevada species prefers barren clay hills and a stiff soil derived from the comminuted detritus of limestone mountains, and appears to require, or at least to tolerate, some quantity of soluble alkali. In this respect it resembles *A. cryptoceras* Wats., with which, in the type locality, it was associated.

It is a pleasure to name this species in honor of Miss Alice Eastwood of the California Academy of Sciences, to whom the author is indebted for much help and encouragement.

## ADDITIONS TO THE FLORA OF UTAH

BY FRANK W. GOULD

*University of Arizona, Tucson*

In 1941 and 1942 the writer had the privilege of botanizing extensively in southwestern Utah. Collections were made mostly in the St. George region and the nearby Pine Valley Mts. which rise to over 10,000 feet from the valley of the Virgin River. St. George is well known to botanists through the collecting activities of Marcus E. Jones in the latter part of the nineteenth century. One of Jones's favorite localities, the flat-topped Black Hill on the western outskirts of the town, still possesses an interestingly diverse flora. Here steep, boulder-strewn slopes have discouraged extensive grazing, and the native species have been able to hold out against the encroachment of such weedy introductions as *Bromus rubens* L. and *Erodium cicutarium* L'Her. The native flora of the historic Red Hill, a sandstone outcrop that bounds St. George on the north, has not fared as well, for this area is not only heavily pastured but is also used extensively for picnic grounds.

One collection of special interest from the St. George region is that of *Erodium texanum* Gray. A small stand of this species was located on Red Hill (*Gould No. 1488*), and a single depauperate plant was observed on Black Hill. There has been apparently no previously published record of *E. texanum* in Utah, but Dr. Bassett Maguire, in personal communication, reported another collection made near the Colorado River in Garfield County (*Parry in 1940*). Kearney and Peebles (*Fl. Pl. and Ferns Ariz.*, p. 507) give the range of the species as "Texas to southeastern California."

Two species of *Compositæ* collected near Pine Valley, on the northern slope of the Pine Valley Mts., represent new state records according to Dr. S. F. Blake. *Cirsium arizonicum* (Gray) Petrak was found scattered but not infrequent in oak openings at 7,000 ft. (*Gould No. 1883*). Blake in Kearney and Peebles (*op. cit.*, p. 1014) gives the range of this species as "Utah (?) and Arizona." It is common throughout northern and southwestern Arizona. *Lactuca saligna* L. was collected on roadsides in the Pine Valley Forest Recreational Camp (*Gould No. 2011*). Concerning this weed, Dr. Blake wrote, "I find that this is a European species which has been turning up in many places in

the last fifteen years or so. There are specimens in the U. S. National Herbarium from Virginia, West Virginia, Kentucky, Ohio, Indiana, Michigan, Missouri, and California, and it no doubt occurs in other states."

---

## SOME WEEDY SPECIES OF LATHYRUS

BY JOHN THOMAS HOWELL

TWO OREGON VETCHLINGS. West of the Cascade Range in Oregon two annual species of *Lathyrus* from the Mediterranean Region of the Old World have been found growing without cultivation, *L. angulatus* L. and *L. sphaericus* Retz. Although they are quite alike in appearance with their unijugate leaves and with their uniflorous peduncles, there are a number of characters by which they may be distinguished. In *L. sphaericus* the stipules are linear-semisagittate, all leaf-tendrils are simple, the peduncles are only about as long as the short petioles, the legumes are prominently longitudinally veined, and the seeds are smooth. In *L. angulatus* the stipules are lanceolate-semisagittate, the tendrils are branched on the upper leaves, the peduncles are much longer than the petioles, the legumes are finely net-veined, and the seeds are rough.

*Lathyrus angulatus* as it occurs in Oregon has been confused with *L. pusillus* Ell., a species indigenous to the southeastern United States. *Lathyrus pusillus* can be readily distinguished from *L. angulatus* by the position of the flower: in the former it is at the top of the peduncle, in the latter it appears lateral since the peduncle is produced beyond it into an elongate slender tip.

The following Oregon specimens of *L. angulatus* have been loaned to me by Dr. Helen M. Gilkey from the Oregon State College Herbarium: Harrisburg, Linn Co., *Gillett in 1941*; Jefferson, Marion Co., *Hyslop in 1943*; Dallas, Polk Co., *Beck in 1932*.

The only Oregon specimen of *L. sphaericus* that I have seen is one collected by Miss Eastwood and me in waste ground along the Umpqua River at Winchester, Douglas Co., *No. 1476*.

TANGIER PEA IN CALIFORNIA. Rocky bluffs at the south end of Tiburon Peninsula, Marin County, are covered in the spring with masses of *Lathyrus tingitanus* L., which, with its bright reddish-purple flowers, makes a brilliant display. For a number

of years this rampant annual was passed as *L. latifolius* L. which is perennial and very different in many characters. In Marin County, the Tangier Pea may be reported not only from Tiburon (*Howell in 1939, Howell No. 21260*) but also from San Rafael (*Howell No. 19639*) and Inverness Park (*Howell in 1944*) where it has become established in waste places.

Outside of California, *L. tingitanus* has been reported from the Willamette Valley, Oregon, the only record of the plant that I have seen for the Pacific states (cf. Gilkey Handb. of NW. Flow. Pl., 183; Abrams Ill. Fl. 2:619).

## NEW VARIETIES OF CALYPTRIDIDIUM PARRYI

BY JOHN THOMAS HOWELL

A further detailed study\* of *Calyptrididium Parryi* Gray has disclosed that forms of that species which have been found at a few isolated stations in the mountains of southern Arizona and in southwestern Nevada should be accorded taxonomic recognition. The species in typical form is found in California from the higher mountains of southern California northward to Mt. Pinos and the southern Sierra Nevada, with an outlying station in the Mt. Hamilton Range in the central western part of the state. The variants are distinguished by characters that I believe to be rather fundamental and perhaps they should be accorded specific recognition; but since the plants bear a close habitual resemblance to each other that is probably an indication of a common ancestry and close relationship, I have preferred to treat them as divergent parts of a single species. The varieties may be distinguished by the following key:

1. Flowers in age persistent or not readily deciduous.
    2. Pedicels apparently jointed with the rhachis; seeds more or less tuberculate.....1. var. *typicum*
    2. Pedicels not jointed with the rhachis; seeds smooth and shining .....2. var. *arizonicum*
  1. Flowers in age readily deciduous. Seeds shining and generally smooth except for narrow tuberculate margin.....3. var. *nevadense*
1. **C. Parryi** Gray var. **typicum** J. T. Howell, nom. nov. *C. Parryi* Gray, Proc. Amer. Acad. 22: 285 (1887).

Representative collections, all from California. San Jacinto Peak, San

\* See Leaflet West. Bot. 3: 262-266 (1943). The present study is based on specimens in the California Academy of Sciences (CAS), Dudley Herbarium (DS), Gray Herbarium (G), Sacaton Field Station (Sac), University of California (UC), and United States National Herbarium (US). The letters in parentheses are used in the customary manner in citing specimens.

Jacinto Mts., *W. W. Swarth in 1914* (CAS); Mohave slope of Bear Valley, San Bernardino Mts., *Parry & Lemmon in 1876* (type, G; photograph, DS); Bear Valley, *Parish No. 3725* (CAS, DS, G, UC); near summit of Mt. San Antonio, San Gabriel Mts., *Abrams No. 1929* (DS); Griffins, Mt. Pinos region, *Elmer No. 3948* (CAS, G, DS); end of Mt. Whitney Road, southern Sierra Nevada, *Kerr in 1937* (CAS); Isabel Peak, Mt. Hamilton Range, *H. K. Sharsmith No. 3381* (DS).

The last-cited collection differs in having somewhat smaller seeds (0.5—0.6 mm. in diameter instead of 0.66 mm.) that are less conspicuously tuberculate and more shining. The fact that the plants are small perhaps indicates only an edaphic response, but the central Californian plant needs further study with additional collections.

Because *C. pygmaeum* Parish was referred to *C. Parryi* by Mrs. Ferris (in *Abrams Fl. Pac. St. 2:130*) the question of the specificity of that plant was again raised and I have restudied the type-collection (DS, type; G). This study has not only confirmed my belief that the species is distinct from *C. Parryi*, but it has disclosed that the "notable" differences in the seeds of the plants from the San Bernardino Mts. and from the Sierra Nevada that were described in my earlier notes do not exist (cf. *Leaflet West. Bot. 3:263*). The pocket on the type-sheet of *C. pygmaeum* contains capsules and seeds of *C. monandrum* Nutt. and *C. Parryi* as well as of *C. pygmaeum*, and, since the seeds of *C. Parryi* are most numerous, they were erroneously believed to belong to *C. pygmaeum*, not only by me, but also by Rydberg, who published Parish's name (*N. Amer. Fl. 21:320*). Hence the smaller (0.4 mm.) smooth, shining seed characteristic of *C. pygmaeum* adds yet another structure to those already indicated for distinguishing this "good" species.

2. *C. Parryi* Gray var. *arizonicum* J. T. Howell, var. nov. A var. *typico* per semen omnino laeve et nitens et a var. *typico* et var. *nevadensi* per pedicellos non articulatos abluens.

Type: U. S. National Herbarium No. 497458, collected in hills above Rosemont, Pima Co., Arizona, between Mar. 13 and Apr. 23, 1903, by David Griffiths, *No. 4125*. Other Arizona collections are: Canoa to Arivaca, Pima Co., *Griffiths No. 3556* (US); near Nogales, Santa Cruz Co., *Peebles & Fulton No. 11454* (Sac).

The smooth shining seed of the Arizona variant of *C. Parryi* was noted by Kearney and Peebles in their *Fl. Pl. & Ferns Ariz.*, p. 300. In typical *C. Parryi* the jointed character of the pedicel is usually evident, but in var. *arizonicum* no articulation can be

seen. In this character var. *arizonicum* resembles *C. pygmaeum*. In var. *typicum* the stems are prostrate but, at least at times, in var. *arizonicum* the stems are suberect.

3. *C. Parryi* Gray var. *nevadense* J. T. Howell, var. nov. A var. *typico* differt: floribus in senectute a rhachide deciduis; seminibus sublævibus niti-disque utrimque præter marginem leviter tuberculatum.

Type: Dudley Herbarium No. 190847, collected on the north slope of Gold Mt., elev. 7000 ft., Esmeralda Co., Nevada, by D. D. Keck, No. 559, June 23, 1930. Duplicate in Herb. Univ. Calif.

This form of *C. Parryi* is known only from the attractive plants of the type-collection which were distributed under the name *C. roseum*. Although the relationship of the plant as shown by the character of the capsule is with *C. Parryi*, the readily deciduous fruits and fruiting sepals are distinctly reminiscent of *C. roseum*, along the southern distributional limit of which var. *nevadense* has been found.

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## A NEW NAME IN ASTRAGALUS

BY THOMAS H. KEARNEY

There is an interesting species, not uncommon in sandy areas from South Dakota and western Nebraska to Idaho, New Mexico, and northeastern Arizona, which apparently has no valid name in *Astragalus*. The plant in question is characterized by slender stems arising at intervals from long slender creeping rootstocks, the terminal leaflet represented by a prolongation of the rachis or the entire leaf reduced to the rachis, and the pods greatly inflated, papery-walled, and conspicuously mottled. It is obviously related to *A. ceramicus* Sheld. (*A. pictus* Gray, not of Steud.), but differs in the erect leaves with fewer (or no) lateral leaflets, fewer-flowered racemes, and broader pods, as well as in the great prolongation of the leaf-rachis. To remedy the deficiency, a new name is proposed, as follows:

***Astragalus mitophyllus* Kearney, nom. nov.**

*Psoralea longifolia* Pursh, Fl. Amer. Sept. 741 (1814).

*Phaca longifolia* Nutt. ex Torr. & Gray, Fl. North Amer. 1: 346 (1838).

*Astragalus filifolius* Gray, Pacif. Railroad Rpt. 12: 42 (1860). Not *A. filifolius* Clos (1846).

*Astragalus ceramicus* Sheld. var. *imperfectus* Sheld., Minn. Bot. Studies 1: 19 (1894).

*Astragalus longifolius* Rydb., Fl. Nebr. 21: 47 (1895). Not *A. longifolius* Lam. (1783).

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ALICE EASTWOOD and JOHN THOMAS HOWELL

A TENTATIVE KEY TO THE SMALL-FLOWERED  
LUPINES OF THE WESTERN UNITED STATES

BY ALICE EASTWOOD

This key, as well as other keys to species of *Lupinus* that I have tried to make and have published in LEAFLETS OF WESTERN BOTANY, have been chiefly for my own guidance in attempting to resolve the intricacies of the numerous and perplexing entities in this genus. In each case some salient morphological character or environmental situation has been chosen for delimiting a group. So many lupines unlike in appearance have been aggregated as synonyms or varieties under some species collected by early explorers and therefore the first named, a species, perhaps, which is purely local or which is known from a part of the country still but little explored. As my guide, I have taken the original descriptions supplemented when possible by photographs of types taken at the Royal Herbarium at Kew, at the Herbarium of the British Museum at South Kensington where Nuttall's specimens are, and at the Lindley Herbarium at the University of Cambridge, England, where those named by Agardh are, chiefly the collections of Douglas. I also took notes on these types, adding characteristics not mentioned in the descriptions. I call these keys tentative, since they are practically only tentative, and I hope that they may help others as they have already helped me.

The present key includes the very small-flowered species with flowers less than a centimeter long and also generally as wide since many are nearly circular in outline. It excludes the small-flowered caespitose lupines related to *L. lepidus* for which I hope some time to prepare a key that will include those from western North America. The key to the species from California allied to *L. Breweri* has already been published (Leaflet West. Bot. 2: 249—253). The species treated here are divided into three groups and the keys to each, with notes and descriptions, will be published in two papers. The three groups may be distinguished as follows:

1. Leaves bright green, upper surface of leaves glabrous or  
sometimes with a few scattered fine appressed hairs  
.....GROUP 1

2. Leaves greenish, with indument evident on both surfaces  
 .....GROUP 2
3. Leaves white, indument dense, silvery and silky.....GROUP 3

## KEY TO GROUP 1

(Species with leaves bright green, glabrous or subglabrous)

1. Stems apparently simple..... 2
1. Stems branching..... 4
2. Stems low, decumbent; leaves on long petioles, leaflets oblanceolate to narrowly spatulate, acute; flowers dark blue; pods large.....  
 .....1. *L. onustus* group
2. Stems erect and generally tall..... 3
3. Leaflets narrowly linear-oblanceolate, petioles 3 cm. or more long; calyx saccate at base; corolla blue, 7—8 mm. long.....2. *L. tenellus*  
*L. foliosus* var. *stenophyllus*
3. Leaflets broadly oblanceolate or spatulate; stems leafy, leaves erect on short petioles; calyx gibbous at base; flowers blue, about 8 mm. long..... 3. *L. spathulatus*
4. Leaflets broadly oblanceolate..... 5
4. Leaflets narrowly oblanceolate or linear-oblanceolate..... 6
5. Flowers blue, 5—6 mm. long, somewhat scattered, keel ciliate on upper part.....4. *L. parviflorus*
5. Flowers blue, rarely white, more or less verticillate, 8—9 mm. long, keel densely ciliate on lower part.....5. *L. viridifolius*
6. Branches erect from basal decumbent stems; flowers 5—6 mm. long, white or sordid, in densely flowered narrow racemes.....6. *L. ingratus*
6. Stems branching above; bracts surpassing flowers in bud; flowers violet, about 6—7 mm. long, keel delicately ciliolate.....  
 .....7. *L. myrianthus*

1. LUPINUS ONUSTUS Watson and allies. These are low plants with decumbent stems, leaflets broadly oblanceolate, leaves chiefly basal and on long petioles, and flowers small, roundish in outline, violet or purple. See Leaflet West. Bot. 4:41—43 for a discussion of the group by the author.

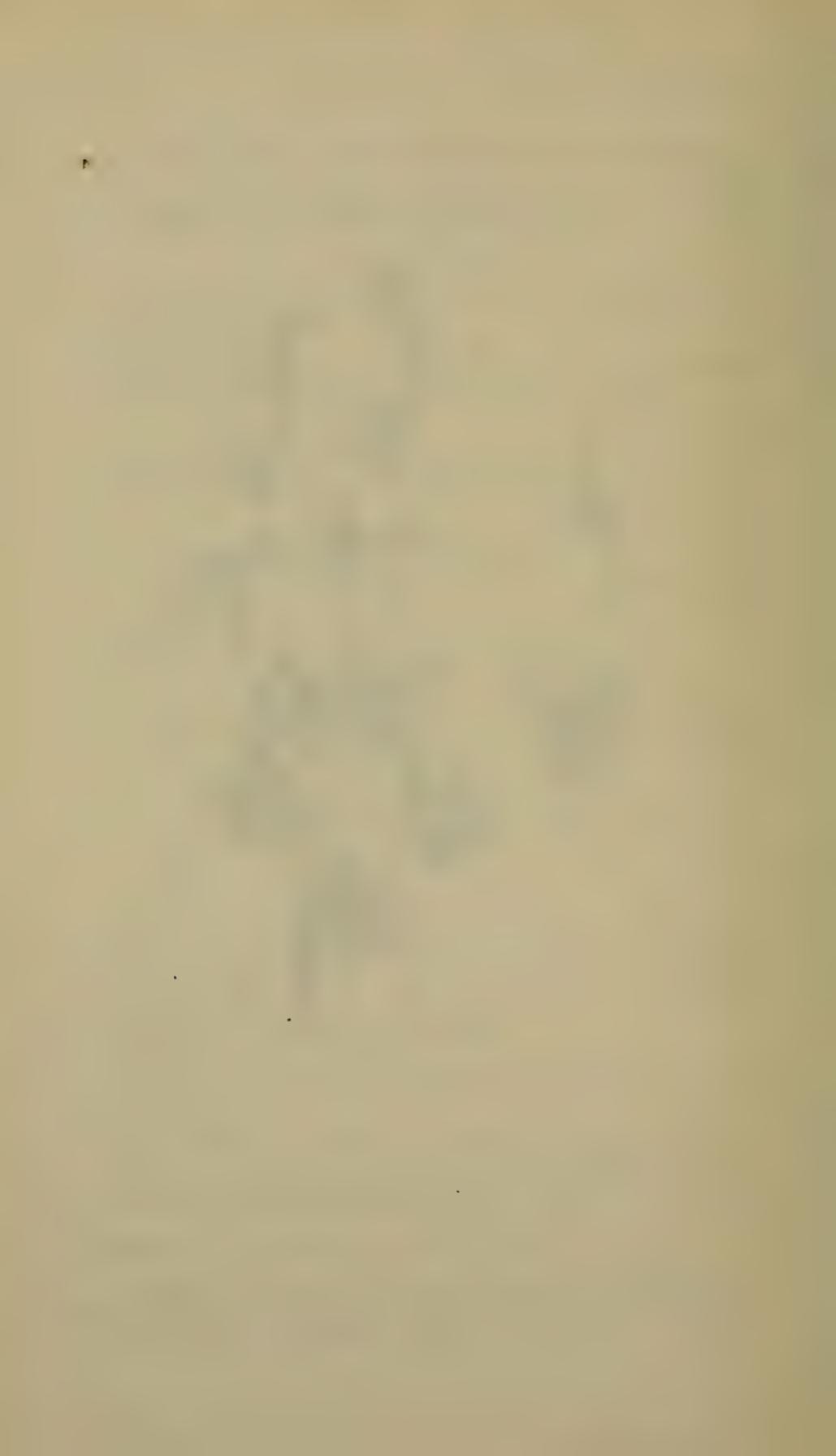
2. LUPINUS TENELLUS Dougl. ex G. Don Gen. Syst. 2:367 (1832).

Type-locality as given on Douglas' specimens in Herb. Mus. Brit.: "Grand Rapids and on the Multnomah River 1825"; type-locality on Douglas' specimen in Herb. Lindley.: "between Fort

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Explanation of Plate. Type-specimen of *Lupinus parviflorus* Nutt. in Herb. Nuttall. in Herb. Mus. Brit. The specific name is preceded by an asterisk, the peculiar mark with which Nuttall indicated a new species. "Columbia plains" is the locality given.





Vancouver and the Rocky Mts." A photograph of Douglas' specimen in Herb. Lindley. at Cambridge, England, is in the Calif. Acad. Sci. and from that specimen the following description was made:

Stems very slender, reddish, sparingly pubescent, branchlets ascending; racemes short-peduncled, flowers subverticillate with whorls about 2 cm. apart, pedicels 5 mm. long, bracts shorter than buds, soon falling; leaflets 5—8 with a few short hairs on upper surface, more densely pubescent on lower, folded and falcate, about 2 mm. wide when folded, 3—4 cm. long, linear-lanceolate, tapering at both ends; calyx saccate at base, but not spurred, distinctly bracteolate, lower lip entire, tapering, about 4 mm. long, upper a little shorter; folded banner and wings broad at top, with a short claw at base; keel strongly falcate, slightly ciliate above the middle where it is 4 mm. wide.

This and *L. foliosus* Nutt. var. *stenophyllus* Nutt. resemble the illustration of *L. laxiflorus* in Bot. Reg. pl. 1140, which, as before noted (Leaf. West. Bot. 4:188), Sir William Hooker referred to as *L. laxiflorus* var.  $\beta$ .

In Torrey and Gray Flora of North America (1:377), under *L. laxiflorus* var. *tenellus*, all three are included.

From the description, *L. rubricaulis* Greene (Pl. Baker. 3:35; type-locality, Crested Butte, Colorado), seems to be very similar to *L. tenellus*. The leaflets are broader and of a different shape.

3. LUPINUS SPATHULATUS Rydb., Bull. Torr. Bot. Club 29:244 (1902). (*L. parviflorus* of Watson in King's Report, 1871.)

Type-locality: Wasatch Mts., Utah, the type, *Watson No.* 225, collected in 1869.

Stems erect and apparently simple, densely leafy with erect short-petioled leaves; leaflets about 7, narrowly obovate, glabrous above, lightly pubescent beneath; flowers blue, somewhat verticillate, 8—9 mm. long, banner and keel glabrous; calyx obtuse at base, lower lip twice as long as the upper. In Herb. Calif. Acad. Sci. specimens from the Wasatch Mts., Utah, agree with this description, also some from Wyoming and Colorado.

4. LUPINUS PARVIFLORUS Nutt. ex H. & A. Bot. Beech. Voy. Suppl. 336 (1841).

Type-region: "plains of the Rocky Mountains towards the Oregon," the type collected by Nuttall.

"A very distinct large and branching species with rather crowded racemes of small blue flowers and large smooth leaves, the leaflets often 1.5 inches in length and half an inch wide, broader upwards; pedicels rather shorter than the flowers, keel small." Nuttall Ms. At first the stems are

somewhat hairy becoming smooth. The racemes are long and slender, the flowers very small, the calyx silky, and the keel ciliate near the apex.

These notes were made from Nuttall's type in Herb. Mus. Brit. There is a photograph in Herb. Calif. Acad. Sci. which is reproduced here. *Lupinus alsophilus* Greene, Pitt. 4: 135 (type-locality: mountains above Cimarron, Colorado), from the description, is very similar.

5. *LUPINUS VIRIDIFOLIUS* Heller, Muhl. 2: 64 (1905).

Type-locality: "on wooded slopes in rich soil at Dunsmuir," Siskiyou County, California, the type, *Heller No. 7928*.

Stems several from a woody root, often decumbent, branching and leafy; leaflets broadly oblanceolate, glabrous above, paler and lightly pubescent beneath; flowers violet-blue, about 8 mm. long, generally verticillate in long racemes; keel strongly curved, densely bearded near the base.

Specimens in Herb. Calif. Acad. Sci. are from the type-region, and also north to Weed and south to Kennet. Specimens from Siskiyou and Trinity counties are also included but are not typical.

6. *LUPINUS INGRATUS* Greene, Pitt. 4: 133 (1900).

Type-locality: low grassy lands at Chama, New Mexico, the type collected by C. F. Baker.

Stems decumbent with many erect and simple branches; leaves crowded, smooth above, minutely pubescent beneath, leaflets narrowly oblanceolate; flowers white or sordid, 5—6 mm. long, in densely flowered, narrow racemes; banner pubescent on back; keel glabrous, covered by the wings.

This description was made from a specimen collected by C. F. Baker at Chama, New Mexico, loaned from the Baker Herbarium at Pomona College, Claremont, through the kindness of P. A. Munz. A photograph is in Herb. Calif. Acad. Sci.

7. *LUPINUS MYRIANTHUS* Greene, Pitt. 4: 134 (1900).

Type-locality: Gunnison, Colorado, the type collected by Greene in 1896.

Stems freely branching above; leaflets 7—9, narrowly oblanceolate, acutish, glabrous above, finely strigulose beneath; flowers violet, about 5 mm. long, verticillate in densely flowered subsessile racemes, keel delicately ciliolate.

Specimens collected July 20, 1945, in a meadow 4 miles west of Sapinero, Gunnison County, Colorado, alt. 8300 ft., by H. D. Ripley and R. C. Barneby (*No. 7166*), agree with the original

description and since they come from the type-region are undoubtedly this species.

## KEY TO GROUP 2

(Species with leaves greenish, pubescence evident on both sides)

1. Stems simple..... 2
1. Stems branching..... 4
2. Calyx with a short spur.....8. *L. lassenensis*
2. Calyx spurless..... 3
3. Keel ciliate about the middle, flowers lavender-blue, about 7 mm. long ;  
pubescence of leaves scanty.....9. *L. cæsius*
3. Keel glabrous, flowers bluish-purple, about 8 mm. long ; pubescence  
of leaves silvery, denser on lower than upper surface.....10. *L. laxus*
4. Leaflets and stems villous or hirsute.....11. *L. floribundus*
4. Leaflets and stems with appressed pubescence ; banner glabrous,  
flowers 8—9 mm. long, dark blue ; stems low, several from a  
woody root.....12. *L. Macounii*

8. **Lupinus lassenensis** Eastwood, spec. nov. Caules simplices foliosi basi et supra, 6—7 dm. alti singulatim ex rhizomate horizontali et gracili una cum solutariis fasciculis foliorum ; petiolis foliorum radicalium filiformibus, 5—16 cm. longis ; stipulis basi discretis vel adnatis brevissime, 3—5 mm. longis ; foliolis 5—7, spathulatis vel late oblanceolatis mucronatis, maximis 3—5 cm. longis, 1 cm. latis, viridescensibus adpresse sericeis supra et infra ; floribus 7—8 mm. longis, albidis, verticillatis in racemis gracilibus, terminalibus, 10—15 cm. longis, pedunculis brevibus, bracteis caducis, lanceolatis, brevioribus calycibus, pedicellis 2 mm. longis ; calyce basi breviter calcarato, albo, adpresse sericeo, labio superiore ovato, 3 mm. longo, breviter bidentato, labio inferiore longiore et angustiore, divaricato ; vexillo orbiculari, 7 mm. lato, supra glabro, infra tenuiter sericeo, basi late stipitato ; alis 8 mm. longis, 4 mm. latis prope apicem ; carina curvata ciliata supra medium latum, apice purpurea exserta ; legumine immaturo adpresse sericeo, seminibus paucis.

Type : Herb. Calif. Acad. Sci. No. 325,176, collected by Lewis S. Rose, No. 45262, Sept. 6, 1945, in Lassen Volcanic National Park at Manzanita Creek, alt. about 6700 ft., Shasta County, California. It grew amid yellow pines (*Pinus ponderosa*) where also were *Arctostaphylos patula* Greene, *Castanopsis sempervirens* (Kell.) Dudley, and *Ceanothus velutinus* Dougl. It abounded in gravelly soil and was the only species of lupine in the area.

This key in which it is placed is artificial. *Lupinus lassenensis* belongs with the species with spurred calyx and comes nearest *L. wenatchensis* Eastwood, from which it is chiefly distinguished by the manner of growth, *L. wenatchensis* having cespitose stems from a long vertical woody root while this has scattered stems

from a horizontal rootstock. Also the flowers differ in color and size.

9. *LUPINUS CÆSIUS* Eastwood, Leaf. West. Bot. 3:169 (1942).

Type-locality: Diamond Lake, Douglas County, Oregon, collected by J. T. Howell in 1931.

A delicate lovely lupine with several stems leafless at base, branching and leafy above, each branch terminated by a laxly flowered raceme of small lavender-blue flowers; keel and wings conspicuously surpassing the banner which is darker in color and hairy on back; keel ciliate at middle; stems and petioles very slender, the leaflets a little pubescent, longer than or as long as the petioles.

10. *LUPINUS LAXUS* Rydb., Bull. Torr. Bot. Club 30:258 (1903).

Type-locality: Forks of the Madison, Montana, collected by Rydberg and Bessey, *No. 4442, 4443a*.

Stems 4—6 dm. high, simple, clustered at base; leaflets 7—9, linear or linear-oblongate, green but appressed-silky on both sides; corolla light bluish-purple, about 8 mm. long, banner broad, pubescent on back, keel glabrous. (From original description.)

11. *LUPINUS FLORIBUNDUS* Greene, Proc. Acad. Philadel. 44:364 (1892).

Type-locality: region of the middle and upper Bear Creek, Colorado.

"Stems tufted, rather firmly erect (sometimes decumbent at base), a foot high or more, with several ascending branches, each ending in a well-developed raceme; herbage more or less villous or hirsute; leaves all short-petioled; leaflets about 7, an inch long or less, oblong-lanceolate, acutish; racemes very short-peduncled, dense and cylindrical, 2 to 4 inches long, scarcely  $\frac{3}{4}$  inch in diameter, the flowers very small, light blue; abruptly falcate-incurved keel about equalling the wings and only 2 or 3 lines long, the banner shorter; ovary densely hirsute." From original description.

12. *LUPINUS MACOUNII* Rydb., Bull. Torr. Bot. Club 34:42 (1907).

Type-locality: Cypress Hills, Saskatchewan, collected by John Macoun, *No. 4070*.

Silky strigose, stems several, somewhat branched; leaflets about 9, linear-oblongate, 2—3 cm. long; racemes dense; calyx gibbous at base with spreading short silky hairs, the lower lip almost twice as long as the ovate upper; corolla dark blue, 8—9 mm. long, the banner with a light spot, somewhat shorter than the wings. (From original description.)

## LEAF HAIRS OF ASTRAGALUS

BY THOMAS H. KEARNEY

It is well known that 2-armed hairs, similar to those of the family *Malpighiaceæ*, occur in *Astragalus*, *Indigofera*, and a few other genera of *Leguminosæ*. Characteristic hairs of the *Malpighiaceæ* are described and figured by Niedenzu<sup>1</sup> and by Solereder.<sup>2</sup> Hairs illustrated by Niedenzu, and by Solereder (fig. 36, A and E), are duplicated almost exactly in *Astragalus*.

As regards the malpighiaceous hairs of *Astragalus* and other *Leguminosæ*, Solereder (ibid. p. 270) states: "They possess either one or two basal cells of variable length. The end cell may have either thin or thick walls and is of varied shape. The arms may be either equal or unequal; in the latter case . . . transitions may occur to 1-armed hairs, no arm being developed on one side, but only a rounded swelling. . . . In the trichomes with equal arms the two ends may be pointed or blunt, or only one arm may be pointed. . . . The 2-armed hairs of the genera of *Galegeæ* are specially characterized by the fact that the thick wall of their end cell is almost without exception incrustated with carbonate of lime. The carbonate of lime appears to be distributed throughout the membrane of the terminal cell, but in especially large quantity in the apices of the latter and in the wart- or peg-like thickenings which the end-cells of the 2-armed hairs of the *Galegeæ* not uncommonly exhibit."

The presence of "Spindelhaare" in the leguminous genera *Indigofera* and *Cyamopsis* was mentioned by Taubert,<sup>3</sup> who quotes Weiss to the effect that they occur also in many species of *Astragalus*. As to their occurrence in American species of *Astragalus*, Jones<sup>4</sup> remarks: "In *A. amphioxys* the hairs are flat, echinate, tapering toward both ends and fixed at or near the middle. This is also true of *A. calycosus*, the *Uliginosi*, *nitidus*. . . . There is a complete transition in the hairs from normal to pick-shaped. About the only valuable character distinguishing *A. Shortianus* from *A. amphioxys* is the pubescence which

<sup>1</sup> Niedenzu, F. *Malpighiaceæ*, in Engler, *Das Pflanzenreich* IV. 141:1—870 (1928). Fig. 1, p. 5.

<sup>2</sup> Solereder, Hans. *Systematic Anatomy of the Dicotyledons* (transl. Boodle & Fritsch, revis. Scott) 1:164, fig. 36 (1908).

<sup>3</sup> Taubert, P. *Leguminosæ*, in Engler & Prantl, *Die Natür. Pflanzenfam.* III. 3:70—388 (1894), p. 77.

<sup>4</sup> Jones, Marcus E. *Revision of North American species of Astragalus* (1923), p. 5.

in the former is of slender hairs fixed by the base, and in the other flat hairs fixed by the middle and wide and echinate, but this varies in the species from a flat hair with a mere knob on one side at the base to one fixed by the middle." Rydberg,<sup>5</sup> classifying North American *Astragalus* in 33 segregate genera, refers only casually to the attachment of the hairs. He mentions the occurrence of 2-forked hairs in his description of *A. amphioxys* (as *Xylophacos amphioxys*), and of *A. humistratus* var. *tenerrimus* (as *Batidophaca tenerrima*).

The present writer, while engaged in revising a previously published key to the Arizona species of *Astragalus*,<sup>6</sup> found, as Jones had found earlier, that the presence of malpighiaceous or spindle hairs, as contrasted with basifixed hairs, sometimes affords a useful character for distinguishing related species, for example in section *Xylophacos* and as between *A. ceramicus* Sheldon and *A. mitophyllus* Kearney. It was considered advisable, therefore, to investigate all of the 71 species known to occur in the State of Arizona or very close to its borders, these representing 18 of Rydberg's segregate genera and Barneby's section *Cystiella*. For convenience of comparison only the hairs on the surface of the leaflets were examined in detail, but it was observed that in *A. amphioxys* Gray and *A. calycosus* Torr. (Fig. A), species exhibiting especially fine examples of malpighiaceous leaf hairs, similar hairs are borne on the pods, also.

In all, 18 species, or about 25 per cent of the total number examined, possessed more or less well-developed malpighiaceous hairs, only basifixed hairs having been observed in the remaining 53 species. The classification of the species in respect to this character is shown in Table 1.

The distribution of species with malpighiaceous hairs among the 19 sections or segregate genera listed in Table 1, is erratic. In 11 of these groups only basifixed hairs were observed in all of

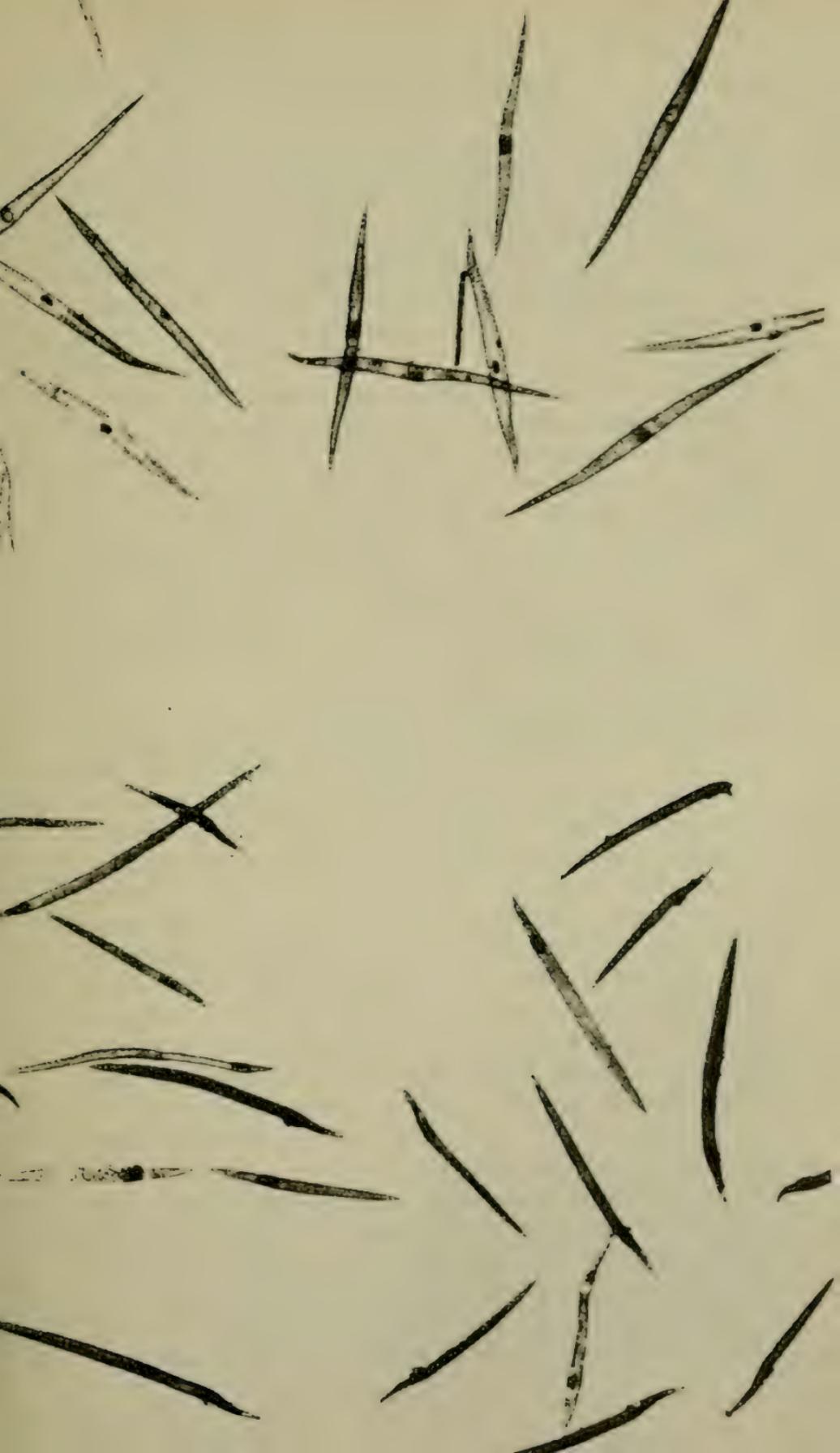
<sup>5</sup> Rydberg, Per Axel. *Fabaceæ-Galegeæ-Astragalaneæ*. North Amer. Flora 24:251-462 (1929).

<sup>6</sup> Kearney, Thomas H., and Peebles, Robert H. *Flowering Plants and Ferns of Arizona*. U. S. Dept. Agriculture Misc. Publ. 423:469-476 (1942).

Explanation of Plate. Malpighiaceous leaf hairs of *Astragalus*, detached and magnified 60 times.

A. Hairs of *A. calycosus* Torr., with arms of approximately equal length.

B. Hairs of *A. ceramicus* Sheld., with very unequal arms.





the species examined, although in several instances the group is represented in the table by only one species. *Batidophaca* ranks highest in the proportion of "malpighiaceous" species (5 out of 6). In *Phaca*, on the other hand, only 3 of the 17 species examined had 2-armed hairs, and in *Homalobus* the proportion was 1 out of 5, the exception having been the anomalous *A. Woodruffi* Jones. In *Xylophacos* the ratio is nearly, and in *Cnemidophacos* exactly, 1:1.

The finest examples of malpighiaceous hairs, very sharp-pointed at both ends and with arms of approximately equal length, were found in *A. confertiflorus* (*Cnemidophacos*), *A. amphioxys* and *A. vespertinus* (*Xylophacos*), *A. accumbens* and *A. sesquiflorus* (*Batidophaca*), and *A. calycosus* (*Hamosa*). Of these, *A. amphioxys* and *A. calycosus* (Fig. A) are outstanding in the high proportion of hairs having approximately equal arms. It is interesting that such closely related species as *A. ceramicus* Sheldon (Fig. B) and *A. mitophyllus* Kearney should differ markedly in this character, in the former a few of the hairs having arms of nearly equal length, whereas, in *A. mitophyllus* the second arm is a mere knob-like or spur-like projection, and much less taper-pointed than the long arm.

As to the general character of the malpighiaceous hairs in *Astragalus*, little remains to be added to the descriptions of Solereder and of Jones, as quoted above. Without exception, the walls of the free portion of the hair were found to be minutely granular-roughened, and the free portion, as distinguished from the stalk, to be 1-celled. The stalk projects but slightly, or not at all, above the general level of the epidermis. In species in which a high proportion of the hairs have arms of about equal length, such as *A. amphioxys* and *A. calycosus*, the hairs are short, stiff, very sharp-pointed at both ends, and closely appressed. They can be pivoted around the point of attachment by touching them with a needle.

At the other extreme are such entities as *A. humistratus* Gray var. *crispulus* Barneby and *A. gilensis* Greene, in which the malpighiaceous hairs are longer, more flexuous, and more spreading, with one arm much shorter than the other and sometimes reduced to a mere knob or spur. These often are mingled with hairs that appear to be strictly basifixed. The gradation is so complete, in fact, that some of the species listed in the table as

having only basifixed hairs may be found on further examination to possess a few hairs with 2 very unequal arms. The character is of practical diagnostic value only when some of the hairs have both arms well developed, since, in species having only hairs with the second arm greatly reduced, the distinction from strictly basifixed hairs is not easy to make.

The species also differ greatly in the proportion of basifixed hairs among the malpighiaceous ones on the same leaflet, these being few or none in species with a high proportion of approximately equal-armed hairs, but often more numerous than the malpighiaceous hairs when the latter have arms of very unequal length.

The basifixed hairs of this genus also differ markedly in character. In *Homalobus*, *Diholcos*, *Pterophacos*, *Phaca* (most of the species), etc., they are short, relatively thick, straight, and appressed, contrasting strikingly with the long, very fine, wavy, and loosely matted hairs of *Astragalus* as limited by Rydberg (*A. Bigelovii*, etc.).

TABLE 1. Classification of the Arizona species of *Astragalus* in respect to presence or absence of malpighiaceous hairs.<sup>7</sup>

Segregate genus or section <sup>8</sup>	Species with malpighiaceous hairs	
	Present <sup>9</sup>	Absent
Kentrophyta	impensus (Sheld.) Woot. & Standl.	
Homalobus	*Woodruffi Jones	canovirens (Rydb.) Barneby convallarius Greene lancearius Gray wingatanus Wats. Haydenianus Gray
Diholcos		moencoppensis Jones troglodytus Wats.
Cnemidophacos	confertiflorus Gray sophoroides Jones	Blyæ (Rose) Tidestrom Newberryi Gray pephragmenus Jones
Xylophacos	amphioxys Gray castaneæformis Wats. *vespertinus Sheld.	*tephrodes Gray zionis Jones
Pterophacos		tetrapterus Gray
Lonchophaca	kaibensis Jones	lonchocarpus Torr.

<sup>7</sup> Including several species not yet known definitely to occur within the State, these indicated by asterisks (\*).

<sup>8</sup> For convenient reference Rydberg's classification is followed here, although not always satisfactory to the writer.

<sup>9</sup> In greater or less proportion.

<i>Segregate genus or section</i> <sup>8</sup>	<i>Species with malpighiaceous hairs</i>	
	<i>Present</i> <sup>9</sup>	<i>Absent</i>
Batidophaca	*accumbens Sheld. albulus Woot. & Standl. gilensis Greene humistratus Gray (sensu lat.) sesquiflorus Wats.	desperatus Jones
Pisophaca		famelicus Sheld.
Phaca	ceramicus Sheld. mitophyllus Kearney humillimus Gray	allochrous Gray *ampullarius Wats. *aridus Gray Crotalariae Gray insularis Kellogg oophorus Wats. Palmeri Gray Preussii Gray sabulonum Gray Sileranus Jones subcinereus Gray Thurberi Gray triquetrus Gray Wootoni Sheld. Brandegei Porter cobrensis Gray Rusbyi Greene Egglestonii (Rydb.) Kearney & Peebles eremiticus Sheld. recurvus Greene Pattersoni Gray praelongus Sheld. Bryantii Barneby lentiginosus Dougl. (10 vars.)
Atelophragma		
Tium		
Jonesiella		
Cystium <sup>10</sup>		
Cystiella <sup>11</sup>		
Hamosa	arizonicus Gray calycosus Torr.	*striatiflorus Jones ensiformis Jones feensis Jones Hartwegii Benth. hypoxylus Wats. Layneae Greene nothoxys Gray Nuttallianus DC. Bigelovii Gray *Matthewsii Wats. Thompsonae Wats.
Astragalus		dispermus Gray crassicarpus Nutt.
Hesperastragalus		
Geoprumnon		

<sup>10</sup> Section *Diplocystium* of Barneby. See Rupert C. Barneby, *Leafh. West. Bot.* 4:65—147 (1945).

<sup>11</sup> See Barneby, *Proc. Calif. Acad. Sci.* ser. 4, 25:166 (1944).

## PUGILLUS ASTRAGALORUM V

BY R. C. BARNEBY

The following notes and descriptions are based principally on collections of Mr. H. D. Ripley and the writer in the western States, and represent an attempted solution of some of the taxonomic problems which have arisen in relation to them. I have also been fortunate in having access to the files and libraries of numerous herbaria, and to the curators in charge of these I express my grateful appreciation. For the purpose of citation the usual symbols have been used in the text, as follows: California Academy of Sciences (CAS), Gray Herbarium (G), New York Botanical Garden (NY), Philadelphia Academy of Natural Sciences (P), Herbarium of the University of Idaho, Southern Branch (Poc), Herbarium of Pomona College (PO), U. S. Field Station, Sacaton (Sac). I am also especially indebted, for loans and gifts of pertinent material, to Miss Alice Eastwood and Mr. J. T. Howell, to Prof. Ray J. Davis of Pocatello, and Dr. Bassett Maguire of New York. Unless otherwise stated, duplicates of the collections discussed are deposited in the herbarium of the California Academy.

*ASTRAGALUS ALVORDENSIS* Jones.

OREGON: 4 miles west of Rome, Malheur Co., Ripley & Barneby No. 6164.

Lately reported from approximately the same station by Peck (Leaflet West. Bot. 4: 182). The curvature of the pod in our collection varies from a little less strongly falcate than shown in Jones' figure (Rev. Astrag. Pl. 29) to spirally coiled through one and three-quarter circles. The cross-section in the cited plate is reversed, the ovules appearing to spring from the obtuse dorsal, instead of the acute ventral suture. A related species, which forms a passage between *A. alvordensis*, hitherto somewhat anomalous among the *Collini*, and the rest of the section, may be described as

*Astragalus camptopus* Barneby, spec. nov., inter *Podo-sclerocarpos* Gray sive *Homalobi Collinos* Rydb. adnumeranda, legumine spiraliter 1—2-cyclo *A. speirocarpo* Gray necnon *A. alvordensi* Jones affinis, sed ab eo corolla purpurea, foliolis latioribus et legumine longius stipitato hirsutulo (nec strigoso), ab hoc imprimis corolla duplo longiori, ab ambobus vero radice gracili horizontali caules solitarios vel paucos hinc inde emittenti diversissima.

Herba perennis humilis paucicaulis, præter corollam ac legumen pilis brevibus incurvis basifixis undique strigoso-cinerea; caulibus gracilibus erectis vel sæpius adscendentibus ad medium ramosis, abrupte flexuosis striatis 12—25 cm. altis, inferne nudis superne confertim foliatis, e radice tenui horizontali late repenti singulatim vel 2—3 simul emissis; stipulis caulinis, ad basin petiolo adnatis liberisve, anguste deltoideis 1—3 mm. longis, apice deflexis, intus glabris; foliis divaricatim patulis reflexisve, breviter petiolatis, 3—6 cm. longis; foliolis 5—9-jugis confertiusculis, obovato-cuneatis obcordatis vel suborbicularibus, obtusis retusisque, secus rachin manifeste decrescentibus, 4—10 (12) mm. longis, bicoloribus sed utrinque strigosis, subtus canis, pagina superiori viridula; pedunculis erectis folio suffulcranti circa dimidio brevioribus in racemum 9—15-florum mox extensum, fructiferum 3—8 cm. longum, abeuntibus; bracteis ovatis acutis 1—2 mm. longis, pedicellum patulum plerisque subæquantibus; calycis ebracteolati membranacei aliquantulum inflati purpurascens pilis incurvis sæpe fuscis laxè strigulosi tubo nunquam rupto profunde campanulato (4.5) 5—6 mm. longo, basi obliquo sed vix gibbo, dentibus 0.4—0.8 mm. longis difformibus, ventralibus 2 late, lateralibus inferiorique angustius deltoideis, obtusis; corolla purpurea; vexillo obovato, 13—15 mm. longo, emarginato, infra medium per 45° retroarcuato, marginibus reflexis; alis 12—14 mm. longis, lamina elliptico-oblonga subrecta obtusa, auriculo subulato incluso circa 8 mm. longa; carinæ 10.5—12 mm. longæ unguiculis fere tota longitudine liberis, laminis late lunatis obtusissimis 4—5 mm. longis; legumine pendulo, 1-loculari, pluriovulato, stipitato, valde compresso, lineari-oblongo 3—4 mm. lato, per cyclos 1.5—2 more *Medicaginis* spiraliter contorto, inferne in stipitem gracillimum 10—15 mm. longum deorsum arcuatum vel sigmoideo-contortum glabratum sensim angustato, sutura utraque prominula, ventrali acuta, pericarpio chartaceo lento reticulato lutescenti-viridi vel demum stramineo sæpe purpureo-guttulato, pilis patulis circa 0.4 mm. longis sparsiuscule hirsutulo vel secus suturam ventralem glabro; seminibus lævibus, 2 mm. longis, fuscis.

IDAHO: sandy knolls and gulches in low hills, 5 miles southwest of Bruneau, Owyhee Co., alt. 2500 ft., 2 June 1945, fl. & fr., Ripley & Barneby No. 6525. Type in Herb. Calif. Acad. Sci., No. 324949. Isotypes G, NY, P, PO, Intermountain Herb. Similar habitat, 14 miles southwest of Bruneau, alt. 3300 ft., No. 6535; sandy hillside, 8 miles south of Hot Springs, Owyhee Co., No. 6519; sandy rhyolitic knoll, 15 miles southwest of Grandview, Owyhee Co., J. H. Christ No. 14106; near Murphy, Owyhee Co., No. 9570 (this and the preceding in herb. Christ.).

*Astragalus camptopus* is evidently the plant referred to by Jones (Cont. West. Bot. 17:16,—1930) under the name *A. speirocarpus*, which he encountered on his trip from Elko, Nevada, to Mountain Home, Idaho, in 1930. In the same Contri-

bution (p. 29) he described it at some length, this time under the heading of *A. sinuatus* Piper, but he seems to have reached no decision as to its proper place in the genus. I have seen no material collected by Jones, but in a package attached to a sheet of *A. ophiogenes* Barneby (*Jones No. 25408*, PO, cited below) which he obtained near Bruneau in that year, there is a loose pod of *A. camptopus*, and it seems likely that there is a full collection of it somewhere at Pomona.

Apart from a rare form of *A. Whitedii* Piper, otherwise very different, the only North American *Astragali* besides *A. camptopus* in which the pod is compressed and coiled, like that of an annual medick, into a ring, are *A. speiroparpus* Gray and *A. alvordensis* Jones. From the latter, which it most closely resembles in habit, in its abruptly zigzag stems, widely divaricate or somewhat deflexed leaves, and branching, fan-shaped sprays, it is immediately distinguished by the erect peduncles, and showy purple corolla which is twice as large. While similar to ours in the size of the flower and calyx, *A. speiroparpus* differs at first glance in its ochroleucous petals, narrower leaflets, strigose legume borne on a usually shorter stipe (though the length of the stipe is an unreliable criterion in the group), and in its simpler, less abruptly flexuous branching. In the character of the root-system, with the stems rising at intervals, solitary or a few together, from buds on a slender, horizontally creeping rhizome, the proposed species seems to be unique among its relatives. In *A. alvordensis* some slight tendency in the same direction may be observed; the stems there are often solitary, or at most few and loosely clustered near the summit of an oblique root, but the plants do not, as in *A. camptopus*, form extensive colonies. I have no personal experience of *A. speiroparpus* in the field, and authentic material, prepared so as to show the base of the plant, is rare in herbaria. But from the evidence available the root seems always to be vertical, and the stems to rise from the slender divisions of a branched (but probably subterranean) caudex. It should be remarked that *A. speiroparpus*, to which *A. camptopus* would be referred from Rydberg's key to *Homalobus* ser. *Collini* (N. Amer. Fl. 24: 258,—1929), is endemic to the valley of the Columbia in Washington and northern Oregon, its nearest station to Bruneau being over three hundred miles to the northwest.

*ASTRAGALUS TOANUS* Jones.

IDAHO: Bliss Hill, Gooding Co., *R. J. Davis* No. 88, No. 3181 (Poc), *Ripley & Barneby* No. 6472; west of Hammett, Elmore Co., *Ripley & Barneby* No. 6481; southwest of Bruneau, Owyhee Co., No. 6527.

Although collected some years ago near Bliss by R. J. Davis, this species has been known in the literature only from northern and central Nevada and from extreme western Utah. The material from the last two stations cited is quite unusual in having the pod strigose and even canescent when young, whereas throughout the rest of its range, so far as known, the ovary and pod are completely glabrous from the first.

*Astragalus Purshii* Dougl. var. *concinus* Barneby, var. nov., ab omni-bus speciei polymorphæ formis foliolis paucis (7—9) late obovatis vel suborbicularibus obtusis pube gossypino-pannosa intertexta vestitis recedens. Ab *A. utahensi* (Torr.) T. & G. (cui olim ab auctoribus relata est), ambitu foliolorum, pube, corollaque purpurea nostræ simillimo, dentibus tuboque calycinis brevioribus, foliolis paucis ac præsertim leguminis forma longius distat.

IDAHO: Challis, Custer Co., *Macbride & Payson* No. 3224 (NY, type!, CAS, G); Big Lost River 20 miles northeast of Sun Valley, *Hitchcock & Muhlick* No. 8809 (CAS); northeast of Dickey, Custer Co., *Cronquist* No. 3057 (Poc); Brazil's Ranch, Birch Creek, Lemhi Co., *R. J. Davis*, No. 92—33 (Poc); Salmon, *Payson & Payson* No. 1764 (NY, G). MONTANA: Beaverhead Co., *Tweedy* No. 12 (NY); Armstead, Beaverhead Co., *Payson & Payson* No. 1909 (G, NY); Red Rock, Beaverhead Co., *C. L. Shear* No. 3350 (NY).

Sufficient material has now accumulated to show that in *A. Purshii* var. *concinus* there exists an entity allied to both *A. Purshii* and *A. utahensis*, yet distinct enough to deserve a name. In general aspect, with its dense, cottony-pannose pubescence, purple flower and broad, obtuse leaflets, it most closely resembles depauperate individuals of the latter, to which Rydberg (Bull. Torr. Bot. Club 52:367,—1925) referred all the material then available. It differs, however, from that species not only in the fewer leaflets (7—9 or less as opposed to 9—19), and shorter calyx (the tube about 7 mm. as opposed to 8—11 mm. in length), but also in the strongly arcuate-beaked legume, which as to shape and vesture is precisely that of *A. Purshii* and its var.

*tinctus* Jones. In fact it forms a passage between *A. Purshii* and *A. utahensis*, and raises the question of whether the latter can properly be maintained as distinct. Further discussion of this problem must await a revision of the group now in preparation.

Geographically var. *concinus* is as well segregated from *A. utahensis* as from *A. Purshii* var. *tinctus*, the only form of the species with which, on account of its purple corolla, it could be confused. *Astragalus utahensis* is commonest in the basin of the Great Salt Lake, extending thence southward along the Sevier River, westward into central Nevada, across the Wasatch into the foothills on both sides of the Uinta Mountains, and into extreme southern Idaho, south of the Snake River. From its center of distribution in interior northern California, *A. Purshii* var. *tinctus* follows the Cascades northward to the Columbia River, but is replaced to the east by the typical, ochroleucous-flowered form of the species; whereas the var. *concinus* is confined to the valleys enclosing the Lost River, Lemhi and Bitterroot ranges in central Idaho and adjacent Montana.

*Astragalus ophiogenes* Barneby, spec. nov., inter *Argophyllos* Gray, sive *Xylophaci glareosos* Rydb., disponenda, hinc legumine parvo arcuato *A. callitrichi* Barneby, cui pube implexa arachnoideo-tomentosa manifeste dissimilis, illinc *A. glareoso* Dougl. cognatisque speciebus a quibus imprimis corolla ac legumine multo minoribus discrepat, affinis.

Herba perennis cæspitosa pluricaulis, pube implexa e pilis basifixis gossypinis tortuosis constituta omnibus fere partibus cano-tomentosa ac villosa; caulibus e summa radice verticali emissis, primum brevissimis, demum sæpissime ad 8 cm. usque elongatis, prostratis, densissime foliatis; stipulis imo basi petiolo adnatis, (5) 7—12 mm. longis, anguste triangularibus lanceolatisve, acutis vel acuminato-caudatis, glabrescentibus; foliis erectis, (2) 4—11 cm. longis, petiolis gracilibus rachi paulo superatis inferne subpersistentibus; foliolis (3) 5—8-jugis, anguste (nonnumquam latiuscule) obovatis ellipticisve, 5—12 mm. longis, 2.5—5 mm. latis, plerumque acutis, rarius obtusis vel submarginatis, utrinque canis; pedunculis striatis, (1.5) 4—13 cm. longis, ad anthesin erectis, ineunte fructu recliniatis; racemis laxiuscule (3) 7—11-floris, (1) 2—4 cm. longis, fructiferis vix elongatis; bracteis lineari-subulatis, 3—8 mm. longis, pedicellum brevem erectum manifeste superantibus; calycis membranacei purpurascens ebracteolati tubo cylindrico 5—6 mm. longo mox rupto, dentibus subulatis vel deltoideis acutis (0.75) 1—1.5 mm. longis; corolla saturate purpurea; vexillo obovato, emarginato, 13—14 mm. longo, supra medium leviter arcuato, marginibus reflexis; alis circa 13 mm. longis, lamina oblongo-lunata 2 mm. lata, auriculo obtuso reflexo incluso 8 mm. longa; carinæ 10.5—11.5 mm. longæ unguiculis inferne (per 2 mm.) inter se liberis, superne concretis, laminis obovato-

lunatis 4—5 mm. longis obtusissimis, secus margines inferiores per 60° sursum arcuatis, marginibus ventralibus leviter concavis; legumine patulo sessili 1-loculari, oblique ovoideo-lunato, 8—11 mm. longo, 5—7 mm. lato, inferne obcompressa subrecto, medium versus in rostrum deltoideum lateraliter compressum valde acutum pungentemque stylo persistenti coronatum per annulum circa dimidium (vel minus) arcuato, suturis ambabus ad basin sulcatis, supra acutis, valvulis coriaceis reticulatis, pilis patulis validis sericeo-nitidis 2—3 mm. longis pericarpium imperfecte tegentibus undique hirsuto; seminibus ovalisque circa 12, illis suborbicularibus, 2.3—2.5 mm. longis, fusco-viridibus.

IDAHO: in deep sand at the foot of a volcanic mesa, east of King Hill, Elmore Co., alt. 2500 ft., 31 May, 1945, fl. & fr., Ripley & Barneby No. 6478. Type in Herb. Calif. Acad. Sci., No. 324948. Isotypes G, NY, Poc. Bruneau, Owyhee Co., Jones No. 25408, No. 25435 (PO).

In the shape, small size, and relatively sparse vesture of the legume, *A. ophiogenes* closely simulates *A. callithrix* Barneby, endemic, so far as known, to dunes in the high valleys of central Nevada, but the two are probably not intimately related. The pubescence of the Idaho species, composed of very fine, tortuous, and matted hairs, is similar to that found in *A. Purshii* Dougl. and *A. glareosus* Dougl., while that of *A. callithrix* is of shorter, coarser, and more appressed, silvery and less tangled hairs, in this respect approaching *A. Newberryi* Gray. The character of the vesture, more easily perceived than described, is of proved value in separating species-groups among the woolly-podded *Argophylli* (*Xylophacos*), and suggests that, in spite of a superficial similarity to *A. callithrix*, the true affinities of *A. ophiogenes* are with *A. glareosus*. From the latter and from *A. nudisiliquus* A. Nels., the two other members of the section which occur along the Snake River in southwestern Idaho, *A. ophiogenes* is immediately separated by the very much smaller corolla and legume.

It is perhaps of interest to note the habitats and overlapping ranges of these three species. King Hill is the type-locality of both *A. nudisiliquus* and *A. ophiogenes*, and it was while searching, unsuccessfully, for a topotype of the former that Mr. Ripley and I came across the colony from which the type of *A. ophiogenes* was taken. A few days later we visited Bruneau, in the hope of locating Jones' station for *A. ophiogenes*, but there found only *A. nudisiliquus*, which Jones apparently missed, although it is abundant on the cobblestone bluffs along the river. While

occurring in the same immediate region, however, the two species differ in habitat. *Astragalus nudisiliquus*, as I have seen it in several places along the Snake and Bruneau rivers and along the Malheur in Oregon, is characteristic of, and nearly confined to, the steep bluffs of detrital sand and gravel which there form a conspicuous feature of the landscape. The plants are strongly caulescent, loosely matted and a foot or two across. By contrast *A. ophiogenes* is a plant of valley dunes, luxuriating in low places among the brush, where it is always closely cespitose, the stems being entirely hidden by the tufted foliage. Both of these belong to the strip of Sonoran vegetation which lines the banks of the Snake River and extends some short distance up its tributary streams. The third species native to southwestern Idaho, *A. glareosus* Dougl., I have seen only at greater elevations; it is commonest on the sagebrush plains and hillsides of the Arid Transition Zone, ranging eastward along the foothills as far as Butte County, and far northwestward into the Columbia Basin.

ASTRAGALUS NEWBERRYI Gray.

IDAHO: south of Rogerson, Twin Falls Co., *Ripley & Barneby No. 6468*.

A new record for the state. The specimens represent the relatively robust var. *Watsonianus* (Sheld.) Jones, the prevailing race in northern Nevada, whence it extends feebly southward in the mountains to Clark County, and northward into Harney County, Oregon.

ASTRAGALUS IODANTHUS Wats. var. DIAPHANOIDES Barneby.

IDAHO: Bruneau, Owyhee Co., *Ripley & Barneby No. 6485*; 23 miles southwest of Marsing, Owyhee Co., *No. 6148*. OREGON: Rome, Malheur Co., *No. 6159*.

Apparently the first record of the species from either Idaho or Oregon. The material is not quite like the form of var. *diaphanoides* prevalent in northern Nevada, having fewer, larger, and more glaucous leaflets, while the corolla is purplish-blue as in var. *typicus*. The short calyx and broad, prominent keel, however, are characteristic of var. *diaphanoides*.

*Astragalus tetrapterus* Gray var. *typicus* Barneby, nom. nov. *A. tetrapterus* Gray, Proc. Amer. Acad. 13: 369 (1878). *Pterophacos tetrapterus* (Gray) Rydb., Fl. Rocky Mts. 507, 1063 (1917). *Astragalus tetrapterus* var. *capricornus* Jones, Rev. Astrag. 149 (1923).

NEVADA: north of Pioche, Lincoln Co., Ripley & Barneby No. 3531; Moorman Ranch, west of Ely, White Pine Co., No. 6269; Cobre, Elko Co., No. 5561, topotype of var. *capricornus*; south of Contact, Elko Co., No. 6463.

The typical variety of the species occurs in sagebrush valleys, usually in sandy soil, throughout the length of eastern Nevada, extending thence into southern Utah; and it has lately been recorded by Peck (Leaflet West. Bot. 4: 182,—1945) from southern Oregon. The var. *capricornus* was described as differing from the type in having smaller, purple flowers and shorter leaflets, but since Jones (l. c.) cited *A. tetrapteris* "with purple flowers" from the type-locality of his variety, his intention is somewhat obscure. It was reduced by Rydberg (N. Amer. Fl. 24: 308,—1929) to *Pterophacos tetrapteris*, I think rightly, although in the condensed leaves and slightly reduced leaflets and flowers it approaches var. *cinerascens*. The color of the petals is not diagnostic in this species. In White Pine County, Nevada, every variation between the ochroleucous or flesh color prevalent in the species and a brilliant cerise pink were observed to occur in a single station.

***Astragalus tetrapteris* Gray var. *cinerascens* (Rydb.) Barneby, comb. nov. *Pterophacos cinerascens* Rydb., N. Amer. Fl. 24: 309 (1929). *Astragalus cinerascens* (Rydb.) Tidestr., Proc. Biol. Soc. Wash. 50: 21 (1937), non DC. ex Steud., Nom. Ed. 2, 1: 160 (1840).**

OREGON: south of Narrows, Harney Co., Ripley & Barneby No. 6090, topotype; Rome, Malheur Co., No. 6163.

A comparison of Rydberg's descriptions of *Pterophacos tetrapteris* and *P. cinerascens* brings to light an imposing list of differences in pubescence, number and shape of leaflets, and in the length of calyx, corolla, and legume, but it has been found impossible to apply these criteria to the more ample material now available. In the topotype from Narrows are found pods up to 3 cm. long (average for the species as a whole) and leaflets acute and obtuse on the same branch. It is, in fact, almost characteristic of *A. tetrapteris* to have the leaflets acute in the upper leaves and obtuse in the lower. Both Oregon collections, here referred to var. *cinerascens*, differ from the rest in their somewhat shorter calyx-teeth and strigose or at least puberulent legume, and show

some tendency to reduction in size of leaflets. The corolla in the topotype is a little smaller than in most material from farther south, but this is not true of the plant from a similar environment (steep, sandy bluffs) near Rome, Oregon. The pubescence is copious in the topotype, but not more so than in the material from Cobre, Nevada (var. *capricornus*), which differs, in fact, only in the glabrous pod; whereas the plant from Rome is actually greener than most, although it has otherwise the requirements for *P. cinerascens*.

With all critical characters interlocking in this way, it becomes impossible to recognize more than a single species. If two races are to be recognized within *A. tetrapterus*, the most natural (though still pretty artificial) break seems to occur between the Oregon plants with strigulose legume and those with glabrous legume from farther south.

**Astragalus limnocharis** Barneby, spec. nov., legumine vesicario-inflato 1-loculari sessili *Inflatis* Gray sive *Phaca* subgen. *Chartocystidi* Rydb. addenda, stipulis alte connatis, foliolis involutis, floribus parvulis necnon carinæ forma *A. jejuno* Wats. manifeste affinis, sed ab eo imprimis racemo plurifloro, legumine dimidio majori petiolisque deciduis recedens.

Herba perennis humilis tenella e radice verticali gracili oriens, pube brevi appressa basifixa omnibus fere partibus subcinereo-strigosa vel junioribus canescens; caulibus paucis prostratis vel adscendentibus 1—3 cm. longis, hinc inde breviter ramosis, stipulis laxè imbricatis tota fere longitudine indutis; stipulis anguste deltoideis acutis 3—4 mm. longis, petiolo breviter adnatis, altrinsecus ad medium usque connatis, inferne caulem laxiuscule vaginantibus, apice patulis, primum subherbaceis viridi-purpurascentibus parce strigosis ciliatisque, mox chartaceis, castaneis glabratibus; foliis erectis confertis 2—4 cm. longis, petiolo gracillimo rachi aliquantum breviori; foliolis (3) 4—6-jugis brevissime articulatis, oblanceolato-oblongis obtusis 3—7 mm. longis, crassis, margine circacircum involuta cymbiformibus, lamina subtus strigosa, supra (concava) glabra sed ciliis longiuculis e margine involuta ortis et centripetis patulis plus minusve oblecta; pedunculis gracillimis folium subæquantibus in racemum 4—8 florum fructiferum vix 5 mm. longum abeuntibus, demum reclinatis; bracteis subulatis pedicello filiformi patulo circa 1.5 mm. longo subæquilongis; calycis plerumque atrostrigosi ebracteolati tubo obconico-campanulato circa 1.5 mm. longo, dentibus subulatis sinu obtuso separatis vix 1 mm. longis; petalis ochroleucis immaculatis; vexillo obovato 7.5 mm. longo, 4 mm. lato, apice emarginato, marginibus reflexis; alis circa 7 mm. longis, lamina oblanceolato-lunata auriculo parvo incluso 6 mm. longa, 1.5 mm. lata; carinæ 4.5—5 mm. longæ laminis 3 mm. longis, inferne rectis, superne per angulum rectum in apicem rectangularem (ut vero carina truncata videatur) abrupte arcuatis, auriculo minuto; legumine sessili, vesicario-inflato, patulo, 1-loculari,

oblique ovoideo, brevissime rostrato, circa 15 mm. longo, suturis filiformibus nullibi inflexis ventrali (? leviter sulcato) quam dorsalem valde gibbum minus arcuato, valvulis membranaceis transverse reticulatis strigulosis subdiaphanis pulchre purpureo-maculatis; ovulis circa 10, longe funiculatis; seminibus maturis ignotis.

UTAH: frequent on the gravelly beach of Navajo Lake, at Spruce Forest Camp, Iron Co., 13 July 1940, fl. & fr., *Bassett Maguire No. 19474*. Type in herb. N. Y. Bot. Gard., distributed by the Intermountain Herbarium, Utah State Agricultural College. Navajo Lake, alt. 9500 ft., *Cottam No. 4253* (PO).

*Astragalus limnocharis* is related to *A. jejunus* Wats., resembling that species in its connate stipules, ventricose-inflated, membranous pod, in the shape of the keel-petals, and in the curiously inrolled margin of the leaflets. It is truly herbaceous, however, without any tendency to develop a suffruticulose caudex, while the petioles are promptly deciduous, the corolla is larger and wholly ochroleucous, the leaflets are rounded and not acute at apex, and the pod is decidedly larger and less oblique in outline. *Astragalus jejunus* occurs in a quite different environment, being a narrow endemic of dry knolls in the northern foothills of the Uinta Mountains in Utah and adjacent Wyoming.

Two other species with inflated, unilocular legume occur also in the mountains of southern Utah, *A. Wardii* Gray and *A. serpens* Jones. The first of these differs from *A. limnocharis* in its much greater stature and almost complete lack of pubescence, the pod being entirely glabrous, while *A. serpens* is quickly distinguished by its vesture of looser, curly hairs, its woody caudex not clothed in imbricated stipules, its purplish corolla, and the flat margin of the leaflets.

The writer is indebted to Dr. Bassett Maguire of the New York Botanical Garden for the communication of the type-material of *A. limnocharis*.

#### ASTRAGALUS CANADENSIS L.

Two forms of this widely distributed species are known from Idaho and adjacent states, one in open wooded or mountainous country, the other in arid, desertic regions, as in the Snake River valley. The first, often found in herbaria under the name *A. canadensis*, is tall and green, with ample leaflets and well-developed, commonly dark-hairy calyx-teeth, the anterior pair not much broader or shorter than the three others, which are subulate and

1.5—3 mm. long. The second, passing as *A. Mortonii* Nutt. or *A. canadensis* var. *Mortonii* (Nutt.) Wats., is a lower and more pubescent plant, with the teeth of the white-strigose calyx all short, 1—2 mm. long, the upper pair deltoid and much wider and shorter than the rest. In both the pod is strigose, sometimes sparingly so in the first, and sulcate along the dorsal suture, whereas in *A. canadensis* of the eastern States it is glabrous and terete. As shown by Rydberg (Bull. Torr. Bot. Club 56: 545,—1929), the original *A. Mortonii* of Nuttall was not the plant currently passing under that name, but the taller, montane "*A. canadensis*" of the western mountains. The lower plant with short calyx-teeth was early distinguished by Nuttall himself as *A. spicatus*, a preoccupied name for which Rydberg substituted *A. pachystachys*, also previously used. In 1902 it was described anew by Gandoger as *A. Mortonii* fma. *brevidens* (the type-collection from Evanston, Wyoming, *A. Nelson No. 3842, NY*), a name overlooked by Rydberg. Since the epithet *brevidens* most aptly brings out the chief character of the plant in question, I would suggest the transfer

***Astragalus canadensis* L. var. *brevidens* (Gand.) Barneby**, comb. nov. *A. Mortonii* fma. *brevidens* Gand., Bull. Soc. Bot. Fr. 48: xvi (1902). *A. Mortonii* fma. *Rydbergii* Gand., l. c. *A. spicatus* Nutt. ex T. & G. (1838), non Pall. (1753). *A. pachystachys* Rydb. (1923), non Bge. (1869). *A. Torreyi* Rydb., an insignificant segregate.

ASTRAGALUS AGRESTIS Dougl. ex G. Don, Gen. Hist. 2: 258 (1832). *A. hypoglottis*  $\beta$  Hook. Fl. Bor.-Amer. 1: 148 (1831). *A. goniatus* Nutt. ex T. & G. Fl. N. Amer. 1: 330 (1838).

The name *A. agrestis* Dougl. was first mentioned by Hooker in the synonymy of *A. hypoglottis* (l. c.), and it is generally so cited. Since this did not, of course, constitute valid publication, it is of interest to determine when and where this took place. Rydberg (N. Amer. Fl. 24: 451,—1929) gives the species as of Dougl. ex Jones, Proc. Calif. Acad. Sci. II, 5: 646 (1895), but the validation in Don's General History, where a full description of the species is given under Douglas's binomial, seems likely to be the earliest. *Astragalus agrestis* Dougl. thus has clear priority over *A. goniatus* Nutt., which would otherwise have had to replace it.

## INTERESTING WESTERN PLANTS—VII

BY PHILIP A. MUNZ

*Bailey Hortorium, Cornell University, Ithaca, New York*

***Oenothera primiveris*** Gray var. ***caulescens*** Munz, var. nov. Folia floresque specie similes; caulibus elongatis, 1—3 dm. altis.

Leaves and reproductive parts as in the species, but plants caulescent, the stems 1—3 dm. high.

Type from open flats in the desert 7 miles south of Wellton, Yuma County, Arizona, March 30, 1941, *P. A. Munz No. 16606* (California Academy of Sciences Herbarium No. 325,178); isotypes at Bailey Hortorium, Gray Herbarium, and Pomona College.

This caulescent variant of *Æ. primiveris* was first called to my attention by Mrs. Frances Hamilton Hendrixson, who collected it March 1, 1939, at the Mesa Citrus Farm of the University of Arizona, 8.5 miles south of Yuma (Bailey Hortorium, Pomona College). So far as I could observe on my 1941 trip to Tinajas Altas, the proposed variety replaces the species in the southwestern corner of Arizona and is a geographical entity worth recognizing.

***Cordylanthus bernardinus*** Munz, spec. nov. Planta annua, 2—4.5 dm. alta, diffuse ramosa, flavovirens, dense minuteque scabrido-pubescent; foliis multis, linearibus, simplicibus aut superioribus trilobatis, 5—15 (20) mm. longis, 1 mm. latis, non glandulosis; floribus 2—5 in capitulis terminalibus; bracteis olivaceis, subpurpureis et callosis apice, tripartitis vel palmate 5-partitis, 5—17 mm. longis, lobis linearibus, vix 1 mm. latis, 2.5—10 mm. longis, cum pubescentia caulium et pilis longioribus glandulosisque et cum tamen aliis basi bulbosis ex 3 vel 4 cellulis compositis; "foliis calycis" 18 mm. longis, "folio" inferiore 5-costato, in parte terminali subporphyreo, "folio" superiore in basin hyalino; corolla 16 mm. longa, flavovirenti, dense albido-pubescenti, tubo 5 mm. longo, fauce 4 mm. longa, labiis 5 mm. longis; staminibus 4, parte libera filamentorum 6 mm. longa, barbata, antheris bilocularibus, loculo superiore 1.5—2 mm. longo, inferiore 1 mm. longo; stylo glabro, stigmate 0.3 mm. longo, vix exserto; capsula immatura glabra, oblonga, 9 mm. longa; seminibus immaturis, 1.5 mm. longis, oblongis, subarcuatis, subfavosis.

Annual, 2—4.5 dm. high, diffusely branched from near base, yellowish-green, densely and finely scabrous-pubescent throughout, with somewhat retrorse hairs about 0.1 mm. long; leaves numerous, linear, apparently simple except on uppermost branches (where 3-lobed), 5—15 (20) mm. long, about 1 mm. wide, somewhat callous-tipped, but not so evidently as are the floral bracts, not glandular; flowers mostly 2—5 in heads at tips of

branches; bracts olive-green, with purplish callous apices, 3-parted to palmately 5-parted at about one-third way from base, 5—17 mm. long, the lobes linear, scarcely 1 mm. wide, 2.5—10 mm. long, with same pubescence as stems and leaves and also some longer gland-tipped hairs especially along the margin, as well as some 3- or 4-celled hairs with bulbous base; "calyx-leaves" about 18 mm. long, the lower one 5-ribbed, bulbous-scabrous as well as glandular-pubescent and somewhat ciliate-villous, somewhat purplish-brown in upper half; upper one slightly shorter, somewhat more finely pubescent, 5-nerved, hyaline towards the base; corolla about 16 mm. long, mostly yellow-green, densely white-pubescent without and within the throat, the tube 5 mm. long, throat about 4 mm. long, lips 5 mm. long; stamens 4, adnate to tube, the free part of the filaments about 6 mm. long, densely bearded, anthers 2-celled, the upper cell 1.5—2 mm. long, the lower 1 mm. long; style glabrous, stigma about 0.3 mm. long, barely exerted; immature capsule glabrous, oblong, about 9 mm. long; immature seeds about 1.5 mm. long, oblong, slightly arcuate, apparently to become favose.

Type from alkaline seep, 1 mile west of Cushenbury Springs, at 3000 feet elevation, north base of San Bernardino Mts., San Bernardino County, California, Sept. 28, 1941, *P. A. Munz No. 17056* (California Academy of Sciences Herbarium No. 325,177); isotypes at Bailey Hortorium, Gray Herbarium, Pomona College, Stanford University, and University of Washington.

The proposed species resembles *C. rigidus* (Benth.) Jeps. in the small number of flowers in each head and in the linear lobes of the flower-bracts, but it lacks the long pubescence and its bracts are 3- or 5-lobed instead of merely 3-lobed. It is very near to *C. eremicus* (Cov. & Morton) Munz of the Panamint Mts. in pubescence and in shape of flower-bracts, but *C. bernardinus* is olive-green not gray-green in color and has mostly simple leaves, its corolla is usually longer, and its bracts and "calyx" are more pubescent. *Cordylanthus eremicus*, which is found considerably north of the Cushenbury Springs area, grows in dry places among pinyons at a much higher elevation. It is possible that specimens that connect the two plants may be collected from intermediate stations in the future, but for the present it seems desirable to give specific status to the new plant.

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CALIFORNIA RECORDS FOR SWEET VERNAL GRASS. *Anthoxanthum odoratum* L., which is usually reported in California from localities near the coast, has been recently collected at several montane stations towards the interior: near Cobb Mt., Lake Co., *Howell No. 20967*; near Cisco, Placer Co., *Beetle No. 2719*; near Pacific House, Eldorado Co., *Howell No. 18905*.—J. T. Howell.

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ALICE EASTWOOD and JOHN THOMAS HOWELL

THE PROSTRATE OAKS OF MARIN COUNTY,  
CALIFORNIA

BY ALICE EASTWOOD

On the bare wind-swept hills of Sausalito and Tiburon across the bay from San Francisco, oaks that in more favorable situations become large magnificent trees, here are reduced to mats, hugging the ground like the willows and birches of arctic and alpine regions. For centuries they have been swept by the almost continuous winds from the west and forced to lie low.

In Sausalito the most remarkable patch is on a privately owned lot where Spencer Ave. turns to the west to cross the low pass on the road to Rodeo Lagoon and Fort Barry. Here three species are crowded together over a few yards of space. They are *Quercus Wislizeni* A. DC., *Q. chrysolepis* Liebm., and *Q. morehus* Kell. On Mt. Tamalpais, *Q. Wislizeni* is one of the shrubs that constitute what is known as the chaparral. Small trees are rare. However, in the inland valleys of the coast mountains and the foothills adjacent to the Sacramento and San Joaquin valleys, it is the most important large evergreen oak resembling in general appearance the common live oak of the coastal areas (*Q. agrifolia* Née). Dr. Jepson in his *Silva of California* tells of trees 70 to 80 ft. in height and 6 ft. in diameter in Ukiah Valley.

*Quercus chrysolepis* is common on Mt. Tamalpais and along watercourses becomes a large tree. However, the most notable trees are two that can be seen on a knoll not far from the Bolinas Ridge trail, with broad crowns and thick trunks. John Muir always called it the gold oak, a most appropriate name, from the gold hairs on the lower surface of young leaves and on the acorn cups where it is often very dense. Dr. Jepson calls it the maul oak, and gives several other common names. He gives the proportions of a tree in Hupa Valley, Humboldt Co., as 95 ft. high and 20 ft. across the crown and with a trunk 7 ft. 6 in. in diameter. It is widely distributed and variable in the shape and size of its fruits.

*Quercus morehus* is supposed to be of hybrid origin, the parents *Q. Wislizeni* and *Q. Kelloggii*. On a few sheltered spots on Mt. Tamalpais it becomes a small tree and bears fruit. The tree described by Dr. Kellogg grew near Clear Lake in Lake Co. However, it seems to be widely distributed though never forming groves, individuals generally scattered. I found small trees at Newcastle, Placer Co.

Higher on the Sausalito Hills a small prostrate patch of *Q. Kelloggii* Newb. exists, the California black oak. This is widely distributed in the Transition Zone of the Sierra Nevada and the higher elevations of the coast mountains. As the redwood area in Marin Co. is the same zone near the coast, the tree is found there at a low elevation. On Mt. Tamalpais it grows near the base on the north side.

On the Tiburon Hills not one of these four oaks is found in the mats that here and there spot the hills. The most remarkable is *Q. Garryana* Dougl., the deciduous white oak of northern California and common in Oregon, Washington, and Vancouver Island. In Marin Co. I know of a few small trees on the hills to the west of Fairfax. According to Dr. Jepson, trees are known in northern California to be 25 to 50 ft. high and with a trunk 1.5 to 5 ft. in diameter.

*Quercus durata* Jepson, a shrubby oak found only on serpentine, is the most abundant above Tiburon. It is a low shrub on the serpentine areas on Mt. Tamalpais, never a tree nor prostrate mat.

The third species is the common live oak of the coast, *Q. agrifolia* Née, which is the commonest species along the coastal hills and valleys and represented in sheltered, well-watered situations by large trees. It loves the fogs and is not found where the coastal fogs do not prevail. I remember one tree on the way from King City to Jolon near the Mansfield Ranch where, from a rift in the Santa Lucia Mts., the fog sought this spot and the people at the ranch called them the fog oaks. This is the encina of the Spaniards who distinguished *Q. lobata* Née as roble or the white oak.

NOTES ON THE GRASS FAMILY IN MARIN  
COUNTY, CALIFORNIA

BY JOHN THOMAS HOWELL

After more than five years of field work in Marin County, California, and several months of herbarium study,\* I believe that the status of the Grass Family in this limited area offers data of considerable interest from the phytogeographic as well as from the systematic viewpoint. Although Marin County has an area of only 549 square miles, it is a region of great topographic and ecologic diversity, with its hills and valleys culminating in the elevated rocky ridge of Mt. Tamalpais and its shores washed by the waters of the Golden Gate, San Francisco Bay, and Pacific Ocean. In this restricted region the Grass Family is represented by 53 genera, 141 species, and several varieties, a really noteworthy number whether the figures are compared with the grass flora of California or of the entire United States. In Hitchcock's *Manual of the Grasses of the United States*, 159 genera and 1100 species are recognized for the United States and, comparing our local totals with these figures, we see that in Marin County we have represented one-third of the grass genera of the United States and more than one-eighth of the species. In comparison with the rich and varied grass flora of California, nearly three-fourths of the genera (as given by Hitchcock in *Jepson's Man. Fl. Pl. Calif.—1923*) and over one-third (35%) of the species (based on Beetle's figure in *Leafl. West. Bot.* 3:258,—1943) are found in this agrostologically rich field. It need not detract from these impressive figures to state that there have been slight changes in the totals both for the United States and for California in more recent years and that for Marin County I am recognizing as species perhaps a half-dozen entities that were not accepted by Hitchcock.

An analysis of the number of species discloses that only 81 species are indigenous and that the amazing total of 60 species

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\* In my intermittent grass studies over a number of years, I am indebted for help and encouragement to Mrs. Chase, Dr. Hitchcock, and Dr. Swallen. Mrs. Chase has been particularly helpful in connection with Marin County problems and I am very grateful. Also I wish to thank Dr. A. A. Beetle who has furnished me important distributional data and has given me specimens of critical species which have been very helpful.

are introduced. Some of these aliens are among the rarest and most localized of the Marin County grasses, but a considerable number are very widespread and commonly constitute the dominant elements in much of the grassland of the region. Some of the rarer introduced species will probably never become very abundant, but others display a rampant vigor which will undoubtedly carry them far afield through the county.

Although among Marin flowering plants a few species are to be regarded as endemic to the county, no indigenous grass species is endemic and only one rather trivial variety may be considered endemic (see Note 1 at end). The chief interest in analyzing the geographic distribution of the native grasses has been to ascertain the number of species for which Marin County is the southern limit of distribution in the Coast Ranges, *i. e.*, the number of species for which the Golden Gate represents a major geographic break. For purposes of comparison, it has been interesting to determine how many indigenous species occurring in Marin County reach their southern limit at Santa Cruz at the north end of Monterey Bay and in the Santa Lucia Mts. as far as San Luis Obispo south of Monterey Bay. Sufficiently detailed field studies in these southern districts have probably not been made to supply fully adequate data, but from the floristic information available, comparative figures that are reasonably accurate can be obtained. Briefly, these data may be stated as follows: of the 81 species of grasses indigenous in Marin County, 39 species are of general distribution in California or western North America, 10 species reach a southern Coast Range limit in Marin County, 19 species extend south of the Golden Gate to the Santa Cruz Mts. or to Santa Cruz, and 13 species reach Monterey or the Santa Lucia Mts.

The grasses for which Marin County is the presently known southern distributional limit in the Coast Ranges are: *Agrostis Blasdalei* Hitchc., *Agrostis longiligula* Hitchc. (var. *australis* J. T. Howell, see Note 2 at end), *Agrostis palustris* Huds., *Calamagrostis purpurascens* R. Br. (var. *ophitidis* J. T. Howell, see Note 3 at end), *Elymus vancouverensis* Vasey, *Glyceria leptostachya* Buckl., *Panicum pacificum* Hitchc. & Chase, *Phleum alpinum* L., *Pleuropogon Hooverianus* (L. Benson) J. T. Howell (see Note 4 at end), and *Poa confinis* Vasey. This list does not

include *Agrostis pallens* Trin. for which Marin County is generally regarded the southern limit: Hitchcock (in Jepson Fl. Calif. 1:118) cites a Davy collection from "Lands End," which is on the south shore of the Golden Gate in San Francisco.

From these figures it seems evident that although the Golden Gate represents a distinct break in the distribution of indigenous grasses, it is secondary in importance to the breaks at Monterey Bay and at San Luis Obispo. These data are to be correlated with the magnitude of the geologic breaks at these three points: although the Golden Gate and San Francisco Bay are major geographic features, they are not so significant geologically as Monterey Bay which marks the seaward extension of the Salinas Valley or as the Santa Lucia Mts. which extend south to San Luis Obispo. In connection with these observations it is of particular interest to note that the California redwood, *Sequoia sempervirens* (Lamb.) Endl., with which so many of the grasses of middle coastal California are associated, reaches its southern limit in the Santa Lucia Mts. in southern Monterey County.

As to northward-ranging species, Marin County is not at all significant, none reaching a northern Coast Range limit in the county. A species finding its northern limit in southern Sonoma County just beyond the Marin County boundary is the rare *Hystrix californica* (Boland.) Kuntze. Phytogeographically speaking, it is disappointing that a grass typical of the Coast Ranges south of San Francisco Bay has not yet been reported from Sausalito, Angel Island, or Tiburon, because in these areas several flowering plants related to the southern flora have been found at their northern distributional limit.

#### NOTES

Note 1. *Melica Geyeri* Munro ex Boland. var. *aristulata* J. T. Howell, var. nov. A specie differt: lemmis aristas tenues breves (0.5—2 mm. longas) ferentibus.

Type: Herb. Calif. Acad. Sci. No. 324945, collected in Black Canyon, San Rafael Hills, Marin County, California, Apr. 11, 1943, J. T. Howell No. 17906. Duplicate in U. S. Nat. Herb. The small awn is generally evident in collections of *M. Geyeri* from the southern part of Marin County, but in a collection from Salmon Creek Canyon in the northern part of the county the awn is minute or lacking. In specimens examined from the Coast Ranges north of Marin County the awn is entirely lacking.

Note 2. *Agrostis longiligula* Hitchc. var. *australis* J. T. Howell, var. nov. Specie accedens sed aristas lemmarum rectis brevissimis (brevioribus glumæ et circa 1 mm. longis) vel obsoletis; ligulis longissimis 11 mm. longis.

Type: Herb. Calif. Acad. Sci. No. 324947, collected in Ledum Swamp on road to Pt. Reyes, Marin County, California, July 4, 1943, *J. T. Howell No. 18250*. There is a duplicate in the U. S. National Herbarium.

This variant of *A. longiligula* is found in wet places along the California coast in Marin, Sonoma, and Mendocino counties where it is associated with groves of *Pinus muricata* D. Don. A second Marin County collection is *J. T. Howell No. 20737* from Shell Beach north of Inverness and there are specimens from Del Mar, Sonoma County (*Kennedy in 1916*), and from near Fort Bragg, Mendocino County (*Beetle No. 2873*), in the Agronomy Division Herbarium, University of California, Davis. The species, in which the bent exerted awn is about 3 mm. long, is found near the coast from Tillamook County, Oregon, to Mendocino County, California. From *A. oregonensis* Vasey, in which the lemma is awnless, forms of *A. longiligula* var. *australis* without awns may be distinguished by the elongate ligule.

Note 3. *Calamagrostis purpurascens* R. Br. var. *ophitidis* J. T. Howell, var. nov. A specie in longitudine trichomatum differt: in specie partibus foliorum (lamina supra, vagina summa, et ligula) trichomata elongata scabrido-pubescentia ferentibus, in varietate trichomata tantum brevia scabridaque.

Type: Herb. Calif. Acad. Sci. No. 324946, collected from serpentine slope between Rock Spring and Laurel Dell, Mt. Tamalpais, Marin County, California, June 29, 1941, *J. T. Howell No. 16334*.

Rather common in serpentine areas in Marin County and recurring in southwestern Lake County. Tiburon Peninsula, Marin Co., *J. T. Howell No. 14695, No. 18070*. Mt. Tamalpais, Marin County: along railroad near summit, *Heller No. 8396*; Bootjack cypresses, *J. T. Howell No. 20878A*; Arturo Trail, *J. T. Howell No. 16207*; Northside Trail west of Collier Spring, *J. T. Howell No. 14680*. Carson Ridge, Marin Co., *J. T. Howell No. 16988*. Lake County: between Cobb Mt. and Adams Springs, *Jussel No. 308*; near Glenbrook, *J. T. Howell No. 20984*.

In this variety the inflorescence usually, though not always, lacks the rosy-violet coloring which gives to the species its name, and generally the parts of the spikelets average a little larger in the variety than in the species. Because of numerous intergrades in these characters, however, it has been found desirable to establish the variety solely on the character of the pubescence of the leaf-parts which seems to be quite reliable. The variety, as it is now known, is closely confined to serpentine outcrops and is completely detached from the species which is a high altitude or high latitude plant ranging widely from the Sierra Nevada and Rocky Mts. to the far north and east. Two other montane plants which are widely distributed in western North America and which reach Mt. Tamalpais in the California Coast

Ranges along with the *Calamagrostis* are *Cheilanthes gracillima* D. C. Eat. and *Erigeron inornatus* Gray (i. e., var. *angustatus* Gray). In Lake County, *Deschampsia cespitosa* (L.) Beauv. grows not far from the *Calamagrostis*, but the *Deschampsia* has not been detected in Marin County.

Note 4. **Pleuropogon Hooverianus** (L. Benson) J. T. Howell, comb. nov. *P. refractus* (Gray) Benth. var. *Hooverianus* L. Benson, Amer. Jour. Bot. 28: 360 (1941).

There are numerous differences which separate *P. refractus* from *P. Hooverianus*. In *P. refractus* the pedicels are refracted at maturity, the rachilla-joints are not glandular-swollen at the base, the upper and lower glumes except in size are essentially alike, the narrowly oblong lemma is minutely ciliate-denticulate at the rounded top and is scabrous and prominently nerved nearly or quite to the base on the back, the awn of the lemma is about 1 cm. long, the palea bears two approximate carinate ridges which form a median groove and which terminate in a pair of acuminate hyaline tips, and the palea-wings terminate in triangular free appendages about 0.5 mm. long. In *P. Hooverianus* the pedicels are ascending or erect at maturity, the base of the rachilla-joints are glandular-swollen at base, the lower glume is subentire and acute while the upper glume is coarsely and irregularly few-toothed, the apex of the lemma is coarsely few-toothed, the upper part of the lemma is membranaceous, nerved, and scabrous and the lower part is indurate, scarcely nerved, and smooth, the awn of the lemma is about 1 mm. long, the palea is smooth without groove or ridges, the 2 lobes at the apex of the palea are oblongish and obliquely truncate, and the palea-wings terminate in subulate divergent appendages about 2 mm. long.

*Pleuropogon Hooverianus* is known at present only from Mendocino and Marin counties, the following stations being from the latter county: about midway between Nicasio and San Geronimo, *Leschke in 1944*; Wood-acre (according to Hoover); Lagunitas Meadows north of Mt. Tamalpais, *Leschke in 1943*, *J. T. Howell No. 18155* and *No. 20794*.

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## ARIZONA PLANT RECORDS

BY FRANK W. GOULD

*University of Arizona, Tucson*

In the recent collections of southern Arizona plants that have been added to the Herbarium of the University of Arizona, there are a number representing range-extensions and species unreported for the state. Most of the latter are introductions, but, with the exception of one, *Euryops multifidus* (L. f.) DC., should probably be considered additions to the state flora. The following are new to the state record except where otherwise indicated.

*BROMUS TEXENSIS* (Shear) Hitchc. Cochise County: Huachuca Mountains, *Gould et al. No. 2472* (determined by Agnes Chase). Hitchcock (1) gives the range of this species as Texas (apparently rare) and northern Mexico.

*ERAGROSTIS LEHMANNIANA* Nees. Pima County: Tucson, *Gould No. 2533*. An introduction of the U. S. Soil Service that has become well established on roadsides in the vicinity of Tucson.

*SCHISMUS ARABICUS* Nees. Pima County: Tucson, *Gooding in 1935, Gould No. 3043* (determined by T. H. Kearney, confirmed by Agnes Chase). Well established in the Tucson area, appearing in the early spring as bright green tufts on roadsides and sandy openings in desert shrub areas.

*ARRHENATHERUM ELATIUS* (L.) Presl. Yavapai County: Prescott, *E. W. Phillips in 1945*. Graham County: Graham Mountains, *Thorner & Shreve No. 7337*. Reported range in Kearney and Peebles Flora (2) "Flagstaff, Coconino County." Mr. Phillips states that this grass is abundant on his ranch near Prescott and that it grows in dense tufts 12 to 20 inches in diameter, flowering from spring to frost.

*TRICHOLÆNA ROSEA* Nees. Pima County: Tucson, Santa Catalina Mountains, *Parker & Haskell No. 5903*; Sahuaro National Monument, *Nichol in 1939*. This large, showy grass is a native of South Africa. In the Tucson area it is undoubtedly an escape from the early grass garden of the University of Arizona. Tucson collections by Toumey in 1892 and Thorner in 1904 are both marked "cultivated." Hitchcock (1) gives its range in this country as Florida and Texas. Although reported as an annual by Hitchcock, it grows as a perennial bunchgrass on the southern slopes of the Santa Catalina Mountains near Tucson.

*PANICUM ANTIDOTALE* Retz. Cochise County: Douglas, *Jones in 1944*. An introduction of the U. S. Soil Conservation Service that is spreading from the original seeding areas.

*CAREX BREVIOR* (Dewey) Mack. Navajo County: Lakeside Ranger Station, *Pultz No. 1678* (determined by F. J. Hermann).

*TALINUM PARVIFLORUM* Nutt. Cochise County: Huachuca Mountains, *Gould et al. No. 2482*. Reported range in Kearney and Peebles Flora (2), "Showlow, Apache County, near Prescott. Yavapai County."

LEPIDIUM CAMPESTRE R. Br. Maricopa County: Mesa, *Smith in 1945*. A weed of European origin, locally abundant in eastern United States and reported from one county in California (3).

CAMELINA SATIVA (L.) Crantz. Yuma County: Yuma, *Brown in 1905*. A European species that is reported as occasional in California.

LAMIUM AMPLEXICAULE L. Pima County: Tucson, *Gould No. 2935*. A common weed of eastern United States and listed as occasional in California (3). This plant is established as a lawn weed on the University of Arizona campus at Tucson.

VERONICA ARVENSIS L. Pima County: Tucson, *Pultz No. 1650* (determined by F. W. Pennell). This European species is established as a weed on greens and fairways of the Randolph Golf Course, Tucson.

SYMPHORICARPOS LONGIFLORUS Gray. Pima County: Baboquivari Mountains, *Gould, Darrow & Haskell No. 2765*. Reported by Kearney and Peebles from two localities in Coconino County and three localities in Mohave County.

BRICKELLIA PARVULA Gray. Pima County: Baboquivari Mountains, *Gould, Darrow & Haskell No. 2744, 2777* (determined by S. F. Blake and T. H. Kearney). In a communication to Dr. Kearney, Dr. Blake states he knows of no other collections of this species except the type-collection (*Wright No. 249* near Limpia, Texas) and another collection made in the Baboquivari Mountains by Gilman in 1931.

EURYOPS MULTIFIDUS (L. f.) DC. Pima County: Santa Rita Experiment Range, *Pultz No. 1593*. A conspicuous, shrubby member of the *Compositae* with showy flowers that has been introduced on the experiment range by the U. S. Forest Service. Although hardly well enough established to be considered a part of the State flora this species is mentioned here as a record of its identity.

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3. Robbins, W. W., Bellue, M. K., and Ball, W. S. Weeds of California. Calif. State Dept. of Agriculture (1941).

A DISCIFORM PLANT APPARENTLY RELATED  
TO *SENECIO CONGESTUS*BY ARTHUR CRONQUIST  
*New York Botanical Garden*

Among some plants from Alaska recently sent me for determination by Mr. Lawrence I. Grinnell are some fragmentary specimens similar in many respects to *Senecio congestus* (R. Br.) DC. (*S. palustris* (L.) Hook., not Vell.), although with much more densely pubescent involucre than is customary even for the more hairy individuals of that species, and differing also in certain other respects such as the strongly anthocyanous rather than pale, yellow-greenish phyllaries, and entire rather than more or less toothed or lobed leaves. The plants differ markedly from *S. congestus*, however, and indeed from the genus itself as usually described, in that the outer pistillate flowers have tubular, eligulate corollas. There are many discoid species of *Senecio*, but these are customarily discoid through absence of the pistillate flowers, rather than reduction of the ligules. The genus *Erechtites*, in fact, is distinguished from *Senecio* largely by the reduction of the pistillate corollas to a mere tube. There is a strong similarity between the achenes and pappus of *E. hieraciifolia* (L.) Raf. and those of the plants in question, but the specimens do not otherwise resemble *Erechtites*, and have only one row of pistillate flowers to a head, as in *Senecio*, rather than several, as in *Erechtites*. While the similarity in pistillate flowers, achenes, and pappus to *Erechtites* suggests that the latter may be derived from the part of *Senecio* that includes *S. congestus*, no further conclusions as to the relationship of these plants with *Erechtites* seems warranted.

It has been suggested to me by another student of the family that these plants are merely an unusual form of *Senecio congestus*. That may well be true, in which case they are worthy of note for an anomaly that is rare or perhaps unique in the genus. In any case, the specimens are not adequate to serve as the type of a new entity. Further field observations are much to be desired. I quote from a letter from Mr. Grinnell about the exact station from which the plants were taken. "Stony Pass. Mt. McKinley Park. This is a subsidiary pass on the McKinley Park Road, about sixty miles west of McKinley Park Hotel, and about five

miles east of Camp Eielson (a tourist camp). I think there is a road sign bearing the name of the pass. The collecting spot is right at the top of the pass, and is recognizable as a good collecting area of about fifty yards in diameter, because a spring seeps out of the ground, creating a grassy, moist area. The spot is close to the road, on its south side."

## A TENTATIVE KEY TO THE SMALL-FLOWERED LUPINES OF THE WESTERN UNITED STATES

BY ALICE EASTWOOD

(Concluded from page 222)

### KEY TO GROUP 3

(Species with leaves white with a dense silvery silky indument)

1. Stems simple, cespitose from a woody root..... 2
1. Stems branching..... 3
2. Banner glabrous, flowers 6—7 mm. long; calyx with spreading hairs  
.....13. *L. Evermannii*
2. Banner not glabrous, flowers 8 mm. long; calyx with appressed hairs  
.....14. *L. pulcher*
3. Keel glabrous..... 4
3. Keel ciliate..... 5
4. Flowers yellow or pink.....15. *L. lucidulus*
4. Flowers blue.....16. *L. tenuispicus*
5. Banner stipitate.....17. *L. Hillii*
5. Banner not stipitate..... 6
6. Plants densely white-tomentose with both appressed and spreading  
hairs ..... 7
6. Plants less densely pubescent, silvery-silky hairs all appressed.....  
.....18. *L. holosericeus*
7. Flowers about 5 mm. long, keel ciliate; racemes usually densely  
flowered.....19. *L. meionanthus*
7. Flowers about 8 mm. long, keel villous above the middle.....  
.....20. *L. candidissimus*

13. LUPINUS EVERMANNII Rydb., Bull. Torr. Bot. Club 30:255 (1903).

Type-locality: near Sawtooth, Idaho, the type, *B. W. Evermann No. 533*.

"Perennial and densely cespitose: the numerous stems about 1.5 dm. high, slender, erect or ascending, leafy, appressed hairy: petioles 2—4 cm. long, also appressed hairy; leaflets oblanceolate to linear-oblanceolate, 1—2.5 cm. long, densely canescent on both sides with long appressed hairs; stipules lanceolate, acuminate: raceme very short-peduncled, dense and short; bracts lanceolate, short, deciduous: flowers 6—7 mm. long; pedicels and calyx

densely pubescent with spreading hairs; lips of the latter ovate-lanceolate, the lower about  $\frac{1}{3}$  longer than the upper: corolla purplish-blue; banner with a light spot, glabrous.

"This species is nearest to *L. holosericeus*, but the corolla is lighter and the pubescence of the calyx is spreading. It is also lower and more caespitose, resembling more *L. candicans* in habit but has much smaller flowers." Original description.

14. *LUPINUS PULCHER* Eastwood, Leafl. West. Bot. 3:173 (1942).

Type-locality: 18 miles south of Cedar City, Iron Co., Utah, altitude 6500 feet, the type collected by Fred A. Barkley and Merton J. Reed, *No. 4069*.

Stems many from a woody root terminated by short-peduncled many-flowered racemes of blue flowers, leafy above, almost leafless at base, densely silvery-silky appressed-pubescent throughout; flowers about 8 mm. long, banner generally glabrous near the top, silky-pubescent below, keel curved, woolly-ciliate above the middle. A beautiful species.

15. *LUPINUS LUCIDULUS* Rydb., Bull. Torr. Bot. Club 29:245 (1902).

Type-locality: Spread Creek, Wyoming, the type, *F. Tweedy No. 271*.

Stems branched above, leafy; leaflets 7 or 8, linear-oblongate, silvery and silky on both sides; lower lip of calyx three times as long as ovate upper; corolla yellow or light pink, banner with a darker spot and a few short hairs on back, somewhat exceeding the wings. From original description.

16. *LUPINUS TENUISPICUS* A. Nelson, Bot. Gaz. 54:410 (1912).

Type-locality: Tamarack, Washington Co., Idaho, the type collected by June Clark, *No. 203*.

Silvery-silky with loose copious somewhat spreading and tangled hairs, growing in dense clumps from a woody caudex; stems rather slender, 3—7 dm. high, sparingly branched above; radical leaves on long petioles, cauline on shorter ones and the uppermost almost sessile; calyx barely gibbous at base; banner nearly orbicular, hairy on the back, 6—8 mm. long; wings somewhat shorter than the banner, almost covering the keel which is glabrous, short and blunt on a stipe half as long as the blade. From original description.

*LUPINUS OREOPHILUS* Greene (Pitt. 4:135,—1900, type-locality, dry foothills along the Cimarron River, southern Colorado; *L. Greenei* A. Nelson, New Man. Rky. Mt. Bot. 274,—1909) is perhaps the same. These lupines, from the original descriptions, seem to be very similar to *L. holosericeus*.

17. *LUPINUS HILLII* Greene, Leaf. Bot. Obsv. 2:236 (1912).

Type-locality: "Coconino Forest Reservation in northern Arizona, . . . common in open thinly grassy groves of yellow pine."

Stems several, slender, rigid, terminating in 1—3 racemes, otherwise simple; pubescence short, dense, villous, interspersed with a few long hairs; leaflets 5—9, cuneate-oblong, obtuse, about 2.5 cm. long and 8 mm. wide at summit, less densely silky above than below; flowers blue-purple, 6—7 mm. long, in somewhat lax, short-peduncled racemes; banner stipitate, shorter than the wings; keel shorter than either, not falcate, strongly ciliate from base almost to apex. Specimens variable in density of pubescence with both erect and decumbent stems are in Herb. Calif. Acad. Sci. from Arizona.

18. *LUPINUS HOLOSERICEUS* Nutt. in T. & G. Fl. N. Am. 1:380 (1840).

Type-locality: "islands and gravelly banks of the Wahlamet" (Willamette River, Oregon).

A specimen so-labelled is in Nuttall's herbarium in Herb. Mus. Brit. On the sheet there are four specimens, two collected by Elihu Hall and quite different from Nuttall's specimen which is marked with an asterisk indicating the type. One below is similar to the type, but has verticillate instead of laxly-flowered racemes. A photograph of the type shows a low plant with three stems, probably branches, the two outer in flower, the inner in fruit. The flowers are small, almost circular in outline; calyx bracteolate, slightly gibbous at base, upper lip slightly 2-cleft, the lower entire, almost the same length. The entire plant is densely silvery and silky. Torrey and Gray describe the stems as 6—8 inches high, leafy and branching. The specimens that agree most closely with the type are all tall branching plants from Idaho.

19. *LUPINUS MEIONANTHUS* Gray, Proc. Amer. Acad. 6:522 (1865).

Type-locality: near Carson City, Nevada.

Stems several from a woody root, scaly near the base, very leafy above, simple or branching, densely white-silky-tomentose throughout with appressed and some spreading hairs; leaflets 6—8, oblanceolate, varying in length and width but generally longer than the petioles; flowers about 5 mm. long and wide, blue, banner somewhat villous on back, sessile; keel ciliate; racemes narrow, spicate, densely flowered generally but sometimes verticillate and more loosely flowered, pedicels very short. Specimens in Herb. Calif. Acad. Sci. are from Eldorado, Placer, Nevada, Plumas, and Mono counties in California and from Washoe, Ormsby, and Douglas counties in Nevada.

20. *LUPINUS CANDIDISSIMUS* Eastwood, Leaf. West. Bot. 3:20 (1941).

Type-locality : old sawmill site, Sheep Mt., Clark Co., Nevada, elev. 6600 ft., the type collected by Annie M. Alexander and Louise Kellogg, *No. 1753a*.

Very densely white-tomentose and villous, branching and leafy; leaflets about 8, narrowly oblong or oblanceolate; flowers rosy-lavender, 8 mm. broad; banner villous on back, keel villous above the middle; calyx gibbous at base. A beautiful lupine with its snowy-white foliage and small rosy-lavender flowers.

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## ON THE BOTANY OF BARTLETT MOUNTAIN

BY JOHN THOMAS HOWELL

Overlooking Clear Lake from the northeast is Bartlett Mt., a forest-crowned ridge that is one of the highest in the California Coast Ranges in central Lake County. To the southward, towards San Francisco Bay, the Coast Ranges become gradually lower, except for occasional peaks, like Cobb Mt. and Mt. St. Helena, 4722 feet and 4344 feet in altitude, respectively; while to the northward, the ridges get higher until the 7000-foot crests of Hull Mt. and Snow Mt. are reached in northern Lake County, the southernmost of the high inner North Coast Range peaks. Bartlett Mt., which might be regarded a southern outlier of these higher northern ranges, is an elevated ridge five miles long, about 4800 feet high at the north and 4760 feet high at Pinnacle Rock, a prominent eminence to the south. The ridge lies entirely within the involved drainage system of Cache Creek, an affluent of the Sacramento River, with the western slope of the ridge draining into Clear Lake and with the northern, eastern, and southern slopes draining into several branches of the North Fork of Cache Creek.

Because of its location immediately to the south of the higher Coast Range peaks, Bartlett Mt. promised to be a fruitful field for intensive botanical exploration, so in June, 1945, when Mr. Milo S. Baker invited me to join him on a collecting trip to the region, I gladly accepted. Sawmill Flat, where we made camp, is situated south of Pinnacle Rock at an elevation of about 4000 feet just east of the summit of the road from Clear Lake to Bartlett Springs. The flat is a small open area surrounded by a Transition Zone forest, in which the characteristic trees are *Pinus Lambertiana*, *P. ponderosa*, *Pseudotsuga taxifolia*, *Quercus chrysolepis*, *Q. Garryana*, and *Fraxinus oregana*. Along the

edge of the forest, two species of *Arctostaphylos* are numerous and well developed, *A. candidissima* and *A. elegans*, and a little lower on the flat was an individual or two of *A. Stanfordiana*. In the woods and on the open flat, numerous herbaceous annuals and perennials flourished and along the small stream that heads on Pinnacle Rock were sedges, rushes, and other moisture-loving plants. To the east of Sawmill Flat, along the road to Bartlett Springs, the steep southeastern flanks of Bartlett Mt. are chaparral-covered where the slopes are not too precipitous and rocky for the shrubbery. There we found such characteristic species as *Quercus dumosa*, *Q. durata*, *Cercocarpus betuloides*, *Ceanothus cuneatus*, *C. integerrimus*, *Garrya Fremontii*, and *Arctostaphylos glandulosa*. To the northwest beyond Pinnacle Rock, we explored a ridgecrest forest service road that traverses meadowy glades and forest groves, and occasionally from vantage points we had fine vistas over the broad blue expanse of Clear Lake more than 2500 feet below.

On our botanical reconnaissance of Bartlett Mt. from Low Gap on the north to Bartlett Flat on the south, Mr. Baker and I collected or noted 218 species of ferns and seed plants. Although most of them are characteristic and widespread in the Coast Ranges, a considerable proportion are what might be termed Sierran, since they are species characteristic of the main forest belt of the Sierra Nevada at middle elevations and, in the Coast Ranges, are restricted to a narrow zone in the higher northern parts. None of our "Sierran" plants from Bartlett Mt. seems to be new to the Coast Ranges, but many of them have never been reported from so far south, and a couple of other plants, widely distributed in the South Coast Ranges, have not before been reported in the North Coast Ranges. Besides these plants from the north and south, a small number of species which are generally regarded as characteristic of hills nearer the coast were found; and another small group of rare plants that occur in Lake County and in the northern part of the Sierra Nevada were collected. Because Bartlett Mt. seems to be an area in which elements from several parts of the California flora find common ground or their distributional limit, I believe that it is of interest to enumerate the most important collections which we made. In the following lists, I have given not only the locality

and collection-number for the plants on Bartlett Mt., but also the literature-reference to the nearest station where the plant has been heretofore reported.

1. PLANTS ON BARTLETT MT. NOT REPORTED HERETOFORE FROM SO FAR SOUTH IN THE COAST RANGES

*CAREX FRACTA* Mkze. Sawmill Flat, No. 21013. South from Mt. Sanhedrin, Lake Co.; Jepson Fl. Calif. vol. 1.

*CAREX HIRTISSIMA* W. Boott. Between Pinnacle Rock and Low Gap, No. 21126. South from Mt. Sanhedrin, Lake Co.; *ibid.*

Since this rare species was known from only four collections even as late as 1936 (cf. Stacey, Leaf. West. Bot. 1: 242), it may be in order to list several additional specimens now filed in Herb. Calif. Acad. Sci.: Forbestown, Butte Co., *L. S. Rose No. 37375*; Browns Valley, Yuba Co., *L. S. Rose No. 40386*; Little Squaw Valley, Lake Co., *Eastwood & Howell No. 5717*; Elk Mt. Ranger Station, Lake Co., *Eastwood & Howell No. 5681*.

*POLYGONUM DOUGLASHII* Greene. Sawmill Flat, No. 21088. South from Glenn Co.; cf. Baker List.\*

*GODETIA CYLINDRICA* (Jeps.) C. L. Hitchc. var. *TRACYI* Jeps. Sawmill Flat, No. 21073. Southwest from Stonyford, Colusa Co.; Jepson Fl. Calif. vol. 2.

*ZAUSCHNERIA LATIFOLIA* Greene. Between Sawmill Flat and Ruppert Ridge, No. 21181. South from Anthony Peak, Mendocino Co.; cf. Baker List.

*SANICULA SEPTENTRIONALIS* Greene. Sawmill Flat, No. 21057. South from Glenn Co.; *ibid.*

*COLLOMIA TINCTORIA* Kell. Pinnacle Rock, No. 21119. South from Snow Mt., Lake Co.; cf. Jepson Fl. Calif. vol. 3.

*COLLINSIA RATTANII* Gray. Sawmill Flat, No. 21010. South from Mt. Sanhedrin, Lake Co.; cf. Newsom, Bot. Gaz. 87: 294.

*GALUM AMBIGUUM* Wight. Sawmill Flat, No. 21009. South from Tehama Co.; cf. Baker List.

*CHRYSOTHAMNUS NAUSEOSUS* (Pall.) Britt. var. *OCCIDENTALIS* (Greene) Hall. Between Ruppert Ridge and Bartlett Flat. South from Glenn Co.; cf. Baker List.

*LUINA HYPOLEUCA* Benth. Pinnacle Rock, No. 21117. South from Chimney Rock, Mendocino Co.; cf. Gray, Synop. Fl. 1, pt. 2: 377.

Californian plants of *L. hypoleuca*, in which the corolla-lobes are a little shorter, were described as var. *californica* Gray and according to the original description came from "the coast range of California behind Santa Cruz (also farther north) . . ." (Proc. Amer. Acad. 9: 206,—1874). That this plant was ever collected in the Santa Cruz Mts. is very doubtful and Gray indicated this doubt 10 years later in the Synoptical Flora: "W. California, on Chimney Rock, Mendocino Co. (and according to the ticket, behind Santa Cruz), *Kellogg*" (vol. 1, pt. 2: 377,—1884). Although much collect-

\*Baker, M. S. A partial list of seed plants of the north bay counties of California. May, 1945. Pages 1—34. Mimeographed.

ing has been done recently in the Santa Cruz Mts., no specimen from there is in the herbaria at Stanford University, University of California, or California Academy of Sciences. Until we have information to the contrary, I believe that the type-locality of var. *californica* should be accepted as Chimney Rock, Mendocino Co., and the southern distributional limit as Pinnacle Rock.

## 2. PLANTS ON BARTLETT MT. NOT REPORTED HERETOFORE FROM SO FAR NORTH IN THE COAST RANGES

*PELLÆA MUCRONATA* (D. C. Eat.) D. C. Eat. var. *CALIFORNICA* (Lemm.) M. & J. (Determined by Carlotta C. Hall.) Between Sawmill Flat and Ruppert Ridge, No. 21162. Maxon (in Abrams Ill. Fl. 1: 31) reports this cliff-brake, under the name *Pellaea compacta* (Davenp.) Maxon, only from the mountains of southern California, but Jepson (Man. p. 33) cites it also from Tuolumne Co. southward in the Sierra Nevada. The present collection is the first I have seen from the Coast Ranges.

*ERIOGONUM INERME* (Wats.) Jeps. Pinnacle Rock, No. 21120. Heretofore known in the Coast Ranges only as far north as Mt. Diablo (cf. Bowerman, Fl. Pl. & Ferns Mt. Diablo p. 67), this species adds another to the growing list of South Coast Range plants reoccurring in Lake County.

*STENOTOPSIS LINEARIFOLIUS* (DC.) Rydb. Between Sawmill Flat and Ruppert Ridge, No. 21175. Like the preceding, this shrub has not before been reported in the Coast Ranges north of Mt. Diablo (cf. *ibid.*, p. 68, 249). The species also occurs on the Marysville Buttes in the Sacramento Valley east of the present station in Lake Co.

## 3. CERTAIN RARE PLANTS ON BARTLETT MT. THAT ARE COMMON TO LAKE CO. AND THE NORTHERN SIERRA NEVADA

*GILIA GILIOIDES* (Benth.) Greene var. *VOLCANICA* (Brand) Jeps. & Hoov. Pinnacle Rock, No. 21121. Jepson (Fl. Calif. 3: 197) states that the Lake Co. plants differ somewhat from the typical form of the variety in the Sierra foothills.

*ALLOCARYA GLYPTOCARPA* Piper. Sawmill Flat, No. 21068. This rare species has been collected a couple of times in Lake Co. east of Bartlett Mt. and Miss Eastwood and I have it from Elk Mt. 14 miles to the northwest (No. 5678).

*COLLINSIA SPARSIFLORA* F. & M. var. *COLLINA* (Jeps.) Newsom. Sawmill Flat, No. 21002. Growing in the vicinity of the large-flowered *C. sparsiflora* var. *Bruca* (Jones) Newsom, this tiny-flowered collinsia appeared specifically distinct, but the critical characters of the two are similar. Newsom (Bot. Gaz. 87: 286) cites only a single Lake Co. collection of var. *collina*, viz., Lakeport, Bentley in 1917.

## 4. PLANTS ON BARTLETT MT. NOT BEFORE REPORTED FROM THE INNER NORTH COAST RANGE IN LAKE CO.

*STIPA LEMMONII* Scribn. Sawmill Flat, No. 21049. From Fl. Calif. 1: 107, I judge that this station is a southeastern distributional limit for the species.

*CAREX FETA* Bailey. Sawmill Flat, *No. 21038*; between Pinnacle Rock and Low Gap, *No. 21123*. Although I can find no Lake Co. specimen of this common species cited in the literature, several additional collections may be recorded here: between Adams Springs and Kelseyville, *Eastwood & Howell No. 5761*; Kelseyville, *J. T. Howell No. 18027*; Upper Lake, *Eastwood & Howell No. 5656*; Elk Mt., *Eastwood & Howell No. 5671*.

*CAREX SUBFUSCA* W. Boott. Sawmill Flat, *No. 21020*. An occasional plant in the Coast Ranges, this sedge has not been reported before from Lake Co.

*DISPORUM HOOKERI* (Torr.) Britt. Pinnacle Rock, *No. 21118*. This is a plant usually restricted to hills and low mountains in the vicinity of the coast.

*STREPTANTHUS GLANDULOSUS* Hook. Between Sawmill Flat and Ruppert Ridge, el. about 4000 ft., *No. 21161*. Not uncommon to the south and west of Lake Co. at elevations mostly less than half as great.

*HEUCHERA MICRANTHA* Dougl. Pinnacle Rock, *No. 21103*. In the Coast Ranges this plant is found mostly near the coast below 2000 ft. elevation.

*LOTUS DENTICULATUS* (Drew) Greene. Sawmill Flat, *No. 21045*. In Lake Co. this species has been reported from Witters Springs, west of Clear Lake (cf. Jepson Fl. Calif. 2: 322).

*LEMMONIA CALIFORNICA* Gray. Sawmill Flat, *No. 21012*. Although *Lemmonia* has been collected a number of times south and west of Clear Lake, the station in Bartlett Mt. indicates a short range-extension to the northeast.

*CRYPTANTHA MILOBAKERI* Jtn. Between Sawmill Flat and Ruppert Ridge, *No. 21150*. The type-locality is in Lake Co. south of Kelseyville.

*PECTOCARYA PUSILLA* (A.DC.) Gay. Sawmill Flat. Occasional in the Coast Ranges.

*MADIA MADIOIDES* (Nutt.) Greene. Near Pinnacle Rock about 4500 ft. elevation, *No. 21099*. This tarweed, like its associates, *Disporum Hookeri* and *Heuchera micrantha*, is a plant which usually grows much nearer the coast at lower elevations.

##### 5. NOTEWORTHY WEEDS NEW TO LAKE COUNTY

*POLYPOGON MARITIMUS* Willd. Bed of Bartlett Creek, el. about 2400 ft., *No. 21214*; Sulphur Banks, *No. 21218*. Also collected in 1945 on the north side of Mt. Tamalpais, Marin Co., *No. 21236*.

*ARENARIA SERPYLLIFOLIA* L. Sawmill Flat, *No. 21061*.

*SCLERANTHUS ANNUUS* L. Sawmill Flat, *No. 21056*.

*GALIUM PARISIENSE* L. Sawmill Flat, *No. 21054*; Bartlett Flat, *No. 21199*.

*VERONICA ARVENSIS* L., reported by M. S. Baker from Lake Pillsbury, Lake Co., was also collected at Sawmill Flat, *No. 21070*.

## 6. A NEW LUPINE FROM BARTLETT MT.

BY ALICE EASTWOOD

**Lupinus debilis** Eastwood, spec. nov. Caules multi debiles et graciles decumbentes ex rhizomate lignea, supra divaricate ramosi, 3—4 dm. longi, tenuiter appresse sericei; foliolis 5—9, viridescens oblanceolatis mucronatis, maximis circa 4 cm. longis, 8 mm. latis, tenuiter appresse sericeis supra et infra; petiolis gracilibus divaricatis, longioribus vel æquilongis foliolis; stipulis foliorum superiorum filiformibus, villosis, circa 2 mm. longis; floribus azureo-cæsiis, circa 1 cm. longis, verticillatis in racemis terminalibus, 3—5 cm. longis; pedunculis gracilibus circa æquilongis racemis; pedicellis erectis, gracilibus circa 2 mm. longis; bracteis caducis, lanceolatis, brevissimis; calyce appresse sericeo, basi paululum saccato, labio superiore ovato, apice divaricate dentato, labio inferiore lanceolato, 7 mm. longo, apice incurvo; vexillo orbiculari, circa 9 mm. lato, sessili, brevioris alis; alis 6 mm. latis prope apicem; carina fere tecta alis, apice exserta glabra, falcata; leguminibus 3 cm. longis, 8 mm. latis, appresse sericeis, seminibus 3 vel 4.

Type: Herb. Calif. Acad. Sci. No. 325,725, collected on Bartlett Mt. between Ruppert Ridge and Bartlett Flat, Lake Co., California, June 21, 1945, by John Thomas Howell, No. 21193.

*Lupinus debilis* belongs to the *L. albicaulis* group with the spreading decumbent habit and glabrous falcate keel of that perplexing aggregate. It has smaller flowers than any other species in the group known to me and is especially lovely with its slender stems and bluish-lavender flowers.

## 7. A NEW SUBSPECIES OF CALYCADENIA TRUNCATA FROM THE COAST RANGES OF CALIFORNIA

BY DAVID D. KECK

*Carnegie Institution of Washington, Division of Plant Biology,  
Stanford University*

**Calycadenia truncata** DC. subsp. **microcephala** H. M. Hall in herb. subsp. nov., gracilis, ramis paucis a basi arcuato-adscendentibus glaberrimis; pedunculi squamis lævibus vel parce scabridis aliquantibus leviter ciliatis; capitulis circa 5 mm. altis spicatis vel terminalibus; involucri squamis nunc valde lævibus nunc parce setosis; receptaculi squamis 3(—6), 4—5 mm. longis; corollis radii 3, ligulis 2—3 mm. longis, disci 3 vel 4; acheniis disci sterilibus glabris; pappo nullo.

Type: *H. M. Hall No. 9602*, Mill Creek Canyon about 8 miles eastward from Ukiah, Mendocino Co., California, August 12, 1913 (Herb. Univ. Calif., Berkeley; isotypes, California Academy of Sciences, Carnegie Institution, and Dudley Herbarium). Inner North Coast Range from southern Trinity Co. to Lake Co.; local in Monterey Co.; all in California. TRINITY: Three Forks of Mad River, *Tracy No. 10196*; ridge between Van Duzen and Mad rivers near Low Gap, *Tracy No. 2761*; summit between Mad and Trinity rivers on Eureka-Red Bluff road, *Abrams No. 6176*. LAKE: Elk Mt., *Tracy No. 2317*; Scotts Valley, *Tracy 1706*; 5 miles west of Lake-

port on Hopland road, *Howell No. 18009*; Hot Springs, Aug. 21, 1892, *K. Brandegee*; Sawmill Flat, Bartlett Mt., *Howell No. 21034*; Witters Spring, June, 1885, *Rattan*; Glenbrook, July, 1884, *K. Brandegee*. MONTEREY: Burro Trail, east slope Santa Lucia Mts., June 9, 1909, *K. Brandegee*.

This subspecies is separated from *Calycadenia truncata* subsp. *scabrella* (Drew) Keck,\* to which it is most nearly related, by the reduced number of disk-florets (3 or 4 instead of the usual 8 to 15) and the smaller heads. *Scabrella* extends from southern Oregon to Placer and Lake counties, California, but flanks the region occupied by *microcephala*. There is, however, some intergradation between them. Typical *truncata* differs further in being much more robust, with large heads with 3—8 rays with ligules 7—12 mm. long and with 10—25 disk-florets, in having scabrous and pectinately ciliate peduncular bracts, and in the pappose mostly fertile and pubescent disk-akenes. It occurs from Placer Co. to Mariposa Co. and from Mendocino Co. to southern Monterey Co. The species as a whole is morphologically and genetically isolated from all others.

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\* *Calycadenia truncata* DC. subsp. *scabrella* (Drew) Keck, comb. nov. *Hemizonia scabrella* Drew, Bull. Torr. Bot. Club 16:151 (1889).

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FIELD MARIGOLD IN CALIFORNIA. In February, 1946, Dr. Rimo Bacigalupi discovered *Calendula arvensis* L. abundantly naturalized in an orchard near Sonoma, Sonoma Co., where its brightly colored heads made an attractive show. I cannot find that the field marigold has been reported heretofore from America, but it is widely distributed in the Old World from central Europe southward to western Asia, northern Africa, and the Canary Islands. With so wide a distribution where it is native, it will probably become widely dispersed where it is adventive.—J. T. Howell.

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CONCERNING A COASTAL HABENARIA IN CALIFORNIA. *Habenaria maritima* Greene (1892) is a striking plant of the coastal headlands in northern California which the writer has always considered distinct from *Habenaria elegans* (Lindl.) Bol., both from field work with these two species as well as from herbarium experience. As to the former binomial, Prof. M. L. Fernald of the Gray Herbarium has very recently (*Rhodora* 48:10,—Jan. 1946) called attention to a prior homonym, namely, *Habenaria maritima* Raf. (1833), but intimates he has no intention of supplying the name now obviously needed under the International Rules for this littoral species. It may, therefore, be called *Habenaria Greenei* nom. nov.—W. L. Jepson.

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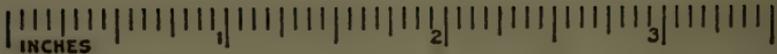
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## BOTANY OF THE INTERMOUNTAIN REGION—I

BY BASSETT MAGUIRE  
*New York Botanical Garden*

AND

ARTHUR H. HOLMGREN  
*Utah State Agricultural College*

The New York Botanical Garden and the Utah State Agricultural College have jointly undertaken the further plant exploration of Utah and the Intermountain Region in anticipation of a floristic treatment of this large physiographic province. Field work to this end has been carried on for the past twelve years by the Utah State Agricultural College, reports of which have been issued from time to time under the title "Great Basin Plants." The present paper, which is the first of a series of minor reports, deals with noteworthy plants collected in Utah and Nevada as a result of the coöperative efforts of the two institutions.

The period between June 22 and August 19, 1943, was spent in the field. Field operation was carried on largely in northeastern Nevada and adjacent Utah. More intensive work was done in the higher mountain groups, namely, the Deep Creek and Raft River ranges, and the Jarbidge, Copper, and Independence mountains (North Humboldt Mountains), Elko County, Nevada. A brief trip was made into the Santa Rosa Range, Humboldt County, Nevada. Nearly 1000 collection numbers, yielding some 5000 sheets, were obtained.

From the material studied there appears to be two new entities, the names for which are herein proposed, and 53 records that seem to represent range extensions of importance or species not known from the area and not included in the recently mimeographed issue of Holmgren's Handbook.<sup>1</sup>

Names representing the new proposals and important records are given separately for the several mountain groups.

DEEP CREEK RANGE, JUAB AND TOOELE COUNTIES, UTAH  
JULY 12—17

The Deep Creek Range is a narrow, mostly granitic, rugged, lofty range, its highest peaks exceeding 12,000 feet. The range

<sup>1</sup> Holmgren, Arthur H. Handbook of the Vascular Plants of Northeastern Nevada. U. S. A. C. and the Grazing Service. 1942.

Leaflets of Western Botany, Vol. IV, pp. 261-280, August 28, 1946.

extends about 40 miles in the most western parts of Juab and Tooele counties, Utah, along the Utah-Nevada line. The period of our visit was too early for the most favorable high elevation collecting.

*BOTRYCHIUM LANCEOLATUM* (Gmel.) Ångstr. ssp. *TYPICUM* Clausen. Rare, Indian Farm Creek, 10,000 ft., *M. & H. No. 21990A*. Apparently new to the Intermountain Region.

*BOTRYCHIUM LUNARIA* (L.) Swartz var. *MINGANENSE* (Vict.) Dole. Infrequent, Indian Farm Creek, 10,000 ft., *M. & H. No. 21990*. New to Utah.

*CAREX DEWEYANA* Schwein. Frequent, Granite Creek, 7500 ft., *M. & H. No. 21871*. New to Utah.

*Carex campylocarpa* Holm ssp. *affinis* Maguire & Holmgren, ssp. nov., sect. *Acutæ* Fries subsect. *Rigidæ* Clarke.

Typo similis sed rhizomatibus vaginisque fuscis pallentibus; inflorescentia et bracteis fere æquilongis; perigyniis viridibus, aliquantum inflatis.

Type: *Maguire & Holmgren No. 21947*, frequent in wet boggy soil in spruce woodland, 10,000 feet, Indian Farm Creek, Deep Creek Range, Juab County, Utah, July 16, 1943.

Habitally and in habitat the ssp. *affinis* is quite similar to the Cascadian population. It differs in its pale rhizomes and basal sheaths, longer lower inflorescence bract, somewhat plumper perigynia, and perhaps more consistently ciliolate orifice of the perigynia. The two races are broadly disjunct, the typical population being confined to the Cascade Range of Oregon and Washington and the ssp. *affinis* known only from the Deep Creek Range, Juab County, Utah.

Specimens seen: July 16, 1943, *Maguire & Holmgren No. 21949*; August 5, 1944, *Holmgren et al. No. 3603*; August 5, 1944, *Holmgren et al. No. 3607*; August 8, 1944, *Holmgren et al. No. 3634*.

*THALICTRUM ALPINUM* L. Frequent, Indian Farm Creek, 11,500 ft., *M. & H. No. 21971*. New to Utah.

*RANUNCULUS ADONEUS* Gray var. *ALPINUS* (S. Wats.) Benson. Frequent, Indian Farm Creek, 11,500 ft., *M. & H. No. 21961*. (Also: Wheeler Peak, 11,500 ft., Snake Range, *Maguire No. 21163*, and Lake Stelta, 10,500 ft., Snake Range, *Maguire No. 21161*, White Pine County, Nevada.) These three collections represent new records for Utah and Nevada, and the entire Great Basin.

*ERIGERON SIMPLEX* Greene. Frequent, Indian Farm Creek, 11,500 ft., *M. & H. No. 21964*. Unreported for the Great Basin.

#### NORTH HUMBOLDT MOUNTAINS

In north central Elko County, Nevada, the Humboldt Mountains consist of a group of more or less related and associated mountain masses. Three of these, the Jarbidge, Copper, and Independence mountains, were visited.

## JARBIDGE MOUNTAINS, AUGUST 4—9

These mountains somewhat exceed 11,100 feet. The summits extend well above the timberline and consist of rugged peaks and loose slide-rock, of gray porphyritic basalt. To the north, drainage is into the Snake River Plains; to the south, into the Great Basin proper. There is evidence that the flora has received a considerable number of elements from the high mountains of Idaho and Oregon.

*BOTRYCHIUM SIMPLEX* Hitchc. var. *TYPICUM* Clausen. Infrequent, Bear Creek Meadows, 8000 ft., *M. & H. No.* 22313. New to Nevada.

*BOTRYCHIUM BOREALE* Milde ssp. *OBTUSILOBUM* (Rupr.) Clausen. Locally frequent, Coon Creek, 8000 ft., *M. & H. No.* 22388. New to Nevada.

*CLAYTONIA MEGARRHIZA* (Gray) Parry. Frequent, Jarbidge Peak, 10,500 ft., *M. & H. No.* 22279. New to Nevada.

*GAULTHERIA HUMIFUSA* (Graham) Rydb. Frequent, Gorge Creek, 8500 ft., *M. & H. No.* 22262. New to Nevada.

*COLOMIA DEBILIS* (S. Wats.) Greene var. *TRIFIDA* Payson. Frequent, Jarbidge and Black Jumbo peaks, 10,500 ft., *M. & H. No.* 22277 and 22284. New to Nevada.

*ERIGERON VAGUS* Payson. Frequent, Jarbidge and Black Jumbo peaks, 10,500 ft., *M. & H. No.* 22286, 22278, and 22298. New to Nevada.

*HULSEA CARNOSA* Rydb. Frequent, Jarbidge Peak, 10,500 ft., *M. & H. No.* 22282 and 22285. New to Nevada.

*SENECIO SAXOSUS* Klatt var. *TOIYABENSIS* Greenm. Frequent, Jarbidge Peak, 10,500 ft., *M. & H. No.* 22283. Apparently known previously only for Nye County, Nevada, and Blaine County, Idaho.

## COPPER MOUNTAIN, AUGUST 7

*TRisetum MONTANUM* Vasey. Frequent, head of Coon Creek, *M. & H. No.* 22393. New to Nevada.

*STIPA ELMERI* Piper & Brodie. Frequent, summit of mountain, *M. & H. No.* 22341. New to northeastern Nevada.

*IVESIA GORDONII* (Hook.) Torr. & Gray. Frequent, near summit of mountain, *M. & H. No.* 22342. New to Nevada.

*VIOLA PALLENS* (Ging.) Brainerd. Frequent, Copper Basin, 7500 ft., *M. & H. No.* 22379. Apparently the only record for Nevada and the Great Basin.

## INDEPENDENCE MOUNTAINS, AUGUST 11 AND 12

The peaks forming this group lie somewhat to the south and west of Copper and Jarbidge mountains, and apparently consist chiefly of sedimentary outcroppings. The peaks do not greatly exceed 10,000 feet, nevertheless, high bog-filled basins and long steep talus slopes have been developed as a result of sharp, deep

Pleistocene glaciation. It was from such basins that the following records were taken.

*CAREX PRÆCEPTORUM* Mackenzie. Frequent, Hayes Creek at headwaters of Jack Creek, 8-9000 ft., *M. & H. No. 22442* and *22453*. New to Nevada.

*CAREX GYMNOCLADA* Holm. Frequent, Hayes Creek at headquarters of Jack Creek, 8-9000 ft., *M. & H. No. 22440, 22441, 22454,* and *22465*, New to Nevada.

*EPILOBIUM OREGONENSE* Hausskn. Frequent, Hayes Creek, *M. & H. No. 22439*. In Nevada previously known from Washoe and Esmeralda counties.

*VACCINIUM SCOPARIUM* Leiberg. Frequent, Hayes Creek at headwaters of Jack Creek, 9000 ft., *M. & H. No. 22449*. Apparently new to Nevada and the Great Basin.

#### RUBY RANGE, JULY 20—24 AND AUGUST 16—19

From the standpoint of interest and richness of flora, and rugged scenic attractions, the Ruby Range exceeds all other basin ranges. Perhaps nowhere in the Great Basin has Pleistocene glaciation taken place more prominently than here. The larger canyons are deeply carved, leaving numerous lateral hanging valleys, over which an abundance of snow water cascades and falls throughout most of the summer. The headwater basins are broad and deep and usually occupied by lakes, ponds, and bogs. Because of heavy snowfall, spring usually does not arrive in these higher basins and alpine slopes and peaks (reaching nearly 12,000 feet) until mid-July. The most favorable collecting season, therefore, follows in August.

*BOTRYCHIUM LUNARIA* (L.) Swartz var. *MINGANENSE* (Vict.) Dole. Frequent, Terrace Ranger Station, Lamoille Canyon, *M. & H. No. 22533*. This was previously reported as rare from the Ruby Range in Holmgren's Handbook, but this new station indicates that the species is well established in the region.

*CRYPTOGRAMMA STELLERI* (Gmel.) Prantl. Infrequent, cliffs above Island Lake, 9200 ft., *M. & H. No. 22565*. New to Nevada.

*ADIANTUM PEDATUM* L. var. *ALEUTICUM* Rupr. Infrequent, cliffs above Island Lake, 9500 ft., *M. & H. No. 22641*. New to Nevada.

*SELAGINELLA SELAGINOIDES* (L.) Link. *M. & H. No. 22064, 22064A, 22540,* and *22631*. This inconspicuous little *Selaginella*, rarely collected in western United States,<sup>2</sup> is of frequent occurrence in the Ruby Range, where it grows along moist open stream banks or rock ledges, associated with *Carex capillaris*, *C. gynocrates*, *C. aurea*, *Thalictrum alpinum*, *Gentiana calycosa*, and *Potentilla fruticosa*.

<sup>2</sup> Holmgren, A. H. *Am. Fern Journal* 32:86, 87 (1942).

POTAMOGETON FILIFORMIS Pers. var. BOREALIS (Raf.) St. John. Infrequent, shallow ponds below Lamoille Lake, 9500 ft., *M. & H. No. 22678*. New to Nevada.

POA LETTERMANI Vasey. Infrequent, ledges of cliffs south of Lamoille Lake, 11,000 ft., *M. & H. No. 22131*. New to Nevada and the Great Basin.

CAREX PRÆCEPTORUM Mackenzie. Frequent, ponds below Lamoille Lake and basin above Island Lake. *M. & H. No. 22591* and *22683*. This species is of frequent occurrence in the higher mountains of northwestern Nevada.

CAREX GYNOCRATES Wormskj. Frequent, Lamoille Canyon. *M. & H. No. 22069* and *22632*. New to Nevada.

CAREX ILLOTA Bailey. Frequent, about ponds below Lamoille Lake, 9500 ft., *M. & H. No. 22697*. New to Nevada.

CAREX PHYSOCARPA Presl. Frequent, meadow above the Terrace Ranger Station in Lamoille Canyon, 8550 ft., *M. & H. No. 22623*. New to Nevada.

EROCALIS TRIPHYLLA (S. Wats.) Rydb. Locally common, about ponds below Lamoille Lake, 9500 ft., *M. & H. No. 22100*. New to Nevada.

MONTIA HALII (Gray) Greene. Locally frequent, cliffs north of Island Lake, 10,500 ft., *M. & H. No. 22640*. New to Nevada.

SAXIFRAGA ADSCENDENS L. *S. tridactylites* L. ssp. *adscendens* (L.) A. Blytt f. *americana* Engler & Irmisch. Frequent, ledges of cliffs south of Lamoille Lake, 11,000 ft., *M. & H. No. 22118*. New to Nevada.

SAXIFRAGA CÆSPITOSA L. Infrequent, data as in preceding species, *M. & H. No. 22129*. New to Nevada.

SAXIFRAGA CERNUA L. Frequent, data as in preceding species, *M. & H. No. 22117*. New to Nevada.

SAXIFRAGA SAXIMONTANA E. Nels. Frequent, south slopes of basin above Island Lake, 10,000 ft., *M. & H. No. 22566*. New to the Great Basin.

PARNASSIA KOTZEBUEI Cham. Frequent, slopes south of Island Lake, 10,000 ft., *M. & H. No. 2256*. New to the Intermountain Region.

POTENTILLA BREWERI S. Wats. Common, meadow above Island Lake, 10–11,000 ft., *M. & H. No. 22574*, *22586*, *22675*, and *21985*. The quite representative material from Island Lake extends the known range of the species well into the Great Basin from the Sierra Nevada.

**Linum Lewisii** Pursh var. **saxosum** Maguire & Holmgren, var. nov. Caulibus depressis vel adscendentibus, 5–10 cm. longis, gracilibus; foliis 5–10 mm. longis, 1–2 mm. latis, oblanceolatis, obtusis, superioribus interdum lanceolatis, acutis; pedicellis subcapillaribus, 5–10 (vel 15) mm. longis; sepalis 4–5 mm. longis, obtusis; petalis 6–7 mm. longis.

Stems depressed, or ascending, 5–10 (or 15) cm. long, slender, inconspicuously striate, punctate; leaves 5–10 mm. long, 1–2 mm. wide, oblanceolate, the upper sometimes becoming lanceolate, obtuse or the upper acutish, fleshy, the margins involute, numerous and crowded toward the base; those of the non-flowering shoots shorter and imbricate; pedicels subcapillary, 5–10 (or 15) mm. long; sepals at maturity 4–5 mm. long, obtuse, white-punctate, 3-nerved, scarious-margined, exceeding half the length of capsule; petals blue, 6–7 mm. long.

Type: *Maguire & Holmgren No. 22653*, locally frequent, in soil of light texture, ridge northwest of Island Lake, 10,800 ft., Ruby Range, Elko County, Nevada, August 18, 1943; New York Botanical Garden; isotype, Utah State Agricultural College.

This variety, which is possibly specifically distinct, may be separated from typical *L. Lewisii* by the following series of minor characters.

*L. Lewisii*

1. Stems erect, 2—7 dm. high.
2. Leaves linear-lanceolate, acute.
3. Sepals obtuse, emucronate.
4. Petals 15—20 mm. long.
5. Plains, foothills, or montane species.

*L. Lewisii* var. *saxosum*

1. Stems depressed or ascending, 0.5—1 (1.5) dm. long.
2. Leaves linear-ob lanceolate, obtuse.
3. Sepals acute or acuminate, mucronate.
4. Petals 6—7 mm. long.
5. Alpine ridges well above timberline.

VACCINIUM NIVICTUM Camp. Frequent, Lamoille Canyon, 9100 ft., *M. & H. No. 22095* and *22112*. New to Nevada.

GILIA MONTANA Nelson & Kennedy. Frequent, ridge south of Island Lake, 10,800 ft., *M. & H. No. 22582*. In Nevada previously known only from Mt. Rose, Washoe County.

ERIGERON SIMPLEX Greene. Frequent, slopes above Island Lake, 10,000 ft., *M. & H. No. 22578*. New to Nevada.

## SANTA ROSA RANGE, HUMBOLDT COUNTY, NEVADA

These interesting, essentially timberless mountains have much in common physiographically and floristically with the mountains in adjacent Malheur County, Oregon, and the Steens Mountains of Harney County, Oregon. It is not surprising to find coincidence of certain rather unusual or rare plants on the two mountain groups. Our collecting here was not intensive; hence, further records showing floristic affinities with the Steens and east Oregon plains may be anticipated.

AGASTACHE CUSICKII (Greenm.) Heller var. *PARVA* Cronquist. Frequent, ridge  $\frac{1}{4}$  mile west of Indian (Hinkey) Summit, *M. & H. No. 22518*. The specimens of this collection conform essentially to var. *parva* Cronquist, but show some tendency to approach var. *typica*. Our specimens grew on thin, almost sterile shale, under conditions of extreme exposure, consequently they may represent an ecotypic expression of var. *typica*, known only from the Steens Mountains, lying some 75 miles to the northwest in Harney County, Nevada.<sup>3</sup>

DIMERESIA HOWELLII Gray. Frequent, data as in preceding species, *M. & H. No. 22512*. New to Nevada.

<sup>3</sup> Cronquist, Arthur. Noteworthy Plants from Idaho II. *Madroño* 7:81 (1943).

## MISCELLANEOUS RECORDS

*FESTUCA RUBRA* L. Frequent, 2 miles north of Lamoille, *M. & H. No.* 22035. New to northeastern Nevada.

*OXYTHECA DENDROIDEA* Nutt. Frequent, 13 miles south of Contact, Elko County, Nevada, *M. & H. No.* 22243. New to northeastern Nevada.

*PAPAVER RHEAS* L. Frequent, Sardine Canyon, Cache County, Utah, *M. & H. No.* 21835. New to Utah.

*DALEA KINGII* S. Wats. Frequent, 9 miles north of Winnemucca, Humboldt County, Nevada, *M. & H. No.* 22523. Although this species is considered rare, the colony at the above station is extensive.

*DIMERESIA HOWELLII* Gray. South of Redpoint, Elko County, Nevada, *R. L. Piemeisel No.* 420639; Long Valley entrance to Charles Sheldon Antelope Refuge, 21 miles northeast of Vya, Washoe County, Nevada, *Percy Train No.* 2960. These collections and the Santa Rosa Range collection indicate that this curious little composite is well established across northern Nevada.

A NEW *ERIOGONUM* FROM ARIZONA

BY THOMAS H. KEARNEY

*Eriogonum Darrovii* Kearney, spec. nov. Herba annua, humilis, ubique foliosissima et florifera, ex basi pluri-ramosa; ramis decumbentibus aut adscendentibus, usque ad 10 cm. longis, etiam atque etiam dichotomis, ramulis plus minusve rectis; caulibus, foliis, bracteis, et involucris molliter pilosis vel subsericeis pilis brevibus, tenuibus, plus minusve incurvatis; foliorum infimorum lamina circa 8 mm. lata et 10 mm. longa, late ovali vel subobovata, petiolo vix longiore; foliis superioribus gradatim minoribus, lamina elliptica vel subspathulata, petiolo multo longiore; involucris axillaribus, solitariis, subsessilibus aut breviter pedunculatis, usque ad 18 flores subtendentibus, altis 2—2.5 mm., 5-lobatis, lobis tubo aliquantulum longioribus, oblongo-lanceolatis, obtusis, crassiusculis, angustissime albo-marginatis; calycibus ochroleucis demum rubescentibus, 1.5 mm. longis, late campanulatis basi turbinata, basi et marginibus sepalorum exteriorum albo-hirtellis; sepalis exterioribus patentibus, flabelliformi-cucullatis supra, leviter constrictis infra; sepalis interioribus rectis, parum longioribus, multo angustioribus quam exteriores, subspathulato-oblongis, obtusissimis, leviter emarginatis; acheniis circa 1 mm. longis, trigonis, anguste rostratis basi bulbosis.

The whole plant has a compact appearance, unusual in the genus, due to the very numerous leaves and flowers and the shortness of the internodes, the longest being about 15 mm. long. The leaves diminish gradually upward, but even the uppermost ones are well-developed and not at all bract-like. At each node the leaves and branchlets are subtended by 3 thin, not rigid, triangular bracts. The leaf-blades are obtuse or somewhat apiculate at apex, cuneate or attenuate at base. The peduncles are very short (not

more than 3 mm.) and relatively stout, or almost wanting. The involucre is turbinate-campanulate, green and sericeous like the herbage. The bractlets within the involucre resemble the lobes of the latter in shape and texture, but are smaller. The pedicels considerably surpass the involucre. The perianth, pale yellow in bud, turns pink at or soon after anthesis. The slender beak of the achene is somewhat longer than the nearly globose base.

Known only by the type-collection from 5 miles west of Ryan, Kaibab National Forest, northwestern Coconino County, Arizona, by Robert A. Darrow (*No. 2998*, August 31, 1945).\* Dr. Darrow, to whom it is a pleasure to dedicate this interesting little plant, found it growing abundantly among *Cowania* and sagebrush.

*Eriogonum Darrovii* is not closely related to any other species of *Eriogonum* known to the writer. Among annual species that are characterized by marked differentiation of the outer and inner segments of the perianth, may be mentioned *E. Abertianum* Torr., *E. angulosum* Benth., *E. cernuum* Nutt., *E. pharnaceoides* Torr., *E. Thomasii* Torr., and *E. Thurberi* Torr. All of these are very different, in other characters, from the species here described. *Eriogonum Thurberi* most nearly resembles *E. Darrovii* in the shape and relative proportions of the perianth segments, but the two plants are very unlike otherwise, *E. Thurberi* being characterized by great reduction of all but the basal leaves, wide-branching scapes, long filiform peduncles, and glandular-puberulent involucre and perianths.

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## NOTES ON ARCTOSTAPHYLOS UVA-URSI

BY ALICE EASTWOOD

The genus *Arctostaphylos* was founded on the boreal and most widely distributed species, *A. Uva-ursi* (L.) Spreng. It is the common and only species in the Arctic regions of both hemispheres and in North America extends throughout the entire Rocky Mountain system to the southern part of the United States. It is found along the shores of both the Atlantic and Pacific and occurs also in the mountains of Oregon and Washington. Its trailing stems cling to the ground and take root here and there.

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\* Type in Herbarium California Academy of Sciences (No. 329031). Isotypes in U. S. National Herbarium, Gray Herbarium, Herbarium New York Botanical Garden, and Herbarium University of Arizona.

The obovate leaves are bright green, the flowers small and few in dense terminal clusters, and the ripe berries bright red. M. L. Fernald and Francis Macbride (*Rhodora* 16:211—213) separate two North American geographical varieties from the typical form: var. *coactilis*, common in the Rocky Mountains and also along the Atlantic and Pacific coasts, and var. *adenotricha*, ranging from the north shore of the Gulf of St. Lawrence to western Canada and Montana. The first is characterized by the close persistent canescent tomentum clothing the branchlets; the second by the viscid character of its pubescence even with stipitate glands mixed with the hairs.

There was some doubt as to the position of the specimens collected by Fendler near Santa Fe, New Mexico, and named *Daphnidostaphylis Fendleriana* by Klotzsch (*Linnæa* 24:80). This seems as unlike the typical plants which were from northern Europe as either of the two North American varieties. Specimens collected by the author in Santa Fe Canyon, *No. 15576*, and Pecos Canyon, *No. 15520*, in October, 1928, have been used for comparison. These have a woolly viscid pubescence on the branches unlike the dark puberulence of northern European specimens. The most striking difference, however, is in the leaves, those of European being glossy on both sides while those from New Mexico are dull, quite without the shining appearance of the type. The specimens from the Pyrenees with which they were compared by Fernald and Macbride are far from the region of the type and may indicate variations in this species in other lands. Therefore I name this **A. Uva-ursi** (L.) Spreng. var. **Fendleriana** (Klotzsch) Eastwood, comb. nov.

In the herbarium of the California Academy of Sciences the typical form is represented by Arctic plants and also some from higher peaks of the Cascade Mts.; the var. *coactilis* by many specimens from the Rocky Mountain region and Atlantic and Pacific coasts; and the var. *adenotricha* by specimens from Dawson collected by the author on the rocks of Dawson Slide in 1914 (*No. 11* and *96*) and also by specimens collected by J. T. Howell in 1931 at Field, B. C., *No. 7823*, not far from Golden, the type-locality. Leaves and stems of these were so viscid that they stuck to the collecting paper.

## ERIOGONUM ANGULOSUM AND RELATED SPECIES

BY JOHN THOMAS HOWELL

From most annual species of *Eriogonum* with the involucre pedunculate, *E. angulosum* and its immediate relatives may be distinguished by the bracteate primary cauline leaves which subtend one or more axillary foliage leaves having petioles and well-developed blades. Among other species which have these same characters but which do not appear to be immediately related to the "*angulosum* group" are *E. Darrovii* Kearney, *E. argillosum* Howell, and *E. vestitum* Howell, the first differing in its abbreviated peduncles and peculiar perianth, the latter two differing in their filiform bractlets and in the scarious-membranous sinuses of their involucre. Benthams detected the peculiar or inverted arrangement of the leaves when he described *E. angulosum* in 1837 and, believing the bracts to be stipules, he referred the species to a new section, § *Stipulata* (Trans. Linn. Soc. Lond. 17:406). In 1856 in de Candolle's Prodrumus (14:22), he corrected his interpretation of the bracts and changed the sectional name to *Substipulata*. Since then *E. angulosum*, together with various other species, has continued to be set off by some workers: Torrey and Gray called the group *Pseudo-stipulata* (Proc. Amer. Acad. 8:187,—1873); Mary K. Curran proposed § *Bracteolata* in 1885 (Bull. Calif. Acad. Sci. 1:273); Kuntze treated the group as § *Ganysma* b. *Pseudostiparium* (in Lexicon Gen. Phaner. p. 204 *vide* Gandoger, Bull. Soc. Bot. Belg. 42:185,—1906); Rydberg in 1917 artificially associated *E. angulosum* with *E. divaricatum* under the sectional name *Divaricata* (Fl. Rky. Mts. & Adj. Plains, pp. 211, 216); and Stokes designated Sect. II Group C, the "*angulosum* type" (Gen. Eriog. pp. 30, 37—39). Other botanists have followed Watson (Proc. Amer. Acad. 12:259,—1877), who referred all species with pedunculate involucre, including *E. angulosum*, to § *Ganysma*.

As treated here the "*angulosum* group" consists of five closely related entities, which, because they are usually readily distinguishable by rather fundamental differences, I am accepting as species: *E. angulosum* Benth., *E. gracillimum* Wats., *E. gossypinum* Curran, *E. viridescens* Heller, and *E. maculatum* Heller. Although the geographic ranges of the first four overlap in

the South Coast Ranges of California and *E. maculatum* lies immediately to the east in the Mohave Desert, each of the species exhibits its own peculiar details of distribution. Thus, only *E. maculatum* extends beyond California, reaching Oregon, Washington, Idaho, Nevada, Utah, Arizona, and perhaps Lower California, and over this vast subcontinental area it maintains its distinctive characteristics. In California, only *E. angulosum* and *E. viridescens* extend westward into the Santa Lucia Mts., *E. maculatum*, *E. viridescens*, and *E. gracillimum* range to Inyo County and into the central area of the Mohave Desert, and *E. gossypinum* is restricted to the head of the San Joaquin Valley and bordering foothills. Not infrequently two or more species grow together, but always each is perfectly distinct without any suggestion of intergradation. I first became interested in this problem in 1930 when I found *E. gracillimum*, *E. maculatum*, and *E. viridescens* growing together near Red Rock Canyon, Kern County, and about that time Ralph Hoffmann discovered the same three near Randsburg. Specimens obtained by Miss Eastwood on Poso Creek, Kern County, and by R. F. Hoover in the Kettleman Hills, Kings County, disclose that these collectors have found the four species endemic to California growing together. These distributional data, whether concerning specific ranges or individual occurrences, strengthen my opinion that the entities involved are specific.

Within the group several lines of morphological development may be traced, and generally the structures affected offer characters of taxonomic value. Stems which are so strongly angled in *E. angulosum* are less angled in the other species, and in such a highly specialized species as *E. viridescens* the stems are round. The striking development of the "cotton" in the involucre of *E. gossypinum* is anticipated in *E. gracillimum* in which there is sometimes more than a moderate amount of tomentum on the bractlets and on the inner walls of the involucre. The similarity or difference between inner and outer sepals is usually apparent enough, but occasional individuals vary in a way which shows that *E. gracillimum* and *E. angulosum* are closely related. The development of an inflated area in the fruiting sepals can be traced in this group from an air-filled chamber of almost microscopic size in *E. angulosum* to a relatively conspicuous bladder in *E. viridescens*. The fruiting sepals of many species of *Eriogonum* have

the same cucullate or utriculate appearance that can be observed in *E. maculatum* and *E. viridescens*, but whereas the effect in the other species is produced entirely by a curving or arching of the sepals, in *E. maculatum* and *E. viridescens* the hooded effect is produced, at least in part, by this remarkable air pocket. The only other species of *Eriogonum* in which I have detected air pockets in the sepals is the Lower Californian *E. galioides* Johnston, a plant belonging to § *Ganysma* but not phylogenetically a part of our immediate group.

The plants of the *angulosum* group grow in open sunny places in arid or semi-arid regions and thrive best in loose sandy or gravelly soil of plains or in friable clay on gentle slopes or steep declivities. As can be generally observed among annual species of *Eriogonum*, the robustness of individuals depends to a large degree on such edaphic details as the texture of the soil, drainage, and availability of soil moisture. Sandy flats of the open desert, wash slopes of desert bad lands, slide areas of coastal hills, and cuts and fills along roads are all habitats where the attractive plants of this group are at home.

The common name, nun's veiling, that has been applied to members of the group discloses a fundamental ignorance of conventional fabrics: mademoiselle or madame might don a net adorned with involucre-like tufts, but a nun, never!

*Acknowledgments.* I am very grateful to the following institutions for allowing me to examine specimens deposited in them: Dudley Herbarium, Stanford University (DS); Gray Herbarium, Harvard University (G); University of California (UC); University of Idaho, Southern Branch (UI); United States National Herbarium (US); Willamette University (W). Unless otherwise indicated by the use of the symbols given in parentheses, the specimens cited are represented in the Herbarium of the California Academy of Sciences (CAS) where this study has been made. To Dr. J. M. Greenman I am grateful for searching collections at the Missouri Botanical Garden for possible Lower California specimens collected by Orcutt.

#### KEY TO THE SPECIES

1. Inner and outer sepals quite different, the inner elongate and linear-lanceolate to narrowly oblong, the outer ovate, elliptical or roundish, the outer sepals usually with a very small to rather extensive inflated area.

2. Outer sepals obovate to elliptical, the inflated area if present restricted to a point above the midvein; stamens usually elongate, frequently conspicuously exerted, 1—2 mm. long  
.....1. *E. angulosum*
2. Outer sepals elliptical to roundish or obovate, the inflated area generally obvious; stamens included, 0.5—1 mm. long.
3. Inner sepals obtuse to acute; inflated area of outer sepals above midvein, the sides of the blade incurved below; pedicels and involucre glandular-puberulent, the hairs not capitate; lobes of involucre much shorter than the tube .....2. *E. maculatum*
3. Inner sepals acute to acuminate; inflated area of outer sepals broadly hippocrepiform, extending halfway to base of blade of sepals; pedicels and involucre capitate-glandular; lobes of involucre about as long as the tube.....3. *E. viridescens*
1. Inner and outer sepals not very different, the outer segments narrow and usually without an inflated area.
4. Involucre shallowly lobed, not filled with a cottony tomentum; sepals oblong to elliptical, frequently crenulate.....  
.....4. *E. gracillimum*
4. Involucre deeply lobed, filled with a dense cottony tomentum which frequently conceals the flowers; sepals narrow, linear-lanceolate to linear-oblong, not crenulate.....  
.....5. *E. gossypinum*

1. ERIOGONUM ANGULOSUM Benth., Trans. Linn. Soc. Lond. 17: 406, pl. 18, fig. 1 (1837). *E. angulosum* subsp. *typicum* Stokes, Genus Eriog. 37 (1936).

California, frequently common in the South Coast Ranges from Contra Costa County southward to the western borders of the Mohave Desert and to coastal southern California, rare or occasional in the northern San Joaquin Valley and bordering foothills of the Sierra Nevada, becoming more frequent southward.

Representative collections, all from California. California, Douglas (Herb. Benth., Kew, type); Deer Valley, Contra Costa Co., Hall No. 10276 (DS, UC); Corral Hollow, Alameda Co., Brewer No. 851; Midway, Alameda Co., Eastwood & Howell No. 5286; Hospital Canyon, San Joaquin Co., Eastwood & Howell No. 5078; Stockton, San Joaquin Co., Parry in 1881 (G); La Puerta Creek, Stanislaus Co., Elmer No. 4364; 8 miles east of Oakdale, Stanislaus Co., Hoover No. 44 (UC); Los Buellis Hills, Santa Clara Co., R. J. Smith in 1908 (G); Los Banos Hills, Merced Co., Howell No. 13833; Ortigalita Canyon, Merced Co., Lyon No. 1586; Woodland, Madera Co., Biswell No. 185 (UC); Paicines, San Benito Co., Stokes No. 13, Howell No. 8036, Howell No. 11520; Glaucothane Ridge, Panoche Valley, San Benito Co., Lyon No. 1737; 7 miles west of Priest Valley,

Monterey Co., *Ripley & Barneby No. 6991*; King City, Monterey Co., *L. S. Rose No. 679*; 6 miles west of Jamesburg, Santa Lucia Mts., Monterey Co., *Howell No. 11588*; 12 miles from Coalinga on road to Parkfield, Fresno Co., *Eastwood & Howell No. 5841*; Fresno, Fresno Co., *Kearney No. 152* (US); Porterville, Tulare Co., *Kelly in 1921, Winblad in 1937*; Kettleman Hills, Kings Co., *Hoover No. 2644*; Cholame, San Luis Obispo Co., *Eastwood No. 13891*; Poso Creek, Kern Co., *Eastwood No. 13970*; Edison, Kern Co., *Wolf No. 4356*; Griffin, Ventura Co., *Elmer No. 3742*; Palmdale, Los Angeles Co., *Wolf No. 4362, Eastwood & Howell No. 4883*; Los Angeles, Los Angeles Co., *Nevin in 1884* (G); Riverside, Riverside Co., *Piemeisel No. 3686* (US); near San Diego, San Diego Co., *Stokes in 1895* (DS).

When at Kew in 1935 I examined the type of *E. angulosum* in order to determine the character of the flowers, since in the South Coast Ranges where Douglas is known to have traveled three related kinds are found. The type was compared with the Calif. Acad. Sci. specimen *Stokes No. 94* from the Santa Lucia Mts. and found to be similar.

*Eriogonum angulosum* is diverse in appearance, the habit depending on the age and robustness of the individuals. Small depauperate plants may bloom in the spring when only a few inches tall, the erect stems bearing scattered involucre filled with rosy flowers. In the immediate vicinity in more favorable places vigorous plants may be vegetating lustily, developing elongate leafy branches that will produce flowers from summer until winter.

East of the Salinas Valley and generally throughout its distribution, the species may be readily recognized by the elongate stamens which conspicuously exceed the sepals in anthesis. In the Santa Lucia Mts., however, where probably the species is typical, the stamens equal or but little exceed the sepals.

2. *ERIOGONUM MACULATUM* Hel., *Muhlenbergia* 2: 188 (1906). *E. angulosum*  $\beta$  *rectipes* Gandoger, *Bull. Soc. Bot. Belg.* 42: 186 (1906). *E. angulosum* var. *maculatum* (Hel.) Jeps. *Fl. Calif.* 1: 405 (1913). *E. angulosum* subsp. *maculatum* (Hel.) Stokes, *Genus Eriog.* 38 (1936). From descriptions and type-localities, the following should undoubtedly be referred to synonymy here also: *E. angulosum*  $\gamma$  *patens* Gandoger, op. cit. p. 187 (type, *Hillman*, from Wadsworth, Nevada). *E. angulosum*  $\delta$  *pauciflorum* Gandoger, loc. cit. (type, *Hillman*, from Reno, Nevada). *E. angulosum*  $\epsilon$  *flabelatum* Gandoger, loc. cit. (type, *Hillman*, from Central Pacific "entrance," Sierra Nevada, California).

Widely distributed through the western United States from southern Washington and Idaho southward to southern Arizona, southeastern California, and probably northern Lower California.

Representative collections. WASHINGTON: Yakima region, *T. S. Brandege* in 1883 (G, US); near Morgan's Ferry, Yakima River, *Suksdorf* No. 438 (G).

OREGON: near Malheur River, *Cusick* No. 1954 (type-collection of *E. angulosum*  $\beta$  *rectipes* Gdgr., G, US); Union Co., *Cusick* No. 1266 (G); 5 miles south of Fields, Harney Co., *Peck* No. 18964; Abert Lake, Lake Co., *Peck* No. 15610; 6 miles west of McDermitt, Malheur Co., *Peck* No. 21749 (W).

IDAHO: King Hill, Elmore Co., *Nelson & Macbride* No. 1155 (DS, G, UC, US); Oreana, Owyhee Co., *Davis* No. 2068.

UTAH: Gold Hill, Tooele Co., *Jones* in 1891 (US); 16 miles north of Callao, Juab Co., *Maguire & Holmgren* No. 22017 (G); Tule Valley, Millard Co., *Maguire & Becraft* No. 2553a (G, UC); Milford, Beaver Co., *Jones* No. 1782 (DS, UC, US); Washington, Washington Co., *Eastwood & Howell* No. 9132.

ARIZONA: Kingman, Mohave Co., *Eastwood* No. 18083; Fish Creek, Maricopa Co., *Eastwood* No. 17030; San Tan Mts., Pinal Co., *Harrison & Fulton* No. 6937 (UC, US); Ft. Thomas, Graham Co., *Peebles* No. 14582; Tucson Mts., Pima Co., *Thornber* in 1906.

NEVADA: between Ruby and Franklin lakes, Elko Co., *Holmgren* No. 1489 (UC); Hot Springs Range, Humboldt Co., *Keck* No. 939; Trinity Mts., Pershing Co., *Ripley & Barneby* No. 5635; Toyabe Range near Austin, Lander Co., *Eastwood & Howell* No. 7352; 2 miles north of Beowawe, Eureka Co., *Holmgren* No. 1035A (UC); Truckee Pass, Washoe Co., *Kennedy* No. 1326; Silver City, Lyon Co., *L. S. Rose* No. 37631; 1.5 miles east of Mile House, Douglas Co., *Thomas* No. 86 (UC); 10 miles east of Hawthorne, Mineral Co., *Maguire & Holmgren* No. 25509; southwest of Columbus Salt Marsh, Esmeralda Co., *Eastwood & Howell* No. 9520; South Twin Canyon, Toyabe Mts., Nye Co., *Rollins & Chambers* No. 2539; Kyle Canyon Fan, Charleston Mts., Clark Co., *Clokey* No. 7496.

CALIFORNIA: Wendel, Lassen Co., *Hoover* No. 4670; Sherwin Grade, Mono Co., *Howell* No. 14368; base of White Mts., east of Laws, Inyo Co., *Heller* No. 8233 (type-collection, CAS, DS, G, UC, US); Surprise Canyon, Panamint Mts., Inyo Co., *Howell* No. 3984; Red Rock Canyon, Kern Co., *Howell* No. 4963; Deadmans Point, San Bernardino Co., *Howell* No. 2508, 2509; Barstow, San Bernardino Co., *Eastwood & Howell* No. 8830; north base of Eagle Mts., Riverside Co., *Alexander & Kellogg* No. 2177 (DS, G, UC); Mountain Springs, Imperial Co., *Ferris* No. 7073 (DS); Jacumba, San Diego Co., *Abrams* No. 3668.

In 1930, when collecting with Frank W. Peirson near Red Rock Canyon, Kern County, California, I first distinguished *E. maculatum* and *E. viridescens*. Later in the same year, with Herbert L. Mason in the Santa Lucia Mts., I discovered the inflation of the outer sepals in *E. viridescens*.

Although the range of *E. angulosum* is frequently given to include northern Lower California, no specimens have been seen

to determine which member or members of the group may occur there. Undoubtedly *E. maculatum* will be found south of the international boundary since the plant is known to grow in the southwestern part of the Colorado Desert immediately to the north.

3. *ERIOGONUM VIRIDESCENS* Hel., *Muhlenbergia* 2: 25 (1905). *E. angulosum* var. *viridescens* (Hel.) Jeps. *Fl. Calif.* 1: 405 (1913). *E. bidentatum* Jeps., *Madroño* 1: 115 (1923). *E. angulosum* subsp. *viridescens* (Hel.) Stokes, *Genus Eriog.* 38 (1936). *E. angulosum* subsp. *bidentatum* (Jeps.) Stokes, loc. cit.

California, occasional on plains and hills about the upper San Joaquin Valley eastward to the western Mohave Desert, infrequent northward in the South Coast Ranges to Merced and Monterey counties.

Representative collections, all from California. Two miles northeast of Ortigalita Peak, Merced Co., *Lyon No. 1388*; upper Tres Pinos Creek, San Benito Co., *Dudley in 1899* (DS); above Jolon, Monterey Co., *Ripley & Barneby No. 6982*; near The Indians, Santa Lucia Mts., Monterey Co., *Howell No. 5653*; Panoche Hills, Fresno Co., *Lyon No. 1561*; 7 miles east of La Panza, San Luis Obispo Co., *Eastwood & Howell No. 2352A*; Kettleman Hills near Avenal, Kings Co., *Hoover No. 2646*; Sunset, Kern Co., *Heller No. 7733* (CAS, type; DS, G, UC, US); Taft, Kern Co., *Eastwood & Howell No. 4072* (topotype of *E. bidentatum* Jeps.); Maricopa Hills, Kern Co., *Eastwood No. 3259*; Bakersfield, Kern Co., *Jones in 1903* in part; Poso Creek, Kern Co., *Eastwood No. 13967*; Mojave, Kern Co., *Jones No. 4081*; Red Rock Canyon, Kern Co., *Howell No. 4962*; Bissell Station, Kern Co., *K. Brandegees in 1912* (G, UC, US); Crystal Spring, Coso Mts., Inyo Co., *Coville & Funston No. 909* in part (DS).

In 1937 when Miss Eastwood and I found *E. viridescens* at Taft, the type-locality of *E. bidentatum*, we concluded that the two names applied to the same plant. This same conclusion, reached by Hoover after field and herbarium studies, was the subject of a note in 1940 (*Leafl. West. Bot.* 2: 276). Although I have been unable to examine the type of *E. bidentatum* for this study, I believe that there is sufficient evidence for referring the name to synonymy.

*Eriogonum viridescens* is somewhat variable in habit. Although the plants of the desert and upper San Joaquin Valley are rather closely much branched and rounded, the plants from farther north and west are more slender with elongate stems and fewer branches. The flowers of the two forms, however, are those characteristic of this remarkable species.

4. *ERIOGONUM GRACILLIMUM* Wats., *Bot. Calif.* 2: 480 (1880). *E. angulosum* var. *gracillimum* (Wats.) Jones, *Contrib. West. Bot.* 11: 16 (1903).

*E. variabile* Hel., *Muhlenbergia* 2: 24 (1905). *E. angulosum* var. *victorensis* Jones, op. cit. 12: 74 (1908). *E. angulosum* var. *variabile* (Hel.) Parish, Bull. So. Calif. Acad. Sci. 14: 13 (1915). *E. angulosum* subsp. *gracillimum* (Wats.) Stokes Genus Eriog. 38 (1936). *E. angulosum* subsp. *victorensis* (Jones) Stokes, loc. cit.

California, from the South Coast Ranges, southern Sierra Nevada foothills, and upper San Joaquin Valley to central Mohave Desert and coastal southern California.

Representative collections, all from California. Los Banos Hills, Merced Co., *Howell No. 13831*; 2 miles northeast of Ortigalita Peak, Merced Co., *Lyon No. 1387*; Little Panoche Creek, Fresno Co., *Lyon No. 263*, *Eastwood & Howell No. 5108*; Little Panoche Pass, San Benito Co., *Eastwood & Howell No. 5195*; Tres Pinos, San Benito Co., *Eastwood No. 6898*, *Stokes No. 8*, *Howell No. 11517*; 4 miles northeast of King City, Monterey Co., *L. S. Rose No. 35610*; Kettleman Hills, Kings Co., *Hoover No. 2645*; 7 miles east of La Panza, San Luis Obispo Co., *Eastwood & Howell No. 2352*; Sisquoc River near Santa Maria, San Luis Obispo Co., *Sinshemer in 1927*; Maricopa Hills, Kern Co., *Eastwood No. 3260*; Bakersfield, Kern Co., *Howell No. 6674*; Poso Creek, Kern Co., *Eastwood No. 13971*; Mohave Desert, Mrs. A. E. Bush, June, 1879 (G, type; US; frag., UC); near Mojave, Kern Co., *Heller No. 7756* (CAS, type of *E. variabile* Heller; G, UC, US); Red Rock Canyon, Kern Co., *Howell No. 4965*; 2 miles north of Indian Wells, Inyo Co., *Ferris No. 7894* (DS); Victor (Victorville), San Bernardino Co., *Jones in 1903* (type-collection of *E. angulosum* var. *victorensis* Jones, CAS, DS, US), *Howell No. 11400*; Lancaster, Los Angeles Co., *Elmer No. 3655*; Los Angeles, Los Angeles Co., *Parry in 1884* (G); San Jacinto Plains, Riverside Co., *S. B. & W. F. Parish No. 1173* (DS, G, US); Temecula Valley, Riverside Co., *Nevin in 1881* (G); San Diego Co., *Vasey No. 528* (G, US).

In fruit the inner and outer sepals of *E. angulosum* are decidedly unlike while in *E. gracillimum* they are more nearly equal in length and differ very slightly in shape. In *E. angulosum* the outer segments, which are elliptical to roundish above a more or less prominent claw, usually become markedly concave-convex and frequently develop a small air pocket at the top of the midvein. The inner segments vary from oblong to narrowly linear-lanceolate, are plane or undulate, and generally conspicuously exceed the outer segments. In *E. gracillimum* the inner and outer segments, which are about equal in length, are usually oblong in general outline but usually a little pandurately constricted near the middle and more or less erosely denticulate or crenulate at the apex. The outer segments may become a little longitudinally pouched on either side of the midrib, but usually the cucullate effect is not nearly so marked as in *E. angulosum*. Rarely above

the midrib of the outer sepals a small inflated area is discernible under magnification.

To be correlated with these characters in the perianths of the two plants are several other differences which are useful in distinguishing them. In *E. angulosum* the stems are usually more prominently angled, the involucre are broader and more floriferous, the bractlets are broadly oblanceolate to obovate-spatulate, the stamens frequently exceed the perianth in anthesis, and the achene varies to 1.5 mm. in length. On the other hand, *E. gracillimum* usually has shorter and more slender stems, the involucre are turbinate and more deeply lobed, the bractlets vary from linear-oblanceolate to spatulate, the stamens are usually shorter than the perianth, and the achene is usually about 1 mm. long. Many times I have seen the two plants growing together and never have I had the slightest doubt as to the identity of each. In spite of the usual distinctness of the entities, however, occasional specimens are not easy to place. These occur chiefly in the hills and mountains south of the San Joaquin Valley and may represent hybrid derivatives although in the course of extensive field work I have not observed suspected hybrids when the two plants have been found together.

The type plant of *E. gracillimum* which has been examined from the Gray Herbarium represents a very slender phase of the species and, although it was collected in June, it appears to be advanced beyond maturity. The flowers are small and the sepals are unusually slender for *E. gracillimum* as it is accepted here, but these deviations in character are believed to be due to the age of the plant. The only other plant seen that is comparable to the type is one collected by Oliver in Antelope Valley in 1884, also in the Gray Herbarium.

5. ERIOGONUM GOSSYPINUM Curran, Bull. Calif. Acad. Sci. 1:274 (1885).

California, local and rather rare about the head of the San Joaquin Valley in Kern and Kings counties.

Representative collections, all from Kern County, California, except the last. Near Bakersfield, *Curran in 1884* (CAS, type); Caliente, *Curran in 1884* (G); Bakersfield, *Jones in 1903*; Maricopa Hills, *Eastwood No. 3271*; between Taft and Maricopa, *Ripley & Barneby No. 3279*; Taft, *Eastwood & Howell No. 4073*; near Edison, *Eastwood & Howell No. 4017*; Poso Creek, *Eastwood in 1926*; Kettleman Hills near Avenal, Kings Co., *Hoover No. 2643*.

*Eriogonum gossypinum* with its abundant long hairs on the bractlets and the inner walls of the involucre and *E. viridescens* with its outer sepals conspicuously inflated are two plants especially notable, even in a genus conspicuous for peculiar and remarkable adaptations. Each is highly specialized and each culminates short evolutionary trends observable within the limits of this small group of species.

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AN ALIEN ASTRAGALUS IN WASHINGTON. Among a collection of *Astragalus* kindly sent for determination by Prof. C. Leo Hitchcock from the herbarium of the University of Washington, Seattle, I find two sheets of the Old World *A. falcatus* Lamk. (Encyc. Meth. 1: 310—1783) collected in July, 1929, near Pullman, Washington (*G. N. Jones No. 2482*). A strong perennial herb, native to the Caucasus and the southern Urals, it may well become established in the climate of the interior Northwest, and it seems of interest to draw attention to this first evidence of its introduction. According to Rydberg's account of the North American *Galegeæ* (*N. Amer. Fl.* vol. 24), the species would key to the astragaline genus *Hamosa*, but differs from those natives which it at all resembles in habit by the malpighiaceus hairs of the herbage. In flower only, with its dense racemes of deflexed, ochroleucous flowers, it might be taken for some form of *A. canadensis* L. or *A. Mortonii* Nutt., but may be distinguished by its cauline stipules (i. e., not connate) and conspicuously shorter calyx and corolla, the former not or scarcely gibbous at the base. It may nevertheless be related to these species, since Bunge (*Gen. Astrag. Geront.* 2: 168,—1869) placed it in sect. *Euodmus* next to *A. uliginosus* L., the Siberian analogue of *A. canadensis*; but the deflexed, falcate, triquetrous legume is very different. The species is figured by Pallas (*Sp. Astrag. Tab.* 28), and even better (for our plant) by DeCandolle (*Astragalogia*, Tab. 26). A short description follows.

ASTRAGALUS FALCATUS Lamk. Green but sparingly strigose with dolabriform hairs; stems erect, about 6 dm. high, from a taproot; stipules cauline, free; leaves subsessile, with 25—33 oblong-elliptic leaflets 7—20 mm. long, glabrous above; racemes equaling or surpassing the leaf, many-flowered, dense, becoming 10—15 cm. long in fruit; flower and pod deflexed; calyx-tube campanulate, 4 mm. long, the teeth about 1 mm. long; corolla ochroleucous, the little-arcuate banner 1 cm. long; pod sessile, lunate-oblong,

acute at both ends, 15—25 mm. long, 3—4 mm. broad, laterally compressed, the ventral suture very acute, the dorsal deeply sulcate, the valves leathery, minutely strigulose with mixed light and dark hairs, the cross-section triangular-cordate.—R. C. Barneby.

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A NOTE ON *HIERACIUM*. Among some specimens recently sent for identification by Professor M. E. Peck is a variant of *Hieracium gracile* Hook., differing from the usual type in the very pale, yellowish instead of black hairs of the involucre (Peck No. 22228, 8 miles east of Weston, Umatilla Co., Oregon, July 10, 1944). The plant is otherwise known from the Wallowa Mts. and from the Sierra Nevada, and was described by Father Zahn as *H. gracile* Hook. subsp. *gracile* Zahn var. *detonsum* A. Gray subvar. *densifloccum* Zahn (Pflanzenreich 4. Family 280:1133,—1922). There seems to be no particular reason to associate it with the sparsely hairy and more glandular var. *detonsum* A. Gray, and those of us who prefer a slightly less complex hierarchy may more conveniently treat it as ***Hieracium gracile*** Hook. var. ***densifloccum*** (Zahn) Cronquist, stat. nov. It is of course properly to be considered a part of subsp. *gracile* Zahn.—Arthur Cronquist, New York Botanical Garden.

---

TWO WASHINGTON WEEDS. What is probably the first collection of *Rorippa sylvestris* (L.) Bess. in Washington was made at Mud Bay, Thurston County, by M. J. Forsell on Sept. 1, 1945. The creeping yellow cress, which is a native of Europe, is otherwise known on the Pacific Coast only from the Willamette Valley in Oregon (cf. Peck Man. Pl. Oreg., p. 343).

Mr. Forsell has also collected *Trifolium fragiferum* L., the strawberry clover on Charley Creek near Markham Station, Grays Harbor County. This plant, a native of the Old World, has become locally established in northern California and Oregon and, according to Abrams (Ill. Fl. 2: 538), it has been found at Grandview, Yakima County, Washington. Mr. Forsell's collection is the first record I have seen from western Washington.—J. T. Howell.

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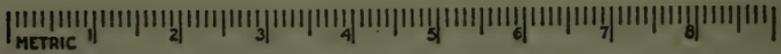
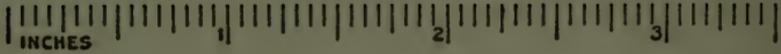
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## SPECIES OF THE LUPINUS LEPIDUS GROUP

BY ALICE EASTWOOD

These have been variously interpreted by different authors. In Jepson's *Flora of California*, the following have been classified as varieties of *Lupinus lepidus* Dougl. (since this is the first to have been described): *L. confertus* Kell., *L. sellulus* Kell. (*L. Torreyi* Gray), *L. aridus* Dougl., and *L. Culbertsoni* Greene. Two varieties have been added by Jepson, namely, var. *artulus* and var. *ramosus*. Since all of these differ so in appearance when compared, they seem to me distinct species. These notes and key will explain my point of view.

The illustration of *L. lepidus* on the plate facing page 186 of this volume was taken from a photograph of the type in Lindley's herbarium at Cambridge University, England, and shows the general habit of the group. They all have the clusters of long-petioled leaves and flowering stems from a perennial woody tap root. The racemes are terminal, generally elongated and in some seemingly spicate owing to the short pedicels. The marked features of the flowers are the narrow standard, longer than wide and shorter than the prominent wings. These about cover the keel which from the middle to almost the apex is lightly to densely ciliate. The pods are 2- or 3-seeded and the floral parts generally marcescent.

The different species are conspicuously different in the character of the indument, but there are other less obvious features. In this treatment, this definitely divides them into two groups, namely, those that are white in color from the dense, appressed and spreading hairs on stems and leaves and those that are greenish from sparse appressed hairs. In some of the latter a few spreading hairs are present, but the tone of color is never white. I am not considering *L. Culbertsoni* Greene as belonging to this group, judging by isotypes in Baker's distribution of Culbertson's collection in the Herbarium of the California Academy of Sciences.

1. LUPINUS CONFERTUS Kell., Proc. Calif. Acad. 2: 192, fig. 59, described on Oct. 6, 1862, published Jan., 1863. Type-locality not given, but undoubtedly Washoe Co., Nevada, which was very active at that time as a mining center from which Dr. Kellogg received specimens. In Herb. Calif. Acad. Sci. are the following Nevada collections: Washoe Lake,

*C. F. Baker No. 1171*; Kings Canyon, Ormsby Co., *C. F. Baker No. 1110*; Steamboat Springs, Washoe Co., *M. K. Curran (K. Brandegee)*. These all agree with the description and figure. *Lupinus Torreyi* Gray ex S. Watson in Bot. King's Report 58 (1871), based on collections from Washoe Lake, *Torrey No. 82*, Donner Pass, *Torrey No. 89*, and Yosemite Valley, *Bolander No. 6286*, is a synonym. The two latter specimens are what Kellogg named *L. sellulus*. The following letter from Louis C. Wheeler, to whom I wrote when he was at the Gray Herbarium, verifies my supposition that *L. Torreyi* and *L. confertus* represent the same species.

"*Torrey No. 82*, Lake Washoe, Nevada, which may well be taken as the type of *L. Torreyi*, has a shorter, thicker raceme than *No. 89*. The flowers are larger and the styles more conspicuous. Altogether *No. 82* matches *L. confertus* Kellogg far better than *L. sellulus* Kellogg. It is interesting to note that in the copy of Botany of King's Expedition at the Gray Herbarium there appears after the description of *L. Torreyi* the notation, in Watson's hand, '= *L. confertus*, Kell.' (Watson published Gray's manuscript and herbarium name.)"

Asa Gray evidently confused the two. In the Index Kewensis, *L. Torreyi* is listed as a synonym of *L. confertus*. *Lupinus confertus* is a very shaggy white plant, the most robust of the group, with tall, stout flowering stems appearing scapose but generally with a few leaves, with stipules persistent and conspicuously recurved, with densely flowered racemes about 2 cm. broad and with flowers from 12 to 14 mm. long on very short pedicels. Variety *ramosus* (Jepson) Eastwood,<sup>1</sup> which is the general form farther south, has more leafy stems and ascending branches from the leaf-axils.

2. *LUPINUS ARIDUS* Dougl. in Lindl. Bot. Reg. 15: pl. 1242 (1829). Type-locality from specimen in Bentham's Herbarium at Kew: "Plains of the interior of the Columbia." Douglas described the species as an "inhabitant only of woodless, scorched grounds, where, from its compact habit, it forms thick carpets of purplish blue, giving relief to the eye from the micaceous sand in which it delights to grow." A specimen in Herb. Kew. collected by Lyall and incorrectly named *L. minimus* is this species. The label reads "collected among loose sand." The following specimens in the Herb. Calif. Acad. Sci. agree. Washington: sandy slopes along Columbia River, Sonoran Zone, Kittitas Co., type-region, *Thompson No. 11441*; sagebrush sand drifts at North Dalles, Kittitas Co., *Thompson No. 11110*; drifting sand, junction of Crab and Wilson creeks, Douglas Co., *Sandberg & Leiberg No. 311*. Oregon: sagebrush slopes 10 miles west of Beattie, Klamath Co., *Thompson No. 13182*; sandy sagebrush slopes in the John Day Valley, Wheeler Co., *Thompson No. 11903*; near Spray, Wheeler Co., *M. E. Jones No. 25465*.

The plant is very shaggy and white with appressed and spreading hairs and has a compact habit 1 dm. or more high. The long densely flowered racemes surpass the leaves, the peduncles generally shorter, the racemes 1 to 1.5 cm. wide, bracts caducous; flowers about 1 cm. long on short pedicels, banner spreading from the wings, and wings shorter, about 6 mm.

<sup>1</sup> *Lupinus confertus* Kell. var. *ramosus* (Jeps.) Eastw., comb. nov. *L. lepidus* Dougl. var. *ramosus* Jeps. Fl. Calif. 3: 268 (1936).

wide, covering the keel which is ciliate above the middle. The lower part of the stem in all specimens is peculiar, being elongated and probably covered by the drifting sand and bearing the imbricated persistent bases of old stipules and petioles.

*Lupinus volutans* Greene, Muhl. 8: 118 (1912). Type locality: "Malheur Valley, in arid southeastern Oregon," collected in June, 1895, by J. B. Leiberger, type in U. S. Nat. Herb., No. 276551. Greene adds: "It appears to have grown in dry clayey or alkaline soil, and the dust of this adheres to all the basal parts of the plant, as if it had wallowed in it." The type together with others was loaned to me by the curator, Wm. R. Maxon, for whose kindness I am grateful. From the appearance it seems similar to *L. aridus*, with paler flowers. The environment is somewhat similar as is also the appearance of the lower probably submerged stems.

3. *Lupinus ursinus* Eastwood, spec. nov. Cæspitosus ramosus ex caudice ligneo brevique, omnino villosus, 10—12 cm. altus, basi foliosus; foliis longe petiolatis, foliolis 5—7, oblongo-lanceolatis vel oblanceolatis, 1—2 cm. longis, 2—5 mm. latis, acutis, petiolis multo longioribus foliolis; stipulis adnatis  $\frac{1}{2}$ , supra subulatis, 4 mm. longis; pedunculis longioribus vel brevioribus foliis; racemis scaposis plerumque folia superantibus, dense floriferis, ad anthesin 4—7 cm. longis, 2 cm. latis, in fructu elongatis, bracteis persistentibus, gemmas superantibus, cristatis apice acuminato racemorum juniorum; floribus violaceis, 8—9 mm. longis; calycis labio superiore ovato, 1.5 mm. lato, 2 mm. longo, bidentato; labio inferiore longiore, lanceolato; vexillo brevioris alis, obovato, 4 mm. lato, reflexo, dorso villosa, alis circa 8 mm. longis, carina apice superante alas, ex medio dense villosa.

Type: Herb. Calif. Acad. Sci. No. 62076, collected on Mt. Eddy, Siskiyou County, California, by the author, August 20, 1912, No. 2068.

It is allied to *L. aridus* Dougl., differing noticeably in the short caudex. In *L. aridus* and *L. volutans* the peculiar elongated branches of the caudex, clothed with the old stipules and petioles may be due to the drifting sandy soil in which they grow. There are some differences in the flowers though not more than among plants of *L. ursinus* from different localities. In general the flowers of *L. ursinus* are smaller and the indument more shaggy.

It is the common low shaggy lupine belonging to this group found in the upper altitudes in Shasta, Siskiyou, Plumas, Modoc, Glenn and Mendocino counties in California. A pale-flowered, more shaggy form grows in an open somewhat sandy area where the road to Willows branches near the trail to Black Butte in western Glenn County.

4. LUPINUS LEPIDUS Dougl. in Lindl. Bot. Reg. 14: pl. 1149 (1828). Type-locality ". . . from Fort Vancouver to the Great Falls of the Columbia on the dry elevated banks of streams." The illustration mentioned before shows the habit of the plant. The tone is greenish and the pubescence appressed-sericeous. In age the upper surface of the leaves becomes glabrous.

Specimens in Herb. Calif. Acad. Sci. which agree are the following: gravelly prairies near Tacoma, Pierce Co., Wash., *Thompson No. 10464*; Tacoma, *Kate Eastwood Phelps*; 8 miles north of Centralia, Lewis Co., Wash., *J. T. Howell No. 7532*; dry sandy soil, Esquimaux, Brit. Col.,

*J. K. Henry in 1914*. I listed the following in the National Herbarium, Washington, D. C.: Nesqually, *Wilkes Expedition*; Gold Stream, Vancouver Island, *Macoun*; Vancouver, Brit. Col., *Piper No. 4923, 4935, Wm. Canby*; Olympia and Gate City, Thurston Co., Wash., *Heller No. 4048*; Portland, Oregon, *Thos. Howell No. 1342*.

5. *LUPINUS SELLULUS* Kell., Proc. Calif. Acad. 5:36 (1873). Type-locality: Donner Lake, summit of Sierra Nevada. This in recent publications has been considered a synonym of *L. Torreyi* Gray. Since, as explained under *L. confertus*, *L. Torreyi* is a synonym of *L. confertus*, *L. sellulus* is now restored as the name of the lupine common especially at Donner Summit and on the mountains around Lake Tahoe, though it is not restricted to that area. The leaflets are oblanceolate, acute or rounded and mucronate, 3—6 mm. wide, much shorter than the peduncles and with loosely appressed shining hairs that do not hide the green beneath. The peduncles generally surpass the leaves, the racemes always do. The bracts are conspicuously persistent. The racemes are densely flowered, the flowers with short pedicels, racemes up to 15 cm. long, 1.5—2 cm. broad, the top conical in bud.

*Lupinus sellulus* Kell. var. *elatus* Eastw., Leafl. West. Bot. 3:174 (1942). Type-locality: East Lake, Fresno Co., California. This differs in the tall upwardly branching stems. Specimens in our herbarium are from Fresno, Inyo, Mono, San Bernardino, and Mariposa counties.

*Lupinus sellulus* Kell. var. *artulus* (Jepson) Eastwood, comb. nov. *L. lepidus* Dougl. var. *artulus* Jepson Fl. Calif. 2:268 (1936). Type-locality: Warner Valley, Plumas Co., California. This differs from typical *L. sellulus* in the narrower racemes, smaller flowers, and much more densely ciliate keel. It occurs in Plumas and Modoc counties in California.

## KEY

1. Plants white with densely appressed and spreading hairs..... 2
  1. Plants greenish..... 4
  2. Tall stout plants; racemes elongated and densely flowered, about 2 cm. broad; flowers 12—14 mm. long on very short pedicels; bracts persistent .....1. *L. confertus*  
Plants with branching stems.....*L. confertus* var. *ramosus*
  2. Low caespitose plants..... 3
  3. Basal part of stem elongated and clothed with persistent stipules and petioles; bracts caducous.....2. *L. aridus*, *L. volutans*
  3. Basal part of stem very short, not as above; bracts persistent.....  
.....3. *L. ursinus*
  4. Racemes somewhat loosely or verticillately flowered, pedicels evident, bracts caducous.....4. *L. lepidus*
  4. Racemes densely flowered, flowers subsessile, bracts persistent.....  
.....5. *L. sellulus*  
Plants with branching stems.....*L. sellulus* var. *elatus*  
Plants with narrower racemes.....*L. sellulus* var. *artulus*
- In a forthcoming paper other allies of *L. lepidus* will be discussed.

NOTES ON THE DISTRIBUTION OF CALIFORNIA GRASSES—II<sup>1</sup>

BY A. A. BEETLE

*University of Wyoming, Laramie*

*Agropyron arenicola* Davy, one of California's most restricted grasses from the point of known localities, has been re-collected at the type-locality, Point Reyes, Marin County (*Beetle No. 3899*), and also at Fort Bragg, Mendocino County (*Beetle No. 4001*). In the latter locality it was found growing in association with *Agrostis Blasdalei* Hitchc. (*Beetle No. 4002*), another of California's rarest grasses.

*Anthoxanthum aristatum* Boiss., one of the most recently introduced of California's exotic grasses, has been found in eastern Shasta County near Ingot (*Beetle No. 3989*). Other counties where it has thus far been found are Del Norte, Sonoma, and Marin.

*Deschampsia cæspitosa* (L.) Beauv. in California, as it has been known to followers of the manuals of Hitchcock and of Jepson, is separated by Lawrence (*Amer. Jour. Bot.* 32:302,—1945) into two entities, the typical material with "glumes less than 5 mm. long; awn shorter than or equalling the lemma . . ." and subsp. *beringensis* (Hult.) Lawrence with "glumes 5—7 mm. long; awn usually exceeding the lemma." It is perhaps worthwhile to note, since it is not mentioned in Lawrence's synonymy, that the subsp. *beringensis* has also been treated in a subspecific category as follows: *Deschampsia cæspitosa* var. *arctica* Vasey, *Bull. U. S. D. A. Bot.* 13: no. 45 (1892); *N. Am. Fl.* 17:566 (1939).

After describing *Deschampsia danthonioides* (Trin.) Munro, Hitchcock (*Man. Grasses of U. S.* 288,—1935) adds: "Variable in the size of the spikelets. A form described from southern California as *D. gracilis* Vasey, with somewhat laxer panicles, the rather more numerous spikelets only 4 to 5 mm. long, grades into the usual form." The glumes (4—5 mm. long) and lemmas (1.5 mm. long) of this plant are also smaller than those found in typical *D. danthonioides* where the glumes are 6—7 mm. long

<sup>1</sup> For the first paper of this series see *Leaf. West. Bot.* 3:258—260 (1943). The specimens cited in the present paper are in the Grass Herbarium of the Agronomy Division, College of Agriculture, University of California, Davis, California. This collection was mentioned as being in Berkeley in the first paper of this series.

and the lemmas 2.5 mm. long. As Hitchcock states, some intergrades exist but, rather than being scattered throughout the range of either, they occur on their borders and are what would be expected where one is dealing with two well-marked geographic varieties. *Deschampsia danthonioides* in California is common in northern California and, avoiding the Central Valley, extends south in the Sierra Nevada at middle elevations to Tulare County and south in the Coast Ranges, being rather common as far as the San Francisco Bay region, becoming less abundant southward, and finally stopping at higher elevations in the mountains of Ventura, Los Angeles, and San Bernardino counties. On the other hand, *D. danthonioides* var. *gracilis* (Vasey) Munz (Man. S. Calif. Bot. 45, 597,—1935) is limited in its occurrence to the Central Valley from southern Butte County south to Kern County with a recurrence in coastal San Diego County.

Although *Koeleria cristata* (L.) Pers. is not listed in the North American Flora (17: 550, 551,—1939) for Alaska, neither is *K. yukonensis* nor *K. Cairnesiana*. These two species of Hultén reported for Alaska by Anderson (Iowa State College Jour. Sci. 18: 404, 405,—1944) are separated on pubescent culms and sheaths as contrasted with glabrous culms and sheaths. In view of the failure of this character even in separating varieties, not only in California material of *K. cristata* but in a number of other species (cf. *Trisetum spicatum* and *Danthonia californica*), it is logical to assume that the range of *K. cristata* should be extended to Alaska and that the two Hultén species reduced to it in synonymy.

*Melica fugax* Boland. var. *Macbridei* (Rowland) Beetle<sup>2</sup> is a variation of *M. fugax* first described from Idaho which is characterized by the elongate and strongly reflexed rays of the panicle. To the Idaho localities may be added: California, Alpine County, Two Lakes (uncommon in shade of junipers), July 27, 1942, *A. A. Beetle* No. 3765; Nevada, Elko County, Martin Creek near Gold Creek, Aug. 8, 1913, elev. 7500 ft., *P. B. Kennedy* No. 4447.

Conclusions drawn from the geographic distributions of plants are accurate in proportion to the completeness of the knowledge of their occurrence. Since the latest treatment of

<sup>2</sup> *Melica fugax* Boland. var. *Macbridei* (Rowland) Beetle, comb. nov. *M. Macbridei* Rowland ex Nelson, Bot. Gaz. 54:404 (1912).

*Melica* (Boyle, a cyto-taxonomic study of the North American species of *Melica*, Madroño 8: 1—26,—1945) is the most readily available source for the known distributions of North American melics, a genus better represented in California than in any other state, it is well to make the following additions to the ranges given therein: *Melica stricta* Boland. has been reported for Montana (Vasey, descriptive Cat. Grasses of the U. S. 74,—1885). *Melica Porteri* Scribn. has been reported for Nebraska (Winter, Analysis of the Flowering Plants of Nebraska 27,—1936; Hitchcock Man. Grasses of U. S. 200,—1935) and Missouri (Hitchcock, l. c.; Gates, Grasses of Kansas 114,—1937). *Melica mutica* Walt. has been reported for Illinois by Engelmann (1844), Lapham (1857), Flagg (1878), Brendel (1887), Huett (1897), Moser 1918), and Hitchcock (1935). Hitchcock's Manual also gives it for Iowa and it is in Kansas according to Gates and Nebraska according to Bessey. The range of *M. nitens* (Scribn.) Nutt. as given by Boyle includes West Virginia and Ohio, but no dots are included on the map. Core, Berkeley, and Davis (West Virginia Grasses 64,—1944) have reported it for the former state and Schaffner (Grasses of Ohio 275,—1917) for the latter state.

The occurrence of natural hybrids between species of *Melica* has never been reported. It is of interest then to note that a collection of Yates, No. 5887, June 24, 1936, 10 miles southwest of Cummings near top divide between Eel River and coast, Mendocino County, represents a hybrid between *M. californica* and *M. Harfordii*. The plant has abnormal florets and sterile pollen which immediately suggest a hybrid and in its morphological characteristics it is intermediate between the above-mentioned species, having the contracted inflorescence and lemma measurements of the former and the prominent awn of the latter. A second naturally occurring hybrid is represented in a plant collected by Elizabeth Wilson on June 4, 1940, Soda Bay, Lake County. This plant has abnormal florets and sterile pollen but is intermediate in morphological characteristics between *M. californica* and *M. imperfecta*.

In describing *Puccinellia grandis*, which is commonest in coastal marshes from California to Alaska, Swallen (Jour. Wash. Acad. Sci. 34: 18, 19,—1944) gave a name to a species that has puzzled California botanists for many years. Early California collections (*Davy & Blasdale No. 6126* in 1899 from the mouth

of the Noyo River in Mendocino County and *Davy No. 6740, 6749* from Point Reyes Peninsula in Marin County) have long lain unidentified. Collections by Tracy from Humboldt County (*No. 3742* in 1912, *No. 4820* in 1917) were first called *P. festucaformis* Parl., but more recently, along with *Yates No. 5569* from the same locality, were called *P. nutkaensis* (Presl) Fern. & Weath. Specimens from near the south end of San Francisco Bay (*Nixon in 1915, Hackley in 1928, Beetle No. 4278*) were referred to *P. maritima* (Huds.) Parl., as more recently Hoover (Madroño 3:228,—1936) referred his *No. 477* from the flood plain of Little Panoche Creek in western Fresno County. This latter inland locality seemed suspicious from a distributional standpoint until further search turned up a specimen from Livermore Pass in Contra Costa County (without date or collector), others from Fort Tejon, Kern County (*Davy No. 2367, Beetle No. 4323*), and finally one from near Woodland, Yolo County, *Beetle No. 4277*, where it is common at the type-locality of *Puccinellia simplex* Scribn. (*Beetle No. 4368*).

*Trisetum cernuum* Trin. reaches its southern limit in coastal northern California whence it ranges northward to Alaska, its type-locality. In Alaska only the typical material is found (Anderson, Iowa State Coll. Jour. Sci. 18:406,—1944). Southward the species is represented by two well-marked varieties, which, at least in California, are well separated geographically. One is a plant of the Coast Ranges, *T. cernuum* var. *canescens* (Buckl.) Beal (*T. canescens* Buckl. of most manuals), and the second is a plant of the Sierra Nevada, *T. cernuum* var. **projectum** (Louis-Marie) Beetle.<sup>3</sup> These entities, for which intergrades are easily found in isolated localities, may be keyed as follows:

Culms few, spreading from a loose base; blades often up to 1 cm. broad; culm leaves often more than 1 dm. long; blades and sheaths not densely pubescent.

Spikelets of lowest fascicle all long-pedicellate; first glume 1.5 mm. long, the second 3—4 mm. long, truncate below the apex.....

.....*T. cernuum*

Spikelets of lowest fascicle nearly sessile; first glume 3—4 mm. long, the second 5—7 mm. long.....*T. cernuum* var. *canescens*

Culms several from a compact base; blades up to 3 mm. broad; culm leaves mostly less than 1 dm. long; blades and sheaths densely pubescent.....*T. cernuum* var. **projectum**

<sup>3</sup> *Trisetum cernuum* Trin. var. **projectum** (Louis-Marie) Beetle, comb. nov. *T. projectum* Louis-Marie, *Rhodora* 30:217 (1928).

*Poa napensis* Beetle, spec. nov. Perennis cæspitosa, foliis præsertim radicalibus confertis, tantum 1 vel 2 caulinis, scabridis, longissimis 1 dm. longis, angustioribus quam 1 mm., rigide rectis; culmis usque 5 dm. altis, teretibus, valde sed minute scabridis; panícula brevi, minore quam 1 dm., ramis paucis brevibus, patentibus scabris, 3—7 spiculas ferentibus; gluma inferiore 3 mm. longa, superiore 3.5 mm. longa, valde scabrida præcipue supra; lemma 3—4 mm. longa, glabra, scabridissima præcipue supra, firma infra, apice late hyalina obtusa, obscurissime 5-nervosa; palea prominenti, paulum breviori quam lemma, 2 carinis ciliatis.

Tufted perennial; leaves crowded at the base (only 1 or 2 on the culm), up to 1 dm. long, scabrid, less than 1 mm. broad, stiffly erect; culms up to 5 dm. tall, terete, strongly but minutely scabrid; panicle short, less than 1 dm. long, of a few short, spreading, scabrous branches bearing 3—7 spikelets; first glume 3 mm. long, second glume 3.5 mm. long, strongly scabrid, especially above; lemma 3—4 mm. long, glabrous, very strongly scabrid, especially above, firm below, the apex broadly hyaline and blunt, very inconspicuously 5-nerved; prominent palea a little shorter than the lemma, ciliate on the two keels.

Type: Agronomy Div. Herb., Univ. Calif., Davis, collected in meadow moistened by seepage from hot springs, 2 miles north of Calistoga at Myrtle Dale Hot Springs, Napa County, California, May 7, 1946, *Beetle No. 4256*. Associated with *Scirpus chilensis* Nees (*S. Olneyi* Gray) at its most northern locality in California, and with *Puccinellia simplex* Scribn. (*Beetle No. 4259*). The only other collection of *P. napensis* seen is *Tracy No. 1862* from the type-locality.

This new *Poa* has the filiform leaves and general appearance of *P. Cusickii* Vasey but a lemma that indicates it is most closely related to *P. nevadensis* Vasey. It is from a locality decidedly outside the recognized range of either.

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#### ERRATA

Page 33, line 36; for *Tweedei* read *Tweediei*.

Page 101, line 32; for 7375 read 7573.

Page 169, line 24; for Allan read Allen.

Page 174, line 23; for Frog read Troy.

Page 181, line 30; for cm. read dm.

Page 266, line 40; for Nevada read Oregon.

✓ ✓ ✓

N. B. In LEAFLETS OF WESTERN BOTANY, vol. 3, page 165, line 36, *criniger* should read *crinigerum*.

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