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JOHN THOMAS HOWELL

MOSSES OF CALIFORNIA: AN ANNOTATED LIST OF SPECIES[1]

BY LEO FRANCIS KOCH

The information acquired about the mosses of California in the nineteenth century is largely the result of the efforts of two men: Henry N. Bolander, who first collected them systematically, and Leo Lesquereux, who first studied Bolander's material. The results of their work appeared in two articles written by Lesquereux (1865, 1868). "A Catalogue of Pacific Coast Mosses," the later of the two papers, reported 215 species from California. H. N. Bolander (1870), Sereno Watson (1880), and Lesquereux and James (1884) obviously based their reports for mosses in California almost entirely upon these two contributions.

Next in importance are the field work and publications of Marshall A. Howe (1894, 1896, 1897). In Marin Co. alone, he collected such rarities as *Acaulon muticum, Camptothecium alsioides, Fissidens pauperculus,* and *Triquetrella californica.* Since his time, only incidental collections have been made, and a few miscellaneous papers have been published on the mosses of California.

The "Moss Flora of North America North of Mexico" (Grout, 1928-40) contains 265 species with ranges including California. The present work lists 317 species.

In the remarks about distribution within California, the following terminology is adopted:

1. *Northern California* extends from the Oregon boundary to Mendocino Co. and Lake Tahoe inclusive.

2. *Central California* is the area south of Mendocino Co. and Lake Tahoe, as far as and including the Santa Lucia and the Tehachapi Mts.

3. *Southern California* includes the remainder of the state south to the Mexican boundary and the desert areas as far north as the northern boundary of Inyo Co.

4. *Sierras* includes all the high mountain ranges in the northern two-thirds of the state as well as the Sierra Nevada.

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[1]Paper from the Herbarium and Department of Botany, University of Michigan, Ann Arbor, Michigan.

Leaflets of Western Botany, Vol. VI, pp. 1-40, February 24, 1950.

5. *Redwoods* represents the range of the Coast Redwood, *Sequoia sempervirens,* from southern Oregon south along the coast to the Santa Lucia Mts., Monterey Co., California.

6. *Bay area* includes Marin Co., Sonoma Co., Solano Co., Contra Costa Co., Alameda Co., San Francisco Co., and San Mateo Co.

The distribution of widespread species is indicated by one of the following designations:

1. *Cosmopolitan,* species that are reported from every continent;

2. *Bipolar-montane,* species that are known from both hemispheres, and in most instances are reported also from isolated stations in the higher mountain ranges of the Temperate and Torrid zones;

3. *Circumboreal,* species that are found in all the boreal continents, their range extending southward in elevated regions, but not into the southern hemisphere;

4. *Arctic-montane,* species that have their greatest concentration in the Arctic, but are also known from disjunct mountains southward in the northern hemisphere;

5. *Europe-North America,* species that are common to Europe and North America;

6. *North Pacific Basin,* species that are common to the oceanic areas of eastern Asia and western North America;

7. *Boreal America,* species that are restricted to the North American continent north of Mexico; they may have a transcontinental range or be limited to the Rocky Mts. westward;

8. *Sonora,* species that inhabit the desert areas of the southwestern United States and northern Mexico. A number of so-called "endemic" species are known only from sections of this region such as Southern or Central California, Southern California and Baja California, Southern California and Arizona, etc.

Anomalous species that cannot be classified in any of the defined categories are *Orthodontium pellucens, Tortula princeps,* and *Vesicularia amphibola.*

The arrangement of families is essentially that of Brotherus (1924-25). A concerted effort has been made to conform with the International Rules of Botanical Nomenclature. When a binomial is used that was not accepted by Grout (1928-40), the

requisite synonymy and its page reference in the "Moss Flora" are given.

Unless otherwise stated, a question mark indicates that the author has not seen a specimen of the species from California. A name preceded by two asterisks (**) indicates a new record for California, while a name preceded by one asterisk (*) indicates a plant reported from California but not included in the range given in the "Moss Flora."

Acknowledgments. I am indebted to the following institutions and individuals for the loan of herbarium specimens: California Academy of Sciences (CAS), Duke University (Grout Herbarium, AJG, and Herbarium of the American Bryological Society, ABS), New York Botanical Garden (Elizabeth Gertrude Britton Moss Collection, EGB), Stanford University at Stanford, California (DS), University of California at Berkeley (UCB), at Los Angeles (UCLA), University of Michigan at Ann Arbor (UMAA), Dr. H. S. Conard (HSC), and Dr. E. B. Bartram (EBB). Important private collections which were studied are those made by D. G. Catcheside, W. B. Cooke, I. M. Haring, G. J. Ikenberry, J. M. Linsdale, E. E. Morse, and H. K. Wagnon. Bryologists who determined specimens in certain genera and families are A. L. Andrews, E. B. Bartram, H. S. Conard, Seville Flowers, Geneva Sayre, A. J. Sharp, W. C. Steere, E. C. Wallace, W. H. Welch, and F. E. Wynne-Hillier. Many valuable references to the literature were received from W. C. Steere and E. V. Watson.

SPHAGNACEAE

SPHAGNUM CAPILLACEUM[2] (Weiss) Schrank, Baier. Fl. 2: 435 (1789). Upper Tuolumne Canyon, *Bolander* (Lesq., 1868)[3]; a second collection, *Bolander 6*, in the Lesq. herbarium (Andrews, pers. comm.). Bipolar-montane.

SPHAGNUM FIMBRIATUM Wils. in Hook., Crypt. Bot. Antarct. Voy. 92 (1845). Mt. Brewer at 11,000 ft., *Brewer* (Lesq., 1868); Mt. Dana, *Bolander* (Lesq., 1868)[3]; type specimens of *S. microphyllum* and *S. Bolanderi* (Warnstorf, 1891) acc. Andrews (1913). Bipolar-montane.

SPHAGNUM MAGELLANICUM Brid., Musco. Recent. 2(1):24 (1798). California, *James 71* (EGB). Bipolar-montane.

SPHAGNUM MENDOCINUM Sull. & Lesq. in Sull., Icon. Musc. Suppl. 12 (1874). Near Mendocino City, Mendocino Co., *Bolander*, first described as *S. subsecundum* var. *longifolium* by Lesq. (1868); near Kings River at 8000–9000 ft., Fresno Co., *Brewer* (Lesq., 1868, as *S. auriculatum)*; North Fork, Little River, Mendocino Co., *Howe 607, 688*. Pacific Coast.

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[2]California was not included in the range of this species by Andrews (1913).

[3]The Mt. Dana collection cited by Lesq. (1868), under *S. acutifolium*, was determined by Andrews (pers. comm.) as "poorly developed *S. fimbriatum*."

SPHAGNUM PALUSTRE L., Sp. Pl. 2:1106 (1753). Mendocino Co., northward; remarkably enough not reported from the Sierra Nevada. Brotherus (1924) said ". . . fast kosmopolitisch, nicht in Afrika."

SPHAGNUM PLUMULOSUM Roell, Flora 69:89 (1886). California, *Bolander 211* (EGB, as *S. subnitens).* Bipolar-montane.

SPHAGNUM SQUARROSUM[4] Crome in Hoppe, Bot. Zeit. (Regensb.) 2:324 (1803). Abundant on Lassen Peak at 5000 ft., *Brewer* (Lesq., 1868); Yosemite Nat. Park, *Byxbee, Eastwood 339;* Tehama Co., *Butler 5.* Circumboreal.

SPHAGNUM SUBSECUNDUM Nees in Sturm, Deut. Fl., Crypt. 5(17) tab. 3 (1819). Mendocino swamps and near Mariposa Big Trees, *Bolander* (Lesq., 1868); Sierra Nevada at 9000 ft., *Brewer* (Sull. & Lesq., 1865); probably the same collection, *Brewer 2794* (CAS), labelled: "in Sierras near Camp 167, Tulare Co."; Spanish Peak at 6500 ft., Plumas Co., *Leiberg 5437.* Circumboreal, south to Guatemala (Bartram, 1949).

SPHAGNUM TERES (Schp.) Aongstr. in Hartm., Skand. Fl. (ed. 8) 417 (1861). Near Lassen Peak at 5000 ft., *Brewer* (Lesq., 1868); Mt. Shasta, *Brown 659* (EGB); Willow Lake, Plumas Co., *Austin* (EGB), *Bruce 2398* (UCB); Eldorado Co., *Stebbins* (LFK 2315). Circumboreal.

EXCLUDED SPECIES

SPHAGNUM COMPACTUM Lamk. & DC. Specimens from Yosemite Valley and Mt. Dana, *Bolander* (Lesq., 1868) are *S. squarrosum* or *S. teres* (Andrews, pers. comm.).

SPHAGNUM PAPILLOSUM Lindb. I have been unable to substantiate the report by Lepage (1947) of California in the range of this species.

ANDREAEACEAE

ANDREAEA BLYTTII Schp., Bryol. Eur. 6(62-64) M:25, tab. 635 (1855). California, *Bolander* (EGB, annotated "an unusual collection" by Sharp). Arctic-montane.

?ANDREAEA RUPESTRIS Hedw., Sp. Musc. 47 (1801). In California acc. Britton and Emerson (1913), and Sharp (1936). Bipolar-montane.

GEORGIACEAE

TETRAPHIS PELLUCIDA Hedw., Sp. Musc. 45 (1801). Redwoods, near Big River City (Mendocino Co.?), *Bolander* (Lesq., 1865); near Eureka, Humboldt Co., *Howe 459, 912;* near Trinidad, Humboldt Co., *Tracy 15257* (UCB); Sisson, Siskiyou Co., *Howe 101.* Circumboreal.

DITRICHACEAE

CERATODON PURPUREUS (Hedw.) Brid., Bryol. Univ. 1:480 (1826). Common everywhere. Cosmopolitan.

DISTICHIUM CAPILLACEUM (Hedw.) Br. & Schp., Bryol. Eur. 2(29-30) M:4, tab. 193 (1846). Frequent in the high Sierras, south to Tulare Co., *R. R. Koch* (LFK 2170). Bipolar-montane.

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[4]A specimen (CAS) labelled: "Santa Barbara, California; H. A. Warne, 1878" is doubtful. Confirmation of this unlikely station is desirable.

DISTICHIUM INCLINATUM (Hedw.) Br. & Schp., Bryol. Eur. 2(29-30) M:5, tab. 194 (1846). Soda Springs, Upper Tuolumne, Yosemite Nat. Park, *Bolander* (Lesq., 1868); a specimen at New York (EGB), merely labelled "California" is presumably this collection. Arctic-montane.

DITRICHUM AMBIGUUM Best, Torr. Bot. Club Bull. 20:117 (1893). Humboldt Co. to Santa Cruz Co. and inland to Placer Co. and Tuolumne Co. Pacific Coast, south to Guatemala (Bartram, 1949).

DITRICHUM HETEROMALLUM (Hedw.) Britt., No. Am. Fl. 15:64 (1913). Humboldt Co., *Howe;* San Benito Co., *R. R. Koch* (LFK 1329). Europe-North America.

DITRICHUM SCHIMPERI (Lesq.) Paris, Index Bryol. 396 (1896). Northern California, south to Marin Co. and Yosemite Valley. Pacific Coast.

?PLEURIDIUM ACUMINATUM Lindb., Svenska Vet.-Akad. Stockh. Oefv. 20:406 (1863). Near San Rafael, *Bolander* (Lesq., 1868). The Californian moss known by this name does not seem identical with the European and eastern North American species; its relation to *P. Bolanderi* is not clear to me. Circumboreal.

PLEURIDIUM BOLANDERI C. Muell.[5] in Jaeger, St. Gall. Nat. Ges., Ber. 1869:91 (1869). Common in Central California, south to San Luis Obispo Co., *Allen, Ikenberry.* Pacific Coast.

PLEURIDIUM CALIFORNICUM Grout, Moss Fl. No. Am. 1:31 (1936). Foothills, Altadena, *Kingman* (type, Holz. exs. *No. 330* as *P. Bolanderi).* A number of specimens from Central California resemble the type of this species, but also contain plants matching *P. Bolanderi,* and are probably that species. Unfortunately, I have not been able to do the field work necessary to solve this taxonomic riddle. California only.

EXCLUDED SPECIES

DITRICHUM PUSILLUM (Hedw.) Britt. was listed for California doubtfully by Grout (1928-40). Specimens seen, so named, are *D. ambiguum.*

DITRICHUM TORTULOIDES Grout was reported from Marin Co., *Howe 92* (EGB) by the author (Grout, 1927). The two plants that Grout segregated from this collection appear to me to belong with the rest of the specimen to *D. ambiguum.*

SELIGERIACEAE

**BLINDIA ACUTA (Hedw.) Br. & Schp., Bryol. Eur. 2(33-36) M:3, tab. 114 (1846). Cisco to Summit (Placer Co.?), *Bolander 359, 373* (EGB); vicinity of Echo Lake, Eldorado Co., *Conard* (HSC); near Vernal Falls, Yosemite Nat. Park, Mariposa Co., *MacFadden 17448;* Lower Soldier Lake, Tulare Co., *Howell* (LFK H154b). Arctic-montane, south to Guatemala (Bartram, 1949).

DICRANACEAE

ANISOTHECIUM VARIUM (Hedw.) Mitt., Linn. Soc. Lond., Journ. Bot. 12:40 (1869). *Dicranella varia* (Hedw.) Schp.; MFNA 1:56. Common at low altitudes in Central California; south to Santa Catalina Id., *Millspaugh 4872* (Williams in Millsp. & Nutt., 1923). Circumboreal, south to Guatemala (Bartram, 1949).

[5]A report by Roth (1911) for this species "bei Chikago," must surely be a misidentification.

BRUCHIA BOLANDERI Lesq., Cal. Acad. Sci. Mem. 1:5 (1868). Near Big Tree Grove, Westfall's Meadow at 8000 ft., *Bolander* (type EGB). California only.

DICHODONTIUM PELLUCIDUM (Hedw.) Schp., Coroll. Bryol. Eur. 12 (1855). Nine collections in Northern California and the Sierras, south to Tulare Co., *R. R. Koch* (LFK 2158, UMAA). Circumboreal.

DICRANELLA HETEROMALLA (Hedw.) Schp., Coroll. Bryol. Eur. 13 (1855). Infrequent in Northern California. Circumboreal; also in Bolivia, acc. Herzog (1916).

?DICRANELLA SUBULATA (Hedw.) Schp., Coroll. Bryol. Eur. 13 (1855). Mt. Dana at 8000-10,000 ft., *Bolander,* acc. Lesq. (1868). Arctic-montane.

DICRANOWEISSIA CIRRATA (Hedw.) Lindb., Svenska Vet.-Akad. Stockh. Oefv. 21:230 (1864). Abundant in Northern and Central California, south to Monterey, Madera, and Tulare Cos.; Los Angeles Co., *Moxley 1158* (Moxley, 1928). Circumboreal; also Hawaii acc. Bartram (1933b).

DICRANOWEISSIA CONTERMINA Ren. & Card. in Holz., Contr. U. S. Nat. Herb. 3:269 (1895). *D. crispula* var. *contermina,* type seen, EGB; MFNA 1:73. Big Valley Mts., Modoc Co., *Baker & Nutting 45* (EGB, CAS); Mt. Shasta, Siskiyou Co., *Cooke* (3 coll., UMAA). Pacific Coast.

*DICRANUM BONJEANI de Not. in Lisa, Elenco dei Muschi 29 (1837). Eureka, Humboldt Co., *Bolander,* acc. Lesq. (1868); Drumheller Dam, Placer Co., *MacFadden 9803;* Mendocino Co., *Howe 593a.* Circumboreal.

DICRANUM FUSCESCENS Smith, Flora Brit. 3:1204 (1804). Northern California, primarily in redwoods, south to San Mateo Co. Also *D. congestum* Brid. (*D. fuscescens* var. *congestum* in MFNA), acc. Paris (1904). Circumboreal.

DICRANUM SCOPARIUM Hedw., Sp. Musc. 126 (1801). Northern California, south to Alameda Co. but not as common as farther north in its range. Circumboreal.

ONCOPHORUS VIRENS (Hedw.) Brid., Bryol. Univ. 1:399 (1826). Tuolumne Canyon and Mono Pass, *Bolander,* as *Dicranum virens* var. *serratum* Schp. (Lesq., 1868); Mt. Shasta, *Cooke 14690* (Cooke, 1941). Arctic-montane.

ORTHODICRANUM STRICTUM Broth., Laubm. Fennosk. 92 (1923). *Dicranum strictum* Schleich., not Smith, 1804; MFNA 1:80. Northern California, south to Santa Cruz Co., *Koch 2048,* and Tulare Co., *Ikenberry.* Circumboreal.

EXCLUDED SPECIES

DICRANOWEISSIA CRISPULA (Hedw.) Lindb. is commonly listed as growing in California but I have been unable to verify the record. The species may yet be found on the higher peaks of the Sierras.

DICRANUM BERGERI Bland. was reported by Rau & Hervey (1880) as *D. Schraderi* Schwaegr. with California in its range.

DICRANUM SPURIUM Hedw. was given from California by Rau & Hervey (1880).

ONCOPHORUS WAHLENBERGII Brid. var. COMPACTUS (Funck) Br. & Schp. Lesq. & James (1884) cited collections from Tuolumne Canyon and Mono Pass, *Bolander,* as *Cynodontium virens* var. *compactum* Br. & Schp.; these should have been included under var. *serratum* Schp. as they were first recorded by Lesq. (1868).

FISSIDENTACEAE

?FISSIDENS ADIANTHOIDES Hedw., Sp. Musc. 157 (1801). In California acc. Grout (1928-40, 1943), but without further data. Circumboreal.

••FISSIDENS BRYOIDES Hedw., Sp. Musc. 153 (1801). Previous reports from California (Bradshaw, 1926; Moxley, 1928) were based on specimens of *F. limbatus* (Moxley, 1929; Grout, 1928-40, 1943). Yosemite Valley, Mariposa Co., *Ikenberry 1358a*. Dr. Ikenberry generously allows me to publish this record in advance of a report being prepared upon his extensive Californian collections. Rock Creek at 10,500 ft., Tulare Co., *Howell* (LFK H177a). Circumboreal.

FISSIDENS GRANDIFRONS Brid., Musco. Recent. Suppl. 1:170 (1806). On rocks in or along streams, frequently in calcareous regions, throughout Northern and Central California. Circumboreal, south to Guatemala (Bartram, 1949).

FISSIDENS LIMBATUS Sull., Pac. R. R. Rep. 4:185 (1856). Abundant except at high altitudes. Extremely variable; many specimens have been variously determined as *F. minutulus, F. bryoides, F. incurvus, F. sublimbatus, F. tamarindifolius,* and *F. viridulus*. Var. BREVIFOLIUS (Card. & Ther.) Grout from Soldier's Home, Los Angeles, *Hasse* (type). Western Boreal America, but common only in California. In Puerto Rico acc. Grout (1943).

FISSIDENS PAUPERCULUS Howe, Erythea 2:97 (1894). Near Mill Valley, Marin Co., *Howe 80* (UCB, type); recollected in Marin Co. by Howe and by Koch (Koch, 1948); Big Basin Redwood State Park, Santa Cruz Co., *Koch 2207a* (Koch, 1949). Probably grows elsewhere in the Redwoods. California only.

FISSIDENS RUFULUS Br. & Schp., Bryol. Eur. 1(46-47) M. Suppl. 2:1, tab. 102 (1851). Sporadic throughout Northern California, south to Santa Cruz Co., *Koch 2075,* and Tulare Co., *Ikenberry 46*. Californian plants do not agree well with European ones; perhaps *F. ventricosus* Lesq. is, after all, a distinct species. Europe-North America.

OCTODICERAS FONTANUM (LaPyl.) Lindb., Svenska Vet.-Akad. Stockh., Oefv. 20:405 (1863). *Fissidens julianus* (Mont.) Schp.; MFNA 1:11. California, *Bolander* (EGB); Napa Co., *Koch 1397* (UMAA). Aquatic, attached to rocks or wood; probably widespread but overlooked. Cosmopolitan at lower altitudes and latitudes.

EXCLUDED SPECIES

FISSIDENS MINUTULUS Sull. Paris (1904) included California in the range of this species; Grout (1943) merely said: "occasionally west of the Rocky Mountains." Several specimens from California, determined as this species and apparently seen by Grout, appear to me to be forms of *F. limbatus*.

FISSIDENS VIRIDULUS (Web. & Mohr) Wahlenb. was listed by Rau & Hervey (1880, as *F. incurvus)* with California in its range; apparently they considered *F. limbatus* a synonym of that species.

ENCALYPTACEAE

ENCALYPTA CILIATA Hedw., Sp. Musc. 61 (1801). Infrequent in Northern California, south to Yosemite Valley, *Bolander, MacFadden, Koch*. Circumboreal.

ENCALYPTA RHABDOCARPA Schwaegr., Sp. Musc. Suppl. 1(1):56 (1811). On lava rocks near Egg Lake, Modoc Co., *Baker & Nutting,* acc. Howe (1897); Surprise Canyon, Panamint Mts., as *Leersia trachymitra* (Ripart) Holz. acc. Holzinger (Coville, 1893); east side of Army Pass, Inyo Co., *Howell* (CAS, LFK H136). Arctic-montane.

ENCALYPTA VULGARIS Hedw., Sp. Musc. 60 (1801). Eight collections from Mt. Diablo, *Bolander, Howe,* and Placer Co., *MacFadden,* south to Los Angeles Co., *Allen.* Bipolar-montane.

EXCLUDED SPECIES

ENCALYPTA STREPTOCARPA Hedw. Rau & Hervey (1880) and Paris (1904, as *E. contorta),* reported California in the range of this species, but Flowers (1938) limited its range in the west to British Columbia.

POTTIACEAE

ACAULON MUTICUM (Hedw.) C. Muell., Bot. Zeit. (Leipz.) 5:99 (1847). Meadow near Mission Dolores, *Bolander* (Lesq., 1868); roadside near the "Old Mill," Mill Valley, Marin Co., acc. Howe (1896). Europe-North America.

ALOINA ALOIDES (Schultz) Kindb. var. AMBIGUA (Br. & Schp.) Craig in Grout, Moss Fl. No. Am. 1:214 (1939). Pasadena, *Palmer,* acc. Howe (1897, as *Tortula ericaefolia);* Santa Catalina Id., *Knopf 411, Millspaugh 4589, 4652,* acc. Williams in Millsp. & Nutt. (1923, as *Aloina ericaefolia).* The species, Circumboreal.

ALOINA RIGIDA (Hedw.) Kindb. in Limpr., Laubm. Deut. Oest. Schw. 1:637 (1888). Seven collections from Southern California; also from Monterey Co., *Linsdale 200,* and Mt. St. Helena, Napa Co., *Jepson* (Koch, 1949). Some specimens are referable to var. *pilifera* (Br. & Schp.) Limpr. Circumboreal.

BARBULA ACUTA (Brid.) Brid., Musco. Recent. Suppl. 4:96 (1819). Four specimens from the vicinity of Stanford University, Santa Clara Co., *Baker* (Pac. Slope Bry. 33, 157, 351, 352), as *B. Bakeri* (EGB). Further study will probably prove that these specimens represent a distinct species or variety. Circumboreal.

BARBULA BRACHYPHYLLA Sull., Pac. R. R. Rep. 4:186 (1856). Near Benicia, Solano Co., *Bigelow* (type); San Nicholas Id., *Howell 10,* acc. Bartram (1933a). California only.

BARBULA CONVOLUTA Hedw., Sp. Musc. 120 (1801). Widely distributed except at high altitudes; frequent in the Bay area. Circumboreal.

BARBULA CYLINDRICA (MacKay) Schp. in Ruthe, Hedwigia 12:46 (1873). Common to about 5000 ft. except in desert areas. Circumboreal. In Hawaiian Ids. acc. Bartram (1933).

**BARBULA UNGUICULATA Hedw., Sp. Musc. 118 (1801). On ground and rocks, Fern Dell, corner of Western and Los Feliz Aves., Los Angeles, *Habeeb 1404* (Habeeb, unpublished manuscript). Possibly introduced. Bipolar-montane.

BARBULA VINEALIS Brid., Bryol. Univ. 1:830 (1826). Common to about 5000 ft. Circumboreal, south to Guatemala (Bartram, 1949).

CROSSIDIUM DESERTORUM Holz. & Bartr., The Bryol. 26:72 (1923). San Nicholas Id., *Howell 11,* acc. Bartram (1933a); on wind blown silt below Fish Trap Mts. south of Indio, Riverside Co., *Reed 6, 43* (HSC). Also from Arizona.

CROSSIDIUM GRISEUM (Jur.) Jur., Laubmoosfl. 128 (1882). Canyon of the Funeral Mts., west of Amargosa, Inyo Co., acc. Holzinger (Coville, 1893) as *Tortula membranifolia.* The California collection, *Bigelow,* cited by Grout (1928-40) is probably that reported by Sullivant (1856) from Arizona as *Barbula membranifolia.* Circumboreal in warmer regions.

?CROSSIDIUM SQUAMIGERUM (Viv.) Jur., Laubmoosfl. 127 (1882). In California, *Bigelow,* acc. Grout (1928-40). Circumboreal in warmer regions.

DESMATODON CONVOLUTUS (Brid.) Grout, Moss Fl. No. Am. 1:224 (1939). Common in Southern California, north to Wildcat Canyon, Berkeley, Alameda Co., *Howe 56* (EGB); Santa Catalina Id., *Knopf 299* (Williams in Millsp. & Nutt., 1923). Cosmopolitan in warmer regions.

DESMATODON GUEPINI Br. & Schp., Bryol. Eur. 2 (18-20) M:8, tab. 133 (1843). Santa Catalina Id., *Knopf 408A,* acc. Williams (Millsp. & Nutt., 1923); Eaton Canyon, San Gabriel Mts., *Kingman;* Oakland, Alameda Co., *Bolander 47, 330.* Also reported from New Mexico and France acc. Grout (1928-40). Europe-North America.

DESMATODON HENDERSONII (Ren. & Card.) Williams in Millsp. & Nutt., Field Mus. Bot. 5:306 (1923). Five collections from Southern California. Pacific Coast.

DESMATODON LATIFOLIUS (Hedw.) Brid., Musco. Recent. Suppl. 4:86 (1819), and var. MUTICUS Brid. Frequent in the high Sierras at least as far south as Tulare Co., *Howell* (CAS). Arctic-montane.

DESMATODON OBTUSIFOLIUS (Schwaegr.) Schp., Syn. 158 (1860). American manuals credit Bolander with collecting this species but I have not seen the specimen; Alpine Co., *Koch 2198;* Tulare Co., *R. R. Koch* (LFK 2160a). Circumboreal.

DESMATODON SYSTYLIUS Br. & Schp., Bryol. Eur. 2(31) M. Suppl. 1:1, tab. 131 (1846). Foot of Mt. Dana, *Bolander 114b;* Mono Mesa at 12,000 ft. with *D. latifolius,* Inyo Co., *Howell* (CAS). Arctic-montane.

DIDYMODON RECURVIROSTRIS (Hedw.) Jenn., Man. Mosses W. Pa. 97 (1913). Probably frequent in the high Sierras. Specimens from Mineral King at 7800 ft., Tulare Co., *R. R. Koch* (LFK 2164, 2176, UMAA) are much larger throughout than those from farther north: Soda Springs, Tuolumne Co., *Bolander 84, 94, 171* (EGB); Yosemite Valley and Tenaya Lake, Mariposa Co., *Koch 1709, 1750a* (UMAA). Bipolar-montane.

DIDYMODON RIGIDULUS Hedw., Sp. Musc. 104 (1801). Northern and Central California, south to the San Gabriel Mts., Los Angeles Co., *Moxley 1143* (Holzinger exs. No. 654), *Kingman* (Holzinger exs. No. 461). Californian plants do not have the propagula characteristic of the species elsewhere in its range. Bipolar-montane.

DIDYMODON TOPHACEUS (Brid.) Jur., Laubmoosfl. 100 (1882). Frequent in calcareous habitats throughout the state. Circumboreal, south to Guatemala (Bartram, 1949).

?DIDYMODON TRIFARIUS (Hedw.) Brid., Bryol. Univ. 1:508 (1826). In California, acc. Steere (1938); Bear Canyon, Los Angeles Co., *Moxley 1061,* acc. Moxley (1928). Circumboreal.

EUCLADIUM VERTICILLATUM (With.) Br. & Schp., Bryol. Eur. 1(33-36) M:3, tab. 40 (1846). Common in Southern California in calcareous areas; north to Mendocino Co., acc. Howe (1897). Circumboreal at lower altitudes.

GYMNOSTOMUM CALCAREUM Nees & Hornsch., Bryol. Germ. 1:153 (1823). Nine collections widely scattered, usually with *Didymodon tophaceus* or *Eucladium verticillatum.* Bipolar-montane.

?HUSNOTIELLA REVOLUTA Card., Rev. Bryol. 36:71 (1909). Near Kenwood, *Koch 285,* acc. Grout (1928-40). This and other specimens I have reported (Koch, 1949) do not match type material from Mexico very closely. They may represent another species not yet attributed to the flora of North America. Sonoran, south to Guatemala acc. Bartram (1949).

MERCEYA LATIFOLIA Kindb., Torr. Bot. Club Bull. 16:94 (1889). Los Angeles Co., *Moxley 1064* (Arroyo Seco, Moxley, 1928), *MacFadden 18768.* Western Boreal America.

PHASCUM CUSPIDATUM Hedw. Sp. Musc. 22 (1801). Frequent in the Bay area but not abundant; Redding, Shasta Co., *Baker & Nutting;* Santa Monica, Los Angeles Co., *Hasse,* acc. Howe (1897). Grout (1928-40) referred the Californian plant to var. *americanum* Ren. & Card. The species, Circumboreal.

PHASCUM HYALINOTRICHUM Card. & Thér., Bot. Gaz. 37:363 (1904). Soldiers' Home, Los Angeles, *Hasse* (type); a second, previously unrecognized, specimen from Southern California, *Allen* (EGB, as *P. cuspidatum*). Mature spores, not found in the type, are smooth, oval to spherical, and average 23–25 μ in diameter. Southern California only.

POTTIA ARIZONICA Wareh. in Grout, Moss Fl. No. Am. 1:202 (1939). Sull. & Lesq. (1856) No. 119 in part; Pasadena, Los Angeles Co., and San Clemente Id., *Munz,* acc. Wareham (pers. comm.). Var. MUCRONULATA Wareh., under shrubs in a sandy wash, San Gabriel Canyon, Los Angeles Co., *MacFadden 16878,* acc. Wareham (1939). The report of *Anacalypta Starkeana* var. *brachyoda* by Lesq. (1865) may be based upon the same collection used by Sull. & Lesq. for their exs. No. 119. Southern California and Arizona.

POTTIA BRYOIDES (Dicks.) Mitt., Ann. Mag. Nat. Hist. (ser. 2) 8:311 (1851). Six collections from Central and Southern California. Circumboreal in warmer regions.

POTTIA FOSBERGII Bartr., The Bryol. 33:18 (1930). Four collections from Southern California, including the type, near Claremont, Los Angeles Co., *Fosberg;* Baja California, *Howell,* acc. Wareham (1939). Southern and Baja California.

POTTIA STARKEANA (Hedw.) C. Muell., Syn. Musc. 1:547 (1849). Five collections from Central and Southern California. Circumboreal in warmer regions. In Australia acc. Brotherus (1924).

?TIMMIELLA ANOMALA (Br. & Schp.) Limpr., Laubm. Deut. Oest. Schw. 1:592 (1888). All the manuals credit Bolander and Bigelow with collections of this species from the Bay area. I have examined many specimens of

Timmiella from all over the state and believe that none of them compares well with European or Arizona specimens referred to this species. Sterile specimens may be difficult to name; Grout (1928-40) maintained he could not distinguish them at all. Circumboreal in warm, temperate and subtropical regions; in Guatemala acc. Bartram (1949).

Timmiella crassinervis (Hampe) L. F. Koch, comb. nov. *Trichostomum crassinerve* Hampe, Linnaea 30:456 (1860), type seen, EGB; *Timmiella vancouveriensis* Broth.; MFNA 1:164. Common everywhere except at high altitudes. Pacific Coast.

TORTULA AMPLEXA (Lesq.) Steere in Grout, Moss Fl. No. Am. 1:233 (1939). Central and Southern California but not abundant. California only.

TORTULA BARTRAMII Steere in Grout, Moss Fl. No. Am. 1:241 (1939). One collection cited from California without further detail by Steere (1939). Sonora.

TORTULA BOLANDERI (Lesq.) Howe, Erythea 4:51 (1896). Seven collections, widely scattered, south to San Gabriel Mts., *Kingman 641* (EGB). Pacific Coast.

TORTULA BREVIPES (Lesq.) Broth., Musci in E. & P., Nat. Pfl. 1(3)1:431 (1902). Common in Southern California, less frequent northward. Pacific Coast.

TORTULA CALIFORNICA Bartr., The Bryol. 48:92 (1945). Lower Decker Canyon, Riverside Co., *Fosberg 307* (type). California only.

TORTULA INERMIS (Brid.) Mont., Arch. de Bot. (Guill.) 1:136 (1833). Frequent in Southern California. Circumboreal in warmer regions.

TORTULA INTERMEDIA (Brid.) Berk., Handbk. Brit. Mosses 251 (1863). Santa Catalina Id., *Millspaugh 4842, 4871, 4881, Knopf 326, 407b,* acc. Williams (Millsp. & Nutt., 1923). Many specimens, from widely scattered localities within the state, are labelled this species in American herbaria. None of them appears to me to match the European species precisely. Circumboreal.

TORTULA LAEVIPILA (Brid.) Schwaegr., Sp. Musc. Suppl. 2(1):66 (1823). In California, acc. Steere (1939a), but again the California plants do not match European ones very well. Most Californian specimens referred here approach *T. princeps* except in the corticolous habit and smaller size. Europe-North America.

TORTULA LATIFOLIA (Bruch) Hartm., Skand. Fl. (ed. 2) 322 (1832). Six collections from Northern and Central California. Europe-North America.

TORTULA MUCRONIFOLIA Schwaegr., Sp. Musc. Suppl. 1(1):136 (1811). In California acc. Steere (1939a); not seen. Circumboreal.

TORTULA MURALIS Hedw., Sp. Musc. 123 (1801). Widespread at low elevations but uncommon except on rock walls in the Bay area. Almost cosmopolitan; not recorded from high altitudes or latitudes.

**TORTULA NORVEGICA (Web. & Mohr) Lindb., Svenska Vet.-Akad. Stockh. Oefv. 21:245 (1864). Alpine and Nevada Cos., *Koch 1797, 2018.* Arctic-montane.

TORTULA OBTUSISSIMA (C. Muell.) Mitt., Linn. Soc. Lond., Journ. Bot. 12:174 (1869). Occasional in Central and Southern California. Sonora.

TORTULA PAGORUM (Milde) de Not., Epil. Briol. Ital. 542 (1869). On trunks of *Quercus agrifolia* and *Umbellularia californica;* campus, Univ. Cal. (Berk.), Alameda Co., *Thornberg;* admixture in *Fabronia pusilla* (Grout exs. No. 436), Lopez Creek, San Luis Obispo Co., *Allen.* Cf. Anderson, 1943; Koch, 1949. Europe-North America.

TORTULA PAPILLOSA Wils. in Spruce, Lond. Journ. Bot. 4:193 (1845). On trunk of *Quercus agrifolia,* Hastings Reservation, Monterey Co., *Linsdale 134a;* Angels Camp, Calaveras Co., *R. R. Koch* (LFK 2187a, UMAA); probably widespread but only one previous collection from California, *Bolander* (EGB). Bipolar-montane.

TORTULA PRINCEPS de Not., Syll. Musco. Ital. 170 (1838). Abundant except at high altitudes and in deserts. Bipolar but not at high latitudes or altitudes.

TORTULA RURALIFORMIS (Besch.) Dixon, St. Handb. Brit. Mosses 188 (1896). On rocks at about 2000 ft. near Arcata, Humboldt Co., *Howe 212* (HSC). Europe-North America.

TORTULA RURALIS (Hedw.) Crome in Hoppe, Bot. Zeit. (Regensb.) 2:324 (1803). Throughout California but less common at lower altitudes than *T. princeps.* Plants from the Sierras are often referable to **T. ruralis** var. **gigantea** (Lesq.) L. F. Koch, comb. nov. *(Barbula ruralis* var. *gigantea* Lesq., 1868, p. 13.) This variety is not listed in MFNA (Steere, 1939a) but Steere (1940) placed it in synonymy with the species. Bipolar-montane.

TORTULA SUBULATA Hedw., Sp. Musc. 122 (1801). Northern California and the Sierras. Var. *angustata* (Wils.) Limpr. is known in North America only from California acc. Steere (1939a). Circumboreal.

TRICHOSTOMOPSIS BREVIFOLIA Bartr., The Bryol. 34:61 (1932). Under shrubs on hilltop, Tuna Canyon, Los Angeles Co., *MacFadden 8107* (type); Santa Catalina Id., *Millspaugh 4730* in part; San Gabriel Mts., Los Angeles Co., *Kingman 725;* Pigeon Pass, Box Springs Mts., 1800 ft., Riverside Co., *Reed 46* (HSC). California-Arizona.

TRICHOSTOMOPSIS FAYAE Grout, Moss Fl. No. Am. 1:228 (1939). Under shrubs near Sherman Way, Los Angeles, *MacFadden 8172* (type); on ground, Arroyo Tequesquite at 700 ft., Riverside Co., *Reed 45* (HSC). California only.

TRIQUETRELLA CALIFORNICA (Lesq.) Grout, Moss Fl. No. Am. 3:201 (1934). Mt. Diablo, Contra Costa Co., *Bolander* (type); near Olema, Marin Co., *Howe* (Koch, 1949). California only.

WEISSIA CONTROVERSA Hedw., Sp. Musc. 67 (1801). *W. viridula* Hedw.; MFNA 1:155. Common at low altitudes. Cosmopolitan in Temperate and Tropical zones.

EXCLUDED SPECIES

BARBULA BAKERI Card. & Thér. was excluded by Steere (1938) because the original description does not designate a type and the specimens cited are mixtures (Steere, 1939).

BARBULA ELATA Dur. & Mont. was listed for California by Lesq. & James (1884) and Brandegee (1891). Steere (1939) indicated that the specimens involved were probably *B. cylindrica.*

BARBULA FALLAX Hedw. was formerly confused with *B. vinealis* so that western specimens were often determined *B. fallax.*

BARBULA MARGINATA Br. & Schp. Western specimens under this name are *Tortula muralis* acc. Steere (1940).

BARBULA SPADICEA (Mitt.) Braithw. Californian specimens referred here by Lesq. (1868) and others are probably *Didymodon rigidulus,* acc. Steere (1940).

BARBULA VAHLIANA Schultz has been reported for California by Sullivant (1856) and later workers on the basis of specimens of both *Tortula muralis* and *T. brevipes* acc. Steere (1940).

CROSSIDIUM ABERRANS Holz. & Bartr. The collection cited from California by Holzinger and Bartram (1924), is that reported by Sullivant (1856) as *Barbula chloronotos* from Arizona, *Bigelow.*

DESMATODON CALIFORNICUS Lesq. is not listed in Grout (1928-40) but as the type specimen is cited under *Desmatodon convolutus,* I assume that it should have been listed as a synonym of that species.

HYMENOSTYLIUM RECURVIROSTRUM (Hedw.) Dixon was listed from California in American manuals, apparently on the assumption that Bigelow's collections reported by Sullivant (1856) were from California.

POTTIA DAVALLII (Smith) Wareh. Los Angeles, *Bigelow,* acc. Sullivant (1856, as *P. minutula).* Wareham (1939) excluded this species from the North American moss flora.

POTTIA HEIMII (Hedw.) Fuernr. Ditches, Soda Springs at 9000 ft., *Bolander,* acc. Lesq. (1868). Two specimens (EGB), labelled as above, were long ago redetermined as *Didymodon recurvirostris* by Britton.

POTTIA LATIFOLIA (Schwaegr.) C. Muell. was listed by Rau & Hervey (1880) with California in its range.

POTTIA MUTICA Vent. was excluded from the North American moss flora by Wareham (1939), who referred the American plants to *P. arizonica.*

PTERIGONEURUM SUBSESSILE (Brid.) Jur. was reported from California by Sullivant (1856). If the specimen still exists, it was unknown to Wareham in 1948. Cf. Koch, 1949.

TIMMIELLA FLEXISETA (Bruch) Limpr. is listed from Pacific Coast in American manuals. A study of the well-illustrated, original description and the available European specimens (EGB, UMAA) convinces me that this species does not grow in California. All western specimens previously named *T. flexiseta* are referred to *T. crassinervis.*

TORTULA CUNEIFOLIA Roth from Oakland, on clayey soil, *Bolander* (Lesq., 1868) is probably *T. brevipes* acc. Steere (1940).

TRICHOSTOMUM CRISPULUM Bruch was listed by Paris (1906) with California in its range. Presumably this is a mistake similar to that made by Grout (1928-40) who said this species was reported from California by Lesq. & James (1884). Actually the Manual gives the following habitat: "On the ground, Guadalupe Island, Lower California (Palmer)."

GRIMMIACEAE

**GRIMMIA AGASSIZII (Sull.) Lesq. & James, Man. Mosses No. Am. 136 (1884). Near Feeley Lake, Nevada Co., *Koch 2010;* at Eagle Falls on Lake Tahoe, Eldorado Co., *Koch 1980;* H. M. Hall Natural Area, Mono Co., *Catcheside 47105* (det. Sayre). Europe-North America.

GRIMMIA ALPESTRIS (Web. & Mohr) Nees, Bryol. Germ. 2(1):139 (1827). Frequent in the Sierras, south to Mt. Pinos at 8000 ft. near the Ventura-Kern Co. line, *Bennett 31-40* (HSC). Jones (1933) listed var. *Manniae* (K. Muell.) Jones from Napa Co., *Mann* (type). The species, Circumboreal.

*GRIMMIA ALPICOLA Hedw. var. RIVULARIS (Brid.) Broth., Laubm. Fennosk. 181 (1923). Ten collections from Northern California and the Sierras, south to Mineral King at 7800 ft., Tulare Co., *R. R. Koch* (LFK 2161b). Probably frequent throughout the Sierras. The species, bipolar-montane.

**GRIMMIA ANODON[6] Br. & Schp., Bryol. Eur. 3(25-28) M:8, tab. 236 (1845). Mt. St. Helena, Napa Co., *Koch 2120a* (det. Sayre); near Bridgeport, Mono Co., *Alexander* (UCB 719364); White Mts., Inyo Co., *Setchell & Duran* (UCB 545946); Kern Co., *MacFadden 17941*. Circumboreal.

GRIMMIA APOCARPA Hedw., Sp. Musc. 76 (1801). Eight collections from the Sierras, south in the Sierra Nevada to Mariposa Co. and in the Coast Ranges to Mt. Hamilton, Santa Clara Co., *Koch 1408* (det. Sayre). Var. GRACILIS Web. & Mohr, near Bridal Veil Falls, Yosemite Nat. Park, Mariposa Co., *Ikenberry 1153*. The species, Bipolar-montane.

**GRIMMIA ARIZONAE Ren. & Card., Rev. Bryol. 19:85 (1892). Yosemite Valley, Mariposa Co., *Koch 1720* (det. Sayre). Sonora.

*GRIMMIA ATRICHA C. Muell. & Kindb. in Mac. & Kindb., Cat. Can. Pl. 6:65 (1892). Known stations are on Mt. Shasta, Siskiyou Co., and in Inyo and Alpine Cos. Cf. Koch, 1949. Pacific Coast.

GRIMMIA BREVIROSTRIS Williams, The Bryol. 23:52 (1920). On granite, near Buck's Valley, Plumas Co. at 6500 ft., *Leiberg 5445* (type); on rocks at summit of Donner Lake Highway, Nevada Co., *MacFadden 9008* (UCLA); Yosemite Valley, Mariposa Co., *Bolander* (EGB), *Morse 137* (HSC); Sequoia Nat. Park, Tulare Co., *Degener & Peiler 16970* (EGB). California only.

GRIMMIA CALYPTRATA Hook. in Drumm., Musci Bor. Am., no. 60 (1828). In California acc. Sull. & Lesq. (1856, No. 139; 1865, No. 211); Mt. Tamalpais, Marin Co., *Koch 2290* (det. Sayre); west of Woodfords, Alpine Co., *Koch 1786;* canyon near Llano, Los Angeles Co., *MacFadden* (EGB, acc. Sayre). Western Boreal America.

GRIMMIA DECIPIENS (Schultz) Lindb. in Hartm., Skand. Fl., ed. 8, 386 (1861). San Clemente Id. acc. Sayre (1940). Europe-North America.

GRIMMIA HAMULOSA Lesq., Cal. Acad. Sci. Mem. 1:14 (1868). Ten collections from the Sierra Nevada, south to Middle Chain Lake, Madera Co., *Ikenberry 1036*. California only.

GRIMMIA HARTMANI Schp., Syn. 214 (1860). On rock cliffs, San Antonio Canyon at 2000 ft., and at Claremont, Los Angeles Co., *Fosberg 214,* acc. Jones (1933). Arctic-montane.

GRIMMIA LAEVIGATA (Brid.) Brid., Bryol. Univ. 1:183 (1826). Common in Southern and Central California. Californian plants are quite different from those of eastern North America. Bipolar-montane.

GRIMMIA MARITIMA Smith, Fl. Brit. 3:1199 (1804). On maritime rocks, Mendocino Co., *Howe 559, G. E. & L. A. Koch* (LFK 2366). Europe-North America.

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[6]Lesq. & James reported *G. anodon* from Morriston, California, *Lapham*. I am unable to locate such a town in the state and can find no reference to any collections made by Lapham in California.

*GRIMMIA MONTANA Bruch, Bryol. Eur. 3(25-28) M:26, tab. 250 (1845). Frequent in the Sierras, south to Baja California, *Wiggins 9177;* in the Coast Ranges south to Mt. Tamalpais, Marin Co., and Mt. Diablo, Contra Costa Co. Europe-North America.

GRIMMIA MOXLEYI Williams in Holzinger, Musci Acro. Bor.-Am. Eur., no. 600 (1926). Six collections from Southern California including the type from Los Angeles Co. Sonora.

**GRIMMIA PLAGIOPODIA Hedw., Sp. Musc. 78 (1801). On Stamford Rock near Lake Tahoe, Placer Co., *Koch 1968.* Previous report by Wynne (1944) concerned a specimen of *G. montana.* Circumboreal.

*GRIMMIA PULVINATA (Hedw.) Smith, Engl. Bot. tab. 1726 (1807). Common in Southern and Central California except at high altitudes. Californian plants seem considerably more variable than European ones. Bipolar-montane.

GRIMMIA TORQUATA Hornsch. in Grev., Scot. Crypt. Fl. 4:199 (1826). Northern California, south in the Coast Ranges to Marin Co., *Howe,* and in the Sierra Nevada to Madera Co., *R. R. Koch* (LFK 2199). Arctic-montane; Hawaiian Ids. acc. Bartram (1942).

GRIMMIA TRICHOPHYLLA Grev., Fl. Edin. 235 (1824). Common everywhere. Var. MERIDIONALIS Schp. and var. MUEHLENBECKII Husn. in the Sierras. Almost Cosmopolitan.

?GRIMMIA UNICOLOR Hook. in Grev., Scot. Crypt. Fl. 3 tab. 123 (1825). In California acc. Jones (1933). The striking similarity of this moss to the endemic *G. brevirostris* is suggestive. Circumboreal.

RHACOMITRIUM ACICULARE (Hedw.) Brid., Musco. Recent. Suppl. 4:78 (1819). Frequent in the Sierras. Europe-North America.

RHACOMITRIUM CANESCENS (Hedw.) Brid., Musco. Recent. Suppl. 4:78 (1819). Coastal counties of Northern California south to Alameda Co., *Gibbons 163* (EGB), and Santa Cruz Co., *Koch 2066.* Circumboreal.

RHACOMITRIUM DEPRESSUM Lesq., Cal. Acad. Sci. Mem. 1:14 (1868). Yosemite Falls, Mariposa Co., *Bolander* (type); five other collections from the Sierras of Northern and Central California. I question the identity of a specimen from Quebec, Canada, cited as this species by Lepage (1947). Pacific Coast.

RHACOMITRIUM HETEROSTICHUM (Hedw.) Brid., Musco. Recent. Suppl. 4:79 (1819). Frequent in Northern and Central California. Many specimens are referable to var. *sudeticum* (Funck) Jones. Bipolar-montane.

**RHACOMITRIUM PATENS (Hedw.) Hueben., Musco. Germ. 198 (1833). On rocks along Trinity River Canyon, west of Burnt Ranch, Trinity Co., *Ikenberry 1666a;* Spanish Peak at 7000 ft., Plumas Co., *Leiberg 5441;* Meadow Valley, Plumas Co., *Head 487* (CAS). Arctic-montane.

RHACOMITRIUM VARIUM (Mitt.) Lesq. & James, Man. Mosses No. Am. 150 (1884). Seven collections from Northern California and the Sierras, south to Las Plumas, Plumas Co., *Nantt 5* (HSC). North Pacific Basin.

SCOULERIA AQUATICA Hook., Bot. Misc. 1:33 (1828). Occasional in Northern California and in the Sierras, south to Mariposa Co., *MacFadden 17452.* Western Boreal America.

SCOULERIA MARGINATA Britt., Torr. Bot. Club Bull. 22:42 (1895). Eight collections, from Sims, Shasta Co., *Howe 99* (EGB), to Calaveras Co., *Koch 1523* (UMAA). Pacific Coast.

EXCLUDED SPECIES

GRIMMIA COMMUTATA Hueben. was reported by Lesq. & James (1884) from California, *Bigelow, Watson.* A small packet (EGB) from Monterey, *Watson,* was found to be empty and four other specimens labelled *G. commutata* (EGB) are not that species.

GRIMMIA CONFERTA Funck was reported from California by Lesq. (1865, 1868) but I have been unable to substantiate the record.

GRIMMIA DONNIANA Smith was reported by Lesq. & James (1884) from Monitor, California, *Lapham.* I cannot locate Monitor in California, nor can I find any reference to collecting done in California by Lapham.

GRIMMIA ELONGATA Kaulf. was reported from Yosemite Valley, *James,* by Watson (1880) but the record is unsubstantiated. The specimen was probably *G. trichophylla.*

GRIMMIA INCURVA Schwaegr. was reported from California by Lesq. (1868) and by later American manuals. Most of the specimens so named from California that I have seen are *G. trichophylla.*

GRIMMIA OVALIS (Hedw.) Lindb. was mentioned by Bartram (1949) as from California but I cannot substantiate the report.

EPHEMERACEAE

EPHEMERUM SERRATUM (Hedw.) Hampe, Flora 20:285 (1837). Apparently not recollected in California since 1863, when Bolander found it with *Acaulon muticum* and *Phascum cuspidatum* in a meadow near Mission Dolores, San Francisco (Lesq., 1865). The "meadow" is now a crowded residential district. Europe-North America, South Africa.

FUNARIACEAE

ENTOSTHODON ATTENUATUS (Dicks.) Grout, Moss Fl. No. Am. 2:79 (1935). Near Mendocino, Mendocino Co., *Bolander* (Watson, 1880); *Pinus muricata* forest near Inverness, Marin Co., *Howell* (LFK H134); Pasadena, Los Angeles Co., *Allen* (EGB as *E. Templetoni*). Europe-North America.

ENTOSTHODON BOLANDERI[7] Lesq., Am. Phil. Soc. Trans. 13 (1869):10 (1865). Near the Bay of San Francisco, *Bolander,* acc. Lesq. (1865); Byron Hot Springs, Contra Costa Co., *Eastwood* (EGB, CAS, as *Funaria californica);* San Clemente Id., *Mainz 6636,* acc. Grout (1928-40); San Nicolas Id., *Howell 9, 12* (Bartram, 1933). Sonora.

?FUNARIA AMERICANA Lindb., Svenska Vet.-Akad. Stockh. Oefv. 20:398 (1863). In California acc. Jennings (1913) and Bartram (1928). Boreal America.

FUNARIA CALIFORNICA Sull. & Lesq., Musc. Bor.-Am. (ed. 2) 41, No. 238 (1865). Near Auburn, Placer Co., *Bolander* (type); Ukiah, Mendocino Co., *Bolander,* acc. Lesq. (1868); Fort Ross, Sonoma Co., *Howe 151* (EGB); Pasadena, Los Angeles Co., *Palmer* acc. Howe (1897). Pacific Coast.

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[7]The original description mentioned the habitat as wet rocks but in 1868, Lesq. said: "On clayey ground. . . "

FUNARIA HYGROMETRICA Hedw., Sp. Musc. 172 (1801). Everywhere on burned over or otherwise disturbed soil. A majority of California specimens are var. *convoluta* (Hampe) Grout; var. *calvescens* (Schwaegr.) Br. & Schp. grows in Southern California. Recently, Howell found in Marin Co. with ordinary *F. hygrometrica* a form with a capsule mouth about half the usual diameter on an otherwise normal sporophyte. Cosmopolitan.

?FUNARIA MICROSTOMA Br. & Schp., Bryol. Eur. 3(11) M:9, tab. 306 (1841). Moist, gravelly ground, Soda Springs on Upper Tuolumne at 9700 ft., *Bolander 109,* acc. Lesq. (1868) and later American manuals. Europe-North America.

FUNARIA MUHLENBERGII Turn., Ann. Bot. (Konig & Sims) 2:198 (1806). Frequent in Central and Southern California. Grout (1928-40) also listed var. *patula* Br. & Schp. and var. *lineata* Grout from California. Circumboreal.

**PHYSCOMITRELLA PATENS (Hedw.) Schp., Bryol. Eur. 4(12) M:1, tab. 3, 637 (1849). On mud around pond, Mountain View Cemetery, Oakland, Alameda Co., *Gardner* (UCB 197837, 524820, det. Britton); abundant in shade of cat-tails on mud flats of Lake Chabot, Solano Co., *Koch 1320.* Circumboreal.

PHYSCOMITRIUM MEGALOCARPUM Kindb., Torr. Bot. Club Bull. 16:94 (1889), and var. CALIFORNICUM (Britt.) Grout. Frequent in Northern and Central California. I cannot segregate the California plants into the two entities indicated. Western Boreal America.

EXCLUDED SPECIES

PHYSCOMITRIUM PYRIFORME (Hedw.) Brid. was supposedly collected in Marin Co., *Bolander,* acc. Lesq. (1868), but was excluded from our flora by Britton (1894b).

PHYSCOMITRIUM TURBINATUM (Mx.) Brid. is recorded from Shasta Co. and Mendocino Co. in Howe (1897). Britton (1894b) placed a question mark after California in her remarks about the range of the species, while Grout (1928-40) included the state without qualification but failed to cite any specimens. Several collections that I have seen labelled *P. turbinatum* are not that species.

SPLACHNACEAE

?TAYLORIA SERRATA (Hedw.) Br. & Schp., Bryol. Eur. 3(23-24) M:6, tab. 284 (1844). In California acc. Paris (1905) and Sayre (1935). Arctic-montane.

EXCLUDED SPECIES

SPLACHNUM MELANOCAULON Schwaegr. was mentioned by Lesq. (1868) as having been reported from California by Mitten, but I was not able to confirm the statement.

BRYACEAE

**ANOMOBRYUM FILIFORME (Dicks.) Husn., Musc. Gall. 222 (1888). Yosemite Falls, Mariposa Co., *Koch 1685.* Bipolar-montane.

BRYUM ALPINUM With., Syst. Arr. Brit. Pl. 3:824 (1801). In California acc. Andrews (1935-40); Big Tree Canyon, Valley of the Kaweah River, *Coville 1358,* acc. Holzinger (Coville, 1893). Bipolar-montane.

BRYUM ANGUSTIRETE Kindb., Torr. Bot. Club Bull. 16:94 (1889). *Bryum*

pendulum (Hornsch.) Schp., not Brid., 1803, *Breutelia;* MFNA 2:216. Castle Peak at 9000 ft., Nevada Co., *Bolander & Kellogg 356;* Leevining Grade at 8600 ft., Mono Co., *Hall 504;* San Bernardino Co., *Howell* (LFK H36). Circumboreal.

BRYUM ARGENTEUM Hedw., Sp. Musc. 181 (1801). Everywhere, either as the species or var. *lanatum* (Pal.-Beauv.) Br. & Schp. Cosmopolitan.

BRYUM BICOLOR Dicks., Plant. Crypt. Brit. 4:16 (1801). Widespread but most frequent in the Bay area. Circumboreal.

BRYUM CAESPITICIUM Hedw., Sp. Musc. 180 (1801). Northern California and the Sierras. Cosmopolitan.

BRYUM CANARIENSE Brid., Musco. Recent. Suppl. 3:29 (1817). Credited to California by Andrews (1935-40), on the basis of plants described by Renauld & Cardot as *B. Hendersoni.* Widely distributed in California but most common in the Bay area. Europe-North America, South Africa.

BRYUM CAPILLARE Hedw., Sp. Musc. 182 (1801). Abundant everywhere in a multitude of forms; several European species are relegated to synonymy under this name by Andrews (1935-40). Cosmopolitan.

BRYUM CRASSIRAMEUM Ren. & Card., Bot. Gaz. 15:57 (1890). Frequent in Northern and Central California.

BRYUM FLAGELLOSUM Kindb., Sp. Eur. Northam. Bryin. 2:356 (1897). *Bryum cuspidatum* (Br. & Schp.) Schp., not Brid., 1819, *Mnium;* MFNA 2:229. Seven collections distributed throughout the Sierras. Circumboreal, south to Guatemala (Bartram, 1949).

BRYUM GEMMIPARUM de Not., Epil. Briol. Ital. 377 (1869). Beside rivulet in upland meadow, Russ and Graham's Ranch, Humboldt Co., *Howe 1093* (EGB); on moist banks of Pipe Creek, Hemet Valley, San Jacinto Mts., at 5200 ft., Riverside Co., *Munz 5802* (det. Andrews). Europe-North America.

BRYUM LONCHOCAULON C. Muell., Flora 58:93 (1875). *Bryum cirratum* Hoppe & Hornsch., not With., 1801, *Dicranoweissia;* MFNA 2:228. Northern California and the Sierras. Circumboreal.

BRYUM MINIATUM Lesq., Cal. Acad. Sci. Mem. 1:23 (1868). Frequent on wet rocks in Central California inland to Sierra Co., *Leiberg 5449,* and Sequoia Nat. Park, Tulare Co., *Degener & Peiler 16999* (EGB). Pacific Coast and Faroe Ids.

*BRYUM PALLESCENS Schwaegr., Sp. Musc. Suppl. 1(2):107 (1816). In the Sierras. Arctic-montane.

BRYUM PSEUDOTRIQUETRUM (Hedw.) Schwaegr., Sp. Musc. Suppl. 1(2):110 (1816). *Bryum bimum* Schreb.; MFNA 2:231. Occasional in Northern California and the Sierras. Bipolar-montane.

BRYUM STENOTRICHUM K. Muell., Flora 70:219 (1887). *Bryum inclinatum* (Web. & Mohr) Sturm, not With., 1801, *Distichium;* MFNA 2:217. Mt. Dana, *Bolander 103* (UCB 371610 as *B. arcticum),* det. Andrews; on rocks at Clarks, Yosemite Valley, *Bolander,* acc. Lesq. (1868). Bipolar-montane.

BRYUM TURBINATUM (Hedw.) Smith, Fl. Brit. 3:1366 (1804). Wet meadows, Big Trees, *Bolander* (Lesq., 1868); edge of stream, Deep Creek, Sweetwater Mts. at 10,200 ft., Mono Co., *Alexander* (UCB 719377 as *B. Muehlenbeckii).* Bipolar-montane.

*Bryum uliginosum (Brid.) Br. & Schp., Bryol. Eur. 4(6-9) M:18, tab. 339 (1839). Mt. Diablo, Contra Costa Co., *Gibbons,* acc. Lesq. & James (1884); San Mateo Co., *Eastwood 101* (CAS). Circumboreal.

?Bryum Weigelii Spreng., Flora Hal., Mant. Prima 55 (1807). Eureka, Humboldt Co., *Bolander,* acc. Lesq. (1868); not confirmed by Andrews (1935-40). This station seems unlikely for a truly montane species. Arctic-montane.

Epipterygium Tozeri (Grev.) Lindb., Svenska Vet.-Akad. Stockh., Oefv. 21:576 (1865). *Pohlia Tozeri* (Grev.) Del.; MFNA 2:204. Coast Ranges, south to Monterey Co., *Heller 6532,* and inland to Placer Co., *MacFadden 9647* (UCLA). Europe-North America.

Leptobryum pyriforme (Hedw.) Schp., Coroll. Bryol. Eur. 64 (1855). Throughout Northern California and the Sierras. Cosmopolitan.

Mniobryum Wahlenbergii (Web. & Mohr) Jenn., Man. Mosses W. Pa. 146 (1913). *Pohlia Wahlenbergii* (Web. & Mohr) Andrews; MFNA 2:203. Sporadic in Northern and Central California. Cosmopolitan.

Orthodontium gracile Schwaegr. in Hook. & Wils., Lond. Journ. Bot. 3:545 (1844). Redwoods, from Humboldt Co., *Howe 936* in part, to Santa Cruz. Co., *Koch 2072.* Cf. Howe (1897); Andrews (1932); Koch (1949). Mostly associated with *Orthodicranum strictum* at the base of redwood trunks. Europe-North America.

Orthodontium pellucens (Hook.) Br. & Schp., Bryol. Eur. 4(23-24) M:3 (1844). Near Eureka, Humboldt Co., *Howe 936* in part (Howe, 1897). In the Americas from Ecuador north to Central America, West Indies, and Tennessee (Sharp, 1938); in Hawaiian Ids. acc. Bartram (1938).

*Pohlia acuminata Hoppe & Hornsch., Flora 2:94 (1819). Mt. Dana, *Bolander* (Lesq., 1868, as *Bryum polymorphum).* The collection labelled: "On wet rocks, Summit Station," *Bolander 347, 367* (EGB, det. *Pohlia polymorpha* by Andrews) is presumably the one cited above. Circumboreal.

Pohlia annotina (Hedw.) Lindb., Musci Scand. 18 (1879). Frequent in Northern California and the Sierras. Circumboreal.

Pohlia cruda (Hedw.) Lindb., Musc. Scand. 18 (1879). Throughout the High Sierras. Cosmopolitan.

Pohlia Drummondii (C. Muell.) Andrews in Grout, Moss Fl. No. Am. 2:196 (1935). Mt. Dana at 11,000 ft., *Bolander,* acc. Lesq. (1868) as *Bryum nudicaule;* Mt. Shasta, Siskiyou Co., *Cooke 15751C; 15756A;* Inyo Co., *Howell* (Koch, H32), *Eloesser* (Cobb 59). Arctic-montane.

Pohlia longibracteata Broth. in Roell, Bot. Centralbl. 44:419 (1890). In northern California acc. Andrews (1935-40); San Mateo Co., *Koch 2088;* Santa Cruz Co., *Koch 2033.* Pacific Coast.

Pohlia Ludwigii (Schwaegr.) Broth., Finska Vet.-Akad. Hels. Acta 19(12,1893):27 (1892). Banks of stream above Sonora, Tuolumne Co., *Bigelow* (Sull., 1856 as *Bryum Bigelovii);* Mt. Dana at 9,000-10,000 ft., *Bolander* acc. Lesq. (1868). Arctic-montane.

Pohlia nutans (Hedw.) Lindb., Musc. Scand. 18 (1879). Throughout the Sierras. Cosmopolitan.

Pohlia obtusifolia[8] (Brid.) L. F. Koch, comb. nov. *Bryum obtusifolium* Brid., Musco. Recent. 2(3):52 (1803); *Bryum cucullatum* Schwaegr. (1816); MFNA 2:195. Mt. Dana, *Bolander,* acc. Lesq. (1868); Mt. Dana, *Hall 65,* acc. Andrews (1935-40). Arctic-montane.

ROELLIA LUCIDA (Broth.) Kindb., Sp. Eur. Northam. Bryin. 345 (1897). *Bryum Sandbergii* Holz.; MFNA 2:240. "Summit, 7500 ft., Cataract" (Nevada Co.?) *Bolander & Kellogg 339* (EGB); abundant in vicinity of Echo Lake at 7000-8000 ft., Eldorado Co., *Conard* (HSC, "on stony ground under pines"). Pacific Coast.

EXCLUDED SPECIES

BRYUM ARCTICUM Br. & Schp. reported from Mt. Dana, *Bolander,* by Lesq. (1868). Andrews (pers. comm.) identified one of Bolander's collections, labelled *B. arcticum,* from Mt. Dana (UCB 371610) as *B. inclinatum.* I presume it was part of the original collection studied by Lesq.

BRYUM BOLANDERI Lesq. was excluded by Andrews (1935-40) because the type specimen was considered to be inadequate for identification.

BRYUM CALOPHYLLUM R.Br., an arctic species, is not likely to be found in or near Santa Barbara, where it was supposed to have been collected by Foster (Watson, 1880).

BRYUM FIRMUM Schreb., listed by Cooke (1941) from Mt. Shasta, Siskiyou Co., should have been *Bryum bimum* acc. to the specimen label (UMAA).

BRYUM INTERMEDIUM Brid. was excluded from the moss flora of North America by Andrews (1935-40).

BRYUM TRUNCORUM Brid. was listed by Cooke (1941) from Mt. Shasta, Siskiyou Co. I think the specimen (UMAA) is *B. canariense.*

BRYUM WARNEUM Brid. was reported by Lesq. (1868) from Mt. Dana, *Bolander,* but Andrews (pers. comm.) has not seen the species from California.

RHODOBRYUM ROSEUM (Br. & Schp.) Limpr. was reported from California by Lesq. & James (1884), but I imagine the specimen was either *Roellia lucida* or *Bryum canariense;* both species having been mistaken repeatedly for *Rhodobryum* in the past.

MNIACEAE

Leucolepis Menziesii (Hook.) Steere, comb. nov. *Bryum Menziesii* Hook., Bot. Misc. 1:36 (1828); *Hypnum acanthoneuron* Schwaegr., Sp. Musc. Suppl. 3(2), tab. 258b (1829); *Mnium Menziesii* (Hook.) C.Muell.; MFNA 2:245. Frequent in Northern California, south to San Mateo Co. (Howe, 1897), and Santa Clara Co., *Geis 600* (DS), and inland to Mt. Oro district, Nevada Co., *MacFadden 8876* (UCLA). Also from Santa Cruz Co., *Wiesendanger* (CAS 215879). Pacific Coast.

?MNIUM AFFINE Bland. in Schwaegr., Sp. Musc. Suppl. 1(2):134 (1816). In California acc. Lesq. (1868) and later American manuals. Watson (1880) reported var. *elatum* Schp. and Paris (1905) reported var. *ciliare* (Grev.) C.Muell. I have not yet seen a correctly named specimen; usually specimens so named have been *M. medium.* Bipolar-montane.

MNIUM CUSPIDATUM Hedw., Sp. Musc. 192 (1801). Streambank near Sis-

[8]Lack of space requires the omission here of the reasons for the change of name.

son, Siskiyou Co., *Howe* (EGB as *M. Drummondii,* det. Kaiser), acc. Andrews (pers. comm.). Circumboreal.

MNIUM GLABRESCENS Kindb., Ottawa Nat. 7:18 (1893). Frequent in Northern California south to Alameda Co., *Gibbons 155* (EGB). North Pacific Basin.

MNIUM INSIGNE Mitt., Journ. Bot. Kew Misc. 8:230 (1856). Frequent in Northern California south to the Bay area. Pacific Coast.

MNIUM LONGIROSTRUM Brid., Musco. Recent. 2(3):106 (1803). Little Truckee River, from Hobart Mills on old road to Reno, Sierra Co., *MacFadden 9598* (UCLA). "The species is cosmopolitan or nearly so . . ." acc. Andrews (1935-40).

**MNIUM MARGINATUM (With.) Brid. in Pal.-Beauv., Prodr. Aeth. 75 (1805). Frequent in the high Sierras as far south as Inyo and Tulare Cos. Arctic-montane, south to Guatemala (Bartram, 1949) and possibly in Hawaiian Ids. acc. Bartram (1933).

MNIUM MEDIUM Br. & Schp., Bryol. Eur. 4(5) M:32, tab. 398 (1838). Frequent in Northern California. Circumboreal.

MNIUM PUNCTATUM Hedw., Sp. Musc. 193 (1801). Sommerdale, Mariposa Co., *Byxbee 70* (Howe, 1897); the report from Humboldt Co., *Bolander,* by Lesq. (1868) was probably a misidentification of *M. glabrescens.* Circumboreal.

MNIUM VENUSTUM Mitt., Journ. Bot. Kew Misc. 8:231 (1856). Frequent in northern half of the state. Pacific Coast.

AULACOMNIACEAE

*AULACOMNIUM ANDROGYNUM (Hedw.) Schwaegr., Sp. Musc. Suppl. 3(1)1, tab. 215 (1827). Abundant in wooded areas in Northern California, south to Wilson Peak, Los Angeles Co., *McClatchie 404;* Riverside Co., *Fawcett* (HSC). Europe-North America.

AULACOMNIUM PALUSTRE (Hedw.) Schwaegr., Sp. Musc. Suppl. 3(1)1, tab. 216 (1827). Frequent in the Sierras, south to the San Bernardino Mts. at 8200 ft., *Reed 1934B* (HSC); sporadic in the Coast Ranges, south to Pitkin Marsh, near Santa Rosa, Sonoma Co., *Koch 267.* Bipolar-montane.

MEESIACEAE

MEESIA TRIQUETRA (Turn.) Br. & Schp., Bryol. Eur. 4(10) M:7, tab. 310 (1841). Swamps at 9000 ft., *Bolander* (EGB), acc. Lesq. (1868); in bogs, Sisson, Siskiyou Co., *Howe* (Howe, 1896); near Mt. Goddard, *Brewer* (CAS); near Lake Tahoe, *Blasdale* (EGB). Bipolar-montane.

MEESIA ULIGINOSA Hedw., Sp. Musc. 173 (1801). The same distribution in California as the last. Arctic-montane.

BARTRAMIACEAE

ANACOLIA MENZIESII (Turn.) Paris, Index Bryol. 1:27 (1894). Throughout California except at high altitudes. Includes var. *Baueri* (Hampe) Paris. Pacific Coast.

BARTRAMIA ITHYPHYLLA Brid., Musco. Recent. 2(3):132 (1803). Frequent in the high Sierras. Bipolar-montane.

BARTRAMIA STRICTA Brid., Musco. Recent. 2(3):132 (1803). Throughout California at lower altitudes, but most common in the Bay area. Europe-North America.

PHILONOTIS AMERICANA Dism., Soc. Bot. Fr. Mem. 11(17):22 (1910). Occasional in the Sierras. Boreal America.

**PHILONOTIS CALCAREA (Br. & Schp.) Schp. forma OCCIDENTALIS Flowers in Grout, Moss Fl. No. Am. 2:179 (1935). Upper Cascade Creek, Alpine Co., *Koch 1805* (det. Flowers). Also from Texas (type). The species, Circumboreal.

*PHILONOTIS CAPILLARIS Lindb., Hedwigia 70:40 (1867). On moist bank, near Lake San Andreas, San Mateo Co. (Howe, 1896); Lake Lagunitas, Marin Co., *Eastwood 104* (CAS); Santa Cruz Co., *Koch 2055*. Europe-North America.

PHILONOTIS FONTANA (Hedw.) Brid., Bryol. Univ. 2:18 (1827). Frequent throughout Northern and Central California; var. *pumila* (Turn.) Brid. in the high Sierra. The species, Circumboreal.

EXCLUDED SPECIES

PHILONOTIS MARCHICA (Willd.) Brid. In California acc. Paris (1904), but the report is unsubstantiated.

TIMMIACEAE

?TIMMIA MEGAPOLITANA Hedw., Sp. Musc. 176 (1801). In California acc. Sayre (1935a), apparently on the basis of a specimen (EGB), labelled Sierra Nevada, California, *H. A. Warne,* 1874. Considering the large size of the moss, and that it has not been found in California by anyone else, I suspect that Warne found his specimen of *Timmia* somewhere en route to California from Illinois, probably in the Rocky Mts. Circumboreal.

PTYCHOMITRIACEAE

PTYCHOMITRIUM GARDNERI Lesq., Cal. Acad. Sci. Mem. 1:16 (1868). Occasional in Northern California, south to Alameda Co., *Howe* (EGB), and Placer Co., *Bolander* (type), *MacFadden* (Grout exs. No. 281). Pacific Coast.

ORTHOTRICHACEAE

AMPHIDIUM CALIFORNICUM (Hampe) Broth., Musci in E. & P., Nat. Pfl. 1(3)1:460 (1902). In the Coast Ranges, south to Los Angeles Co., *McClatchie, Moxley 1151,* inland to Eldorado, Placer, Plumas, and Tuolumne counties. Pacific Coast.

AMPHIDIUM LAPPONICUM (Hedw.) Schp., Coroll. Bryol. Eur. 39 (1855). Seven collections from the Sierras, south to Mitre Basin and Lower Soldier Lake, Tulare Co., *Howell* (LFK H154a, H172c). Arctic-montane.

ORTHOTRICHUM AFFINE Brid., Musco. Recent. 2(2):22 (1801). Siskiyou Co., *Ownbey 1898, Howe 128;* Nevada Co., *MacFadden 8944*. Circumboreal.

ORTHOTRICHUM ALPESTRE Hornsch. in B.S.G., Bryol. Eur. 3(42) M. Suppl. 1:1, tab. 213 (1849). Mt. Whitney, Inyo Co., acc. Grout (1946). Arctic-montane.

ORTHOTRICHUM BOLANDERI Sull., Icon. Musc. Suppl. 64 (1874). Central

and Southern California; Oakland hills, Alameda Co., *Bolander* (type). California only.

ORTHOTRICHUM CONSIMILE Mitt., Linn. Soc. Lond. Journ. Bot. 8(1864):24 (1865). Along the coast in Northern California, south to Marin Co., *Howe 74, 81, 82* (EGB); also Santa Cruz Mts., *Pringle 104* in part (EGB), and Los Angeles Co., *Moxley 1139*, acc. Moxley (1928). Pacific Coast.

*ORTHOTRICHUM CUPULATUM Brid., Musco. Recent. 2(2):25 (1801). On metamorphic limestone rocks near the Russian River, Ukiah, Mendocino Co., *Bolander*, acc. Lesq. (1868). A small specimen (UCB 371551), labelled "Ukiah Hot Springs," could be this species but more material is desirable to render determination satisfactory. Circumboreal.

ORTHOTRICHUM LAEVIGATUM Zett., Soc. Bot. Fr. Bull. 9:287 (1862). Frequent in Northern California and in the Sierras, south to the San Bernardino Mts., *Parish 3427* (EGB). Var. KINGIANUM (Lesq.) Grout from Yosemite Nat. Park, *Bolander* (type). Europe-North America.

ORTHOTRICHUM LYELLII Hook. & Tayl., Musco. Brit. 76 (1818). Common in wooded regions to about 4000 ft. I found a number of sterile specimens with gemmae. Grout (1946) segregated the non-gemmiparous forms into var. *papillosum* (Hampe) Lesq. & James and forma *Pringlei* (C. Muell.) Grout. Circumboreal.

ORTHOTRICHUM RIVULARE Smith, Fl. Brit. 3:1266 (1804). Frequent, on exposed roots and tree trunks near water, as far south as Santa Clara Co., *Bradshaw 3265*. Europe-North America.

ORTHOTRICHUM ROELLII Vent. in Roell, Bot. Centralbl. 44:390 (1890). California acc. Grout (1946). Pacific Coast.

ORTHOTRICHUM RUPESTRE (Brid.) Schwaegr., Sp. Musc. Suppl. 1(2):27 (1816). Frequent in the Sierras and sporadic in the Coast Ranges, south to Los Angeles Co., *Moxley 1167*. Grout (1946) listed var. *globosum* (Lesq.) Grout from Yosemite Valley, Mariposa Co., *Bolander* (type). Bipolar-montane.

?ORTHOTRICHUM SPECIOSUM Nees in Sturm, Deut. Fl., Crypt. 5(17):5 (1819). In California acc. to American manuals. Californian plants, so named, seem to me to be better referred to forms of *O. Lyellii*. Circumboreal.

ORTHOTRICHUM TENELLUM Bruch in Brid., Bryol. Univ. 1:787 (1826). Corticolous in wooded areas throughout the state at lower elevations. Var. **cylindrocarpum** (Lesq.) L. F. Koch, comb. nov. *O. cylindrocarpum* Lesq., Am. Phil. Soc. 13 (1869):17 (1865); MFNA 2:126. The Bay area south to Pasadena, Los Angeles Co., *Kingman 713* (EGB). The species, Europe-North America.

*ORTHOTRICHUM TEXANUM Sull., Musci Bor.-Am. No. 122 (1856). On shaded stones near Oakland, Alameda Co., *Bolander*, acc. Lesq. (1865); Napa Soda Springs, Napa Co., *Mann*, acc. Mueller (1887, as *O. bullatum);* on exposed, granite boulder at 3000 ft., North Fork, Madera Co., *Ikenberry* (Grout exs. No. 303); on rocks, Gray Eagle Valley, Plumas Co., *Leiberg 5471;* on rocks at 3000 ft., Moreno Dam, San Diego Co., *MacFadden 8061*. The "irregularly warty" peristome, supposedly separating this species from *O. rupestre*, seems poorly developed in Californian plants; more field work and study are essential. Western Boreal America.

*ULOTA PHYLLANTHA Brid., Musco. Recent. Suppl. 4:113 (1819). Eureka, Humboldt Co., *Howe 985* (Koch, 1949); Crescent City, Del Norte Co., *Eastwood 424* (CAS). Bipolar-montane.

EXCLUDED SPECIES

ORTHOTRICHUM ANOMALUM Hedw. *Degener & Peiler 17014a* from Sequoia Nat. Park, reported as this species by Wynne (1943), is *O. laevigatum*.

ORTHOTRICHUM MICROBLEPHARUM Schp. Grout (1946) cited four specimens, *Leiberg 5474, 5472, 5469, 5468,* from Nevada Co. as this species. I believe they are forms of *O. laevigatum*.

ORTHOTRICHUM PULCHELLUM Brunton, reported for California by Lesq. (1868) and Howe (1896), is *O. consimile*. Acc. Grout (1928-40), *O. consimile* and *O. pulchellum* were formerly not well understood.

ORTHOTRICHUM SHAWII Wils. Grout (1946) referred the Californian collection, *Bolander* (EGB), which Britton (1894a) and Barnes & Heald (1896) reported as this species, to *O. affine* and excluded *O. Shawii* from the North American flora.

FONTINALACEAE

FONTINALIS ANTIPYRETICA Hedw., Sp. Musc. 98 (1801). Frequent in lakes and streams, south to San Bernardino Mts., *Parish 3426*. Var. MOLLIS (C. Muell.) Welch at Auberry, Fresno Co., *Ikenberry*. The species, Circumboreal.

*FONTINALIS DURIAEI Schp., Syn., ed. 2, 555 (1876). On rocks, Merced River, *Bolander 79* in part. Circumboreal.

**FONTINALIS HOWELLII Ren. & Card., Bot. Gaz. 13:200 (1888). North of Sisson, *Howe;* Yosemite region, *Bioletti*. Europe-North America.

FONTINALIS NEO-MEXICANA Sull. & Lesq., Musci Bor.-Am. No. 224b (1856). Occasional in lakes and streams in Northern and Central California, south to Mariposa and Santa Cruz counties. Western Boreal America.

**FONTINALIS PATULA Card., Rev. Bryol. 23:67 (1896). California, *Bolander 68* in part (EGB). Pacific Coast.

EXCLUDED SPECIES

DICHELYMA SWARZII Lindb. Brewer's collection, which was distributed by Sull. & Lesq. (1865, No. 344) as this species, is *Drepanocladus exannulatus,* as reported by Watson (1880). Wynne (1944a) listed the name under "Excluded forms and varieties of *D. exannulatus.*"

CLIMACIACEAE

?CLIMACIUM DENDROIDES (Hedw.) Web. & Mohr, Nat. Reise Schweden 96 (1804). In California acc. Grout (1897) and later manuals. Circumboreal.

HEDWIGIACEAE

HEDWIGIA CILIATA (Hedw.) Pal.-Beauv., Ann. Bot. (Konig & Sims) 1:228 (1805). Occasional on rocks everywhere. Cosmopolitan.

PSEUDOBRAUNIA CALIFORNICA (Lesq.) Broth., Musci in E. & P., Nat. Pfl. 1(3)2:715 (1905). *Braunia californica* Lesq.; MFNA 2:43. Common to about 3000 ft., at least as far south as San Benito Co., *Howell;* also from San Diego Co., *MacFadden*. Pacific Coast.

CRYPHAEACEAE

ALSIA CALIFORNICA (Hook. & Arn.) Sull., Amer. Acad. Arts Sci. Trans. 3:185 (1857). Common on tree trunks in coastal counties as far south as Monterey Co., *Heller,* and Santa Catalina Id., *Nuttall 969* (Williams in Millsp. & Nutt., 1923). Also represented is var. *flagellifera* Ren. & Card. Pacific Coast.

DENDROALSIA ABIETINA (Hook.) Britt., Torr. Bot. Club Bull. 32:263 (1905). Common at base of tree trunks, and occasional on rocks in coastal counties as far south as Pasadena, Los Angeles Co., *McClatchie.* Pacific Coast, south to Guadalupe Id., Baja California, *Anthony.*

LEUCODONTACEAE

ANTITRICHIA CALIFORNICA Sull. in Lesq., Am. Phil. Soc. Trans. 13(1869):11 (1865). Common on rocks and tree trunks everywhere, except deserts and high elevations. Europe-North America.

ANTITRICHIA CURTIPENDULA (Hedw.) Brid., Musco. Recent. Suppl. 4:136 (1819), and var. GIGANTEA Sull. & Lesq. Nine collections from Northern California, south to Lake Pilarcitos, San Mateo Co., *Howe 315.* The Californian plants resemble the European ones more closely than does the form from the humid forests of the northern Pacific Coast. Bipolar-montane.

Bestia cristata (Hampe) L. F. Koch, comb. nov. *Leptohymenium cristatum* Hampe, Linnaea 30:459 (1860); *Bestia Breweriana* (Lesq.) Grout, MFNA 3:10. "In mont. Sierrae Nevadae Californicae, ad terram in fissuris rupium?" is the habitat given in the original description. (Type seen, EGB.) Common in the Coast Ranges as far south as Monterey Co., *Heller 6506.* Hampe's original analysis leaves no doubt that he was describing the species later named *Hypnum Brewerianum* by Lesq. (1865) rather than *Pterigynandrum filiforme.* The error of including Hampe's species of *Leptohymenium* under *Pterigynandrum* dates back to Lesq. (1865). Var. **Howei** (Kindb.) L. F. Koch, comb. nov. *Isothecium Howei* Kindb. Marin Co., *Howe* (type). Var. **lutescens** (Lesq. & James) L. F. Koch, comb. nov. *Hypnum Brewerianum* var. *lutescens* Lesq. & James. San Francisco, *Bolander* (type). The species, Pacific Coast.

BESTIA HOLZINGERI (Ren. & Card.) Broth., Musci in E. & P., Nat. Pfl. 1(3)2: 858 (1906). Nine collections, from Humboldt Co. to San Mateo Co., *Koch 2436.* Pacific Coast.

BESTIA LONGIPES (Sull. & Lesq.) Broth., Musc. in E. & P., Nat. Pfl. 1(3)2:859 (1906). Ten collections, from the Bay area south to Los Angeles Co., *McClatchie, Schallert C-3.* California and Oregon; probably Pacific Coast.

****BESTIA OCCIDENTALIS** (Sull. & Lesq.) Grout, Moss Fl. No. Am. 3:264 (1934). "Trees of Mystery" park, Del Norte Co., *L. A. Koch* (LFK 2328); on trees, Olema, Marin Co., *Howe* (EGB). Pacific Coast.

PTEROGONIUM GRACILE (Hedw.) Smith, Engl. Bot. tab. 1085 (1802). On rocks and tree trunks throughout California except at high altitudes. Europe-North America, South Africa.

NECKERACEAE

NECKERA DOUGLASII Hook., Bot. Misc. 1:131 (1828). Coastal counties of Northern California, south to the Bay area. Pacific Coast.

NECKERADELPHUS MENZIESII (Drumm.) Steere, The Bryol. 44:147 (1941). From the Bay area northward, inland to Yosemite Valley. Europe-North America.

POROTHAMNIUM BIGELOVII (Sull.) Fleisch. in Broth., Musci in E. & P., Nat. Pfl. (ed. 2) 11:199 (1925). Frequent in coastal counties as far south as Santa Cruz Co., *Koch 2025*. Pacific Coast.

EXCLUDED SPECIES

NECKERA PENNATA var. OLIGOCARPA (Bruch) Grout is listed in Paris (1905) as *N. oligocarpa* with California in its range. This report seems unlikely.

HOOKERIACEAE

HOOKERIA LUCENS (Hedw.) Smith, Linn. Soc. Lond. Trans. 9:276 (1808). Mt. Diablo, Contra Costa Co., *Bolander,* acc. Lesq. (1868, as *H. acutifolia);* beside rivulet in woods, Eureka, Humboldt Co., *Howe 1019;* on wet bank beside rill near Orick, Humboldt Co., *Sutliffe* (CAS); on bank of stream near waterline, North Fork of Little River, Mendocino Co., *Howe 682*. Circumboreal.

EXCLUDED SPECIES

HOOKERIA ACUTIFOLIA Hook. The report of this species by Lesq. (1868) was probably based on one of Bolander's collections of *H. lucens*.

FABRONIACEAE

FABRONIA PUSILLA Raddi, R. Accad. Sci. Fis. Siena, Atti 9:231 (1808). Frequent in wooded areas, south to Los Angeles Co., *MacFadden 8138, Palmer* (EGB). Europe-North America.

LESKEACEAE

PSEUDOLESKEA ATROVIRENS (Brid.) Br. & Schp., Bryol. Eur. 5(49-51) M:2, tab. 477 (1852). Six collections from the high Sierras, south to Sequoia Nat. Park, Tulare Co., *Degener 16937, 16975b*. Arctic-montane.

PSEUDOLESKEA RIGESCENS Lindb.,[9] Finska Vet.-Soc., Hels., Acta 10(1875):75 (1872). Mt. Shasta, *Howe 115, Cooke 15616A;* Howe's collection is the type of var. *Howei* Best. Pacific Coast.

PTERIGYNANDRUM FILIFORME Hedw., Sp. Musc. 81 (1801). Seven collections from Northern California, south to San Francisco, *Bigelow* (Sull., 1856). Circumboreal.

EXCLUDED SPECIES

LESKEA OBSCURA Hedw. is an eastern North American species acc. Sharp (1934), and its presence in California as indicated by Paris (1905) seems unlikely.

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[9]Although this name is established in bryological literature because of its acceptance by Best (1900), there is some question of its validity according to the International Rules.

THUIDIACEAE

CLAOPODIUM BOLANDERI Best, Torr. Bot. Club Bull. 24:431 (1897). Marin Co., *Bolander* (type); Siskiyou Co., *Eastwood 191, 199, 207* (CAS); Humboldt Co., *Tracy 14807a* (UCB). North Pacific Basin.

CLAOPODIUM CRISPIFOLIUM (Hook.) Ren. & Card., Rev. Bryol. 20:16 (1893). Eight collections from Northern California, south to San Mateo Co., *Howe*. Pacific Coast.

CLAOPODIUM WHIPPLEANUM (Sull.) Ren. & Card., Rev. Bryol. 20:16 (1893), and var. LEUCONEURUM (Sull. & Lesq.) Grout. Common everywhere on shaded banks to about 5000 ft. Europe-North America.

*HAPLOCLADIUM MICROPHYLLUM (Hedw.) Broth., Musci in E. & P., Nat. Pfl. 1(3)2:1007 (1907). *Thuidium microphyllum* (Hedw.) Best; MFNA 3:177. Near Los Angeles, *Bigelow* (Sull., 1856 as *Hypnum calyptratum);* Santa Catalina Id. acc. Sayre (1940). I have not seen either specimen. Circumboreal, south to Guatemala (Bartram, 1949).

**HETEROCLADIUM HETEROPTEROIDES Best, Torr. Bot. Club Bull. 28:128 (1901). On stump in open, Eureka, Humboldt Co., *Howe 908* (EGB); streambank, North Fork Little River, Mendocino Co., *Howe 634, 638a* (EGB); on shaded rock, Russian Gulch, Mendocino Co., *Howe 716* (EGB). Pacific Coast.

AMBLYSTEGIACEAE

*AMBLYSTEGIUM COMPACTUM (C. Muell.) Aust., Musci Appal. 372 (1870). Grout (1928-40) said this species had not yet been reported from California, but Lesq. (1868), Watson (1880), Howe (1896), Cheney (1897), and Paris (1903) mentioned California in its range. The specimens, on which these reports are based, do not compare perfectly with the type, but I have no better name to offer. Big Tree Grove, *Bolander,* and Shasta Springs, Siskiyou Co., *Howe*. Europe-North America. South America (?) acc. Watson (1880).

**AMBLYSTEGIUM JURATZKANUM Schp., Syn. 693 (1860). Grout (1928-40) gave the range of this moss in such general terms that one cannot be sure whether California was included or not. The following specimens seem best placed here, although not with complete satisfaction: above spring at base of Mt. Shasta, Siskiyou Co., *Howe;* Death Valley, Inyo Co., *Haring;* Chilao, Los Angeles Co., *Habeeb 1297;* Lytle Creek, 3000 ft., San Bernardino Co., *Fawcett* (AJG). Circumboreal, south to Guatemala (Bartram, 1949).

AMBLYSTEGIUM SERPENS (Hedw.) Schp., Bryol. Eur. 6 (55-56) M:9, tab. 564 (1853). Sporadic but widely distributed. Cosmopolitan.

AMBLYSTEGIUM VARIUM (Hedw.) Lindb., Musci Scand. 32 (1879). Lassen Co., *Baker & Nutting 154;* Stanislaus Co., *Koch 1457;* San Bernardino Co., *Parish 4277;* Los Angeles Co., *Habeeb 1375;* Ventura Co., *Newton;* Riverside Co., *Fosberg F272*. Circumboreal, south to Guatemala (Bartram, 1949).

*CALLIERGON STRAMINEUM (Brid.) Kindb., Sp. Eur. Northam. Bryin. 81 (1897). Plumas Co., *Austin* (Koch, 1949); also as admixture in *Sphagnum* from Tulare Co., *Brewer 2794* (CAS). In Bolivia acc. Herzog (1916). Bipolar-montane.

CAMPYLIUM POLYGAMUM (Schp.) Bryhn var. FLUITANS Grout, Moss Fl. No. Am. 3:84 (1931). Floating in ponds, Gray Eagle Valley, Plumas Co. at 6500 ft., *Leiberg 5495* (EGB, type). The species, Bipolar-montane.

*CRATONEURON FILICINUM (Hedw.) Roth, Hedwigia 38 (Beibl.):6 (1899). Probably frequent in the Sierras (Koch, 1949). Bipolar-montane.

DREPANOCLADUS ADUNCUS (Hedw.) Warnst., Bot. Centralbl., Beih. 13:400 (1903). Wynne (1944) listed var. *Kneifii* (Schp.) Moenk. and var. *capillifolius* (Warnst.) Wynne from California. As one form or another, frequent in lakes, streams, and swamps throughout Northern California and the Sierras. Bipolar-montane.

DREPANOCLADUS EXANNULATUS (Guemb.) Warnst., Bot. Centralbl., Beih. 13:405 (1903). Swamps near Mendocino, *Bolander,* acc. Wynne (1944); North Fork Little River, Mendocino Co., *Howe;* cold stream near Camp 168, Sierras, *Brewer 2800* (probably Tulare Co.); H. M. Hall Natural Area, Mono Co., *Catcheside.* Var. ROTAE (de Not.) Grout, near Eureka, Humboldt Co., *Howe,* acc. Wynne (1944). Bipolar-montane.

**DREPANOCLADUS FLUITANS (Hedw.) Warnst., Bot. Centralbl., Beih. 13: 404 (1903). Humboldt and Mendocino counties, *Howe;* Ward Creek, Placer Co., *Koch 1952* (det. Wynne-Hillier); Primrose Lake and Mitre Basin, Tulare Co., *Howell* (LFK H149, H157). Bipolar-montane.

DREPANOCLADUS UNCINATUS (Hedw.) Warnst., Bot. Centralbl., Beih. 13:417 (1903). Common in the Sierras; var. *symmetricus* (Ren. & Card.) Grout is also represented. Bipolar-montane.

HYGROAMBLYSTEGIUM TENAX (Hedw.) Jenn., Man. Mosess W. Pa. 277 (1913). *H. irriguum;* MFNA 3:72. In the Sierras. Circumboreal.

HYGROHYPNUM BESTII (Ren. & Bryhn) Broth., Musci in E. & P., Nat. Pfl. 1(3)2:1040 (1908). Mt. Shasta, Siskiyou Co., *Cooke 15615B* (UMAA); Yosemite Nat. Park, Mariposa Co., *Webber 60* (CAS); Rock Creek, Tulare Co., *Howell* (LFK H146). Pacific Coast.

**HYGROHYPNUM DILATATUM (Schp.) Loeske, Moosfl. Harz. 320 (1903). Mossbrae Falls, Shasta Springs, Siskiyou Co., *Howe 132;* Panther Creek, Mt. Shasta, Siskiyou Co., *Cooke 25646;* near Echo Lake, Eldorado Co., *Conard* (HSC). Circumboreal.

**HYGROHYPNUM LURIDUM[10] (Hedw.) Jenn., Man. Mosses W. Pa. 287 (1913). Water courses near Summit (Nevada Co.?), *Kellogg 350* (EGB); above Primrose Lake, Tulare Co., *Howell* (LFK H159). Circumboreal.

**HYGROHYPNUM MOLLE (Hedw.) Loeske, Moosfl. Harz. 320 (1903). San Bernardino Co., *Parish 3884;* Mono Co., *Catcheside 47138;* Plumas Co., *Koch 1880.* Arctic-montane.

*HYGROHYPNUM OCHRACEUM (Wils.) Loeske, Moosfl. Harz. 321 (1903). Six collections from the Sierras, south to Tulare Co. Circumboreal.

HYGROHYPNUM SMITHII (Lilj.) Broth., Musci in E. & P., Nat. Pfl. 1 (3)2: 1039 (1908). Mt. Dana, *Bolander,* acc. Lesq., 1868; Long Lake, Tulare Co., *Howell* (CAS); H. M. Hall Natural Area, Mono Co., *Catcheside 4788.* Arctic-montane.

LEPTODICTYUM RIPARIUM (Hedw.) Warnst., Laubm., Krypt.-fl. Mark. Brand.

[10]Previous report of this species (Howe, 1897) was based on a specimen of *H. dilatatum.*

2:878 (1906). Occasional, from Modoc Co., *Grant 8325, 8250,* to Monterey Co., *Linsdale.* Bipolar-montane.

LEPTODICTYUM TRICHOPODIUM (Schultz) Warnst., Laubm., Krypt.-fl. Mark. Brand. 2:881 (1906). Common in the Sierras. Perhaps the California plant should be referred to var. *Kochii* (Br. & Schp.) Broth. Bipolar-montane.

EXCLUDED SPECIES

CRATONEURON COMMUTATUM (Hedw.) Roth was reported from Mono Pass, *Bolander,* by Lesq. (1868). Bolander's collection (EGB) is *C. filicinum.*

DREPANOCLADUS SENDTNERI (Schp.) Warnst. *Hypnum Sendtneri* forma *vulgaris* Sanio, on wet adobe flats, Forestdale, Modoc Co., *Baker & Nutting* (Howe, 1896), is *Drepanocladus aduncus* acc. Wynne (1944). *Hypnum aduncum hamatum* Br. & Schp. from Whitney Meadows, *Coville 2166,* acc. Holzinger (Coville, 1893) is excluded here on the suggestion of Wynne (1944a) that *D. Sendtneri* should be excluded from the moss flora of North America.

HYGROAMBLYSTEGIUM ORTHOCLADUM (Pal.-Beauv.) Grout. At Little Lake Valley, *Bolander* (California ?) acc. Lesq. (1868) but this record is not substantiated by later workers.

HYPNUM PSEUDOARCTICUM Kindb. was reported by Howe (1897) from the San Bernardino Mts., *Parish.* The specimen seems best named *Hygrohypnum molle.*

BRACHYTHECIACEAE

BRACHYTHECIUM ALBICANS (Hedw.) Schp., Bryol. Eur. 6(52-54) M:19, tab. 553 (1853). Northern and Central California. Var. *occidentale* Ren. & Card. apparently includes most Californian plants. The species, Arctic-montane.

BRACHYTHECIUM ASPERRIMUM (Mitt.) Sull., Icon. Musco. Suppl. 100 (1874). Northern California and the Sierras. Western Boreal America. In Quebec acc. Lepage (1947).

BRACHYTHECIUM BOLANDERI (Lesq.) Jaeg. & Sauerb., St. Gall. Nat. Gesell. 1876-77:324 (1878). Central and Southern California. California only.

BRACHYTHECIUM COLLINUM Schp., Bryol. Eur. 6(52-54) M:5, tab. 548 (1853). Frequent in the high Sierras, at least as far south as Tulare Co., *Howell* (CAS). Circumboreal.

BRACHYTHECIUM ERYTHRORRHIZON Schp., Bryol. Eur. 6(52-54) M:14, tab. 547 (1853). Placer Co., *Morse* (LFK 2450); Madera Co., *Wagnon 1422.* Circumboreal.

*BRACHYTHECIUM LAMPROCHRYSEUM C. Muell. & Kindb. in Mac. & Kindb., Cat. Can. Pl. 6:199 (1892). Seemingly well represented in California acc. to the literature and specimens determined by Grout. All material I have seen has distinctly decurrent leaves. Var. *giganteum* Grout in the high Sierras. Pacific Coast.

**BRACHYTHECIUM PETROPHILUM Williams, N. Y. Bot. Gard. Bull. 2:136 (1901). Common in the Sierras. I am not certain this plant is identical with the type from Dawson, Yukon Territory. It is closely related, however, and does not seem to fit any of the other recognized specific entities in the North American flora. Perhaps it is related to the Washington plant referred to forma *lanceolata* Grout (Grout, 1928-40). Western Boreal America.

**BRACHYTHECIUM WASHINGTONIANUM Eaton in Grout, The Bryol. 3:12 (1900). On reservoir dam, Weaverville, Trinity Co., *Kleeberger H-17;* Mt. Shasta, Siskiyou Co., *Cooke 15704D;* 30 miles northeast of Eureka, Humboldt Co., *Ikenberry 1411.* Pacific Coast.

CAMPTOTHECIUM AENEUM (Mitt.) Jaeg. & Sauerb. var. DOLOSUM (Ren. & Card.) Grout, The Bryol. 31:43 (1928). Shasta Springs, Siskiyou Co., acc. Howe (1896); Santa Catalina Id., *Millspaugh 4548, Knopf 292, 407c,* acc. Williams (Millsp. & Nutt., 1923). Var. ROBUSTUM Grout, l. c., Shasta Springs, Siskiyou Co., *Howe* (type). The specimens referred here have a striking resemblance to *Homalothecium nevadense,* and differ only in their cernuous capsules. The species, Pacific Coast.

CAMPTOTHECIUM ALSIOIDES Kindb., Pittonia 2:243 (1892). On rocks, Mill Valley, Marin Co., *Howe* (4 collections). One of Bolander's collections, previously unrecognized, is at New York (EGB, as *Hypnum stoloniferum*). California only.

CAMPTOTHECIUM AMESIAE Ren. & Card., Bot. Gaz. 13:202 (1888). Near Auburn, Placer Co., *Ames* (type); Howe (1897) listed it from Mt. Diablo, Contra Costa Co., *Howe,* from near Sonoma, *Bioletti,* and from near Pasadena, *McClatchie.* A fine series of specimens from the Hastings Reservation, Monterey Co., *Linsdale,* are mentioned here because of their long capsules, but they do not compare well with a fragment of the type at New York (EGB). Pacific Coast.

CAMPTOTHECIUM ARENARIUM (Lesq.) Jaeg. & Sauerb., St. Gall. Nat. Gesell. 1876-77:315 (1878). Common in the Bay area on sandy soil under shrubs. Probably frequent along the coast to Santa Catalina Id., *Millspaugh 4548* in part, *Nuttall 1022,* acc. Williams (Millsp. & Nutt., 1923). Pacific Coast.

CAMPTOTHECIUM LUTESCENS (Hedw.) Schp. var. OCCIDENTALE Ren. & Card., Hedwigia 32:335 (1893). Five collections from Northern California. The species, Circumboreal.

CAMPTOTHECIUM MEGAPTILUM Sull., Icon. Musc. Suppl. 102 (1874). On shaded northern slopes of Hay Fork Mts., and on bank near Douglas City, Trinity Co., *Howe 1135, 1154;* on rocky ledge in shade, 6 miles west of Big Bar, Trinity Co., *Ikenberry 1486.* Cytological study may eventually substantiate the generic distinctness of this species. Pacific Coast.

CAMPTOTHECIUM PINNATIFIDUM (Sull. & Lesq.) Jaeg. & Sauerb., St. Gall. Nat. Gesell. 1876-77:317 (1878). Apparently common in the coastal counties of the state, but the striking variation in the plants referred here suggests that more than one species may be involved. Pacific Coast.

EURHYNCHIUM BRITTONIAE Grout, Torr. Bot. Club Bull. 25:248 (1898). Little River (Mendocino Co. ?), *Bolander 332* (type), *330* (EGB). Apparently not recollected. California only.

EURHYNCHIUM OREGANUM (Sull.) Jaeg. & Sauerb., St. Gall. Nat. Gesell. 1876-77:361 (1878). Common along the coast of Northern California, south to San Mateo Co., *Dudley* (DS). Pacific Coast.

*EURHYNCHIUM PULCHELLUM (Hedw.) Jenn., Man. Mosses W. Pa. 350 (1913). *E. strigosum* (Hoffm.) Br. & Schp.; MFNA 3:17. Calaveras Grove, *Bolander,* acc. Lesq. (1868); the species and var. *scabrisetum* Grout from Santa Catalina Id. acc. Sayre (1940). Not seen. The species, Circumboreal.

EURHYNCHIUM STOKESII (Smith) Schp., Bryol. Eur. 5(57-61) M:10, tab. 526 (1854). *E. praelongum* var. *Stokesii* (Turn.) Dixon; MFNA 3:21. Very common except at high altitudes. Var. CALIFORNICUM (Grout) Grout supposedly grows in drier habitats. Circumboreal.

**EURHYNCHIUM SUBSTRIGOSUM Kindb. in Mac. & Kindb., Cat. Can. Pl. 6:205 (1892). *E. fallax* (Ren. & Card.) Grout; MFNA 3:19. Mt. Shasta, *Cooke 15657E*. Pacific Coast.

HOMALOTHECIUM NEVADENSE (Lesq.) Ren. & Card., Bot. Gaz. 13:202 (1888). Variable, common on rocks in the Sierras. Var. SUBULATUM Ren. & Card., less common. Pacific Coast.

HOMALOTHECIUM NUTTALLII (Wils.) Grout, Moss Fl. No. Am. 3:60 (1928). Common, corticolous at low altitudes. Grout (1928-40) listed var. *hamatidens* (Kindb.) Grout and var. *tenue* (Kindb.) Grout. **H. Nuttallii** var. **stoloniferum** (Lesq.) L. F. Koch, comb. nov. *Hypnum Nuttallii* var. *stoloniferum* Lesq. (1868). The species, Pacific Coast.

PLATYHYPNIDIUM RIPARIOIDES (Hedw.) Dixon, Rev. Bryol. Lich. 6:111 (1934). *Eurhynchium rusciforme* (Neck.) Milde; MFNA 3:22. A few specimens, widely scattered. Circumboreal, south to Guatemala (Bartram, 1949).

PSEUDOISOTHECIUM STOLONIFERUM (Brid.) Grout, Moss Fl. No. Am. 3:12 (1928). *Hypnum stoloniferum* Hook., 1818, not Pal.-Beauv., 1805, *Anomodon minor*. Abundant in woods, Northern and Central California, seemingly grading into var. *myurellum* (Kindb.) Grout on rocks and soil in exposed habitats. Pacific Coast.

SCLEROPODIUM APOCLADUM (Mitt.) Grout, Torr. Bot. Club Bull. 26:535 (1899). Pasadena, Los Angeles Co., *Palmer* (Grout, 1899); Eaton Canyon near Pasadena, Los Angeles Co., *Kingman 729* (AJG); Mint Canyon, Los Angeles Co., *MacFadden 8035*. Pacific Coast.

SCLEROPODIUM CALIFORNICUM (Lesq.) Ren. & Card., Rev. Bryol. 20:20 (1893). Common in the Bay area, south to Santa Catalina Id., *Millspaugh 4593a* (Williams in Millsp. & Nutt., 1923). California only.

Scleropodium cespitans (C. Muell.) L. F. Koch, comb. nov. *Hypnum cespitans* C. Muell., Syn. Musc. 2:354 (1851); *Hypnum caespitosum* Wils., 1849, not Pal.-Beauv., 1805, *Sematophyllum;* MFNA 3:54. Common along the coast. Europe-North America.

SCLEROPODIUM COLPOPHYLLUM (Sull.) Grout, Torr. Bot. Club Bull. 26:538 (1899). Frequent in Northern California; extremely puzzling farther south and fully as variable as *Pseudoisothecium*. Pacific Coast.

SCLEROPODIUM OBTUSIFOLIUM (Drumm.) Kindb. in Mac. & Kindb., Cat. Can. Pl. 6:202 (1892). Frequent on boulders in or along streams and stream beds; several specimens very near the sea. Pacific Coast.

SCLEROPODIUM TOURRETII (Brid.) L. F. Koch, Rev. Bryol. Lich. 18:177 (1949). *S. illecebrum* (L.p.p.) Br. & Schp.; MFNA 3:51. Common except at high altitudes. Europe-North America.

EXCLUDED SPECIES

BRACHYTHECIUM OXYCLADON (Brid.) Jaeg. & Sauerb. Lesq. (1868) reported *Hypnum laetum* from the Yosemite Valley and Howe (1896) listed *B. laetum*

var. *fallax* from San Francisco. Howe's specimen is *Camptothecium arenarium.*

BRACHYTHECIUM POPULEUM (Hedw.) Br. & Schp. was first reported from the Sierra Nevada by Lesq. (1868). Watson (1880) and Rau & Hervey (1880) repeated this report but later workers failed to substantiate the record.

BRACHYTHECIUM REFLEXUM (Starke) Br. & Schp. was listed by Paris (1904) with California in its range.

BRACHYTHECIUM RIVULARE (Bruch) Br. & Schp. from Santa Anita Canyon, *Moxley 987,* acc. Moxley (1928) is probably *B. lamprochryseum.*

BRACHYTHECIUM VELUTINUM (Hedw.) Schp. was first reported from California by Grout (1897). I am referring the specimens he cited to *B. petrophilum.*

EURHYNCHIUM DIVERSIFOLIUM Br. & Schp. in Sequoia Nat. Park, *Degener 16972* (Wynne, 1943) is *Brachythecium petrophilum;* Paris' report (1905) is not substantiated.

RHYNCHOSTEGIUM ROYAE (Aust.) Ren. & Card. was doubtfully referred to *Eurhynchium praelongum* by Grout (1928-40); the type at New York (EGB) appeared to me to be a mixture of a juvenile *Eurhynchium* and a *Sclerodium.* The name should be rejected as such material can not be named satisfactorily.

RHYNCHOSTEGIUM SERRULATUM (Hedw.) Jaeg. & Sauerb. *Eurhynchium* in MFNA. The report from the valley of the Kaweah River by Holzinger (Coville, 1893) seems unlikely, but I have not seen the specimen.

TOMENTHYPNUM NITENS (Hedw.) Loeske. *Camptothecium* in MFNA. A specimen from Sequoia Nat. Park, *Degener & Peiler 16953b* (EGB) reported by Wynne (1943) is a sterile *Brachythecium.*

PLAGIOTHECIACEAE

ISOPTERYGIUM ELEGANS (Brid.) Lindb., Soc. F. Fl. Fenn. Not. 13:416 (1874). *Hypnum elegans* Hook., not Brid. or Pal.-Beauv.; MFNA 3:163. Schaefer Road (San Luis Obispo Co. ?), *Allen;* Big Tree Park, Del Norte Co., *L. A. Koch* (LFK 2319); Mt. Tamalpais, Marin Co., *Koch 2263.* Bipolar-montane.

**ISOPTERYGIUM PULCHELLUM (Hedw.) Jaeg. & Sauerb., St. Gall. Nat. Ges. 1876-77:441 (1878). *Plagiothecium* in MFNA 3:162. Summit water courses, (Nevada Co.?), *Kellogg 352* (EGB); near Echo Lake, Eldorado Co., *Conard 47-434* (HSC); near lower Soldier Lake, Tulare Co., *Howell* (LFK H154). Bipolar-montane.

PLAGIOTHECIUM DENTICULATUM (Hedw.) Schp., Bryol. Eur. 5(48) M:12, tab. 501 (1851). Northern California, south to Marin Co., *Howe.* Bipolar-montane.

PLAGIOTHECIUM UNDULATUM (Hedw.) Schp., Bryol. Eur. 5(48) M:17, tab. 506 (1851). Along the coast in Northern California. Europe-North America.

HYPNACEAE

HYPNUM CIRCINALE Hook., Musc. Exot. 2, tab. 107 (1820). Primarily in the Redwoods, south to Santa Cruz Co. North Pacific Basin.

HYPNUM CUPRESSIFORME Hedw., Sp. Musc. 291 (1801). Mt. Tamalpais,

Marin Co., *Bailey;* probably to be found throughout the Sierras. Cosmopolitan.

?HYPNUM IMPONENS Hedw., Sp. Musc. 291 (1801). In California acc. Grout (1928-40). Circumboreal.

?HYPNUM REVOLUTUM (Mitt.) Lindb., Hedwigia 7:108 (1868). In California acc. Grout (1928-40). Bipolar-montane.

HYPNUM SUBIMPONENS Lesq., Am. Phil. Soc. Trans. 13(1869):14 (1865). Northern California, south to the Bay area and Eldorado Co. Pacific Coast.

**TRIPTEROCLADIUM LEUCOCLADULUM (C. Muell.) Kindb., Sp. Eur. Northam. Bryin. 1:31 (1896). On rocks, canyon south of junction of Beaver Creek and West Fork, Siskiyou Co., *Ownbey 1897* (HSC). Pacific Coast.

*VESICULARIA AMPHIBOLA (Spruce) Broth., Musci in E. & P., Nat. Pfl. 1(3)2:1094 (1908). Golden Gate Park, San Francisco, *Bradshaw 2964* (EGB), *Wagner* (LFK 2364a). Cf. Koch, 1949. Tropical America.

EXCLUDED SPECIES

HYPNUM FERTILE Sendt. was reported by Lesq. (1868) from the Big Trees (Calaveras Grove), *Bolander*, but the record is not confirmed by later workers.

ENTODONTACEAE

**ENTODON BREVISETUS (Hook. & Wils.) Jaeg. & Sauerb., St. Gall. Nat. Gesell. 1876-77:291 (1878). Gravelly soil in canyon near Pasadena, Los Angeles Co., *McClatchie 12,* (EGB). Not previously reported west of Missouri. Such a remarkable range extension causes me to suspect the origin of the specimen, but a fragment of what appears to be *Alsia* in the packet would indicate Californian material, although the habitat is not what I would expect for *Alsia californica*. Boreal America.

RHYTIDIACEAE

**RHYTIDIADELPHUS LOREUS (Hedw.) Warnst., Laubm., Krypt.-fl. Mark. Brand. 2:922 (1906). Big Trees Park, Del Norte Co., *L. A. Koch* (LFK 2317). Europe-North America.

RHYTIDIADELPHUS TRIQUETRUS (Hedw.) Warnst., Laubm., Krypt.-fl. Mark. Brand. 2:920 (1906). Adams Station on Smith River, Del Norte Co., *Eastwood 415* (CAS); Canyon Creek, Dutch Flat, Placer Co., *MacFadden 9796* (UCLA); presumably both specimens are referable to var. *californicus* (Ren. & Card.) Grout (type, *Ames,* acc. Ren. & Card., 1890). The species, Circumboreal.

HYLOCOMIACEAE

?HYLOCOMIUM SPLENDENS (Hedw.) Schp., Bryol. Eur. 5(49-52) M:5, tab. 487 (1852). In California acc. Grout (1928-40). Circumboreal.

POLYTRICHACEAE

ATRICHUM UNDULATUM (Hedw.) Pal.-Beauv., Prodr. Aeth. 42 (1805). Frequent in Northern California and the Bay area. Circumboreal.

POGONATUM ALPINUM (Hedw.) Roehl., Wett. Gesell., Ann. 3:226 (1814). Four collections from Northern California, south to Alameda Co., *Gibbons*

157 (EGB). Var. BREVIFOLIUM Brid. from Mt. Dana, *Bolander* (Lesq., 1868), and Army Pass, Tulare Co., *Howell* (CAS, LFK H140). Bipolar-montane.

POGONATUM CONTORTUM (Schwaegr.) Sull., Icon. Musco. Suppl. 58 (1874). Five collections from Humboldt and Del Norte counties. North Pacific Basin.

POLYTRICHADELPHUS LYALLII Mitt., Linn. Soc. Lond., Journ. Bot. 8:49 (1865). Common in the Sierras; sporadic in the Coast Ranges. Pacific Coast.

POLYTRICHUM COMMUNE Hedw., Sp. Musc. 88 (1801). Near Eureka, Humboldt Co., acc. Howe (1897); Sonoma Co., *Butler 28a;* Nevada Co., *Koch 2014, Leiberg 5435;* Plumas Co., *Pringle, Bioletti* (EGB); also mentioned by Bradshaw (1926) near Stanford University (?). Bipolar-montane.

**POLYTRICHUM FORMOSUM Hedw., Sp. Musc. 92 (1801). Lassen Peak, Lassen Volcanic Nat. Park, *Koch 1947*. Bipolar-montane.

**POLYTRICHUM GRACILE Smith, Fl. Brit. 3:1374 (1804). Lakeshore, Cottonwood Lakes at 11,200 ft., Inyo Co., *Howell* (LFK H182). Bipolar-montane.

POLYTRICHUM JUNIPERINUM Hedw., Sp. Musc. 89 (1801). Common everywhere except in the desert. Cosmopolitan.

POLYTRICHUM PILIFERUM Hedw., Sp. Musc. 90 (1801). Same as the last but not as common. Cosmopolitan.

SUMMARY

This catalogue lists 317 species, including 31 that are believed to be reported from California for the first time (preceded by **), and 23 whose range according to the "Moss Flora" does not include California, but are reported from the state elsewhere in the literature (preceded by *).

Sixty-eight names, previously recorded for California, are excluded from the flora of the state for various reasons. The occurrence in California of 20 species is questioned (preceded by ?) and 8 other species were not seen by the author.

Of the 288 species seen, 120 are represented from California by 5 specimens or fewer, 34 of these having been encountered only once. Only 17 recognized species are restricted to California.

The obvious conclusion is that the moss flora of California is relatively unknown.

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Vol. VI No. 2

LEAFLETS *of* WESTERN BOTANY

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SAN FRANCISCO, CALIFORNIA

APRIL 25, 1950

LEAFLETS
of
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NOTES ON THE COMPOSITAE OF THE NORTHWESTERN UNITED STATES

BY ARTHUR CRONQUIST

State College of Washington, Pullman

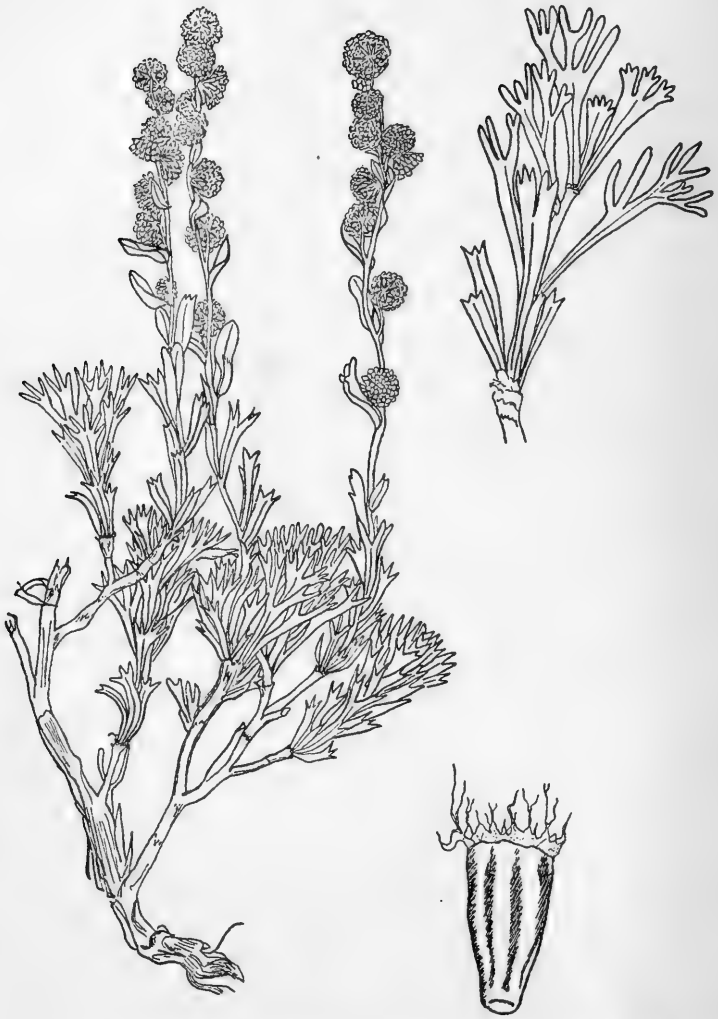
Miscellaneous new entities and transfers which have accumulated from work on northwestern American *Compositae,* chiefly from Idaho, are here presented. A few routine reductions of insufficiently distinct populations are included without further comment. The herbaria from which specimens are cited are indicated as follows:

Ch, private herbarium of J. H. Christ, 1128 N.E. Knott St., Portland, Ore.
IS, Idaho State College, Pocatello
MO, Missouri Botanical Garden, St. Louis
NA, National Arboretum, U.S.D.A., Beltsville, Md.
NY, New York Botanical Garden
US, United States National Herbarium, Washington, D.C.
UT, Utah State Agricultural College, Logan
W, University of Washington, Seattle
WS, State College of Washington, Pullman

I wish to thank the curators of the several herbaria indicated for their kindness in making specimens available to me for study.

Agoseris glauca (Pursh) D. Dietr. var. **aspera** (Rydb.) Cronquist, comb. nov. *A. Leontodon* Rydb. var. *aspera* Rydb., Mem. N. Y. Bot. Gard. 1:457 (1900); *A. aspera* Rydb., Fl. Rocky Mts. 1030, 1069 (1917). In varietal rank the foregoing combination takes precedence over *A. glauca* var. *villosa* (Rydb.) Wittr. (Publ. Puget Sound Biol. Sta. 6: 253,–1928), based on *A. villosa* Rydb. (Mem. N. Y. Bot. Gard. 1: 458,–1900). My opinion that both names apply to the same entity was evidently shared by Wittrock, since he annotated the type specimen of *A. Leontodon* var. *aspera* (NY) as *A. glauca* var. *villosa.* Although *A. Leontodon* var. *aspera* was published as a trinomial, it is referred to in the immediately subsequent text as a variety.

Antennaria arcuata Cronquist, spec. nov. Herba 3–4 dm. alta, laxe tomentosa, per stolones arcuatos usque ad 1 dm. longos perennans; foliis imis oblanceolatis aliquot cm. longis demum deciduis, caulinis angustatis moderate numerosis gradatim reductis inferioribus usque ad 10 cm. longis 1 cm. latis; capitulis femineis moderate numerosis conferte aggregatis, involucro circa 5 mm. alto basi tomentoso apice striatulo et albido-scarioso; pappo basi vix connato; capitulis masculinis ignotis.



Tab. I. *Artemisia papposa* Blake & Cronquist: 1, habit, x ⅔; 2, twig, x 1⅓; 3, immature achene, x 20.

Plants loosely white-woolly, perennial by means of conspicuously arching stolons about 1 dm. long or less, the stolons rooting at the end and giving rise to another short-lived plant with a single strict flowering stem 3–4 dm. tall; basal leaves oblanceolate, several cm. long, but few and not persistent; cauline leaves narrow but well developed, moderately numerous, gradually reduced upwards; heads rather many in a close terminal cluster; involucre about 5 mm. high, tomentose below, the bracts whitish and minutely striate above; pappus-bristles only slightly and irregularly united at the base; staminate plants unknown.

Type: *J. H. Christ 16065*, in wild hay meadow 9 miles east of Carey, Blaine Co., Idaho, July 31, 1946 (WS).

Antennaria arcuata is so different from any other species of the genus known to me that its affinities are obscure. It mildly resembles *Gnaphalium chilense* Spreng. in aspect, but is technically quite different. Although it would not fit into any previously recognized entity even aside from the stolons, the nature of these organs seems likely to furnish a convenient recognition-feature for the species.

Antennaria neglecta Greene var. **Howellii** (Greene) Cronquist, comb. nov. *A. Howellii* Greene, Pittonia 3: 174 (1897).

Artemisia campestris L. var. **Purshii** (Hook.) Cronquist, comb. nov. *A. spithamea* Pursh, Fl. Am. Sept. 522 (1814). *A. borealis* Pall. var. *Purshii* Hook., Fl. Bor. Am. 1: 326 (1833).

Artemisia campestris L. var. **Wormskioldii** (Bess.) Cronquist, comb. nov. *A. borealis* Pall. var. *Wormskioldii* Bess. in Hook., Fl. Bor. Am. 1: 327 (1833); and in Bull. Soc. Imp. Nat. Moscou 8: 84 (1834). Plants from the Columbia River gorge area, with the whole herbage as well as the involucre densely and rather loosely silky, are geographically and ecologically removed from var. *Purshii,* and would seem to merit taxonomic separation. In spite of the fact that Besser's name would suggest Wormskjold's plant from Greenland to be the type, his description and comments clearly indicate that it is peripheral to his concept. It seems necessary to take Douglas' specimens from the Columbia River to represent the type. Furthermore, the first publication of the name was in Hooker's flora, which preceded Besser's own paper. Only Douglas' and other western American collections are cited by Hooker.

Artemisia papposa Blake & Cronquist, spec. nov. Tab. I, fig. 1–3. Frutex depressus ramulis brevibus foliosis, caulibus floriferis herbaceis erectis 8–20 cm. altis; foliis canescentibus pilis laxis brevibus, 1–3 cm. longis basi angustis

apice trifidis vel irregulariter palmatifidis, segmentis frequenter fissis, vel foliis caulinis latioribus integerrimis; inflorescentia racemiformi capitulis 4–10, involucro canescente 2–2.5 mm. alto, receptaculo nudo, floribus exterioribus femineis, ceteris hermaphroditis, omnibus fertilibus; achaeniis pappo brevissimo hyalino vel scarioso irregulariter laciniato coronatis.

Low shrubs with short leafy shoots and simple annual flowering stems 8–20 cm. tall; leaves and involucres canescent with loosely spreading or subappressed, somewhat tangled short hairs; leaves 1–3 cm. long, with narrow base and trifid or irregularly palmatifid apex, the narrow segments often again cleft, or some of the cauline leaves broader and entire; inflorescence racemiform with 4–10 erectly pedunculate heads; disk 3–6 mm. wide; involucre 2–2.5 mm. high; receptacle without hairs; flowers rather numerous, all fertile, the outer pistillate; pappus a short, hyaline or scarious, irregularly laciniate crown, some of the teeth often attenuate into slender hairs.

Type: *Maguire & Holmgren 26312,* sagebrush-juniper slopes, 5 miles southwest of Mud Flat, on road to Juniper Mt., Owyhee Co., Idaho, June 7, 1946 (WS); isotype at UT. The locality as recorded above is approximately Township 10 South, Range 2 West.

Additional collections, all from Idaho: *J. H. Christ 11123,* with sagebrush on high plateau, 20 miles south of Bruneau, Owyhee Co., June 1, 1940 (Ch, NA); *J. H. Christ 14072,* mineral soil on edge of mountain meadows, Mud Flat, 44 miles southwest of Grandview, Owyhee Co., June 17, 1944 (Ch); *J. H. Christ 11778,* on alkaline flats, near Laidlaw Ranch on Little Wood River, Muldoon, Blaine Co., August 2, 1940 (postmature) (Ch, NA).

This unusually well-marked species of the section *Abrotanum* differs from all other known species of *Artemisia* in the presence of a minute but definite pappus. Its nearest, though still rather distant, relative would seem to be the herbaceous *A. norvegica* Fries sens. lat., from which it further differs in its shrubby habit, shorter involucre, and a number of less conspicuous technical characters. The type collection was distributed as *A. frigida* Willd., which, although somewhat similar in gross aspect, belongs to another section and is otherwise quite different.

Aster hesperius var. **hesperius** Cronquist, nom. nov. *A. hesperius* Gray, Syn. Fl. 1^2: 192 (1884), sens. strict.; *A. foliaceus* Lindl. var. *hesperius* Jeps., Man. Pl. Calif. 1047 (1925).

Aster hesperius Gray var. **laetevirens** (Greene) Cronquist, comb. nov. *A. laetevirens* Greene, Pitt. 4: 219 (1900); *A. coeru-*

lescens DC. var. *laetevirens* Cronq., Am. Midl. Nat. 29: 437 (1943). Dr. L. H. Shinners has recently pointed out (Rhodora 51: 91–92,–1949) that the application of the name *A. coerulescens* DC. to a chiefly cordilleran species, as established by Wiegand (Rhodora 35: 26,–1933) and followed by me, is incorrect, deCandolle's plant apparently being conspecific instead with the chiefly more eastern plant now generally treated as *A. praealtus* Poir. The oldest available name for the more western species seems to be *A. hesperius* Gray, to which the var. *laetevirens* is accordingly transferred.

Aster pansus (Blake) Cronquist, comb. nov. *A. multiflorus* Ait. var. *pansus* Blake, Rhodora 30: 227 (1930). In her careful treatment of the Rocky Mountain representatives of the *Aster ericoides* group (Rhodora 35: 323–327,–1933), Mrs. Nelson distinguishes *A. ericoides* L. from its relatives partly by its "caespitose" rather than "creeping" rootstocks. It is quite true that cordilleran plants which have passed as *A. ericoides* (or earlier as *A. multiflorus* Ait.) have the stems clustered from a rhizome which is shortened into a mere caudex, but in this respect they differ from typical eastern *A. ericoides,* which has well-developed creeping rhizomes. The cordilleran plants also tend to have larger heads than *A. ericoides* proper. Apparently the only name applicable to this western group is *A. multiflorus* var. *pansus* Blake, the type of which came from Ellensburg, Washington (isotype at WS). In spite of the fact that Blake defined his variety by the orientation of the pubescence, and included eastern as well as western plants in it, it seems advisable to adopt the epithet he proposed rather than to coin a new name.

Chrysothamnus nauseosus (Pall.) Britt. var. **petrophilus** Cronquist, var. nov. A var. *leiospermo* differt: foliis amplioribus usque ad 5 cm. longis et 1.3 mm. latis; involucris amplioribus 8–10 mm. longis; corolla circa 9 mm. longa, lobis longioribus quam 1 mm.

Shrub about 6–8 dm. tall; tomentum of the twigs pale yellowish-green, close; leaves thinly tomentulose or subglabrate, mostly 2–5 cm. long and 0.6–1.3 mm. wide; involucre glabrous or very nearly so, about 8–10 mm. high, the bracts blunt; corollas glabrous, about 9 mm. long, the lobes a little over 1 mm. long; style-appendages longer than the stigmatic portion, a little over 1 mm. long.

Type: *Cronquist 1965,* limestone cliffs below forks of Irvin Creek, northeast of Argora, Clark Co., Idaho, August 19, 1939

(MO); isotypes at IS, UT. Distributed as *C. nauseosus* subsp. *leiospermus* (Gray) Hall & Clem.

Additional collections, both from Idaho: *Cronquist 1995,* U. S. Sheep Station grounds, near Dubois, Clark Co., August 22, 1939 (IS, MO, UT); *Cronquist 854,* same station, August 22, 1937 (UT). These two collections were distributed as *C. nauseosus* subsp. *glareosus* (Jones) Hall & Clem.

Of the 20 subspecies of *C. nauseosus* (Pall.) Britt. listed by Hall & Clements (Phyl. Meth. Tax., Carn. Inst. Wash. Pub. 326, pp. 209–234,–1923), only three have glabrous achenes. None of these is reported to occur farther north than central Utah. Of these three, subsp. *Bigelovii* (Gray) Hall & Clem. differs in its tomentulose involucre, sharply pointed involucral bracts, and other characters; subsp. *glareosus* (Jones) Hall & Clem. differs in its tomentulose involucre, reputedly smaller size, and larger involucres and corollas; and subsp. *leiospermus* (Gray) Hall & Clem. differs in its shorter, narrower leaves, shorter involucres, and shorter corollas with very short lobes.

Cirsium Davisii Cronquist, spec. nov. A *C. utahensi* differt: caulibus et foliis densius tomentosis, involucro perspicue arachnoideo, floribus purpureis.

Resembling *C. utahense* Petrak in its shortly decurrent leaves, in the absence of a glutinous dorsal ridge on the involucral bracts, and in that the spreading portion of the involucral bracts includes a significant portion of the body of the bract in addition to the spine; differing in its more densely and persistently pubescent herbage (the leaves almost snowy-white beneath), conspicuously arachnoid involucre, and bright pink-purple flowers. Dry corollas from the specimens seen have the following dimensions: tube 8.5–13.5 mm.; throat 8.5–9.5 mm.; lobes unequal, 3.5–7 mm.

Type: *Davis s.n.,* University of Idaho farm, Pocatello, Bannock Co., Idaho, June 8, 1931 (WS); isotype at IS.

Additional collections, all from Idaho: *J. H. Christ 8354,* in low foothills west of Pocatello, Bannock Co., July 12, 1937 (Ch); *J. H. Christ & W. W. Ward 10591,* on roadsides and in foothills along the Portneuf River, 6 miles north of Downey, Bannock Co., June 26, 1939 (Ch); *Davis s.n.,* same station as type, June 24, 1934 (IS); *Davis s.n.,* foothills east of Montpelier, Bear Lake Co., June 28, 1930 (IS).

Cirsium Davisii is obviously allied to *C. utahense,* and a thorough revision of the group might necessitate reconsideration of its taxonomic status, but in any case it seems to be a recognizable

entity. It has been suggested *in herbario* that this plant might be the same as *C. subniveum* Rydb., the type of which came from Jackson's Hole, Wyoming. After examination of the type (US), I am using the name *C. subniveum* for a population, common at middle elevations in the mountains of central Idaho, which has smaller and notably fewer-flowered heads than *C. utahense* and *C. Davisii.*

Gnaphalium microcephalum Nutt. var. **thermale** (E. Nels.) Cronquist, comb. nov. *G. thermale* E. Nels., Bot. Gaz. 30: 121 (1900).

Senecio bivestitus Cronquist, spec. nov. Herba perennis e caudice brevi; caulibus solitariis vel perpaucis, 7–20 cm. altis; foliis imis persistentibus, late oblanceolatis vel anguste obovatis vel ellipticis vel late elliptico-oblongis, sessilibus vel subpetiolatis, 3–7 cm. longis, 8–22 mm. latis, primum dense arachnoideo-tomentosis, tomento deinde plus minusve deciduo, pilos compressos multicellulares subviscidos appressos retegente; foliis caulinis paucis sessilibus plus minusve reductis; inflorescentia corymbiformi, capitulis paucis, involucro 5–7 mm. alto ebracteolato, phyllaribus acuminatis, purpurascentibus apice; disco 1–2 cm. lato, ligulis aurantiacis, 8–15 mm. longis.

Fibrous-rooted perennial apparently with a short, stout, erect caudex, 7–20 cm. tall, densely arachnoid-tomentose, the tomentum partly deciduous; stems solitary or few together, each with its own tuft of persistent basal leaves, these broadly oblanceolate or narrowly obovate to elliptic or broadly elliptic-oblong, sessile and broad-based or more tapering and subpetiolate, 3–7 cm. long, 8–22 mm. wide, more or less copiously provided with persistent, flattened, multicellular, somewhat viscid or glandular, appressed hairs under the tomentum, entire or irregularly wavy and callous-toothed; cauline leaves several, sessile, reduced upwards, becoming lance-acuminate; heads several in a corymbiform inflorescence, the terminal one the largest; involucre 5–7 mm. high, shorter than the disk, its bracts slender, gradually acuminate or attenuate, purplish above, without bracteoles; disk 1–2 cm. wide; rays orange, 8–15 mm. long; achenes hirtellous.

Type: *C. L. Hitchcock 16633,* alpine meadow near Cooke City highway, near summit of Beartooth Mts., Park Co., Wyoming, July 19, 1947 (WS); isotype at W.

Additional collections, both in Wyoming: *Hitchcock & Muhlick 13495,* same station as above, elevation 9700 ft., August 12, 1945 (W, WS); *Daubenmire 48357,* alpine zone, Beartooth Mts., Park Co., July 19, 1938 (WS).

This species does not seem to be closely allied to any other American species, finding its relationships, instead, in the northern European alliance which includes *S. aurantiacus* DC., *S.*

campestris DC., and *S. spathulifolius* DC. Of this group, *S. campestris,* at least, shares the dual type of foliar pubescence, but is larger and more glabrate, with paler flowers and more petiolate leaves. *Senecio aurantiacus* has the orange flowers, but is larger and more glabrate, with more elongate leaves. It is not to be expected that a population isolated in the Beartooth Mts. would be identical with any Old World species, and the new entity is confidently proposed. Dr. Hitchcock tells me that it is abundant where he collected it, occurring in company with a number of arctic-alpine species.

Senecio integerrimus Nutt. var. **exaltatus** (Nutt.) Cronquist, comb. nov. *S. exaltatus* Nutt., Trans. Am. Phil. Soc. II, 7: 410 (1841); *S. lugens* Richards. var. *exaltatus* A. Gray, Bot. Calif. 1: 413 (1876).

Senecio integerrimus Nutt. var. **ochroleucus** (Gray) Cronquist, comb. nov. *S. lugens* Richards. var. *ochroleucus* A. Gray, Syn. Fl. N. Am. 1^2: 388 (1884). Typical *Senecio integerrimus* Nutt., as it occurs on the plains east of the Rocky Mountains, is replaced in the cordilleran area by a phase which has the peduncle of the terminal head more consistently shortened and thickened, and the involucral bracts a little wider, with consistently well-developed black tips. Although this western phase is tremendously variable, only one consistently distinguishable population seems to have become segregated from the main mass. This is the nearly white-rayed plant, commonly with relatively broad and abruptly contracted basal leaves, occurring from northern Idaho, across northern Washington to the Cascades, and thence south apparently to northern California. In some places plants with bright yellow and very pale rays grow intermingled without any other apparent differences.

Senecio lugens Richards., with which these as well as other forms of *S. integerrimus* have been confused, is a more northern plant with more tomentose pubescence and much longer and more conspicuous black tips on the involucral bracts; it seems to be quite distinct.

Stephanomeria tenuifolia (Torr.) H. M. Hall var. **myrioclada** (D. C. Eat.) Cronquist, comb. nov. *S. myrioclada* D. C. Eat., Bot. King Exp. 198 (1871).

Tanacetum potentilloides var. **potentilloides** Cronquist, nom.

nov. *Artemisia potentilloides* A. Gray, Proc. Am. Acad. 6: 551 (1865); *T. potentilloides* A. Gray, Proc. Am. Acad. 9: 204 (1874), sens. strict.

Tanacetum potentilloides Gray var. **nitrophilum** Cronquist, var. nov. A var. *potentilloide* differt: humilius (caulibus 5–15 cm. longis), foliis minus dissectis, caulibus subnudis, capitulis (1–4) minus numerosis.

Differing from var. *potentilloides* in its smaller size (5–15 cm. high), less dissected (commonly merely pinnate) basal leaves, more nearly naked stems, fewer (1–4) heads, and more eastern distribution.

Type: *Holmgren 869,* locally common in moist alkaline meadows, associated with *Distichlis* and *Hesperochiron,* 8 miles north of Twin Bridges, Elko County, Nevada, May 26, 1941 (WS); isotype at UT.

Additional collections. IDAHO: *Christ 12375,* 8 miles west of Hill City, Elmore Co., June 14, 1941 (IS). NEVADA: *Maguire & Holmgren 25772,* Monitor Range, Toiyabe National Forest, Nye Co., July 14, 1945 (UT); *Holmgren 641,* 30 miles northwest of Elko, Elko Co., June 10, 1940 (UT, WS).

Collections of *T. potentilloides* var. *potentilloides.* OREGON: *Eggleston 7110,* 4 miles west of Lakeview, Lake Co. (US); Lake Co., *Austin s.n.,* July, 1893 (US); *Henderson 9516,* near Lakeview, Lake Co. (WS); *Thompson 11935,* near Seneca, Grant Co. (US, WS); *Maguire & Holmgren 26484,* between Suntex and Riley, Harney Co. (UT, WS). OREGON, without county: *Howell s.n.,* June 9, 1885 (US); *Cusick 1660,* S. Blue Mts. and Harney Valley (US, WS); *Coville & Leiberg 312,* central portion of Sprague River Valley (US). CALIFORNIA: *Heller & Kennedy 8679,* between Vinto and Beckwiths, Plumas Co. (US); *Eastwood 7846,* Loyalton, Sierra Co. (US); *Lemmon 37,* Sierra Valley, Plumas or Sierra Co. (US).

The cleavage between *T. potentilloides* var. *potentilloides* and *T. potentilloides* var. *nitrophilum* seems to be sharp, and no really doubtful specimens have been seen. The differences, however, are all quantitative, and dwarf specimens of var. *potentilloides* are very similar to var. *nitrophilum* except for the more divided leaves. Since the entities are unquestionably closely related, it seems advisable under the circumstances to treat them as parts of a single species.

Townsendia florifer (Hook.) A. Gray var. **Watsoni** (A. Gray)

Cronquist, comb. nov. *T. Watsoni* A. Gray, Proc. Am. Acad. 16: 84 (1880). *Townsendia Watsoni* was considered by Miss Larsen (Ann. Mo. Bot. Gard. 14: 18,-1927) to differ from *T. florifer* chiefly in its larger, relatively broader cauline leaves ("mostly obovate-spathulate," as opposed to "mostly linear-spathulate"), and slightly more southern distribution. Variation from one extreme of leaf-shape to the other is continuous, however, and there are plants from southeastern Idaho, within the range of *T. florifer* rather than of *T. Watsoni,* as defined by Miss Larsen, which might about as well be placed with *T. Watsoni.* Some of these specimens have in fact been referred to *T. Watsoni* by a competent and well-known synantherologist. The reduction of the ray-pappus in *T. Watsoni* has sometimes been adduced as a character to distinguish it from *T. florifer,* in which the ray-pappus is supposed to resemble that of the disk flowers, but, as pointed out by Miss Larsen, the ray-pappus of *T. florifer* is highly variable. The two entities here discussed are very similar in general aspect; in view of their morphological and geographical confluence I think it proper to consider them as parts of a single species.

ERIOCHLOA IN ARIZONA

BY FRANK W. GOULD

Agricultural and Mechanical College of Texas

The genus *Eriochloa* is represented in Arizona largely by a group of semi-weedy annuals, variously distinguished as *E. Lemmoni* Vasey & Scribn., *E. gracilis* (Fourn.) Hitchc., *E. gracilis* var. *minor* (Vasey) Hitchc., and *E. aristata* Vasey. Two other species have been reported for the state, one, *E. contracta* Hitchc., is known by a single collection *(Kearney & Peebles 14484),* and the other, *E. procera* (Retz.) Hubbard, is known from collections made on the University of Arizona campus, Tucson. There is good evidence that *E. procera* grew only in the early university grass garden. All of the collections were made in the years 1901 to 1903 and some are marked "cult." In the opinion of the writer this species should be eliminated from listings of Arizona grasses.

Field and herbarium studies over a number of years have led the writer to the conclusion that *E. Lemmoni* and *E. gracilis*

var. *minor* are indistinguishable. It is also apparent that *E. Lemmoni* and *E. gracilis* are composed of intergrading, but for the most part readily distinguishable forms. *Eriochloa aristata* is closely related to *E. gracilis* from which it is differentiated by its larger spikelets. Further studies will probably show these two to be only varietally distinct.

The following new nomenclatorial combination and key present the writer's taxonomic disposition of the Arizona species of *Eriochloa:*

Eriochloa Lemmoni Vasey & Scribn. var **gracilis** (Fourn.) Gould, comb. nov. *Helopus gracilis* Fourn., Mex. Pl. 2: 13 (1886); *Eriochloa gracilis* (Fourn.) Hitchc., Jour. Wash. Acad. 23: 455 (1933).

KEY TO THE ARIZONA SPECIES OF ERIOCHLOA

Spikelets mostly 6 mm. long or less, acuminate or short-awned.
Cusp of fertile lemma usually 5 mm. long or less; panicle-branches often more than 2.5 cm. long and usually more or less spreading at maturity; common.
Leaf-blades mostly pubescent to villous; second glume mostly 4 mm. long or less, rather abruptly acuminate; hairs of the panicle-branches and pedicels tending to be long and dense. 1. *E. Lemmoni*
Leaf-blades usually glabrous; second glume mostly 4.5–6 mm. long, gradually tapering to an acuminate or aristate apex; hairs of the panicle-branches and pedicels tending to be short and not conspicuously dense ..... 1a. *E. Lemmoni* var. *gracilis*
Cusp of fertile lemma mostly more than 5 mm. long; panicle-branches mostly 1–2 cm. long, appressed; infrequent ..... 2. *E. contracta*
Spikelets mostly 7–11 mm. long, with an awn-tip often as long as the body ..... 3. *E. aristata*

NOTES ON MALVACEAE

BY THOMAS H. KEARNEY

AN APOLOGY. In Leaflets of Western Botany (5: 190) the writer published the combination *Neobaclea crispifolia* (Cav.), overlooking the fact that the same combination had been published previously, with full synonymy, by Krapovickas, in a paper entitled "El género *Neobaclea* (Malvaceae) y su distribución geográfica en la República Argentina" (Darwiniana 7: 108-112,—1945). The mature fruit of *Neobaclea*, hitherto unknown, was described and illustrated by Krapovickas (ibid. p. 110).

TYPE OF THE GENUS SIDOPSIS. This monotypic genus was published by Rydberg in 1932 (Flora Prairies and Plains Central North America, p. 541) based upon *Sida hispida* "Ell.," with *Malvastrum angustum* Gray cited as a synonym. Professor Fernald (Rhodora 41: 435-436) pointed out that Pursh, not Elliott, was the author of *Sida hispida,* and that *Malvastrum angustum* is not known from Georgia, the locality of the collection by John Lyon cited by Pursh (Fl. Amer. Sept. p. 452). Pursh described this plant as follows: "S. hispido-pilosa; foliis lanceolatis-serratis, pedunculis solitariis axillaribus longitudine petiolorum, calyce exteriore filiformi.—Flowers yellow." This brief characterization applies well to the plant commonly known as *Malvastrum angustum,* as was the opinion of Hooker (Jour. Bot. 1: 198). Pursh's description does not correspond to any other malvaceous plant of the eastern United States known to the writer. Furthermore, since *Malvastrum angustum* has been found as far to the southeast as Alabama, "rarely Coastal Plain," according to Small (Man. Southeastern Flora p. 849), its occurrence in Georgia is less improbable than Professor Fernald supposed. *Sidopsis* appears to be a valid genus, differing from *Malvastrum* and *Sphaeralcea,* as the writer would now define these genera, in its completely dehiscent carpels, and from *Sphaeralcea* also in the non-reticulate carpels. It would seem permissible to designate the type as *Sidopsis hispida* (Pursh) Rydb., emend. Kearney, with *Malvastrum angustum* Gray, *M. hispidum* (Pursh) Hochr., and *Sphaeralcea angusta* (Gray) Fern. as synonyms.

Professor Joseph Ewan (personal communication) has suggested that the type of *Sida hispida* Pursh may have been obtained, not by John Lyon but by Aloysius Enslen, who collected in "Lower Louisiana," hence in territory where *Sidopsis* is known to occur.

GNAPHALIUM LUTEO-ALBUM L. IN ARIZONA. What appears to be the first Arizona record of this weedy species was collected in March, 1950, by Gale Monson in the Havasu Lake National Wildlife Refuge near Topock, Mohave Co. Although several collections have been known from coastal southern California, this is the first to be seen from as far east as the lower Colorado River.—J. T. HOWELL.

PLANTS OF THE TODOS SANTOS ISLANDS, BAJA CALIFORNIA

BY REID MORAN

University of California, Berkeley

The Todos Santos Islands lie west of the northern coast of Baja California, Mexico, about nine miles from Ensenada and about four miles from Punta Banda. The hilly southern island is slightly more than half a mile long and 300 feet high, while the flat northern island is shorter and lower. Because the islands are connected with Banda Promontory by a submarine ridge, it has been suggested that in the past they formed a part of the promontory.

According to Greene (2), a "Miss Fink" collected *Eschscholzia Orcuttiana* Greene on the Todos Santos Islands. Probably this was Miss Fannie E. Fish. According to Mrs. Ethel Bailey Higgins, Miss Fish lived at Sauzal on Todos Santos Bay in the early 1880's and collected for Dr. C. C. Parry.

In March, 1897, A. W. Anthony, T. S. Brandegee, and A. L. Stockton spent three or four days collecting plants on the Todos Santos Islands. According to Brandegee (1), "Seventy species of plants were collected, and doubtless more would have been found two weeks later, for the vegetation was not much advanced in the early part of March." Brandegee mentioned some of the commonest and most interesting plants but did not give a full list of species.

In the spring of 1948, George Lindsay and I visited the Todos Santos Islands with Mr. and Mrs. Lewis Cavanagh in their ketch, the *Marviento* (3). We had a day of collecting on the southern island on April 7 and landed there again on the afternoon of May 6. We found a total of 60 species. The first set of my collections is in the University of California Herbarium.

In February, 1949, George Lindsay, Paul Silva, John H. Thomas, and Ira L. Wiggins collected on the southern island. Because of the early time of year, their collections of land plants came to only 27 species.

This first plant list for the Todos Santos Islands, including only 70 species, is doubtless incomplete, but interest in the in-

sular floras of Baja California seems to warrant its publication. Collection numbers are mine unless otherwise indicated.

BROMUS RUBENS L. Occasional.

FESTUCA MEGALURA Nutt. Common, *2820.*

MELICA IMPERFECTA Trin. Common, *2789.*

DICHELOSTEMMA PULCHELLUM (Salisb.) Hel. Occasional on north flat, *2796.*

PARIETARIA FLORIDANA Nutt. Common among rocks, *2795.*

URTICA URENS L. *Wiggins 11978.*

PTEROSTEGIA DRYMARIOIDES F. & M. Common among rocks, *2786.*

ERIOGONUM GRANDE Greene. Occasional on cliff at northeast side, *2806.*

ATRIPLEX JULACEA Wats. Occasional on west side, *2824.*

CHENOPODIUM CALIFORNICUM Wats. Occasional among rocks, *2815.*

CHENOPODIUM MURALE L. Common, *2827.*

MIRABILIS LAEVIS (Benth.) Curran. Common, *2802.*

CARPOBROTUS CHILENSIS (Molina) N. E. Br. *Mesembryanthemum chilense* Molina. Common.

CRYOPHYTUM CRYSTALLINUM (L.) N. E. Br. *Mesembryanthemum crystallinum* L. Common.

CALANDRINIA CILIATA (R. & P.) DC. var. MENZIESII (Hook.) Macbr. Locally common on hill, *2834.*

CALANDRINIA MARITIMA Nutt. Locally common on hill, *2832.* Listed by Brandegee as one of the commonest plants of the island.

CLEMATIS PAUCIFLORA Nutt. Occasional, climbing over rocks, *2812.*

ESCHSCHOLZIA ELEGANS Greene. Frequent on south slope of main hill, *2830.*

DESCURAINIA PINNATA (Walt.) Britt. subsp. MENZIESII (DC.) Detling. Occasional, *2787.*

LEPIDIUM NITIDUM Nutt. *Thomas 36.*

THELYPODIUM LASIOPHYLLUM (H. & A) Greene. Rare, *2817.*

DUDLEYA ANOMALA (Davids.) Moran. Densely covering rocks and cliffs with north and east exposure, *3066.* Definitely known before only from North and South Coronado Islands, though doubtfully reported also from the mainland.

DUDLEYA ATTENUATA (Wats.) Moran subsp. ORCUTTII (Rose) Moran. Frequent on flat area at northeast side of island, *3065.*

DUDLEYA BRYCEAE Britt. Common from sea cliffs to top of island, *2785.*

Dudleya semiteres (Rose) Moran, comb. nov. *Stylophyllum semiteres* Rose, Bull. N. Y. Bot. Gard. 3:35. 1903. Occasional on flat at northeast side of island, *3064.* Also collected on South Coronado Island, *2205;* at Rancho Cuevas, *2106;* and near the mouth of the Guadalupe River, *2209, 3100.* All of these localities are in northern Baja California. The plant has been previously known only from the type-collection by C. R. Orcutt in "Lower California or the Colorado Desert of California."

CRASSULA ERECTA (H. & A.) Berger. *Tillaea erecta* H. & A. Only one colony seen, *2807.*

ASTRAGALUS LEUCOPSIS T. & G. Occasional, *2822.*

LOTUS STRIGOSUS (Nutt.) Greene. Occasional, *2801.*

LOTUS WATSONII (Vasey & Rose) Greene. Occasional, *2831.*

LUPINUS TRUNCATUS Nutt. Occasional, *2798.*

VICIA EXIGUA Nutt. Occasional, *2799.*

ERODIUM CICUTARIUM (L.) L'Her. *2819.*

ERODIUM MOSCHATUM (L.) L'Her. Occasional, *2810.*

EUPHORBIA MISERA Benth. Occasional, *2792.*

RHUS INTEGRIFOLIA (Nutt.) B. & H. Low shrubs on flat at north end, *2791.*

RHUS LAURINA Nutt. Flat at north end, *2790.*

MALVA PARVIFLORA L. At abandoned lobster camp, *2826.*

MALVASTRUM EXILE Gray. *Brandegee in 1897.*

BERGEROCACTUS EMORYI (Engelm.) Britt. & Rose. *Cereus Emoryi* Engelm. Forming thickets at northeast end.

MAMMILLARIA DIOICA K. Brandg. Found by George Lindsay in 1949.

OPUNTIA OCCIDENTALIS Englm. & Bigel. Common at northeast end.

APIASTRUM ANGUSTIFOLIUM Nutt. Occasional, *2788.*

CONVOLVULUS ARIDUS Greene subsp. LONGILOBUS Abrams. Occasional, *2797.*

DICHONDRA OCCIDENTALIS House. Common on south slope of main hill, *2829.*

EUCRYPTA CHRYSANTHEMIFOLIA (Benth.) Greene. Occasional, *2805*.

PHACELIA CICUTARIA Greene var. HISPIDA (Gray) J. T. Howell. Uncommon at northeast end, *2793*.

PHACELIA DISTANS Benth. Occasional, *2823*.

PHACELIA HIRTUOSA Gray. Uncommon, *2793a;* determined by Dr. L. Constance.

PHACELIA IXODES Kell. Occasional on east side just above tide, *2825*.

PHOLISTOMA RACEMOSUM (Nutt.) Constance. Occasional among rocks at northeast end, *2813*.

AMSINCKIA INTERMEDIA F. & M. Occasional at northeast end, *2808*.

CRYPTANTHA CLEVELANDII Greene. Uncommon at northeast end, *2821*.

LYCIUM BREVIPES Benth. Collected by Brandegee.

LYCIUM CALIFORNICUM Nutt. Occasional, *2828*.

NICOTIANA CLEVELANDII Gray. Locally common on hill, *2833*.

PHYSALIS GREENEI Vasey & Rose. *Brandegee in 1897*.

SOLANUM PALMERI Vasey & Rose. *Brandegee in 1897*.

CASTILLEJA DOUGLASII Benth. Occasional, *2811*.

ECHINOCYSTIS MACROCARPA Greene. Common, *2818*.

APLOPAPPUS BERBERIDIS Gray. Occasional, *2816*.

ARTEMISIA CALIFORNICA Less. Common at northeast end, *2814*.

COREOPSIS MARITIMA (Nutt.) Hook. f. Common on northeast slopes, *2809*.

ENCELIA CALIFORNICA Nutt. Common, *2800*.

FRANSERIA CHENOPODIIFOLIA Benth. Reported by Brandegee.

HEMIZONIA sp. Common, *2803*. According to Dr. D. D. Keck, this is an undescribed species.

MALACOTHRIX CLEVELANDII Gray. Occasional, *2804*.

PERITYLE EMORYI Torr. *Brandegee in 1897*.

SONCHUS OLERACEUS L. Occasional, *2794*.

SONCHUS TENERRIMUS L. *Brandegee in 1897*.

VERBESINA DISSITA Gray. *Brandegee in 1897*.

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JOHN THOMAS HOWELL

A YEAR WITH PITYOPUS

BY JOHN THOMAS HOWELL

Among the most striking plants in our western woods are two ericaceous saprophytes, the slender reddish-brown pine drops *(Pterospora andromedea)* and the stout brilliant red snow plant *(Sarcodes sanguinea)*. These two are relatively common but they are related to other saprophytes that are rarely, if ever, seen even by keen-eyed botanists. Here in California, *Allotropa, Hypopitys,* and *Monotropa* belong to this rarer group, while it is an occasion anywhere to find *Newberrya, Pleuricospora,* or *Pityopus.*

As it has been treated by recent students (Copeland f., Madroño 3:154-168,—1935; Jepson, Fl. Calif. 3:66,—1939), *Pityopus* is a genus consisting of a single very rare species which was first described from Marin County, California, by Miss Eastwood as *Monotropa californica,* and subsequently named and described from north of Mt. Hood, Oregon, by Dr. J. K. Small, as *Pityopus oreganus.* H. F. Copeland (1935) showed that the two belonged to the same species and published the necessary combination, *Pityopus californicus.*

Aside from the collections on which the two original names were based, less than a half dozen other specimens have been reported between Mt. Hood on the north and Fresno County, California, on the south. Hence it is with the greatest of interest that specimens of this rare plant from two new stations have been collected by Miss Jean Boyd and Mrs. Marie L. Kelly in Mendocino County, California. The first of these, collected in June, 1948, at Lake Leonard, about 15 miles northwest of Ukiah, was studied and determined by Dr. Copeland; the second specimen, found near Little River about one mile inland from the coast at an elevation of about 400 feet, came to my attention in April, 1949, at the flower show of the California Spring Blossom and Wildflower Association in San Francisco. These plants were only in bud but they were kept and cared for by Mrs. Elsie Zeile Lovegrove until they bloomed a month later, when I examined them. This was the beginning of a series of

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field and herbarium studies that have revealed several new facts in the life history of this rare plant. These facts, I believe, can be appropriately recorded by chronologically arranged excerpts from the extensive correspondence between Miss Boyd, Mrs. Kelly, and me, and from my herbarium notes.

To Miss Boyd, May 14, 1949:

The small white ericaceous saprophyte which you sent in bud to Mrs. Lovegrove finally bloomed and I think it is the very rare *Pityopus californicus*. The distinct petals and 1-celled ovary are the characters which point to this conclusion. The only specimen we have had until now is the original plant found by Miss Eastwood in the Little Carson, so you can realize how grateful we are to you for sending the plant and to Mrs. Lovegrove for "nursing the baby" along.

Now I wonder if there are enough plants for you to send a larger specimen. If there aren't many, don't send any more in flower but wait until the plants fruit. The fruit of this genus is still unknown. With you and Mrs. Kelly living nearby, it is a grand opportunity to get the plant with partly or completely ripe fruit and so make a real contribution to botanical knowledge.

Also we don't know too much about the places where this plant grows—under what kind of trees, in what kind of leaf-mold, in sun or shade, wet soil or dry, etc.

From Mrs. Kelly, May 24, 1949:

Jean Boyd forwarded your letter of May 14 with the request that I dash over to the Little River watershed and send you further samples. I am sending what I think are three mature specimens. I hunted carefully for some that had set seed but as you will see some animal seems to have chewed all the tops off. There are 50 or 60 more single plants or groups which should be in bloom early next week.

I am very much puzzled by the fact that Jepson does not mention the very strong perfume. A friend noticed it fully three feet away and thought it resembled orange blossoms or jasmine. I thought it smelled like lemon blossom and vanilla, but like sachet or face powder rather than perfume or cologne. Only the ones in flower had this perfume. I checked both the young buds and the broken off pieces.

The plants are growing on a slight slope which is very damp in winter, dry now, under trees in needle droppings with no other small live plants near. The droppings were dry and nowhere more than two inches deep. Some of the plants were close by the trees, white fir *(Abies grandis)* and Douglas fir *(Pseudotsuga taxifolia)*. The trees are all very unhealthy and dense. I don't think the sun comes through to any degree—it was noon when I was there and it was gloomy, though the day was very sunny and warm. There were no redwoods, *Vaccinium ovatum*, or *Rhododendron*, all of which are characteristic a short distance away.

To Mrs. Kelly, May 27, 1949:

With the receipt of the fine box of material, the identity of the ghostly saprophyte is definitely fixed. I have dissected the immature fruit and the plant is *Pityopus californicus*. I would nominate you and Miss Boyd as the discoverers of the rarest 1949 plant!

Since the plant is so rare, I believe we shouldn't disturb any more, at least while they are maturing. The fruits are well-formed but are very immature. It may be a month (or longer) before the seeds are ripe. If the animals, which seem to be eating the plant, have left any fruits to mature, I hope we may learn how the fruit capsule splits open. Around the Fourth of July, perhaps . . . .

From Miss Boyd, May 30, 1949:

Mrs. Kelly tells me she omitted to write that the plants grow at an elevation of about 400 feet (not over) and the distance from the sea about one mile. The elevation is of interest to me as Jepson places it at 1000 to 3000 feet.

We are both "stumped" as to finding the fruit. Apparently the flower disintegrates and it is difficult to pick up the pieces. We are planning to put paper under some of the less ripe specimens on the chance that the pieces might develop on the ground.

To Miss Boyd, June 6, 1949:

From the present condition of the flowers and immature fruits, I doubt if there will be any fruit ripe before July—provided the devouring animals that crawl in the night leave any to go to seed. Anyway, if it is possible to get fruit, that will be an additional triumph. I suggest watchful waiting!

It was then that Miss Boyd and Mrs. Kelly devised a plan for protecting the little herbs that were so evidently relished by some animal—they covered them with half-inch wire mesh cages that were weighted and fastened to the ground. Without this precaution fruiting specimens would probably never have been obtained.

From Mrs. Kelly, June 27, 1949:

I am sending you a few more *Pityopus* specimens. As you will see by the most advanced one, they are far from the dry capsule stage. I did not disturb the seven "caged" specimens which are much larger (about 7 inches tall). Maybe you can guess when they will be ripe; meanwhile we'll watch them.

I noted a small bumble bee (about a half inch long) busily at work on one of the younger plants that is still fragrant. I was unable to catch him.

From Mrs. Kelly, Aug. 15, 1949:

On Aug. 13 we sent you three fruits of *Pityopus*. Four complete plants remain, two under cages and two with improvised brush covering. We car-

ried the plant material home in absorbent cotton and when we unrolled it to repack it for sending, the odor was unpleasant. My best description is that it resembled Brie or Camembert cheese which had passed prime and started to dry out. You may have noticed the odor when unpacking. The pleasant perfume of the flowers was very evanescent, so this odor may be too.

These "most advanced fruits" of August did not seem to be mature because I expected the fruit to be capsular. The blackened stems and leaves were shriveled and dry but the flower-parts were still intact and the fruit fleshy. None of the odor described by Mrs. Kelly was perceived by me.

Finally on Sept. 17, I received specimens from which the character of the fruit was definitely determined.

Letter to Miss Boyd, Sept. 19, 1949:

I think the mystery of *Pityopus* fruit is solved. In the wonderful lot of material you sent last week are a number of fruits containing ripe seeds. These are embedded in a sticky viscous substance derived from the disintegration of the fleshy placentae. The fruit does not appear to open at all but simply shrivels up and waits for some animal to come along and eat it. Since animals do not make a clean job of eating, some of the seeds escape and start a new crop of plants. There seems to be no sweet or distinctive taste to the viscous mass in the fruits; but the odor of the maturing plants would undoubtedly be attractive to some animals. I never dreamed how long we would have to wait to learn all we have.

One more matter will bear watching: will all the new 1950 plants come from seed, or will some of the abortive 1949 shoots carry on with the first rains of autumn? Since you are so wonderfully situated to make this observation I hope you will be able to. It will complete a whole year's watching.

The belated autumn rains of 1949 did not revive the abortive shoots and no new growth was discernible before 1950. On Feb. 26, 1950, a specimen was collected which was entirely subterranean at that date. This material disclosed the origin of the aerial shoots on slender corraloid roots. The small bud-like shoots were not much larger than the head of a pin and were a couple of inches below the level of the ground. The numerous slender roots were very brittle and they branched to form a meshwork in the sandy humus.

Letter from Miss Boyd, Feb. 27, 1950:

Yesterday we collected specimens of *Pityopus*. We thought it best to send these without disturbing the soil, so that you can determine the growth structure. Had we not covered these plants last May, I doubt if we could

have found any at this date, as we had to remove about 2 inches of duff before the little white buds were visible. Knowing the usual depth of the roots, we dug under them carefully.

This completes over a year's observation by us, as we found the first plant in this locality in December, 1948.

Diagnostic notes taken from fresh flowers on May 14 and 27, 1949, and from ripe fruit on Sept. 17, 1949:

Entire plant dull ivory-white (except anthers and stigma), turning grayish-black when bruised or dried; sepals denticulate, glabrous inside and out, in one flower only 2, in another 4, in the latter 2 broad-based and 2 narrow-based alternating; petals 4, distinct or with bases united less than 0.5 mm., fimbriate-denticulate to base, glabrous outside, hairy inside, strongly saccate (almost spurred) at base, the sac filled by honey secreted by nipple-like honey-glands, the glands at the base of the ovary, 2 opposite each petal and on either side of the base of a filament; stamens 8, opposite petals and sepals (or if sepals are only 2, then between petals in interval where sepals are lacking), anthers purplish-red, broadly reniform, glabrous, dehiscing upward from the bottom of each lobe on the inner face, slits confluent above and anther explanate, filaments hairy, pollen white; ovary glabrous, 1-celled, nearly filled by 6 or 8 fleshy parietal placentae, style hairy, especially above, stigma capitate, umbilicate, yellow; fruit ovate, about 1 cm. long (or only 3–4 mm. long in shriveled specimens), skin leathery and becoming wrinkled on drying, more or less enclosed or subtended by the marcescent sepals and petals; seeds light brown, somewhat shiny, finely foveolate, turgidly oblong or elliptic, about 0.2–0.25 mm. long.

Summary

Pityopus californicus was discovered in 1948 by Miss Jean Boyd and Mrs. Marie L. Kelly at two localities in Mendocino County, California. One of these stations was near their home and they were able to watch the development of the plant for more than a year. Besides obtaining detailed data on the habitat of the plant, they discovered that the flowers have a pleasant perfume and that the maturing plants have a disagreeable odor. The fruit, which matured after the middle of summer, was found to be baccate (as in *Pleuricospora*), with ripe seeds embedded in a viscous mass that was derived from the disintegration of the fleshy placentae. New plants about the size of a pin head were found in late winter attached to slender brittle much-branched corolloid roots.

WHENCE SEDUM PINETORUM BRANDEGEE?

BY REID MORAN
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Sedum pinetorum was described by T. S. Brandegee (1916) from specimens said to have been collected by Katharine Brandegee at deserted Pine City above Mammoth, Mono County, California, in July, 1913. The type specimen is in the herbarium of the University of California at Berkeley. Although several botanists have since sought this plant at the type locality, apparently it has never been re-collected there or elsewhere.

Sedum pinetorum has tiny rosettes arising from tuberous roots. The solitary flower, with slightly united petals, is borne on a nearly leafless terminal stem less than two inches high. Thus in several respects *S. pinetorum* differs from the various better-known species of *Sedum* in California. Jepson (1925) erected for it the genus *Congdonia,* overlooking the prior use of this name by Mueller of Aargau for a genus of *Rubiaceae.*

Berger (1930) placed *S. pinetorum* in his section *Lenophyllopsis* of *Sedum,* and Fröderström (1936) placed it in his group *Minimum* of *Sedum.* It was thus associated by both Berger and Fröderström with *S. minimum* Rose, *S. delicatum* Rose, and *S. compactum* Rose, three montane Mexican species. Two of these have tuberous roots; all of them are few-flowered, the flowers of *S. compactum* being sometimes solitary; and in *S. compactum* the petals are slightly united at the base. It appears likely that the relationships of *S. pinetorum* are indeed with these species.

The region of the type locality of *Sedum pinetorum* is easily accessible and is fairly well known botanically. The absence of any further records of the species therefore seems surprising. The question arises whether the type specimen really came from Pine City or whether there was some confusion of the data as to its origin.

Among the soil and debris with the type specimen of *Sedum pinetorum,* Edward Lee noted several extraneous fragments of plant material. One of these is a leaf fragment which, as suggested by Mr. John T. Howell, recalls the leaves of *Coldenia.* Another of them is a fruit which was recognized by Dr. A. C.

Smith as belonging to *Clethra*. It is not, of course, known whether these fragments were collected with the specimen or whether they somehow became associated with it in the herbarium.

The leaf fragment appears quite similar to leaves of *Coldenia Nuttallii* Hook. This species is found on the eastern slope of the Sierra Nevada and might occur in the vicinity of Pine City. If the leaf fragment really is of this species, then the easiest assumption is that the *Sedum* did come from Pine City and that the *Clethra* fruit accidentally became associated with it in the herbarium. In the opinion of Dr. I. M. Johnston, however, the leaf fragment is not sufficiently distinctive to be definitely identified with this species of *Coldenia*.

No *Clethra* is known from California, and the fruit closely resembles those of certain Mexican species. Therefore, if the *Clethra* fruit was collected with the *Sedum*, it is probable that the *Sedum* was Mexican in origin.

There remains the possibility, however, that the fruit became associated with the *Sedum* specimen in the herbarium. An examination of all fruiting *Clethra* material in the University of California Herbarium revealed one specimen of *C. ?lanata* Mart. & Gal. from which this fruit could have come. This was collected at an unspecified Mexican locality by Mr. and Mrs. J. G. Lemmon in 1905. This specimen was identified as *Clethra* by T. S. Brandegee, and it was accessioned within a year after the *Sedum* specimen. It therefore seems possible that Brandegee may have worked on the two specimens during the same period and that the *Clethra* fruit may have become mixed with the *Sedum* material at that time.

At present no conclusion seems possible as to the origin of the type specimen of *Sedum pinetorum*. Until the plant is rediscovered, however, its occurrence in California can be considered doubtful.

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THREE NEW SPECIES AND ONE NEW FORM IN BROMUS

BY H. KEITH WAGNON
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The following three species and form of *Bromus* are being proposed as the result of an intensive study of the North American species of the section *Bromopsis*. I wish to acknowledge appreciation to Dr. Rogers McVaugh, Curator of the Phanerogams, Herbarium, University of Michigan, for his helpful assistance and criticism of this work. I am also indebted to the curators of the following herbaria for the loan of material necessary for the study: University of Arizona (ARIZ); I. W. Clokey Herbarium, University of California, Berkeley (CLUC); Dudley Herbarium, Stanford University (DS); Missouri Botanical Garden (MO); University of Michigan (MICH); Michigan State College (MSC); New York Botanical Garden (NY); University of Nebraska (NEB); University of California, Berkeley (UC); Grass Herbarium of the Agronomy Division, University of California, Davis (UC-D); Vegetation Type Map Herbarium, University of California, Berkeley (UC-V); University of Mexico (UM); Oregon State College (OSC); Pomona College, Claremont, California (POM); University of Texas (TEX); United States National Herbarium (US); University of Washington (WTU); Herbarium of Dr. Alan A. Beetle, Laramie, Wyoming (AB). The abbreviations for herbaria proposed by Lanjouw (1939) are followed in so far as they are applicable.

Bromus pseudolaevipes Wagnon, spec. nov. sect. *Bromopsidis;* perennis; *B. laevipedis* similis, sed differt foliis pilosis, saepe marginibus exceptis glabris vel totis glabris, inferioribus plerumque auriculatis; ligula usque ad 1 mm. longa; glumis pubescentibus. Chromosomae 2n = 14.

Perennial; culms 60–120 cm. tall, erect or spreading; nodes 4–6, retrorsely puberulent to pubescent; internodes puberulent to pubescent just below the nodes; leaves with sheaths glabrous to pilose, blades 8–25 (–35) cm. long, and 3–7.5 (–10) mm. wide, pilose, frequently only on the margins, or glabrous; auricles, at least on the lower leaves, rarely absent; ligule 1 mm. or less long, fringed or erose-lacerate, obtuse to truncate, glabrous; panicle 9–15 (–20) cm. long, erect to nodding, open with branches ascending to spreading, the axis puberulent to pubescent, the branches mostly 2 to each node, occasionally with prominent pulvini at their bases; spikelets 1.5–3.5 cm. long,

with 4–10 florets; glumes pubescent, rarely entirely glabrous, the first 4–6 mm. long, 3-nerved, subulate or with an acute to obtuse tip, the second 6.5–8 mm. long, (3- or) 5-nerved, with an acute to obtuse tip; lemmas 10–12 mm. long, pubescent over the back, sometimes only on the margins, (5- or) 7-nerved with an acute to obtuse tip bearing an awn (2–) 3–5 mm. long below an entire, or rarely, slightly emarginate apex; palea slightly shorter than the lemma, ciliate on the nerves, hispidulous to pubescent between the nerves; ovarian appendage with posterior lobe obtuse, occasionally with a slight median thickening; anthesis through May and early June; anthers 3.5–5 (5.5) mm. long, partially to completely exserted at anthesis; caryopsis 6–9 mm. long, elliptic-oblanceolate, amber-colored, adhering to the lemma and palea; modal length of guard cells 39–52 microns; modal diameter of pollen grains 35–38 microns; chromosome number $2n = 14$.

DISTRIBUTION: California, in the coast range from San Francisco Bay south to San Diego Co. and Santa Cruz and Santa Catalina islands, eastward into Fresno, Kern, Riverside, and San Bernardino counties, from near sea level to 800 m. elevation.

Type, in the Herbarium of the University of Michigan, *H. K. Wagnon 1507*, June 2, 1948; grown in the greenhouse of the Botanical Garden, University of Michigan, from seed reproduced at the University of California, Berkeley; originally collected by G. L. Stebbins, Jr., *(No. 2862)* along the Ridge Route west of Castaic, Los Angeles Co., California.

Specimens examined, all from California. Alameda Co., *Bolander 2* (NY), *Bolander 1542* (MO,NY), *Howell 19412* (UC-D); Fresno Co., *Short 144* (UC); Kern Co., *Short 193* (UC); Los Angeles Co., Santa Catalina Island, *Fosberg 54501* (CLUC,MO,UC,WTU), *Abrams 1704* (DS,NY,US), *Hoffmann*, June 6, 1930 (OSC), *Tracy 156* (US), Santa Catalina Island, *Brandegee 62* (UC); Monterey Co., *Beetle 4360* (UC-D), *Davy 7730* (UC), *Abrams 5637* (DS), *Dudley*, June 26, 1905 (DS); Riverside Co., Banning, *Davidson* (US); San Benito Co., *Abrams & Borthwick 7812* (DS,POM), *Dudley*, June 1, 1899 (DS), *Epling 8392* (MO), *Stebbins 2792* (UC-D); San Bernardino Co., *Johnston 1298* (US); San Diego Co., *Vasey*, in 1880 (US 1008060); San Luis Obispo Co., *Hoover 6148* (AB,UC), *Hoover 7170, 7197* (AB), *Hoover 7237* (AB,US), *Ferris 9784* (MICH,WTU, DS, the specimen of the Dudley Herbarium is mixed, containing some *B. laevipes*), *Lee 1023* (UC,UC-V), *Davy 7598* (US); Santa Barbara Co., Santa Cruz Island, *Brandegee 70* (UC), Santa Cruz Island, *Hoffmann*, June 29, 1930 (US), *Hitchcock 10463, 2581* (US), *Hoffmann*, June 2, 1930 (OSC); Santa Clara Co., *Hitchcock 2635* (US), *Rutter 1* (US), *Dudley*, April 23, 1899 (DS); Santa Cruz Co., *Leeds*, June 5, 1888 (MO); Ventura Co., *Stebbins 2867* (UC), *Pollard*, June 4, 1946 (MO).

The chromosome count was made from the type collection. This species has been included with *B. laevipes* to which it seems closely related.

Bromus dolichocarpus Wagnon, spec. nov. sect. *Bromopsidis;* perennis; glumae subulatae longissimae (gluma prima 9–12 mm. longa, 1-nervis, raro 3-nervis, gluma secunda 10–17 mm. longa, 3-nervis); lemma 14–20 mm.

longum, apice integrum; arista 6–13 mm. longa, paulum sub apice inserta; caryopsis 10–15 mm. longus; folia, inferiora saltem, plerumque auriculata. Chromosomae 2n = 28.

Perennial; culms 60–155 cm. tall, erect to spreading or geniculate; nodes 3–7, puberulent-pubescent, rarely glabrous; internodes glabrous; sheaths pubescent to sparsely pilose, those on upper culm often nearly glabrous; blades 10–43 cm. long, 4–13 cm. wide, usually pilose on upper surface, glabrous and scabrous on the lower; auricles usually present at least on the lower leaves; ligule 1.5 mm. or less, glabrous, truncate to obtuse; panicle exserted, open, nodding, (8–) 14–30 cm. long, the axis glabrous to puberulent; branches mostly in 2's or 3's, ascending, capillary, sometimes with prominent pulvini at their bases; spikelets 2–3 cm. long, 3–6 florets; glumes glabrous or pubescent to sparsely pilose, subulate, the first 9–12 mm. long, 1- or (3-) nerved, the second 10–17 mm. long, 3-nerved; lemmas rounded on the back, 14–20 mm. long, subulate, sparsely pubescent to glabrous over the back, pilose to hirsute on the margins, 3- or 5-nerved, bearing an awn 6–13 mm. long below an entire apex; palea usually shorter than the lemma, ciliate on the nerves and pubescent between the nerves; anthesis in September; anthers 2–3 mm. long; caryopsis lanceolate-oblanceolate, 10–15 mm. long, amber colored, adhering to the palea and lemma; modal length of the guard cells (38) 45–59 microns; modal diameter of the pollen grains 42 microns (based upon a single specimen); chromosome number 2n = 28.

DISTRIBUTION: Mexico, in the states of Jalisco, Michoacán, México, Hidalgo, Morelos, and Puebla, from 1900 to 3100 m. elevation.

Type, in the Herbarium of the University of Michigan, *Rogers McVaugh 9887*, March 18, 1949; collected in fir forests about 10 miles northwest of C. Hidalgo, Michoacán, México.

Specimens examined, all from Mexico. HIDALGO: El Chico, *Lyonnet 262* (US). JALISCO: road from Zapatlan to Mt. Nevada, *Hitchcock 7151* (US). MÉXICO: district of Temascaltepec, *Hinton et al. 2459* (NY,US), *Hinton 8395* (NY,TEX). MICHOACÁN: vicinity of Morelia, Cerro Azul, *Arsène 3273* (MO). MORELOS: Valle del Tepeite, *Lyonnet & Elcoro 1811* (US). The following specimens are included doubtfully since guard cell measurements indicate that they may be diploids: Mt. Popocatepetl, México, *Hitchcock 5985* (US); Mt. Orizaba, Vera Cruz, *Rose & Hay 5733* (US).

The chromosome count was obtained from seedlings grown from seed collected with the type. Material of this species has been determined as *B. ciliatus* L. and *B. exaltatus* Bernh. It is readily distinguished from *B. ciliatus* by its auricles and long awns. Bernhardi's description (1841) of *B. exaltatus* gives no indication that he had this particular plant in mind. There is in fact, some doubt as to whether his grass was actually a *Bromus* as the 4-nerved condition of the first glume *("gluma inferiore 4 nervia")* is an abnormal condition in *Bromus*. All species of *Bromus* that I have examined show an odd number of nerves on

the glumes such as 1, 3, 5, and 7. Shear (1901) failed in having the type located in the Bernhardi Herbarium now deposited at the Missouri Botanical Garden. I am indebted to Dr. G. B. van Schaack who repeated the search and was also unable to locate the type specimen. In view of the above, the application of the name is uncertain and it should be regarded as a *nomen dubium*.

Bromus mucroglumis Wagnon, spec. nov. sect. *Bromopsidis;* perennis; *B. Richardsonii* similis sed nodis pubescentibus, foliis supra pilosis, foliorum faucibus lanatis pilosisve, glumis piloso-pubescentibus, raro glabris, gluma secunda semper mucronata, palea inter nervos puberula usque ad pilosa. Chromosomae 2n = 28.

Perennial; culms 50–135 cm. tall, erect or spreading; nodes 5–7, retrorsely pilose- sparsely pubescent; internodes glabrous; radical leaves pubescent to pilose; culm leaves with pubescent or occasionally glabrous sheathes; blades 20–30 cm. long and (4–) 7–11 mm. wide, upper surface pilose, the lower surface glabrous to pilose, lax; auricles absent; throat lanate to pilose; ligule 1–2 mm. long, obtuse to truncate, glabrous; panicle 12–20 cm. long, nodding, open with ascending-spreading branches, the axis glabrous and smooth or scabrous; branches in 2's or 3's occasionally with pulvini at their bases; spikelets terete before anthesis, 2–2.8 cm. long with 5–10 florets; glumes pubescent-pilose, rarely glabrous, the first 6–8 mm. long, 1-nerved, subulate, the second 8–8.5 mm. long, 3-nerved, subulate or with an acute tip, mucronate; lemmas rounded on the back, 10–11 mm. long, sparsely pubescent to pilose on the margins and across the back, or occasionally only on the lower half, 7-nerved, tip acute to obtuse, bearing an awn 3–5 mm. long below an entire apex; palea slightly shorter than the lemma, ciliate on the nerves, puberulent to pilose between the nerves; anthesis during late August; ovarian appendage with posterior lobe slightly notched to obtuse, occasionally with a slight median thickening; anthers 1.5–2 (3.4) mm. long; caryopsis 6–9 mm. long, lanceolate-oblanceolate, amber-colored or purple-black, adhering to the lemma and palea; modal length of guard cells 42–52 microns; modal diameter of pollen grains 40–42 microns; chromosome number 2n = 28.

DISTRIBUTION: southwestern New Mexico and middle Arizona southward into the states of Chihuahua, Sonora, and the southern part of Baja California, Mexico, from 1,500 to 2,900 m. elevation.

Type, in the Herbarium of the University of Michigan, *H. K. Wagnon 1520,* July 28, 1948; grown in the greenhouse of the Botanical Garden, University of Michigan, from seed reproduced by the Soil Conservation Service (A-5712), Albuquerque, New Mexico, and originally collected by *Goodding, Locke, & Johnson* at South Cave Creek, Chiricahua Mts., Cochise Co., Arizona.

Specimens examined. ARIZONA: Cochise Co., *Darrow, Gould, Phillips & Pultz 1416* (ARIZ,UC-D), *Gould & Haskell 3323* (ARIZ), *Mearns 2164* (DS), *Jones 24703* (MO,NY,POM,TEX,UC), *Barkley 14A653* (TEX), *Eggleston 10850* (US); Coconino Co., *Knowlton 140* (US); Graham Co., *Thornber & Shreve 8052* (ARIZ); Pima Co., *Gilman 45* (ARIZ,NY), the specimen from

the N. Y. Bot. Gard. is mixed, containing *B. frondosus);* Santa Cruz Co., *Griffiths 7262* (US), Oct. 4, 1939 (UC-D), *Gould 2601* (ARIZ). NEW MEXICO: Dona Ana Co., *Wooton & Standley,* Sept. 23, 1906 (US); Grant Co., *Wooton,* July 11, 1900 (US). MEXICO. BAJA CALIFORNIA: La Chuparosa (loc.?) *Brandegee 73* (US), La Laguna, Sierra de Laguna, east of Todos Santos, Distrito del Sur, *Carter 2341* (US). CHIHUAHUA: Soldier Canyon, Sierra Madre Mts., *Jones,* Sept. 16, 1903 (POM), Canyon de St. Diego, *Hartman 802* (UC), Majalca, northwest of Chihuahua, *Pennell 19299* (US), Santa Clara Canyon, *LeSueur 092* (MO,US).

Chromosome counts were taken from the type, and from plants grown from seed reproduced at the University of California, Berkeley, originally from the collection of *Carter 2341,* La Laguna, Sierra de Laguna, east of Todos Santos, Distrito del Sur, Baja California, Mexico. This species shows considerable variation, some of which may be attributed to the fact that throughout its range, it seems to be confined to "population islands" on isolated mountains. However, most of the variation is apparently in the direction of *B. Richardsonii,* thus suggesting introgression with this species. Perhaps there is also some introgression with *B. lanatipes.* The following collections are representative of these supposed intermediates and may arbitrarily be assigned to either *B. Richardsonii* or *B. mucroglumis.* ARIZONA: Cochise Co., *Goodding 316* (ARIZ), *Cassidy & Taylor,* Aug. 5, 1933 (ARIZ), *Blumer 1368* (ARIZ,NEB,NY), *Mearns 2579* (US); Coconino Co., *Leiberg 5795* (US); Pima Co., *Carter,* Sept. 17, 1937 (ARIZ), *Benson 9777* (ARIZ), *Livingston & Thornber* (ARIZ,UC-D), *Thornber 7672* (ARIZ), *Bryan 113* (ARIZ), *Benson 9711* (ARIZ). NEW MEXICO: Colfax Co., *Standley 144421* (US). MEXICO. BAJA CALIFORNIA: La Encatanda, Sierra San Pedro Martir, *Wiggins & Demaree 4960* (CLUC,NY, US), banks of La Sanca Creek, ca. 5 miles northwest of La Grulla, Sierra San Pedro Martir, *Wiggins & Demaree 4873* (UC, US). CHIHUAHUA: Sanchez, *Hitchcock 7708* (US).

Bromus lanatipes forma **glaber** Wagnon, f. nov., a forma typica vaginis glabris differt.

This form differs from the species in having glabrous rather than lanate culm sheaths; the distribution is the same as the species.

Type, in the herbarium of the New York Botanical Garden, *A. A. & E. Gertrude Heller 3835,* July 12, 1897; collected in the Santa Fe Canyon, 9 miles east of Santa Fe, Santa Fe Co., New Mexico.

Specimens examined. ARIZONA: Coconino Co., *Hitchcock, Amer. Gr. Nat.*

Herb. 887 (MO). COLORADO: Clear Creek Co., *Patterson 264* (MICH,MO,MSC; NY = *B. lanatipes*), *Patterson 140* (US); El Paso Co., *Hitchcock 1776* (US); Ouray Co., *Underwood & Selby 18* (NY). NEW MEXICO: Colfax Co., *Standley, Amer. Gr. Nat. Herb. 881* (NY,UC-D,US), *Eggleston 18990* (NY); Grant Co., *Mulford 24* (MO,NY), *Wolf 2604* (DS); McKinley Co., *Salmon 46* (UM); Otero Co., *Hitchcock, Amer. Gr. Nat. Herb. 886* (NY), *Humphrey 45* (US); Socorro Co., *Eggleston 17002* (NY); Taos Co., *Heller 3586* (NY,POM). TEXAS: Culberson Co., *Grassl 130* (MICH).

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MARIN FLORA POSTSCRIPTS

BY JOHN THOMAS HOWELL

Perusal of Marin Flora has disclosed a number of minor typographical and other errors but these slips, undesirable though they are, are relatively unimportant when compared to the wrong name I give for our weedy *Pelargonium*. On page 180, the plant is called "*P. grossulariaefolium* Ait.", whereas it should have been *P. grossularioides* (L.) Ait. A generally accepted synonym of *P. grossularioides* is *P. grossulariaefolium* Salisb., but that name has not been used for our plant for many decades.

In the introductory discussion of local endemics in Marin Country (Marin Flora, p. 27), I neglected to include two in *Ceanothus: C. Masonii* McMinn, which is restricted to Bolinas Ridge in the "Mount Tamalpais Franciscan Area," and *C. gloriosus* Howell var. *porrectus* Howell, which is found only in the Bishop pine forest on Inverness Ridge of "Point Reyes Peninsula." The addition of these raises the total of Marin County endemics to 11 species, 9 varieties, and 1 form.

A botanist, who proposes as many new plant names as E. L. Greene did, has to be resourceful, particularly in a large genus, in order to avoid repetition of epithets he or other botanists

may have already used. As examples of his nomenclatorial ingenuity, we find Greene naming a lupine from Fresno County, *Lupinus fraxinetorum,* i.e., lupine of the ash trees, the Spanish word *fresno* being *ash* in English or *fraxinus* in Latin; and from the Santa Ynez Mts. he described *Eriogonum agninum,* deriving the name from *agnus,* Latin for lamb, but rendered also as the well-known proper names, Agnes in English and Ynez in Spanish. However, when he described the attractive summer-blooming *Eriogonum* from the Tiburon Peninsula as *E. vimineum* var. *caninum,* I was unable to follow him and confessed my dilemma in Marin Flora (p. 122): "Greene gives no reason for the unusual varietal epithet; the connection between the plant and a dog must have been to him something personal or fanciful."

Now a very plausible explanation for the name *caninum* is suggested by H. Dwight Ripley who has written me as follows: "Greene must have named *E. vimineum* var. *caninum* after Tiburon, which as you know means 'shark' in Spanish. In Latin, *canis* has a subsidiary meaning of 'sea-dog'. Also, in modern Italian 'shark' is *pescecane* or 'dog-fish'. I think this solves the mystery fairly satisfactorily."

A new weed is to be added to the already extensive introduced flora of Marin County, *Brassica juncea* (L.) Coss. This Old World mustard, commonly known as Indian mustard, may be distinguished from the five species of *Brassica* already reported from the county by its broad (to 5 mm.) angled pods that are carried on long spreading-ascending pedicels. The pods are distinctly flattened contrary to the partition, a character that has not been accounted for in descriptions I have seen of the species. The Marin plant grows as a sidewalk weed in Blithedale Canyon, Mill Valley *(Howell 26619).*

A CORRECTION. Having lately received, through the generosity of Dr. Ivan M. Johnston, a copy of the twelfth volume of the Russian Flora, devoted to *Astragalus,* I find that my *A. plumbeus* (Leafl. West. Bot. 5:195,—1949) is antedated by *A. plumbeus* (Nevski) Gontsch. (Fl. U.S.S.R. 12:868,—1946). The species described from the mountains above Leadville, Colorado, may take the name **Astragalus molybdenus,** nom. nov.

—R. C. BARNEBY

A NEW VARIETY IN ERIOGONUM ROTUNDIFOLIUM

BY GEORGE J. GOODMAN
University of Oklahoma, Norman

In typical *Eriogonum rotundifolium* (**E. rotundifolium** Benth var. **typicum** nom. nov., based on *E. rotundifolium* Benth., DC. Prod. 14:21. 1856), the outer perianth-segments are transversely elliptic, being at least twice as wide as long, and at least as long as the inner segments. Two collections have come to my attention with narrower outer perianth-segments, commonly about as wide as long, sometimes but half as wide, and slightly shorter than the inner segments. The shape varies from oblong to broadly obovate. Flowers of this type may be mature and fertile. The variety is here named

Eriogonum rotundifolium Benth. var. **angustius** Goodman, var. nov., segmentis exterioribus perigonii late obovatis vel oblongis, fere circa et longitudine et latitudine aequalibus, nonnumquam autem angustioribus dimidio.

Type: *Barton H. Warnock 46979,* frequent along highway to Casa Piedra, 20 miles south of Marfa, Presidio County, Texas, limestone soil, elev. 4000 ft., Nov. 17, 1946. (Bebb Herbarium, University of Oklahoma.)

Cotype: *Warnock 46988,* frequent along highway to Pecos, 20 miles northwest of Fort Stockton, Pecos County, Texas, limestone soil, elev. 3500 ft., Nov. 27, 1946. (Bebb Herb.)

These two collections come from near the east edge of the range of the species. Thanks are hereby expressed to Dr. Tharp of the University of Texas for the loan of herbarium material.

A NEW COMBINATION IN ERIGERON. **Erigeron compactus** Blake var. **consimilis** (Cronq.) Blake, comb. nov. *E. consimilis* Cronquist, Brittonia 6:186 (1947). This variety differs from typical *E. compactus* in its somewhat larger heads and involucre, the phyllaries with more or less spreading instead of appressed hairs. The type of *E. consimilis* was collected 15 miles north of Ganado, Apache County, Arizona *(Peebles & Smith 13467).*—S. F. BLAKE, Plant Industry Station, Beltsville, Maryland.

AN EARLIER PUBLICATION OF POLYPOGON SEMIVERTICILLATUS. In 1948, when Robert F. Hoover submitted for publication his transfer of *Agrostis semiverticillata* Forsk. to *Polypogon,* he asked me, because of his "isolation from herbaria and literature, . . . to make sure that the *Agrostis* has never before been referred to *Polypogon.*" Since I did not find his combination in the indices and catalogues, Hoover's article was published (Leafl. West. Bot. 5: 138, 1948).

Only a few weeks later, I discovered an earlier publication of *P. semiverticillatus,* this by Hylander in 1945 in his important paper, Nomenklatorische und Systematische Studien über Nordische Gefässpflanzen (Uppsala Universitets Årsskrift 1945: 7, pp. 1–337). Hylander made his transfer on page 74.—JOHN THOMAS HOWELL.

IMPATIENS ROYLEI WALP. IN OREGON. On July 8 and 9, 1947, the writer collected material of this species on wet banks along the Columbia River between Svensen and Westport, Clatsop Co. Only a few plants were found. It is a strikingly beautiful species, often 2 m. in height, with very stout stem, deep red above, long, partly verticillate, sharply serrate leaves, and in these specimens nearly white flowers. It is a native of the Himalaya Mts., but has been reported from a few localities in North America, doubtless escaped from cultivation. Another colony was discovered along Sunset Highway near the bridge over the Necanicum River in southern Clatsop Co. The specimens here were numerous and well scattered and the flowers rose-color.—Morton E. Peck, Willamette University, Salem, Oregon.

CAREX SHELDONII IN THE SIERRA NEVADA. On June 28, 1949, Peter Raven collected the very rare *Carex Sheldonii* Mkze. in a wet grassy place under *Pinus ponderosa* at Baxters, Placer County, his *No. 959.* This is the first-known collection from the Sierra Nevada and the second to be recorded from California. Heretofore the species has been known in California only from the Warner Mts., Modoc Co. (cf. Erythea 8: 86). Beyond California, it is found in Oregon, Idaho, and Utah, but in no place does it appear to be common.—John Thomas Howell.

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of
WESTERN BOTANY

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JOHN THOMAS HOWELL

LESQUERELLA COLLECTED BY H. D. RIPLEY AND R. C. BARNEBY

BY BASSETT MAGUIRE
New York Botanical Garden

Mr. H. D. Ripley and Mr. R. C. Barneby have been so good as to permit me to review a large set of critically collected *Lesquerella* made by them over the past few years. No series of plants secured by these discriminating field botanists can fail to contain noteworthy collections. It is a pleasure, therefore, to make record[1] of the following.

In a recent paper Rollins [2] has discussed relationship among those species (exclusive of Texas and Mexican species) of *Lesquerella* in which the replum is at right angles to the broader axis of the silique, viz. *L. Wardii* Wats., *L. hemiphysaria* Maguire, and two new species, *L. carinata* Rollins and *L. Paysonii* Rollins. Dr. Rollins contrasts these species with the *L. occidentalis* group in which the pod is compressed parallel with the replum, and argues that "This difference is fundamental and reflects major modification in orientation of the flower parts."

However that may be, there are other species which must be associated with the group in which the pod is contrarily broadened or flattened; perhaps all of the *utahensis* group, where the pod shape is somewhat variable, and most certainly with *L. Kingii* (to be discussed in another paper) in which the pods may be not only so broadened, but as in *L. hemiphysaria* may be obcordate, or even subdidymous.

And now, still another species has been found by Ripley and Barneby, which must fit into this alliance. It would stand next to *L. utahensis,* but is readily recognized by its more dense, cinereous pubescence, smaller leaves, and smaller obovate pods that are somewhat broadened contrary to the replum.

It gives me pleasure to name the new species after one of its two keen collectors.

Lesquerella Barnebyi Maguire, spec. nov. Herbae perennes dense stellato-cinereo-pubescentes; caulibus procumbentibus vel adscendentibus simplicibus, 5–12 cm. longis; foliis radicalibus 2.5–3.5 cm. longis, spatulatis, laminis

[1]Further collections of these series are cited in, Botany of the Intermountain Region II. Bassett Maguire & A. H. Holmgren, in press.
[2]Rollins, R. C. Contr. Gray Herb. 171: 42-53 (1950).

5–10 mm. longis, anguste vel late ellipticis, ovatis vel rhomboideis vel subrotundatis, petiolis angustis, 1.5–2.5 cm. longis; foliis caulinis spatulatis vel oblanceolatis, petiolatis, 6–10 mm. longis, indumentis dense stellatis, trichomatibus 0.3–0.5 mm. diametro; inflorescentiis brevi-racemosis, maturis 1–2 cm. longis; sepalis sigmoideis 3–6 mm. longis; petalis non visis; siliculis 2.5–3.5 mm. longis, 3.5–5 mm. latis, obovatis, fere obcompressis, apicibus rotundatis vel subtruncatis, basibus subrotundatis vel saepe acutis, nonstipitatis; stylis 2–3 mm. longis; replo obovato vel obiculari; ovulis fere 4–6; seminibus fere 4, 1.5 mm. longis.

Type: gulches in clay hills, north of Pioche, Lincoln Co., Nevada, 5,600 ft. alt., June 18, 1944, *H. D. Ripley & R. C. Barneby No. 6350* (New York Botanical Garden). Cotype: calcareous gravel flats among junipers, Egan Range, 14 miles northwest of Ely, White Pine County, Nevada, alt. 7,000 ft., June 20, 1948, *Ripley & Barneby No. 9280.*

Lesquerella Paysonii Rollins, Contr. Gray Herb. 171: 44 (1950). Silique strongly flattened contrary to the replum. Limestone gravelly flats, Turpin Meadows east of Moran, 6,500 ft. alt., Teton County, Wyoming, June 29, 1947, *Ripley & Barneby No. 8901;* exposed ridges on broken limestone, 9,000 ft., Teton Pass, Teton County, *Ripley & Barneby No. 8897.*

It is desirable to add the above records to those listed for the recently published *L. Paysonii.* The writer must acknowledge his own delinquency in failing in his obligation to the indefatigable collectors, Ripley and Barneby. The specimens were long in my hands. A description of a new entity to be based on the first cited specimen was drawn up commemorating one of its discoverers. The little manuscript, long delayed in transmittal, and even now in the hands of the editor, must be recalled, and the present writing substituted for the former one.

Lesquerella ovalifolia Rydb. in Britton & Brown, Ill. Fl. 2: 137 (1897). Steep sandy banks north of Pueblo, Pueblo County, Colorado, alt. 4,900 ft., May 31, 1946, *Ripley & Barneby No. 7641.* Seldom collected, in Colorado known best from the vicinity of Pueblo.

Lesquerella prostrata A. Nels., Bull. Torrey Club 26: 124 (1899). Slopes of White shale bluffs, 6 miles west of Kemmerer, Lincoln County, Wyoming, alt. 7,000 ft., June 10, 1946, *Ripley & Barneby No. 7879;* limestone gravel ridge, Wind River Mountains, 5 miles east of Atlantic City, Fremont County, Wyoming,

alt. 8,200 feet, June 30, 1947, *Ripley & Barneby No. 8931.* Payson[3] lists only two collections of *L. prostrata.*

The above collections add considerably to our understanding of the species. While belonging to the *L. utahensis* complex, as Payson says (l.c.), the relationship seems more closely to lie with *L. Paysonii.*

LESQUERELLA PRUINOSA Greene, Pittonia 4: 307 (1901). Siliques sometimes quite truncate. Thin pine forests, Pagosa Springs, Archuleata County, Colorado, alt. 7,150 ft., May 28, 1946, *Ripley & Barneby No. 7587,* topotype. Known only from the type locality.

LESQUERELLA SUBUMBELLATA Rollins, Am. Jour. Bot. 26: 420 (1939). White shale benches, 4 miles southwest of Duchesne, Duchesne County, Utah, alt. 5,900 ft., June 15, 1947, *Ripley & Barneby No. 8703;* white shale hilltops, 17 miles northwest of Rangely, Rio Blanco County, Colorado, alt. 5,500 ft., June 16, 1947, *Ripley & Barneby No. 8740.* Previously reported only from Uintah County, Utah.

VARIATIONS IN ERIOGONUM SPERGULINUM

BY JOHN THOMAS HOWELL

For more than a decade, in the course of field work in the Sierra Nevada of California, I have been aware of what appear to be small- and large-flowered variants in *Erigonum spergulinum* Gray. During the summer of 1949, I became acquainted with *E. pratense* Stokes where it grows in the high southern Sierra in Tulare and Inyo counties. Since the latter plant is obviously related to *E. spergulinum,* I concluded to study this small Sierran complex in order to evaluate the several entities which seemed to be present. Although this study has been made in the Herbarium of the California Academy of Sciences (CAS), I am grateful for the privilege of examining specimens from the Dudley Herbarium, Stanford University (DS); Gray Herbarium, Harvard University (G); Idaho State College (IS); Pomona College (P); University of California (UC); United States National Herbarium (US); and Willamette University (W).

[3]Payson, E. B. A Monograph of the Genus Lesquerella. Ann. Mo. Bot. 8: 221 (1921).

Eriogonum spergulinum and *E. pratense* are annuals belonging to the subgenus *Ganysma* and they may be distinguished from other members of that group by the small 4-lobed involucres and by the foliar development of the lower primary cauline leaves. *Eriogonum spergulinum* has also been referred to the genus *Oxytheca* Nutt., and it was in connection with a reconsideration of its generic position that the species has been most recently studied (G. J. Goodman, Amer. Midl. Nat. 39: 498,-1948).

ERIOGONUM SPERGULINUM. Although Goodman (ibid., p. 500) states that "this species is notable for its remarkable uniformity," small- and large-flowered variants are rather well marked in both field and herbarium. In the small-flowered plant, the perianth is usually about 2 mm. long, though it may vary from 1.5 to nearly 2.5 mm. In the larger-flowered form, the perianth is usually 2.5 to 3 mm. long, but occasionally it may be only 2 mm. long and flowers of one specimen measured 4 mm. Correlated with these differences in size of flowers are differences in the size and shape of anthers and, in less degree, of achenes. In the smaller flowers, the anthers vary from broadly elliptic to broader than long and are only 0.2–0.33 mm. long, while the obovoid achene is usually about 1.5 mm. long. In the larger flowers, the anthers are oblong or elliptic and 0.33–0.5 mm. long, while the nearly circular achene is about 2 mm. in diameter. Among 77 collections of *E. spergulinum* in the Herbarium of the California Academy of Sciences, 55 may be referred to the small-flowered and 22 to the large-flowered variant.

These two kinds of plants also have distinctive distributional patterns. The large-flowered type is restricted to the west slope of the Sierra Nevada from Tulare County north to Eldorado County at elevations from 5000 to 8000 feet, or rarely even to 10,000 feet. The small-flowered plant has a much more extended range. From the Mt. Pinos region of Ventura and Kern counties it extends northward along both slopes of the Sierra in California and Nevada to the southern part of the Cascade Range in northern California and Oregon. Beyond this general range, outlying stations are to be noted from the North Coast Ranges of California, from southeastern Oregon, and southwestern Idaho. The small-flowered plants have been col-

lected at elevations between 4300 feet and 10,900 feet, generally from 6000 to 8000 feet.

Within the range of the large-flowered form on the west slope of the Sierra Nevada from Eldorado County to Tulare County, the small-flowered type is not so frequently collected as the large-flowered type. In this region the approximate ratio of collections appears to be two small-flowered plants to three large-flowered plants.

The type-collection of *E. spergulinum,* made by Bolander on the "bank of Big Creek below [Mariposa] Big Tree Grove," belongs to the large-flowered form. The plants with smaller flowers have also been named, but since the variations described above have gone unnoticed for the most part, no attempt has ever been made to apply the name, *Oxytheca Reddingiana* Jones. The type of Jones' species was collected "near the snow-sheds at Soda Springs, near Summit, Cal., July, 1882," in a district where only the small-flowered plants are found, though Jones' original description, "flowers 1″ long," leaves no doubt of the sort of plant he had. From the time of E. L. Greene (Fl. Franciscana, p. 153), *Oxytheca Reddingiana* has been relegated to synonymy, so the appropriate transfer of the epithet to *Eriogonum* will be attended to below.

The question arises as to what taxonomic status should be accorded these two types of plants. With the distinctive flower and fruit variations correlated with different geographic ranges, each might be recognized as a species. I believe, however, that the morphologic differences, being chiefly matters of size and not entirely disjunct, do not call for specific separation, and that the small-flowered plant should be treated as a variety of *E. spergulinum.*

ERIOGONUM PRATENSE. Although Miss Stokes recognized that this plant "is closely related to *E. spergulinum* Gray," she pointed out that it differs in important details of habit and of vestiture. In *E. pratense* the internodes of the flowering branches are much shortened so that the flowers are close together and not so diffusely arranged as in *E. spergulinum.* Moreover, short proliferous flowering branches frequently arise from nearly all the leaf-axils, and produce an especially noticeable effect about the basal rosette of leaves. The stems are usually hirsutulous-pubescent except for the uppermost branchlets, and, though

the lower internodes tend to be slightly viscidulous, the capitate glands which are so conspicuous on the internodes of *E. spergulinum* are lacking. The perianth is about 2 mm. long, thus corresponding to the smaller-flowered variant in *E. spergulinum,* but, whereas the outside of the perianth-segments of that species is minutely pubescent or subglabrous, in *E. pratense* the perianth is finely but conspicuously hirsutulous. No distinctive differences have been detected in the other flower parts or fruits. Miss Stokes originally described the involucres as glandular; they are either glabrous or sparsely hisutulous, but not glandular. In the higher part of the southern Sierra Nevada in Inyo and Tulare counties between 8800 and 11,300 feet, *E. pratense* is a very common and attractive plant, spreading a lace-like filagree over open sandy flats and slopes that are a distinctive feature between the subalpine forests and meadows in that region.

In spite of its distinctive characters, *E. pratense* can scarcely be maintained as a species since in all its characters it intergrades with *E. spergulinum.* In Tulare County, two collections have been seen which combine the characters of the two kinds of plants: *Hall & Babcock No. 5320* (DS, UC) from Volcano (*i. e.,* Golden Trout) Creek and *Dudley No. 2500a* (DS, UC) from Whitney Creek. In the former, the plants are more like *E. spergulinum* but the internodes are both glandular and glabrous, and the perianths are both subglabrous and hirsutulous. In the latter, the glands of *E. spergulinum* are present on plants otherwise like *E. pratense.* A third collection from Tulare County, *Coville & Funston No. 1622* (DS) from Whitney Meadows, is quite like *E. pratense* except that the perianths are sometimes glabrous. In Mono County, on slopes and flats covered with pumice, other intergrades have been noted: *Howell No. 14504* (CAS) from near Crestview and *Lorraine in 1938 (*DS) from the Mono Craters. These have the hirsutulous perianths of *E. pratense* as well as a habit somewhat reminiscent of that plant, but both have the cauline glands of *E. spergulinum.* Since the two entities intergrade so completely, it seems best to accept *E. pratense* as a variety.

Key to the Varieties of Eriogonum spergulinum

A. Internodes generally without capitate glands; perianths more or less hirsutulous ..... 1c. var. *pratense*

A. Internodes generally with capitate glands; perianths generally subglabrous or sparsely pubescent ..... B
B. Perianths generally 2.5–3.5 mm. long; anthers oblong or elliptic, 0.33–0.5 mm. long ..... 1a. var. *typicum*
B. Perianths generally 1.5–2.5 mm. long; anthers broadly elliptic or roundish, 0.2–0.33 mm. long ..... 1b. var. *Reddingianum*

1a. **E. spergulinum** var. **typicum** J. T. Howell, nom. nov. *E. spergulinum* Gray, Proc. Amer. Acad. **7:** 389 (1868). *Oxytheca spergulina* (Gray) Greene, Fl. Francis. 153 (1891).

Representative collections, all from the Sierra Nevada, California. South Fork of American River, 5500 ft., Eldorado Co., *Belshaw 2G40;* Camp Baxter near Dorrington, 5500 ft., Calaveras Co., *Jussel in 1930*; Strawberry, 5240 ft., Tuolumne Co., *Quick in 1943;* Gin Flat, 7000 ft., Mariposa Co., *Howell 20701;* near top of Chilnualna Falls, Mariposa Co., *Howell 197;* bank of Big Creek below Big Tree Grove, Mariposa Co., *Bolander 5003* (G type; CAS, UC,US): General Grant National Park, Fresno Co., *Winblad in 1935;* Huntington Lake, 7000 ft., Fresno Co., *Pollard in 1943;* Kings River Canyon, 5000 ft., Fresno Co., *Howell 15603;* Generals Highway, near Stony Creek Camp Ground, Tulare Co., *Quick 45-80;* Mineral King, 7800 ft., Tulare Co., *Howell 17145, Winblad in 1936;* Sky Valley, 10,000 ft., Tulare Co., *Culbertson 4570.*

1b. **E. spergulinum** var. **Reddingianum** (Jones) J. T. Howell, comb. nov. *Oxytheca Reddingiana* Jones, Bull. Torr. Bot. Club **9:** 32 (1882).

Representative collections. IDAHO: Brundage Mt., 7000 ft., Valley Co., *Davis 2935* (IS); Landmark, Valley Co., *Davis 2725* (CAS,IS); Cape Horn, Stanley, Custer Co., *Christ 11329* (UC); Trinity Lake region, 8000 ft., Elmore Co., *Macbride 709* (DS,G,US).

OREGON: Davis Lake, 4500 ft., Deschutes Co., *Hitchcock & Martin 4956* (UC,US); Sand Creek, Klamath Co., *Jones 28856, Munz 14423;* Fish Lake, Steen Mts., Harney Co., *Train 23* (US); Drakes Mt., Lake Co., *Peck 19537* (W).

NEVADA: Slide Mt., 7500 ft., Washoe Co., *Howell 14239;* Spooner, 7100 ft., Douglas Co., *C. F. Baker 1136;* Mt. Grant, 9000 ft., Mineral Co., *Train 4209* (UC). The collection cited by Goodman, l.c., from Ormsby Co. probably belongs here.

CALIFORNIA: between Big Flat and Caribou Gulch, Salmon River Canyon, Siskiyou Co., *Howell 1356LA;* Government Flat, 6000 ft., Tehama Co., *M. S. Baker 9833;* Black Butte, Glenn Co., *Howell 19135;* Snow Mt., Lake Co., *Brandegee in 1892* (UC); Mill Creek Meadows, Warner Mts., Modoc Co., *Applegate 8104* (DS); near Lost Lake, 8000 ft., Warner Mts., Lassen Co., *Howell 12123;* south of Milford, 6100 ft., Lassen Co., *Ripley & Barneby 5705;* Prattville, 4300 ft., Plumas Co., *Heller & Kennedy 8801;* on road from Chilcott, Plumas Co., *Eastwood 14888;* Jonesville, 5600 ft., Butte Co., *Copeland in 1931;* Gold Lake, 6400 ft., Sierra Co., *L. S. Rose 34317* (DS); Boreal Ridge near Norden, Nevada Co., *Howell 18378;* Donner Lake, Nevada Co., *Heller 6905;* Soda Springs, 7000 ft., Nevada Co., *Jones 2408* (P, type; US); Chambers Lodge, Lake Tahoe, 6250 ft., Placer Co., *L. S. Rose 41290;* between Fallen Leaf Lake and Lake Tahoe, Eldorado Co., *Howell 1358;* Corral Springs, 7500 ft., Amador Co., *Hansen 703* (DS); Baker Station, Middle Fork Stanislaus

River, 6200 ft., Alpine Co., *Eastwood & Howell 7485;* Camp Baxter near Dorrington, Calaveras Co., *Jussel in 1930;* Tuolumne Meadows, 8600 ft., Tuolumne Co., *Howell 20050;* Buck Camp Trail between Chilnualna Creek and Johnson Lake, Mariposa Co., *Howell 543;* near Garnet Lake, 9700 ft., Madera Co., *Howell 16729;* ridge northwest of San Joaquin Mt., 10,500 ft., Madera Co., *Howell 16606;* Huntington Lake, 7000 ft., Fresno Co., *Pollard in 1943;* Sonora Junction, 7200 ft., Mono Co., *Ripley & Barneby 5809;* near Crestview, Mono Co., *Howell 14497, 25273;* Convict Lake, 7600 ft., Mono Co., *L. S. Rose 35345;* Ruby Falls, Rock Creek Lake Basin, 10,900 ft., Inyo Co., *Peirson 9434;* Big Pine Lakes Trail, 9200 ft., Inyo Co., *Howell 24146;* Rock Creek, 9600 ft., Tulare Co., *Howell 25573;* between Moraine Lake and Sky Parlor Meadow, 9300 ft., Tulare Co., *Howell 17502;* Hockett Meadow, 8500 ft., Tulare Co., *Culbertson 4443;* Mt. Pinos, 8200 ft., Kern Co., *Hall 6657* (UC); Mt. Pinos, 8500 ft., Ventura Co., *Hall 6659* (UC); Griffins, Ventura Co., *Elmer 3979.*

1c. **E. spergulinum** var. **pratense** (Stokes) J. T. Howell, comb. nov. *E. pratense* Stokes, Leafl. West. Bot. 3: 201 (1943).

Collections examined, all from the Sierra Nevada, California. INYO COUNTY: Cottonwood Creek, 10,200 ft. (Cottonwood Lakes, 11,000 ft., according to data on specimen), *Alexander & Kellogg 3357,* type-collection; Little Cottonwood Creek, 9800 ft., *Howell No. 25428,* 10,000 ft., *Howell 26258.* TULARE COUNTY: Siberian Pass Creek, 11,000 ft., *Howell 25738;* Whitney Meadows, 9800 ft., *Coville & Funston 1622* (DS); *Howell 25762;* Golden Trout Creek at Tunnel, 8900 ft., *Howell 25937A;* Ramshaw Meadows, 8800 ft., *Howell 25951;* Army Pass Creek, 11,300 ft., *Howell 26163.*

ADDENDUM:

NOTES ON MY 1950 COLLECTIONS OF ERIOGONUM SPERGULINUM

In July, 1950, Dr. P. A. Munz and I botanized in the region traversed by the South Fork of the Kern River between Monache and Templeton meadows (8,000 to 8,500 feet altitude) and climbed Olancha Peak (9,000 to 12,135 feet). In this area in the southern Sierra Nevada where the interrelation between *Eriogonum spergulinum* var. *Reddingianum* and var. *pratense* had seemed especially critical, I was able to make field observations and collections which have confirmed my earlier conclusions as set forth above.

Out of the eight collections of *E. spergulinum* which I made, five are mixtures of var. *Reddingianum* and var. *pratense* or contain plants intermediate in character. Thus among the individual plants in these collections, some are typical of *Reddingianum,* some of *pratense;* others have the habit of *pratense* but the glandular internodes of *Reddingianum,* or *vice versa;* some have the pubescent perianth of *pratense,* others the subglabrous perianth of *Reddingianum.* These five collections, all

from Tulare County except the first, are: head of Summit Creek east of Olancha Pass, 9,300 ft., Inyo Co., *No. 26749;* Templeton Meadows, 8,500 ft., *No. 27018;* pass north of Hessian Meadows, west of Olancha Peak, 9,000 ft., *No. 27114;* Olancha Peak, 10,700 ft., *No. 27180;* South Fork of Monache Creek, 9,800 ft., *No. 27298.*

A sixth collection is also intermediate in character but in this the plants combine the characters of var. *typicum* and var. *pratense,* the only example I have noticed of this kind of intergradation. All the plants have the habit and the large perianths of var. *typicum* but the internodes of most of the plants are eglandulose as in var. *pratense.* This collection was made in Bakeoven Meadows on the South Fork of the Kern River at 8,100 ft., Tulare Co., *No. 26776.*

The two remaining collections, also from Tulare County, are nearly or quite typical and "pure" for the varieties represented: *No. 27172* from 9,600 ft. on Olancha Peak seems to consist only of plants referable to var. *Reddingianum; No. 27072* from the north end of Monache Meadows at 8,000 ft. is nearly typical of *E. spergulinum.* One plant of the latter set, however, has somewhat smaller flowers, showing a tendency towards var. *Reddingianum.*

These studies on my 1950 collections confirm the conclusions set forth above and further indicate that the entities involved in this complex should not be regarded specific. Notwithstanding the abundant intergradation where two of these entities occur together, particularly in the southern Sierra Nevada, it seems entirely proper to recognize them as named varieties.

A Plant New to California. The herbarium of Oberlin College contains specimens of *Gayoides crispum* (L.) Small *(Abutilon crispum* Sweet) from Mountain Springs Grade, southwestern Colorado Desert, San Diego County *(Mary F. Spencer No. 440,* in 1916). This plant is common in southwestern Arizona (doubtless also in Sonora) and has been collected at several localities in Baja California but, so far as the writer knows, has not been reported hitherto as occurring in California.—T. H. Kearney.

PLANT RECORDS FROM CURRY COUNTY, OREGON

BY WILLIAM H. BAKER
University of Idaho, Moscow

During the seasons of 1946, 1947, and 1948, considerable collections of plants were made in the vicinity of Agness, Curry County, Oregon. Until recent years the only means of reaching this area was by boat from Gold Beach at the mouth of the Rogue River. Agness is situated 35 miles up the river at the confluence of the Illinois River and the Rogue River. A road has now been constructed over the Coquille-Roque River Divide from Powers, Coos County, to Agness, a distance of about 28 miles. It is not surprising that this relatively inaccessible region would yield a number of interesting plant records for Oregon. All of the numbers cited are the author's own collections. Duplicates are deposited in the Herbarium of the University of Idaho and in other herbaria as indicated.

Briza maxima L. A good-sized colony grows at Oak Flat on a grassy slope above the Illinois River, 4 miles south of Agness. It is a European species sometimes cultivated in gardens. Apparently the first report of its natural occurrence in Oregon. Recorded by John Thomas Howell (2) as becoming widespread and locally common in Marin County, California.

Cyperus rivularis Kunth. Growing in moist ground along the shores of the Rogue River at Cherry Flat (W. A. Cochran place), 4 miles north of Agness, *No. 5648* (OSC, CAS). Associated with *C. aristatus, C. erythrorrhizos,* and *C. strigosus.* It is recorded by Abrams (1) as growing on wet soil; Sisson, California; Michigan to Kansas, Ontario, Maine and North Carolina. Identified by John Thomas Howell. It has not been previously collected in Oregon.

Saxifraga Howellii Greene. Wet hillside in oak woodland, along the Rogue River south of Illahe, *No. 5201* (OSC, CAS, UC). The first record of this species in the Rogue River Canyon of Curry County. The type locality is the "headwaters of the Coquille River." Peck (5) records it as growing on moist rocky banks along the Umpqua River and its tributaries. He reports that it is very common around Roseburg. Rimo Bacigalupi (personal correspondence) regards the plant as quite rare and is glad

to have evidence that it still exists. It is apparently distributed locally within the region outlined above.

SAXIFRAGA PARVIFOLIA Greene. Moist banks along Lone Tree Creek, open ground, *No. 5212* (OSC). According to Rimo Bacigalupi (personal correspondence) this plant is to be found near Grants Pass, the type locality. The collection of *S. parvifolia* west of Illahe in Curry County, is therefore a fairly significant extension of range for the species.

SANICULA LACINIATA H. & A. Collected in the Rogue Canyon, open hillside overlooking the mouth of Two Mile Creek on the Rogue River, *No. 5426;* open moist hillside along the Rogue River, south of Illahe, *No. 5195* (OSC, W, UW, CAS, UC). Identified by Lincoln Constance. A fairly common species in the lower Rogue River Canyon in the vicinity of Agness and near the mouth of the Illinois River. This species is not listed in "The Manual of the Higher Plants of Oregon" by Morton E. Peck. Thomas J. Howell (3) records it as growing from California to the Willamette Valley. The author has not seen it growing in the Willamette Valley. The plant apparently has a very local distribution in Oregon. Recorded by Jepson (4) on slopes of the Coast hills from Humboldt County to Monterey County, var. *serpentina* Jepson replaces it from Monterey to Marin County in California.

ARCTOSTAPHYLOS VISCOSISSIMA Peck. Collected on the dry south slope of Iron Mountain, elevation 3,700 feet, *No. 5454* (W). Identified by Morton E. Peck. The first collection of this species since the type. It is also the first collection in flower, the type being in fruiting condition, *Peck No. 8974,* from dry rocky summit of Bald Mountain, 5 miles east of the mouth of Euchre Creek, Curry County. Bald Mountain is approximately 12 miles due west of Iron Mountain and is situated in the same range. An interesting species with very dense foliage and small pink flowers. A wider distribution of this rare shrub is to be expected as the region is explored more intensively.

SYNTHYRIS RENIFORMIS Benth. var. CORDATA Gray. A fairly large number of collections of this variety have been made in the area. Along the edge of Lone Tree Creek, moist banks, about 1 mile south of Illahe, *No. 5204* (OSC, UC, UW, W, CAS, ND); Iron Mountain, summit and along the north slope in open coniferous woods, *No. 5289;* Rogue River Canyon, growing along

Billy's Creek, north of Illahe, *No. 3560;* woods at the mouth of Two Mile Creek, 5 miles north of Agness, *No. 3535*. There is considerable difference in appearance between this plant and typical *S. reniformis*. The former has unusually long leaves, in many instances nearly twice as long as wide. The flowers are often larger and more showy and a deeper blue. It ranges from northern California to Josephine, Curry, and Douglas counties in Oregon. The plant has not been previously collected in the Rogue River Mountains, and it is not listed in any flora covering the state of Oregon.

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STUDIES IN CALIFORNIA APLOPAPPUS

BY JOHN THOMAS HOWELL

Aplopappus (§ Hazardia) **Whitneyi** Gray var. **discoideus** J. T. Howell, var. nov. A var. typica differt: capitulis eradiatis; achaeniis ad 10 mm. longis, costis maioribus saepe pluribus.

Type: Herb. Calif. Acad. Sci. No. 360968, Shackleford Creek Trail south of Sky High Valley, Marble Mts., Siskiyou Co., el. 6,500 ft., *Howell No. 15236,* collected Aug. 9, 1939. Other collections in Herb. Calif. Acad. Sci., all from the Klamath Area of the Coast Ranges and all from California except the first: open crest of Bolan Ridge, Siskiyou Mts., Josephine Co., Oregon, *Thompson No. 12488;* Condrey Mt., Siskiyou Co., *L. C. Wheeler No. 3045;* Mt. Eddy, Siskiyou Co., *Eastwood No. 2053;* Orleans Mt., 4,000–6,000 ft., Humboldt Co., *Pollard in 1943, 1944, 1946;* Plaskett Meadows, Glenn Co., *Howell No. 19151;* Black Butte, Glenn Co., *Howell No. 19121.* Also on Snow Mt., Lake Co., acc. Hall in Carnegie Inst. Wash. Publ. No. 389, p. 257.

Commonly a rayless variant of a radiate species in the *Compositae* is to be accorded no more than a formal rating, if it receives nomenclatural recognition at all, but in the present instance phytogeographic considerations have led me to treat the plant as a variety. Whereas the typical radiate form of the species is found only in the Sierra Nevada (where it occurs the full length of the range from Plumas County southward to Tulare

County), var. *discoideus* is restricted so far as is known to the Klamath Area of the Coast Ranges (where it is nearly coextensive with the region so designated). Because of the important biological and geological differences between the two regions concerned, it has seemed entirely proper to accord varietal value to an otherwise formal character and to recognize for each of these major regions an endemic variety.

In the diagnosis, the larger size of the achenes with their more numerous large ribs is noted as an additional character of the Klamath variety. Because most of the collections studied have only immature fruit, the character of the achenes should not receive undue emphasis in evaluating the variety but should be regarded critically as further fruiting collections become available.

Aplopappus (§ MACRONEMA) **Bloomeri** Gray var. **ophitidis** J. T. Howell, var. nov. Frutex paulum glutinosus humilis ramis patentibus usque ad 3 dm. altus; foliis linearibus, 5–15 mm. longis, 0.5–1.25 mm. latis, tortuosis et falcatis; capitulis solitariis vel paucis laxe cymosis in terminalibus ramulis, discoideis, 5- vel 6-floris; involucris ad anthesin anguste turbinatis, 12–14 mm. longis, 8–10 mm. latis, phyllaribus imbricatis, 5- vel 6-serialibus, exterioribus foliaceis, interioribus chartaceis praeter apicem viridem herbaceum, apice abrupte angustatis in appendicem tenuem caudatam squarrosam vel recurvam, ciliatis margine; corallis 1 cm. longis, lobis circa 1.5 mm. longis; ramis styli 3 mm. longis, appendicibus sterilibus 2 mm. longis.

Type: Herb. Calif. Acad. Sci. No. 360966, collected from serpentine on the summit of Mt. Tedoc, el. about 5,000 ft., northwestern Tehama Co., July 21, 1949, by Freed W. Hoffman.

The shortened leaves, the 1-headed branchlets, and the eradiate 5- or 6-flowered heads would seem to mark var. *ophitidis* as the most reduced expression of *A. Bloomeri* yet to be known, and the plant might readily have been interpreted as specifically distinct if it were not for certain other variants which seem to ally it too closely to the *A. Bloomeri* complex. These variants, which also occur in the higher North Coast Ranges of California, have been described in considerable detail by Hall in his monograph of *Aplopappus* as minor variations numbers 6 and 7 (Carnegie Inst. Wash. Publ. 389, p. 201). These plants are also characterized by short leaves and reduced inflorescences, but both have radiate heads with disk-flowers about 15 or more. The sterile serpentine of Mt. Tedoc summit may well have been the critical factor in the environment which has selected the re-

markably reduced form of the short-leaved Coast Range plants that is found there.

Aplopappus (§ PYRROCOMA) **racemosus** (Nutt.) Torr. var. **praticola** J. T. Howell, var. nov. Herba perennis pratensis caulibus usque ad 3 dm. longis, late patentibus basi, plus minusve tomentosis glabrescentibus; foliis rigentibus, chartaceis, subintegris vel plerumque spinuloso-serratis, tenuiter villosis; capitulis racemosis solitariis brevipedunculatis maiusculis, involucris 13–15 mm. longis, obconoideis vel campanulatis cuneatis plerumque basi, phyllaribus bene imbricatis circa 5-seriatis villosis et dense ciliatis, apice cuspidatis; floribus disci circa 8 mm. longis; ramis styli 3 mm. longis, appendicibus sterilibus 2 mm. longis; achaeniis immaturis pubescentibus.

Type: Herb. Calif. Acad. Sci. No. 360967, from mountain meadow at summit of road north of Carrville, Scott Mts., el. about 5,400 ft., Trinity Co., collected on Aug. 24, 1936, *Howell No. 12752.*

This plant with its unusually large heads could be related to *A. integrifolius* Gray as the species of sect. *Pyrrocoma* are keyed out by Hall in his monograph (Carnegie Inst. Wash. Publ. No. 389, p. 43, 44), but all other characters including important considerations of geographic distribution relate our plant to *A. racemosus* (Nutt.) Torr. In that complex species our plant is to be grouped with those variants of non-alkaline soil which inhabit forests and montane meadows and is most closely related to *A. racemosus* var. *congestus* (Greene) Peck. Both are plants of the Klamath biological province, but whereas var. *congestus* is known chiefly from southwestern Oregon and adjacent California in Del Norte Co., var. *praticola* is known only from the Scott Mts., a range in the eastern part of the Klamath Area. From var. *congestus,* var. *praticola* can be distinguished by its stiff, chartaceous, and spinulose-margined leaves, simple racemes, larger involucres with villous, cuspidate bracts, and larger flowers. Several of these characters are shared by two other related varieties, var. *duriusculus* (Greene) Peck and var. *pinetorum* (Keck) Howell,* but both of these have strictly erect stems, whereas var. *praticola* has the lower part of the stems widely decumbent-spreading.

Aplopappus (§ TONESTUS) **Peirsonii** (Keck) J. T. Howell, stat. nov. *Aplopappus eximius* Hall subsp. *Peirsonii* Keck, Madroño 5: 169 (1940), as *Haplopappus.*

I first became acquainted with this plant in July, 1946, when

*A. **racemosus** (Nutt.) Torr. var. **pinetorum** (Keck) J. T. Howell, stat. nov. *A. racemosus* subsp. *pinetorum* Keck, Madroño 5: 166 (1940), as *Haplopappus.*
A second collection of this striking plant from the vicinity of the type-locality may be recorded as follows: north side of Scott Mts. on the road from Carrville to Callaghan, Siskiyou County, July 31, 1939, *Howell No. 14858.*

I found it at three stations in Inyo and Fresno counties while on the Sierra Club Base Camp outing. Later, in August of the same year, I found *A. eximius* Hall among the summit rocks of Mt. Tallac, Eldorado County, where I had gone in search of topotypes of *Carex tahoensis* Smiley. With the more robust habit and the larger heads of the Peirson plant fresh in my mind, I was impressed with the distinctness of that plant when compared to the more slender specimens and smaller heads of its Tahoe relative. Again at the 1947 Sierra Club Base Camp I found the Peirson plant; and on the 1950 Base Camp outing the plant was collected several times and material for a genetic analysis of the plant was obtained by Prof. G. Ledyard Stebbins, Jr., who was a member of the outing.

Dr. Stebbins' study of the two discloses their genetic distinctness, as he has written me: "I have established the chromosome number of *A. eximius* as 2n = 18, and found that material of *A. Peirsonii* from above Lake Sabrina had 2n = 90, though I could not be really sure. This is good evidence of specific distinctness to a cytologist but would have to be supplemented by morphological differences before it would be accepted by most botanists."

A detailed examination of the two plants reveals a few small qualitative differences but in all parts there are marked quantitative differences, *A. Peirsonii* being larger and coarser than *A. eximius*. Some of the size differences are confluent but most are separated by larger or smaller amounts. These differences (which are summarized in the following diagnoses), together with the geographic separation of the two plants, would seem to indicate that we are concerned with two distinct but closely related species.

A. EXIMIUS. Caudex slender, to 0.5 cm. in diameter, producing thin elongate rootstocks; stems to 1.3 dm. tall; leaves to 5 cm. long and 1.5 cm. wide, frequently prominently serrate-lobed or even divided; heads 1–1.5 cm. long, 1–2 cm. broad; outer phyllaries oblong or oblong-oblanceolate to obovate, subobtuse or mucronate; disk-flowers 6–7 mm. long; appendage of style-branches slender, equaling the stigmatic part or shorter; achenes 3.5–4 mm. long, pappus-bristles 6–7 mm. long, fine, merely scabrous or barbellulate; chromosomes 2n = 18.

A. PEIRSONII. Caudex thick, to 1.5 cm. in diameter, branching but rarely producing elongate rootstocks; stems to 2 dm. tall; leaves to 8 cm. long and 2 cm. wide, serrate to shallowly serrate-lobed; heads 1.5–2 cm. long, 2–3 cm. broad; outer phyllaries oblong or oblong-lanceolate, acute or acuminate;

disk-flowers 8–10 mm. long; appendage of style-branches coarse, equaling the stigmatic part or usually longer; achenes 5 mm. long, pappus-bristles 8–10 mm. long, coarse, prominently barbellate; chromosomes 2n= ca. 90.

In Herb. Calif. Acad. Sci. are the following collections of *A. Peirsonii* not cited by Keck (cf. Madroño 5: 169):

Sam Mack Lake, Big Pine Lakes, 12,000 ft., *Howell 23972;* Fifth Lake, Big Pine Lakes, 11,000 ft., *Howell 23737*; Thunder and Lightning Lake, Baker Lakes, 11,700 ft., *Howell 23989;* south end of Lake Sabrina, 9,600 ft., *Stebbins & Raven 315;* trail above Lake Sabrina, 9,600 ft., *Stebbins & Raven 67;* peak west of Dingleberry Lake, Middle Fork of Bishop Creek, 11,100 ft., *Stebbins & Raven 95, Bracelin 2951;* near Blue Lake, Bishop Creek 10,100 ft., *Stebbins & Raven 277;* ridge north of Mt. Powell, 12,000 ft., *Stebbins & Raven 125;* Baboon Lake, Bishop Creek, *Michael in 1950;* Bishop Pass, *Rowntree in 1936;* Rock Creek Lake Basin, 11,000 ft., *C. W. Sharsmith 2998;* between Ruby Lake and Mosquito Flat, Rock Creek, 11,000 ft., *Howell 22807;* Long Lake, Rock Creek, 10,600 ft., *Howell 22814;* unglaciated ridge south of Mono Rock, Mono Creek, ca. 11,500 ft., Fresno Co., *Howell 22591.*

These collections, together with those cited by Keck (l.c.), would seem to establish *A. Peirsonii* as a restricted endemic between Sawmill Pass on the south and Mono Creek on the north. All of these collections are from the east side of the Sierra Nevada in Inyo County except the last one cited above, which comes from Fresno County just west of the crest.

I am particularly indebted to Dr. Stebbins for permission to publish his genetic data on *A. eximius* and *A. Peirsonii* at this time.

JUNCUS CAPITATUS IN CALIFORNIA. This Old World rush, recently treated as merely a waif in the Sacramento Valley by Hermann (Leafl. West. Bot. 5:111,—1948), has now been found in the Coast Ranges in Santa Cruz County and should certainly be recognized as an established California immigrant. The new station for the plant is on Graham Hill between Felton and Santa Cruz at an elevation of about 500 ft. where it was found by Vesta Hesse, *No. 612,* May 16, 1950. It belongs to the group of annuals related to *J. triformis,* but from all other members of that group it can be separated by the elongate, leaf-like bract which exceeds the usually several-flowered head.—JOHN THOMAS HOWELL.

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LEAFLETS *of* WESTERN BOTANY

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PUGILLUS ASTRAGALORUM XIII: THE VARIETIES OF A. TEGETARIUS WATS. (KENTROPHYTA NUTT.)

BY R. C. BARNEBY
Wappingers Falls, New York

The group of North American *Astragali* immediately related to *A. tegetarius* Wats. has been interpreted in past times from two extreme points of view. Rydberg revived for them the Nuttallian genus *Kentrophyta,* and eventually came to recognize ten species therein; whereas Jones, in his summary Revision, accepted but a single polymorphic *A. montanus,* comprising six varieties. For different reasons neither of these arrangements is satisfactory. *Astragalus montanus* of Jones is a later homonym, and his trinomials are therefore illegitimate. The resuscitation of *Kentrophyta* as a genus is also to be regretted, for it is ultimately separable from *Astragalus* merely by the form and attachment of the leaflets, which are mucronate or spinulose, and confluent with the rachis. When Nuttall described the genus, the two known species occupied an isolated position with regard to *Astragalus,* but this is no longer the case. In fact the similarity in habit, stipule, flower, and legume which exists between the more flaccid states of *A. tegetarius* and the matted, high-montane phase of *A. vexilliflexus* of central Idaho (cf. *Hitchcock & Muhlick 10857,* from White Cloud Range, Custer County, NY) can be taken only as evidence of a direct and close relationship. No floral nor carpological peculiarity has ever been claimed for *Kentrophyta,* and apparently none exists.

In his revision of *Kentrophyta* (Bull. Torr. Club 51: 20, sequ.,—1924) Rydberg stated that the units involved were "all very closely related, and some botanists are inclined to regard them as a single species." The extreme forms, nevertheless, are strikingly divergent, and I have attempted in the past to maintain two principal divisions, a montane and alpine *A. tegetarius,* with usually purple flower, basifixed pubescence and 5–8-ovulate legume, and *A. Kentrophyta* of middle and lower elevations, with whitish petals, at least partially dolabriform vesture, and 2–4-ovulate legume. Unhappily the flower-color and number of ovules are not constant attributes of either group as de-

Leaflets of Western Botany, Vol VI, pp. 89–112, Jan. 31, 1951.

limited by the hair-attachment. Even the form of the hairs loses much of its importance when the gradual transition from a strictly basal to a malpighian attachment is observed. In some plants belonging to the lowland group the lower arm of the hairs is obscure; or the same leaflet may bear a mixture, variously proportioned, of basifixed and dolabriform trichomes. With the collapse of the pubescence-character, there is no alternative but to accept Jones's arrangement of the kentrophytas as segments of a polymorphic whole. Since the oldest specific names, *A. Kentrophyta* Gray, *A. viridis* (Nutt.) Sheld., and *A. montanus* (Nutt.) Jones, are all for one reason or another invalid, the eight varieties, two of which are newly described, are here subordinated to the earliest available and fortunately familiar *A. tegetarius* Wats.

While preparing these notes, I have been privileged to borrow the extensive collections at the New York Botanical Garden (NY) and the California Academy of Sciences (CAS). I am most grateful to Dr. Bassett Maguire, and to Miss Alice Eastwood and Mr. J. T. Howell, for their generosity in this matter, which has enabled me to make a more leisurely and perhaps more thorough study than would otherwise have been possible. Material in the herbarium of H. D. Ripley and the writer is cited below as: (RB).

ASTRAGALUS TEGETARIUS Wats., sensu lato

Pulvinate, matted, diffuse, or bushy-branched perennials, often woody at base; stipules connate opposite the petiole, at least at the lower nodes, the uppermost sometimes nearly free, or with long free blades; leaflets 3–9, linear-elliptic or linear-oblanceolate, conduplicate or with elevated margins, confluent with the rachis, the strong median nerve running out as a mucro or spinule at apex; flowers small, the banner 4–7.5 mm. long, borne in few-flowered racemes commonly much shorter than the subtending leaf; calyx ebracteolate, the obconic-campanulate tube ruptured in age, the teeth variable in length; petals graduated; keel obtuse; pod ovoid-ellipsoid to ovoid-acuminate, 3–10 mm. long, laterally compressed when young but becoming turgid in age, the papery valves dehiscent from apex along both sutures, not inflexed; ovules 2–8; seeds 1–3, large for the size of the pod, 1.8–3 mm. long.

KEY TO THE VARIETIES

1. Hairs of the herbage all basifixed; blade of the banner broadly obovate, obcordate or suborbicular; ovules 5–8, rarely (in Utah) as few as 3; petals commonly purplish; montane and subalpine, Colo., Utah, Calif., Ore., Mont.

2. Mature leaves with 5–9 leaflets; widespread.....a. var. *tegetarius*

2. Mature leaves with 3 leaflets (but a few of the lower often 5-foliolate); Sierra Nevada, Calif. .....b. var. *danaus*

1. Hairs, at least some of them, dolabriform, the lower arm sometimes short and obscure; blade of the banner oblanceolate to narrowly obovate; ovules 2–4; flowers commonly whitish; plains, dunes, canyons, and badlands, Sask., Wash., Nev., New Mex.

3. Pod ovoid-lenticular, beakless or nearly so.

4. Stipules dimorphic, the lowest connate into a sheath, the upper prolonged into lanceolate or spinulose-acuminate free blades; calyx-teeth 1.5–3 mm. long; Ore. to Neb. northward.

5. Leaflets linear-elliptic, widest at the middle, equally strigose-canescent on both faces; Wyo. to se. Ore..c. var. *Jessiae*

5. Leaflets linear-oblanceolate, widest above the middle, glabrous above; se. Wyo. to Neb., northward.d. var. *viridis*

4. Stipules homomorphic or nearly so, all sheathing; calyx-teeth about 1 mm. long; n. New Mex. .....e. var. *neomexicanus*

3. Pod ovoid-acuminate or lance-acuminate, gently incurved to a well-defined beak.

6. Plants prostrate, densely matted; e. to centr. Nev. .....f. var. *ungulatus*

6. Plants erect or diffusely branched, with several developed internodes, not matted; e. Nev., w. Colo., n. Ariz., and apparently near the bend of the Columbia on the Ore.-Wash. border .....g. var. *elatus*

a. var. TEGETARIUS

Astragalus tegetarius Wats., Bot. King Exped. 76, Pl. XIII, fig. 7–10 (where pod-section incorrectly shows only 2 ovules) (1871). *Homalobus tegetarius* (Wats.) Rydb., Bull. Torr. Club 31: 563 (1904), *nomen. Kentrophyta tegetaria* (Wats.) Rydb., op. cit. 34: 421 (1907), *nomen;* op. cit. 51: 21 (1924); N. Amer. Fl. 24: 255 (1929). *Astragalus montanus* (Nutt.) Jones var. *tegetarius* (Wats.) Jones, Rev. Astrag. 81, Pl. 5 (1923).

A. tegetarius Wats. var. (?) *implexus* Canby ex Port. & Coult., Syn. Fl. Colo., Add. (1874).

A. tegetarius Wats. var. *rotundus* Jones, Proc. Calif. Acad. Sci. II, 5: 650 (1895). *A. Kentrophyta* var. *rotundus* (Jones) Jones, Cont. West. Bot. 10: 63 (1902). *A. montanus* var. *rotundus* (Jones) Jones, Rev. Astrag. 80, Pl. 5 (1923). *Kentrophyta rotunda* (Jones) Rydb., Bull. Torr. Club 51: 23 (1924); N. Amer. Fl. 24: 255 (1929).

A. aculeatus A. Nels., Bull. Torr. Club 26: 10 (1899). *Kentrophyta aculeata* (A. Nels.) Rydb., op. cit. 32: 655 (1905); op. cit. 51: 22 (1924); N. Amer. Fl. 24: 256 (1929), *exclus. syn. Nutt. et Jeps.*

Homalobus Wolfii Rydb., Bull. Torr. Club 31: 562 (1904). *Kentrophyta Wolfii* (Rydb.) Rydb., op. cit. 32: 665 (1905); op. cit. 51: 22 (1924); N. Amer. Fl. 24: 255 (1929).

Kentrophyta minima Rydb., Bull. Torr. Club 34: 420 (1907); N. Amer. Fl. 24: 255 (1929).

Prostrate and densely matted, the internodes all shorter than the stipules, or the stems sometimes elongating, with internodes up to 18 mm. long; herbage thinly hirsutulous to silky or villous-canescent with incurved, ascending or twisted hairs, the leaflets sometimes glabrous above; stipules membranous or scarious, the lower 2–4 mm. long, connate nearly throughout, the upper 2.5–7 mm. long, connate about half their length, the free blades lanceolate or lance-acuminate, not rigid nor spinulose; leaves (2) 4–15 (20) mm. long, with (3) 5–9 linear-elliptic leaflets 1–9 mm. long, these commonly crowded or subpalmate, rarely distant, the rachis (0.5) 1.5–4 (7) mm. long, the terminal spinule (0.2) 0.5–1 (1.5) mm. long, scarcely vulnerant; peduncles subobsolete to 1.5, rarely 3 cm. long; calyx 2–4 mm. long, the tube 1–2 mm., the teeth 0.5–2 mm. long; petals bluish-purple, lilac, or the banner white, the keel then purple-spotted at apex; banner 4–7.5 mm. long, the blade broadly obcordate or suborbicular, 3–4.5 mm. broad; keel 3–5 mm. long; pod ellipsoid or oblong-ellipsoid, compressed but becoming turgid in age, (3) 4–8 (9) mm. long, (1.6) 2–2.5 mm. in diameter, loosely strigose-canescent; ovules 5–8, rarely (in Utah) 4 or 3, only 1–3 maturing; seeds 1.8–3 mm. long.

Type: East Humboldt Mountains, Nevada; collected by Sereno Watson in 1868.

Distribution: Dry rocky slopes above timberline, descending on gravel-slides and talus to barren knolls in forest and sagebrush zones, alt. 7600–12,000 ft., on various soils but with marked preference for limestone, White Mts. of se. California to central Idaho and the Wallowa Mts. in ne. Oregon, w. Montana, s. Utah, and central Colorado.

Exsiccata: OREGON. Wallowa Co.: Lostine Canyon, *Peck 5647* (NY); Aneroid Lake, *L. S. Rose 36620* (CAS).

IDAHO. Box Elder Co.: Middle Fork of Dunn Canyon, Raft River Range, *Maguire & Holmgren 22208* (NY). Blaine Co.: Boulder Creek, Sawtooth Mts., *J. W. Thompson 14108* (NY). Clark Co.: Medicine Bow Creek, *Christ & Ward 14910* (NY). Custer Co.: White Cloud Range, *Hitchcock & Muhlick 10873* (CAS, NY); nw. of Mt. Borah, *Hitchcock & Martin 5803* (NY, condensed extreme). Lemhi Co.: Spring Canyon, se. of Gilmore, *Hitchcock & Muhlick 9314a* (NY).

MONTANA. Beaverhead Co.: Black Lion Mt., *Hitchcock & Muhlick 12926* (CAS, RB). Gallatin Co.: West Yellowstone, *E. B. & L. B. Payson 1913* (CAS, NY). Madison Co.: Tobacco Root Mts., *C. L. Hitchcock 17012* (RB). Meagher Co.: Rimrock Ridge, Little Belt Mts., *Hitchcock & Muhlich 12237* (CAS, RB). Ravalli Co.: St. Mary's Peak, Bitterroot Mts., *Hitchcock & Muhlick 15305* (RB). Stillwater Co.: Haystack Mt., *Hitchcock & Muhlick 13457* (CAS, RB).

WYOMING. County unknown: Dome Lake, Big Horn Mts., *A. Nelson 2445* (NY, isotype of *A. aculeatus*). Johnson Co.: Powder River Pass, *L. O. & R. Williams 3137* (NY). Park Co.: w. of Bear Tooth Lake, *C. L. Hitchcock 16678* (RB). Teton Co.: Twogwotee Pass, *Ripley & Barneby 8906* (CAS, RB); Sheep Mt., *Tweedy 256* (NY). Yellowstone Park: Lower Geyser Basin, *Rydberg & Bessey 4488* (NY); ——, *Tweedy 83* (NY, type of *K. minima*); Yellowstone Canyon, *A. & R. Nelson 1079* (NY).

CALIFORNIA. Mono Co.: Crooked Creek, White Mts., *Maguire & Holmgren 26141* (NY, RB).

NEVADA. Elko Co.: East Humboldt Mts., *Watson 286* (NY, isotype of *A. tegetarius);* Island Lake, Ruby Mts., *Munz 16263* (CAS); Spruce Mt., *Holmgren 1281* (NY). Nye Co.: n. of Toyabe Dome, *Hitchcock & Martin 5601* (NY); Toquima Range, *Maguire & Holmgren 25793* (NY). White Pine Co.: Sherman Ridge, *Hitchcock & Martin 5647* (NY).

UTAH. Garfield Co.: Panguitch Lake, *Jones 6002* (NY, cotype of var. *rotundus);* s. of Hatch, *Ripley & Barneby 4790* (RB). Emery Co.: e. slope of Wasatch above Orangeville, *Ripley & Barneby 9228* (CAS). Juab Co.: Indian Creek Farm, Deep Creek Mts., *Maguire & Holmgren 21989* (NY). Kane Co.: Bryce Canyon, *Eastwood & Howell 7206* (CAS). Salt Lake Co.: Alta, *Jones 1127* (NY); American Fork Canyon, *Leonard 167* (NY). San Pete Co.: pass between Six Mile and Twelve Mile canyons, *Coville & Tidestrom 40* (NY). Sevier Co.: Fish Lake, *Jones 5810* (NY). Summit Co.: divide between Bear River and Black's Fork, *Goodman & Hitchcock 1535* (CAS, NY). Wasatch Co.: Strawberry Reservoir, *Ripley & Barneby 9944* (CAS).

COLORADO. Clear Creek Co.: Georgetown, *Jones 679* (NY). Grand Co.: Tabernash, *Ripley & Barneby 10428* (CAS). Jackson Co.: North Park, *Ripley & Barneby 10527* (CAS). Lake Co.: upper Arkansas River below Climax, *Ripley & Barneby 10047* (CAS, NY). Larimer Co.: Chambers Lake, *C. F. Baker in 1896* (NY). Park Co.: South Park, *Wolf 243* (NY, type of *Homalobus Wolfii);* sw. of Hartsel, *Ripley & Barneby 10071* (CAS, NY).

The fruit of var. *tegetarius,* like that of its marginal satellite var. *danaus,* is almost uniformly 5–8-ovulate, and the two differ in this respect from the races which comprise the rest of the species. Two exceptions, however, have been seen from alpine elevations in Idaho, where the pod was exceptionally short; and nearly all collections from the mountains of Utah bear 4- (or even 3-) ovulate fruits. The diverse material from Utah has proved a stumbling-block. Many of the plants from this state differ from var. *tegetarius* elsewhere in being of more rigid texture, with firmer stipules, and they vary greatly among themselves in degree of pubescence. One of several 4-ovulate forms, with leaflets glabrescent above, provided the type of var. *rotundus,* which should perhaps be maintained, though the number of ovules seems to be its only substantial character. Rydberg suggested that the vesture of *K. rotunda* is more closely appressed and straighter than in *K. tegetaria* and *K. aculeata,* and there may be a slight tendency in this direction. In any case the Utah plants here referred to var. *tegetarius* more nearly resemble the typical race of the species in their basifixed vesture and wide banner than few-ovulate var. *Jessiae,* in spite of a strong habital similarity to that variety. The situation in the Utah mountains needs study in the field.

The type of *A. tegetarius* from northeastern Nevada is an unusually flaccid and etiolated plant with developed internodes, long peduncles, and white or whitish standard, and Rydberg maintained it on these grounds as distinct from widespread *A. aculeatus*. The characters do not fall together, condensed white-flowered plants (several from Utah and Colorado), and drawn-out plants with purple flowers (e.g. *Rydberg & Bessey 4487*, from Montana) being not uncommon. It must be admitted that a purple banner is general throughout the range of var. *tegetarius*, the white being known only from Clark County, Idaho, Elko County, Nevada, north-central Utah and northern Colorado; but the purple reappears in eastern California, southern Utah and central Colorado. Without supporting characters the color of the flower is hardly of systematic value.

The calyx-teeth of var. *tegetarius* are usually as long as the tube or longer, but we have sporadic instances of abbreviated teeth, often coinciding with condensed habit, small flower, and small pod. A plant of this nature from Yellowstone Park (where normal var. *tegetarius* forms are also abundant) formed the basis of *K. minima* Rydb. A few collections from Idaho (e.g. *J. W. Thompson 13561*) combine a similarly proportioned calyx with larger flower and more open habit; and a further small race from southern Utah (e.g. *Eastwood & Howell 7206*) closely simulates *K. minima* at nearly all points. It is interesting and suggestive that the legume of the Wyoming *K. minima*, in spite of its small size, is 6-ovulate, while that of the Utah plant is 3–4-ovulate, the number in each case being that found in normal var. *tegetarius* of the same regions. It seems that the populations with short teeth have arisen separately and do not form a natural taxonomic unit; and since further they shade directly into var. *tegetarius* proper both in calycine characters and in size of flower and leaflets, *K. minima* is best treated as a minor variant.

The leaflets of var. *tegetarius* are commonly canescent on both faces, but the foliage is occasionally green and glabrous on the upper surface. The type of *A. aculeatus* is such a plant. When Nelson described this species he compared it with *"A. Kentrophyta"* (var. *viridis* of this paper), from which it is, of course, fully distinct; no comparison with *A. tegetarius* was attempted. Glabrescent leaflets are perhaps more commonly encountered to the south and east of the species-area; but even in the type-locality both silky and glabrescent leaflets have been obtained.

The population in South Park, Colorado, where var. *tegetarius* reaches its southern limit in the Rocky Mountains, is chiefly remarkable for its abundant loose pubescence. Describing it as a doubtful var. *implexus,* Canby emphasized the five crowded leaflets, few as compared with original *A. tegetarius* as then known only from Watson's type, but not an unusual number now, and the "3–4-ovuled legume." All the pods that I have examined from this region have either six or seven ovules. Rydberg described another collection from South Park as *Homalobus Wolfii,* and continued to maintain it in *Kentrophyta* as separable from *K. aculeata* by reason of its "small flowers, short leaflets and grayish, loose pubescence"; but all these features are found to be quite unstable in recently collected topotypes.

It may be surmised that var. *tegetarius,* with its close affinity to *A. vexilliflexus* Sheld., wide montane distribution, basifixed vesture, and relatively flaccid herbage, is the most primitive *Kentrophyta,* and perhaps represents the original stock from which the rest have arisen by process of reduction and hardening of the tissues in response to increasingly hot and arid habitats.

b. var. DANAUS Barneby

Astragalus tegetarius Wats. var. **danaus,** var. nov., a var. *tegetario* stipulis scariosis firmis, foliis plerisque 3-foliolatis (sed infima nonnumquam 5-foliolata adsunt), foliolis rigidissimis nervo mediano percrasso in spinulam induratam 1–1.5 mm. longam vulnerantem excurrenti distinguenda. *Kentrophyta montana* sensu Jeps., Fl. Calif. 2: 342 (1936), *pro max. parte, non* Nutt. *K. aculeata* sensu Rydb., N. Amer. Fl. 24: 256 (1929), *quoad pl. calif., non A. aculeatus* A. Nels. *A. tegetarius* sensu Abrams, Ill. Fl. 2: 568, *quoad pl. calif. et fig. 2776* (1944), non Wats.

CALIFORNIA. Glacier Canyon, Mt. Dana, Mono County, *J. T. Howell 20256* (type, Herb. Calif. Acad. Sci. No. 323149). Mt. Dana, *Eastwood in 1907* (CAS). Mono Pass, Mono-Tuolumne County line, *Eastwood 547* (CAS).

The fact that Jepson, noted for a conservative point of view, was able to see two species of *Kentrophyta* in his material from the high mountains enclosing Owens Valley is suggestive that two real entities occur in California. The plant of the White Mountains, with membranous stipules and relatively flaccid herbage, the mature leaves having 5–7 or even 9 leaflets with inconspicuous midrib running out as a scarcely vulnerant spinule about 0.5 mm. long, was rightly referred by Jepson to *K. tegetaria.* The Sierran plants, differing in their stiffly scarious stipules, rigid and acicular leaflets only three in number in most mature leaves, with corneous midrib running out as a stiff spin-

ule 1–1.5 mm. long, clearly represent a distinct race. As noted above, a form of var. *tegetarius* in Utah may be of rigid texture, but here the leaflets are more numerous and the ovules only 3 or 4, as opposed to 5 or 6 in var. *danaus*. Likewise an elongated spinule, up to 1.5 mm. long, occurs occasionally in var *tegetarius*, especially in Colorado, but the herbage in these cases is quite flaccid and the leaflets numerous.

Jepson described the flower of Californian *"K. montana"* as "yellowish," but the petals are purple in young specimens. No material of var. *danaus* has been seen from the White Mountains, but since Jepson cited *Duran 1741* (from Wyman Creek) as *K. montana* it may occur there.

c. var. JESSIAE (Peck) Barneby

Astragalus tegetarius Wats. var. **Jessiae** (Peck), comb. nov. *A. Jessiae* Peck, Leafl. West. Bot. 4: 180 (1945).

Kentrophyta montana β. Nutt. ex T. & G., Fl. N. Amer. 1: 353 (1838).

K. aculeata sensu Rydb., Bull. Torr. Club 51: 22 (1924), quoad syn. Nutt.; non *A. aculeatus* A. Nels.

K. montana sensu Rydb., op. cit. 20 (1924), pro parte; non Nutt.

A. Kentrophyta sensu Barneby in Davis, Cont. Fl. Ida. 16: 27 (1947), pro parte; non Gray.

Prostrate, loosely matted, the stems densely leafy, up to 15 cm. long, the longest internodes 5–20 mm. long; pubescence usually copious, composed of straight, appressed hairs, some or most attached above the base; stipules scarious, the lowest 1.5–2.5 mm. long, connate nearly throughout, the upper connate through 1.5–2.5 (3) mm., thence passing into a subulate-aristiform or lance-acuminate subspinulose blade 2–5 mm. long; leaves 8–15 (20) mm. long, the linear-elliptic leaflets 4–9 mm. long, crowded on a rachis 1–3 (4) mm. long, canescent on both faces, the vulnerant spinule 1.5–2 mm. long; peduncles 1.5–7 mm. long, 2–3 (4) -flowered; calyx-tube 1–2 mm., the aristiform teeth 1.5–3 mm. long; petals whitish, the obovate banner 5–6 mm. long, 2.5–3.5 mm. broad; keel 3–4.5 mm. long; pod oblong-ellipsoid or obliquely ovoid, 3.5–5 mm. long, 1.5–2 mm. in diameter, slightly arched downward, beakless or nearly so, 3–4-ovulate, usually 1-seeded; seeds about 2 mm. long.

Type: 10 miles south of Adrian, Malheur County, Oregon; collected by M. E. Peck (and Mrs. Jessie G. Peck) in 1942.

Distribution: Bare sandy or gravelly bluffs and knolls in the Snake River drainage of southeastern Oregon and adjacent Idaho, and along the upper branches of the North Platte and Green rivers in west-central Wyoming and (?) extreme northern Utah.

Exsiccata: OREGON. Malheur Co.: 10 mi. s. of Adrian, *Peck 21220* (RB, isotype of *A. Jessiae*).

IDAHO. Owyhee Co.: sw. of Bruneau, *Ripley & Barneby 6507* (CAS, RB); 60 mi. s. of Bruneau, *Maguire & Holmgren 26234* (NY).

WYOMING. Fremont Co.: 10 mi. s. of Perrin, *Ripley & Barneby 7570* (RB). Sublette Co.: Plains between Eden and Big Piney, *E. B. & L. B. Payson 2568* (NY). Sweetwater Co.: Bitter Creek, *L. N. Britton in 1882* (NY); w. of McKinnon, *Ripley & Barneby 7912* (RB).

UTAH. (?): "Uinta Mts., Wyoming Terr.", *Dr. Jos. Leidy in 1873* (NY).

This variety seems to be of bicentric distribution, and probably consists of two distinct populations, that of the Snake River having slightly more rigid and prolonged stipules and calyx-teeth. In other respects the plants are rather uniform. The Wyoming material has been regularly referred to var. *viridis,* but the more congested leaves with linear-elliptic rather than linear-oblanceolate leaflets, pubescent on both surfaces with straighter and more closely appressed hairs, lend it a distinct appearance. Both seeds and pods average larger in var. *viridis.* In habit var. *Jessiae* simulates var. *ungulatus* closely, but the pods are of quite different shape.

The specimen labelled "*Kentorus montanus Nutt. β*" which is mounted with the type of *K. montana* (NY) and corresponds with *Kentrophyta montana β* as published by Torrey and Gray, seems to belong here rather than to var. *tegetarius* (or *K. aculeata),* as supposed by Rydberg. No exact locality was recorded, but Nuttall could well have encountered var. *Jessiae* on the upper Green River.

d. var. VIRIDIS (Nutt.) Barneby

Astragalus tegetarius Wats. var. **viridis** (Nutt.), comb. nov. *Kentrophyta viridis* Nutt. ex T. & G., Fl. N. Amer. 1: 353 (1838); Rydb., Bull. Torr. Club 51: 21 (1924), *exclus. pl. Crandall.;* N. Amer. Fl. 24: 254 (1929). *K. montana* β. *viridis* (Nutt.) Hook., Jour. of Bot. 6: 215 (1847). *Astragalus viridis* (Nutt.) Sheld., Minn. Bot. Stud. 1: 118 (1894); non Bge. (1869); Rydb., Fl. Neb. 21: 47, Pl. XI. fig. 82–87 (1895). *Phaca viridis* (Nutt.) Piper, Cont. U. S. Nat. Herb. 11: 374 (1906).

Kentrophyta montana Nutt. ex T. & G., l. c. (1838); Rydb., Bull. Torr. Club 51: 20 (1924), *pro max. parte;* N. Amer. Fl., l. c. *Astragalus Kentrophyta* Gray, Proc. Philad. Acad. 1863, p. 60 (1863), *nomen;* Proc. Amer. Acad. 6: 231 (1864), *nom. illegit. A. montanus* (Nutt.) Jones, Rev. Astrag. 80, Pl. 5 (1923); non Linn. (1753).

Low, diffuse or matted, habitally similar to the preceding; leaves (10) 12–23 mm. long, the leaflets linear-oblanceolate, attenuate from above the middle, glabrous above, sparsely pubescent below, with at least some loose hairs; stipules dimorphic, the lowest 2–4.5 mm. long, connate into a sheath nearly their whole length, the upper connate through 1–2 mm., thence passing into linear-caudate or rarely subulate, at first greenish but at length scarious blades up to 5 mm. long; petals whitish, the oblanceolate to obovate banner 4.5–5.5 mm. long, 2–3 mm. broad; keel 3.5–4 mm. long; pod ovoid-lenticular, 3.5–7 mm. long, 2–2.5 mm. broad, beakless or nearly so, subsym-

metric or a little arched downward, 2–4-ovulate, 1–3-seeded; seeds 2.1–2.5 mm. long.

Type: "With the preceding [*K. montana*]", i.e. "Hills of the Platte, in naked places", presumably southern Wyoming or adjacent Nebraska; collected by Thomas Nuttall in 1834.

Distribution: Dunes and badlands on the northern Great Plains, from southwestern Saskatchewan to Nebraska and eastern Wyoming.

Exsiccata: "R. Mts.", *Nuttall* (NY, type of *K. montana*). "Platte Plains", *Nuttall* (NY, type of *K. viridis*).

ALBERTA. "Stinking Lake, n. of Cypress Hills", fide *Macoun,* Cat. Canad. Pl. 1: 114.

SASKATCHEWAN. Gull Lake, *John Macoun in 1880* (NY).

SOUTH DAKOTA. Cheyenne River at Smithville (? Smithwick, Fall River Co.), *T. A. Williams 415* (NY). Mellette Co.: White River, *E. J. Wallace in 1896* (NY).

WYOMING. Laramie Co.: Pine Bluffs, *A. Nelson 3621* (NY).

NEBRASKA. Yellowstone, *Hayden in 1853–54* (NY). Dawes Co.: Belmont, *H. J. Webber in 1889* (NY). Scotts Bluff Co.: Scotts Bluff, *Rydberg 79* (NY).

This is the traditional *A. Kentrophyta* or *K. montana,* excepting the New Mexican and western Wyoming records, here referred to var. *neomexicanus* and var. *Jessiae* respectively. It is distinguished principally by the leaves, with their linear-oblanceolate leaflets tapering from above the middle to the base, glabrous on the upper and hirsutulous on the lower surface. In spite of the supposed difference in the stipules of *K. montana* and *K. viridis,* emphasized by Nuttall and later by Rydberg, I can see no significant disparity in this respect in the type-specimens, both of them from "hills of the Platte" (ex char., but note that *K. montana* is actually labelled by Nuttall: "R[ocky] Mts."). Both are branches from young plants, the fruit evidently having been described from remnants of a preceding season, and in both the lowermost stipules are scarious and united into a subtruncate sheath, passing upward into greenish ones, more shortly connate and produced into an acuminate blade. In more mature material the upper stipules are found to become scarious in age, but tend to be more flaccid than those of var. *Jessiae* at an equivalent stage of maturity. Rydberg had only one collection, beside the type, which he was able to refer to *K. viridis,* the young plants obtained by Crandall at Palisades, a village on the Grand River in Mesa County, Colorado. Interestingly enough, a closely similar thing from the Grand River Canyon *(Eastwood 6110),* unquestionably conspecific with Crandall's, was first labelled by Rydberg *"Homalobus impensus"* and later

"*K. montana.*" Both differ from var. *viridis* in having linear-elliptic leaflets strigose on both faces, and doubtless belong to var. *elatus,* the characteristic lowland *Kentrophyta* of the Great Basin; but they are as yet too young to have developed the erect or bushy stems usual later in the year.

The rejection of the name *Astragalus Kentrophyta,* the earliest binomial published for a member of the present group in *Astragalus,* is an unhappy necessity. The combination first appeared in Gray's list of Parry, Hall and Harbour's collections as: "106. *Astragalus Kentrophyta (Kentrophyta montana* Nutt.)". Gray was working at the time on his Revision, printed the following year, and this new name seems to have been thrown out in advance, with no reference to the original publication; and it cannot be said, by International Rule (Art. 44), to be effectively published. In the Revision (Proc. Amer. Acad. 6: 231) Gray cited as synonyms of *A. Kentrophyta* not only the basonymic *K. montana,* but also *K. viridis* Nutt. An *Astragalus montanus* had been established in Species Plantarum, but at this time there was no earlier *A. viridis,* nor other obstacle to the use of Nuttall's epithet in *Astragalus;* so that in this instance *A. Kentrophyta* was illegitimate (Art. 54).

e. var. NEOMEXICANUS Barneby

Astragalus tegetarius Wats. var. **neomexicanus,** var. nov., habitu inter var. *elatum* (Wats.) et var. *viridem* (Nutt.) intermedia, sed ab illa leguminis forma ellipsoidea erostrata haud incurva, ab hac foliolis pube arctissime appressa utrinque strigosis, ab ambabus dentibus calycinis abbreviatis circa 1 mm. longis tubo superatis absimilis. — *K. montana* et *A. Kentrophyta* sensu auct. plur., pro parte. *A. impensus* sensu Woot. & Standl., Cont. U. S. Nat. Herb. 19: 369 (1915).

NEW MEXICO. McKinley Co.: Navajo Experiment Station, *Eastwood & Howell 6839* (type, Herb. Calif. Acad. Sci. No. 262065). Sandoval Co.: Bernalillo, *Ripley & Barneby 2391* (RB). San Juan Co.: near Shiprock Agency, *Standley 7850* (NY); Upper San Juan, *Newberry in 1859* (NY). Valencia Co.: Inscription Rock, *Bigelow in Whipple's Exped., 1853* (NY).

This variety, found on dunes, sand-bars, or "marl rocks" between 5400 and 7000 feet in the upper San Juan, Zuñi, and Rio Grande valleys of northwestern New Mexico, occurs in two forms, one a relatively tall plant, erect or bushy-branched, the other lower and diffuse, quite like var. *viridis* in general habit. Plants of the second type, as seen in Sandoval County, were flowering apparently in their first year, as happens occasionally in var. *viridis* also. All are readily distinguished from var. *elatus,*

with which the variety comes into close geographic contact to the west, by the tiny ovoid-ellipsoid beakless pod, similar to, but like the seeds averaging smaller than that of var. *viridis;* from var. *viridis* in the more closely appressed vesture extending to both leaf-surfaces; and from both in the short calyx-teeth and nearly homomorphous stipules, the upper with blades reduced to a subulate or lance-subulate blade no longer than the sheathing portion. I have seen one example of var. *viridis,* however, with stipules nearly as short, so that this is perhaps not a reliable character. So far as known to me the ranges of var. *viridis* and var. *neomexicanus* are separated by the length of Colorado.

f. var. UNGULATUS (Jones) Barneby

Astragalus tegetarius Wats. var. **ungulatus** (Jones), comb. nov. *A. Kentrophyta* var. *ungulatus* Jones, Proc. Calif. Acad. Sci. II, 5: 650 (1895). *A montanus* var. *ungulatus* (Jones) Jones, Rev. Astrag. 80 (exclus. syn. *K. Wolfii),* Pl. 5 (1923). *Kentrophyta ungulata* (Jones) Rydb., Bull. Torr. Club 51: 23 (1924); N. Amer. Fl. 24: 254 (1929).

A. Kentrophyta sensu Wats., Bot. King 77, *pro parte, quoad pl. nevad.* (1871).

Prostrate and densely matted, in habit and vesture quite like var. *Jessiae,* or more densely silvery; pod lance-acuminate, turgid in the lower half and gradually narrowed into a gently incurved, acuminate beak, the whole 5–6 mm. long, 2–3 (4) -ovulate, 1–2-seeded.

Type: Monitor Valley, Nevada; collected by Sereno Watson in 1868.

Distribution: Calcareous gravel or clay knolls in the valleys of central and northeastern Nevada, alt. 5800–7200 ft.

Exsiccata: NEVADA. Elko Co.: s. of Hubbard CCC camp on U. S. 93, *Holmgren 1581* (NY). Eureka Co.: Monitor Valley, *Watson 290* (NY, isotype of var. *ungulatus);* Monitor Valley s. of Lone Mt., *Ripley & Barneby 6205* (RB); 26 mi. w. of Eureka, *Ripley & Barneby 9932* (CAS, RB). Lander Co.: Reese River valley nw. of Austin, *Ripley & Barneby 6198* (CAS, RB). Nye Co.: Belmont, foothills of Toquima Range, *Ripley & Barneby 3694* (RB).

g. var. ELATUS (Wats.) Barneby

Astragalus tegetarius Wats. var. **elatus** (Wats.), comb. nov. *A. Kentrophyta* var. *elatus* Wats., Bot. King 77 (1871). *A. viridis* var. *elatus* (Wats.) Ckll., Bot. Gaz. 26: 437 (1898), *nom. subnud. A. viridis* var. *impensus* Sheld., Minn. Bot. Stud. 1: 118 (1894), a superfluous substitute. *A. Kentrophyta* var. *impensus* (Sheld.) Jones, Cont. West. Bot. 10: 63 (1902). *Kentrophyta impensa* (Sheld.) Rydb., Bull. Torr. Club 32: 665 (1905); op. cit. 51: 21 (1924); N. Amer. Fl. 24: 253 (1923). *A. impensus* (Sheld.) Woot. & Standl., Cont. U. S. Nat. Herb. 19: 369 (1915). *A. montanus* var. *impensus* (Sheld.) Jones, Rev. Astrag. 80, Pl. 5 (1915).

A. Kentrophyta var. *coloradoensis* Jones, Cont. West. Bot. 10: 63 (1902). *A. montanus* var. *coloradoensis* (Jones) Jones, Rev. Astrag. 80, Pl. 5 (1923).

Kentrophyta coloradoensis (Jones) Rydb., N. Amer. Fl. 24: 253 (1929) (as *"coloradensis"*).

Kentrophyta montana sensu T. & G., Fl. N. Amer. 1: 694 (1840); non Nutt.

Phaca viridis sensu Piper, Cont. U. S. Nat. Herb. 11: 374 (1906), quoad pl. cit.; non *K. viridis* Nutt.

Tufted at base, but with many ascending or erect, rarely diffuse herbaceous branches (1) 2–4.5 dm. long; internodes developed, some of them 1.5–5 cm. long, often exceeding the leaves; pubescence of the herbage closely appressed, the hairs mostly with suprabasal attachment and straight or nearly so; stipules dimorphic, the lowest connate into a subtruncate scarious sheath, the upper lance-acuminate, in youth herbaceous, early becoming scarious, drawn out into stiff, at length divaricate and spinescent blades 3–7 mm. long; leaflets 5–7, linear-elliptic, falcate-divaricate, nearly always strigose on both surfaces, rarely glabrescent above; calyx-tube about 1.5 mm., the linear-subulate to aristiform teeth (1.3) 1.5–2.5 mm. long; petals whitish, the keel, and occasionally the wings also, purple-tipped, the obovate-oblanceolate banner 4.5–6 mm. long, 3–3.5 (4) mm. broad, the keel about 3.5 mm. long; pod narrowly ovoid-acuminate, 4–7 (10) mm. long, 1.5–2 (2.5) mm. in diameter, somewhat incurved, the ventral suture straight or slightly concave, the dorsal convex; ovules 2–4; seed commonly solitary, about 3 mm. long.

Type: Holmes Creek Valley, Nevada; collected by Sereno Watson in 1868.

Distribution: Clay knolls, shale talus, in hot and barren places, commonly associated with red sandstones to the south, but also on other sedimentary and occasionally eruptive rocks, mostly between 5000 and 8000 ft., widespread in the drainage of the Colorado River from northwestern New Mexico, western Colorado, and northern Arizona to eastern Nevada, and with isolated stations near the Great Bend of the Columbia in southern Washington and (?) adjacent Oregon.

Exsiccata: WASHINGTON. Walla Walla Co.: Walla Walla, *Brandegee* (Herb. Univ. Calif.).

OREGON. (?): "Oregon", *Douglas ex herb. Hook.* (NY).

NEVADA. Elko Co.: Holmes Creek Valley, *Watson 291* (NY, isotype of var. *elatus*). Lincoln Co.: Bennett Springs, *Purpus 6275* (NY); Panaca, *Ripley & Barneby in 1942* (RB).

UTAH. Beaver Co.: e. of Frisco, *Ripley & Barneby 9255* (RB). Emery Co.: s. of Emery, *Ripley & Barneby 4754* (RB). Garfield Co.: Bryce Canyon, *Eastwood & Howell 7178* (CAS); Red Canyon, *Eastwood & Howell 789* (CAS). Iron Co.: Maple Canyon, *Garrett R2647* (NY); 10 mi. e. of Cedar City, *Hitchcock, Rethke & van Raadshooven 4630* (NY, leaflets glabrous or pubescent above). Morgan Co.: Lost Creek, *Jones 5838* (NY). Sevier Co.: Fish Creek Canyon, *Garrett 2512* (NY); Pavant Range near Richfield, *Ripley & Barneby 4777* (CAS, RB).

COLORADO. Mesa Co.: Palisades, *Crandall in 1898* (NY); Grand River Canyon, *Eastwood 6110* (NY). Rio Blanco Co.: Piceance Creek, *Ripley & Barneby 9182* (RB). San Miguel Co.: Placerville, *Ripley & Barneby 10269* (RB).

ARIZONA. Navajo Indian Reservation, in 1916, collector not known (NY). Coconino Co.: Lees Ferry, *Jones in 1890* (Pomona Coll. Herb., type of var.

coloradoensis); Kaibab Plateau near Jacob's Lake, *Eastwood & Howell 6413* (CAS); Cliff Spring near Cape Royal, *F. W. Peirson 7430* (CAS).

New Mexico. McKinley Co.: Manuelito, *Ripley & Barneby in 1943* (RB, sterile, but apparently referable here rather than to var. *neomexicanus).*

The var. *elatus* is characterized by its bushy habit, with developed, rigid, annual stems arising from a branched suffruticose caudex. Often the central stems of a plant will be erect and the outer ascending or reclining, but occasionally, on steep gravel slides, all may become diffuse and trailing. In these cases, and when the pod is lacking, specimens are not easy to distinguish from var. *Jessiae,* although the long internodes commonly betray their identity. It is almost never misidentified in herbaria.

The type of var. *coloradoenis* is remarkable, indeed unique in my experience, for its large pod, about 1 cm. long. It may perhaps represent a distinct race from low elevations along the canyons of the Colorado, but other material that I have seen from the region has all been in flower only. The stipules are not all "free," as claimed by Jones; indeed are no different from the normal state in fruiting var. *elatus.*

The recurrence of the variety in the Columbia Basin, at points over 400 miles northwest of the nearest station in Nevada, is surprising. One might expect here a distinct race, and a better acquaintance with these northerly plants will be required before their status can be established. The Douglas plant that I have seen from "Oregon" is only the tip of a branch, but bears a lance-acuminate and slightly arched pod quite like that of var. *elatus.* See also St. John, Fl. S. E. Wash. 219 (1937); and Howell, Leafl. West. Bot. 2: 75 (1938).

CRYPTANTHA CIRCUMSCISSA IN THE SIERRA NEVADA

BY JOHN THOMAS HOWELL

Cryptantha circumscissa (H. & A.) Jtn., like some other widespread species and species-groups in western North America, is relatively uniform in its morphology over a vast area until it reaches and ascends the Sierra Nevada. This species, which is readily distinguished from other species of *Cryptantha* by its circumscissle fruiting calyx, occurs from "southern British Columbia and Idaho, southward to Arizona and northern Lower

California" (Johnston, Contrib. Gray Herb. n. ser. 74: 41), and, although it is somewhat variable in habit, flowers, and fruits, the variations mostly lack correlation and geographic alignment and so seem to have little or no taxonomic significance. Along the east side of the Sierra Nevada and on its southerly slopes, however, *C. circumscissa* develops two minor variants that have distributional significance and should be recognized by name.

One of these, var. *hispida* (Macbr.) Jtn., is characterized by conspicuous bristly hairs on the stems and leaves, the hairs on the typical form of the species being more appressed. This plant was originally described from western Nevada as a species, *Krynitzkia dichotoma* Greene, but as Johnston has remarked (op. cit. p. 42), "this hirsute form is best treated as a geographical variety." It occurs from the region northeast of Lake Tahoe in Nevada, south in California to Tulare and Kern counties, with outlying stations in the Mohave Desert (acc. Jepson, Fl. Calif. 3: 332, under *Greeneocharis)* and on the west slope of the Sierra Nevada in Fresno County. Several years ago, I wrote a brief note establishing an altitudinal limit of 10,400 feet for this variety (Leafl. West. Bot. 4: 169,—1945), but in July, 1950, P. A. Munz and I found it growing on the summit ridge of Olancha Peak above timberline at 12,000 feet.

The second variant appears to be undescribed. It is a diminutive plant of sandy slopes and flats from timberline forests to alpine summits, and as it is now known it is restricted to the southern Sierran crest from Army Pass south to Olancha Peak in Inyo and Tulare counties. It was first discovered by Dr. Munz and me on the Sierra Club Base Camp outing in 1949, and we found it again in 1950 on Olancha Peak where it grew only a short distance from var. *hispida*. The new variety is distinguished by its small size, dense habit, oblanceolate leaves, and short style. In the character of its pubescence, it is like typical *C. circumscissa*, the hairs on the stems and leaves being more or less appressed.

Typical *C. circumscissa,* with relatively open somewhat spreading or erect habit and subappressed pubescence, is a rare plant in the Sierra Nevada, being known from only a half dozen Sierran stations from Sierra County on the north to Inyo and Tulare counties on the south. According to Jepson, the species reaches an altitude of 7500 feet, but on the 1950 Sierra Club Base Camp outing, the plant was found by G. Ledyard

Stebbins, Jr., and Peter Raven on the slope of Table Mt. near Lake Sabrina, Inyo County, at 9500 feet.

The taxonomic and distributional details relating to these plants are summarized in the following synopsis. The Sierran specimens cited are in the Herbarium of the California Academy of Sciences. For synonymy, see Johnston, Contrib. Gray Herb. n. ser. 74: 41, 42.

KEY TO THE VARIETIES OF CRYPTANTHA CIRCUMSCISSA

1. Pubescence substrigose, the hairs on stems and leaves more or less appressed 2
1. Pubescence subhirsute, the hairs (or many of them) on stems and leaves spreading ..... 1c. var. *hispida*
2. Plants larger and more loosely branched, stems usually more than 2 cm. long; leaves narrowly oblongish or linear; styles nearly as long as the nutlets or equaling them ..... 1a. var. *circumscissa*
2. Plants small and compact, stems 2 cm. long or less; leaves oblong-oblanceolate; styles ⅔–¾ as long as the nutlets ..... 1b. var. *rosulata*

1a. CRYPTANTHA CIRCUMSCISSA (H. & A) Jtn. var. CIRCUMSCISSA. Rare in the Sierra Nevada where plants occur on arid slopes, generally east of the crest, 5000–9500 ft.; north to British Columbia (acc. Johnston), south to Lower California, east to Idaho, Utah, and Arizona; Argentina (acc. Jepson).

Sierran collections seen or reported: Chilcoot, Sierra Valley, 4995 ft., Plumas Co., *L. S. Rose 34416;* Beckwith Pass, Lassen Co., acc. Jepson; Tioga Road, about 8300 ft., Mono Co., acc. Johnston; Table Mt. near Lake Sabrina, 9500 ft., Inyo Co., *Stebbins & Raven 52;* in pinyon belt above Sage Flat, 6500 ft., Inyo Co., *Howell in 1950;* Volcano Creek and Lloyd Meadows, Tulare Co., acc. Jepson.

1b. **Cryptantha circumscissa** (H. & A.) Jtn. var. **rosulata** J. T. Howell, var. nov. Annuae parvae compactae caulibus foliis floribusque conferte rosulatis vel raro paulum aperte ramosae; caulibus 0.5–2 cm. longis, strigosis pilis subappressis; foliis oblanceolatis vel anguste oblongo-oblanceolatis, strigosis, apice 1 vel 2 trichomatibus magnis; calyce tarde circumscisso; corolla 1.5–2 mm. longa, lobis circa 0.5 mm. longis; nuculis laevibus nitentibusque, 1.5–1.75 mm. longis, stylo ¼–⅓ longioribus.

Type: Herb. Calif. Acad. Sci. No. 361616, collected in granitic sand near timberline, Cottonwood Lakes, 11,200 ft. alt., Inyo Co., Aug. 12, 1949, *Howell 26227.*

Other collections, all from California and all except the first from Tulare County: Cottonwood Lakes, 11,200 ft., Inyo Co., *Howell 25471;* above timberline at summit of Army Pass, 12,000 ft., *Howell 26200;* Siberian Pass Creek, 11,000 ft., *Howell 25743;* Whitney Meadows, 9700 ft., *Howell 25830;* Olancha Peak, summit ridge above timberline, 12,000 ft., *Howell 27234.*

1c. CRYPTANTHA CIRCUMSCISSA (H. & A.) Jtn. var. HISPIDA (Macbr.) Jtn. Sandy or gravelly slopes, 5000–12,000 ft., from Nevada Co., California, and Washoe Co., Nevada, south to Inyo and Tulare counties, California, in the north found only east of the crest, in the south on both slopes of the Sierra Ne-

vada; east to Virginia City, Storey Co., Nevada *(Eastwood 14823)*, south in California to Erskine Creek (acc. Johnston, l.c., p. 42) and Mohave Desert (acc. Jepson).

Sierran collections seen. NEVADA: between Boca and Verdi, Washoe Co., *Curran in 1884* (type of *Krynitzkia dichotoma);* Verdi, Washoe Co., *Sonne in 1888;* Glenbrook, Douglas Co., *L. S. Rose in 1930.*

CALIFORNIA. Mono County: pine woods 6 miles south of Crestview, *Howell 25272;* Convict Lake, *L. S. Rose 35361.* Inyo County: Rock Creek Lake Basin, *Peirson 9485;* Coyote Ridge, *Stebbins & Raven 180;* Big Pine Lakes Trail, 9500–10,000 ft., *Howell 24045;* Little Cottonwood Creek, 9800 ft., *Howell 25431;* Jeffrey pine belt, Wonoga Peak, 9000–9500 ft., *Howell 25409;* Summit Creek east of Olancha Pass, 9300 ft., *Howell 26747.* Fresno County: Kaiser Peak, *Pollard in 1943.* Tulare County: trail to Mt. Whitney, 10,000 ft., *Culbertson 4243;* Rock Creek, 10,000–10,400 ft., *Howell 26110;* Whitney Meadows, *Howell 25766;* Monache Meadows, *Howell 27071;* Hessian Meadows, *Howell 27098;* Olancha Peak, on summit ridge above timberline, 12,000 ft., *Howell 27245.*

THE STATUS OF ENCELIA ANGUSTIFOLIA AND E. ALBESCENS

BY S. F. BLAKE

ENCELIA ANGUSTIFOLIA Greenm., Proc. Amer. Acad. 39:110 (1903); Blake, l.c. 49:371 (1913).

This species from the Sierra Madre, Tepic (now Nayarit), Mexico, continues to be known only from the type, collected by Dr. J. N. Rose on 13 Aug. 1897. The characteristically scanty original specimen, consisting of a root bearing 3 stems of the year, 2 of them terminating in solitary heads, was divided between the U. S. National Herbarium and the Gray Herbarium. The heads are in rather young flower, and consequently do not reveal the character of the mature fruit. The young achenes are villous on the margins and slightly pubescent on the side, with a pappus of 2 antrorse-pubescent awns about their own length. They have a thin aliform margin, suggesting the wing that is characteristic of the achenes of the related genus *Verbesina,* but since the same feature can be shown by young achenes of *Encelia* its presence is not of real significance. The style branches, however, instead of being relatively short and with short, deltoid, obtuse to barely acutish appendages, as in *Encelia,* are relatively long and have the appendages drawn out into an acuminate hispidulous tip, precisely as in *Verbesina.* For this reason I have

no hesitation in transferring the species to that genus as **Verbesina angustissima,** nom. nov., the name *angustifolia* having already been used in the genus.

Verbesina angustissima falls naturally into the section *Verbesinaria* as defined in Robinson and Greenman's revision of 1899, where its closest relatives are *V. longifolia* Gray and *V. scotiodonta* Blake. It agrees with both these in having leaves with strongly raised nerves and small, calloused teeth; the latter feature is not found in any true species of *Encelia,* and the former only in *E. scaposa.* Subsequent experience has shown that the presence of a wing-like margin on the ovary, the principal feature on which I relied when transferring *Gymnolomia serrata* to *Verbesina* (as *V. scotiodonta)* in 1918, is not an infallible diagnostic character for *Verbesina,* but reexamination of the type collection of that species *(E. W. Nelson 4891)* shows that it has the characteristic style tips of *Verbesina* as described above.

In my revision of *Encelia* in 1913, I used the group name *Angustifoliae* for a group of three species with narrowly linear, unlobed leaves, made up of *E. angustifolia, E. scaposa* Gray, and *E. stenophylla* Greene. Although no type species was designated, the name was obviously based on the first of these species which is now excluded from the genus, so that it may be well to propose for the two remaining species the name **Encelia** series **Stenophyllae,** with *E. stenophylla* Greene as type, and the following diagnosis: *folia angustissime linearia integerrima.* Both species are known in the fruiting condition as well as in flower, and are definitely in agreement with typical *Encelia* in both style and fruit characters.

ENCELIA ALBESCENS Gray, Proc. Amer. Acad. 8:658 (1873); Blake, l.c. 49:365 (1913).

This species was described from 3 one-headed branches 11 to 28 cm. long, collected by Edward Palmer *(No. 21)* in 1869 in Sonora, without definite locality, and now preserved in the Gray Herbarium and the U. S. National Herbarium. The decidedly immature achenes are villous-ciliate, with some hairs on the sides, and are awnless or bear 2 (or according to Gray sometimes 1) weak awns. Gray remarked that it was "a good *Encelia,* of the *Geraea* section by the pappus." In my revision I spoke of it as a doubtful species, too close to *Encelia frutescens* var. *actoni.* Some time ago, when examining the cotype sheet in the National

Herbarium, I was struck by its resemblance to the common *Verbesina encelioides* (Cav.) B. & H. var. *exauriculata* Robinson & Greenman. Careful examination of the sheet in the National Herbarium and the duplicate in the Gray Herbarium, which was kindly lent for study by Dr. R. C. Rollins, has shown that they agree with this plant in every significant feature—pubescence, involucre, and characters of head including the style-branches, which are as described under *E. angustifolia* above. After standing on the books for three-quarters of a century without having a second specimen referred to it, the name *Encelia albescens* can at last be disposed of as a synonym under the *Verbesina* named above.

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NOTES ON SOME SIERRAN SEDGES

BY JOHN THOMAS HOWELL

Twice, in the late summer and early autumn of 1945 and 1946, I was the guest of Judge Curtis D. Wilbur at his cabin on Echo Summit, Eldorado County, California, and on both occasions Miss Edna Wilbur arranged trips to nearby points of interest where a number of noteworthy botanical collections were made. Observations on some of the sedges are given here.

ELEOCHARIS DECUMBENS Clarke. This species, which is one of the rarest in the genus and certainly the rarest spike-rush in California, was collected in a marshy area near Echo Summit, Eldorado County, where it grew with such other sedges as *Carex arctogena, C. ormantha, C. Lemmonii, C. gymnoclada,* and *Scirpus Congdonii.* Since heretofore the species has been definitely known only from the type-collection (cf. Svenson in Rhodora 34: 225), I referred my collection *(No. 22968)* to Dr. Svenson, who wrote about it as follows: "I looked over with great interest your specimen of *E. decumbens* and I agree with you that it represents a small specimen of that nearly unknown species. For several years, William Bridge Cooke looked for the plant on Mt. Shasta, but he was unable to find it . . . It is surprising how little material has been turned up."

The type of this rare plant was reputedly made on "Mount

Shasta, alt. 2500 m." by H. E. Brown, *No. 424*. As Cooke (Amer. Midl. Nat. 26: 80, 81) has pointed out, however, Brown did not restrict the term Mt. Shasta to the mountain itself but used the name to cover a broad indefinite area of northern California. Therefore it seems likely, since a special search by Cooke for the plant on Mt. Shasta did not disclose it there, that the type-collection was one of those specimens which Brown attributed to the mountain but which came from the adjacent but geologically unrelated and floristically different Scott Mts. in the Klamath region to the west. I would like to think of this rare sedge as occurring in the northern Sierra Nevada and in the Klamath region together with other rareties having a similar distribution which I have already had occasion to discuss (cf. Leafl. West. Bot. 4: 168, 169).

In consideration of these matters, *Eleocharis decumbens* should certainly have been included by Cooke (ibid., p. 84) among Brown's "Shasta" plants which he lists as doubtful, since he does not accept it in his treatment of the genus in his Flora of Mount Shasta (Amer. Midl. Nat. 23: 521). Jepson also overlooked this California endemic, both in his Flora *(Eleocharis,* 1922) and Manual *(Eleocharis,* 1923), but Britton included it in Abrams' Illustrated Flora (1: 265,-1923). There I would alter the final statement to read— "Type locality: given as Mount Shasta, California, at 2500 m., but probably in the Scott Mountains."

DULICHIUM ARUNDINACEUM (L.) Britt. This sedge, so widespread in North America, apparently is very rare in California. It was omitted from Jepson's Flora *(Cyperaceae* in part, 1922), but both in Abrams' Flora (1: 278,-1923) and in Jepson's Manual (p. 147,-1923) it was recorded from Humboldt County, California.

The plant is now to be recorded from two counties in the Sierra Nevada. Near Echo Summit, Eldorado Co., I found the plant very common on the marshy borders of a small pond *(No. 22976)*. In the vicinity of Huntington Lake, it has been found by Lawrence Beane at a couple of localities, one of which is Ward Lake *(Beane in 1949)*. Further collections from middle elevations of the Sierra are anticipated with certainty.

CAREX ARCTOGENA H. Smith. Under the name, *C. capitata* L., this species was reported from only three stations in Fresno and Tulare counties, California, by Mackenzie (Erythea 8: 22,-1922), and it had been known from the vicinity of Mt. Rose in western

Nevada. At the suggestion of the late J. W. Stacey, I went to the Nevada locality in 1938 where I was successful in finding the plant near the head of Third Creek *(No. 14135)*. Since that time, in the high southern Sierra Nevada, I have made eleven collections in Tulare and Inyo counties, while still other collections have been made from Inyo and Tuolumne counties by C. W. Sharsmith. In 1946, less than a mile from the Placerville-Lake Tahoe highway, I was surprised to find this relatively rare but widespread sedge in a marsh near Echo Summit, Eldorado Co. *(No. 22959)*. This locality is at an elevation of only 7400 ft., while most of the collections from the southern Sierra Nevada have been made at 10,000 to 12,000 feet.

Recently it has been suggested that *C. arctogena* is to be interpreted as merely an ecologic form of *C. capitata* (M. Raymond, Contrib. Inst. Bot. Univ. Montréal 64: 34-39,-1949). While it is true that one sometimes has difficulty in placing specimens belonging to this alliance, *C. arctogena* was originally separated by such distinctive characters that I hesitate to follow Raymond until I have more carefully studied the problem.

CAREX TAHOENSIS Smiley. In shallow gravelly soil of the summit ridge of Mt. Tallac just south of the highest point, Smiley's Tahoe *Carex* was found to be a common plant *(No. 22952)*. Originally described from a specimen Smiley collected in 1913 on Mt. Tallac, Eldorado Co., "at an elevation of about 9300 feet" (Univ. Calif. Publ. Bot. 9: 119,-1921), the plant was not recognized as a species by Mackenzie but was treated by him as a synonym of *C. phaeocephala* Piper (N. Am. Fl. 18: 139,-1931). *Carex phaeocephala* also occurs on Mt. Tallac but the two plants are very different in appearance and in technical characters. South of Mt. Tallac, *C. tahoensis* is of rare occurrence in the high Sierra Nevada in Mono and Inyo counties. Twice I have recorded collections from these counties as *C. Eastwoodiana* (Sierra Club Nature Notes No. 13, p. 12; Base Camp Botany, 1946, p. 5). Besides the Tallac collections noted above, the species may be recorded by the following collections in Herb. Calif. Acad. Sci.

MONO COUNTY: Mt. Warren, 11700 ft., *Sharsmith 2830;* Dunderberg Peak, 11200 ft., *Sharsmith 2944;* Mt. Conness, northeast side, *Clausen 1650;* Dana Plateau, 12000 ft., *Sharsmith 3518;* Glacier Canyon, Mt. Dana, *Howell 20269*.

Inyo County: Box Lake, Rock Creek Lake Basin, 10500 ft., *Howell 22435;* Coyote Ridge, 12000 ft., *Howell 24001, Stebbins & Raven 199;* Thunder and Lightning Lake, 11700 ft., *Howell 23991.*

Carex Davyi Mkze. Although this is one of the most conspicuous California species in the section *Ovales,* it has remained one of the rarest, being known in literature only from the type and the three additional collections cited by Mackenzie in Erythea (8: 42). In 1946, I collected this rare sedge on the lower slopes of Mt. Tallac northeast of Gilmore Lake at 8800 feet elevation, Eldorado Co. *(No. 22954).* Still other collections of *C. Davyi* in Herb. Calif. Acad. Sci. that might be noted here are: Hermit Valley, Alpine Co., *Peirson 11714;* Winnemuca Lake, Alpine Co., *Peirson 12203, L. S. Rose 44195;* Tuolumne Meadows near Dog Creek, Tuolumne Co., *Howell 20317;* west side of Mono Pass, Tuolumne Co., *Howell 20620.* None of the above stations extends the previously known range of the species, which has been reported from Placer County south to Tulare County,* but both Alpine and Tuolumne counties represent new county records for this rare sedge.

Carex vesicaria L. and C. rostrata Stokes. In 1942 in Sky Parlor Meadow, Tulare Co., and again in 1946 near Echo Summit, Eldorado Co., I found these two common widespread species growing together and was able to compare their distinctive habits. These I shall describe, even at the risk of recording observations which surely must have been set down somewhere but which I have not come across in *Carex* literature.

In *C. rostrata (No. 22971),* the culms are strictly erect, quite perpendicular to the plane of level meadows and lake margins where it grows. The culms of *C. vesicaria (No. 22972),* on the other hand, arise obliquely and form with the ground an angle less than a right angle. As the two species grew together near Echo Summit, *C. vesicaria* formed radially spreading, loosely tufted masses, while *C. rostrata* occurred as a somewhat open growth with the strict culms more distantly spaced. My photo-

*Since these notes were written and put in type, I have had the privilege of studying at the Dudley Herbarium the collection which is the basis of the Tulare County record cited by Mackenzie (Erythea 8: 42): *Dudley 2484,* collected in the "vicinity of Mt. Whitney" on Aug. 7, 1897. Although the sheet is annotated by Mackenzie, the plant is obviously not *C. Davyi,* but, with its very thin, ovate, perigynia 4–5 mm. long, it is referable to *C. proposita* Mkze. which I have recently recognized in the Sierra Nevada (cf. Base Camp Botany, 1949, p. 9). Hence, *C. Davyi,* as I now know it, is restricted to the central Sierra Nevada from Placer County south to Tuolumne County, at 6000 to 10600 ft. elevation.

graph of this revealing association is on file in Herb. Calif. Acad. Sci. but unfortunately it is not good enough to reproduce here.

In the herbarium, it is not always easy to distinguish these very distinct species, particularly if specimens are immature. Nash's excellent drawings in Erythea (vol. 8, figs. 48, 49, 50), illustrate admirably the differences between the spikelets of *C. rostrata* on the one hand and those of *C. vesicaria* and *C. exsiccata* Bailey on the other. I might add that in habit *C. exsiccata* simulates its very close relative, *C. vesicaria,* and that its culms are oblique to the ground.

NEW NAMES IN OXYTROPIS

BY R. C. BARNEBY
Wappingers Falls, New York

A study of the North American species of *Oxytropis* has shown a need for several minor changes in the nomenclature. An account of the genus has been completed, but its publication is likely to be delayed. The following combinations, relating to the members of the genus native to the Rocky Mountains and Western States are published here in order to make them available for floristic works now in preparation.

Oxytropis deflexa (Pall.) DC. var. **foliolosa** (Hook.) Barneby, comb. nov. *O. foliolosa* Hook., Fl. Bor.-Amer. 1: 146 (1834). *Astragalus deflexus* Pall. var. *foliolosus* (Hook.) Tidestr., Proc. Biol. Soc. Wash. 50: 19 (1937).

Oxytropis Lagopus Nutt. var. **atropurpurea** (Rydb.) Barneby, stat. nov. *Aragallus atropurpureus* Rydb., Bull. Torr. Club 34: 424 (1907).

Oxytropis Besseyi (Rydb.) Blank. var. **ventosa** (Greene) Barneby, stat. nov. *Aragallus ventosus* Greene, Proc. Biol. Soc. Wash. 18: 15 (1905).

Oxytropis Besseyi (Rydb.) Blank. var. **argophylla** (Rydb.) Barneby, stat. nov. *Aragallus argophyllus* Rydb., Mem. N. Y. Bot. Gard. 1: 255 (1900).

Oxytropis campestris (L.) DC. var. **gracilis** (A. Nels.) Barneby, stat. nov. *Aragallus gracilis* A. Nels., Erythea 7: 60 (1899).

Oxytropis campestris (L.) DC. var. **Cusickii** (Greenm.) Barneby, stat. nov. *Aragallus Cusickii* Greenm., Erythea 7: 116 (1899).

Oxytropis campestris (L.) DC. var. **dispar** (A. Nels.) Barneby, stat. nov. *Aragallus dispar* A. Nels., Erythea 7: 61 (1899).

Oxytropis campestris (L.) DC. var. **columbiana** (St. John) Barneby, stat. nov. *O. columbiana* St. John, Proc. Biol. Soc. Wash. 41: 100 (1928).

Oxytropis sericea Nutt. var **spicata** (Hook.) Barneby, comb. nov. *O. campestris* β. *spicata* Hook., Fl. Bor.-Amer. 1: 147 (1834).

Oxytropis Lambertii Pursh var. **articulata** (Greene) Barneby, stat. nov. *Aragallus articulatus* Greene, Proc. Biol. Soc. Wash. 18: 13 (1905).

NOTES ON TWO CALIFORNIA WEEDS

BY CLIFTON F. SMITH
Santa Barbara Botanic Garden

A New Papaver. In March, 1950, Mr. Eben McMillan of Cholame, San Luis Obispo County, collected *Papaver apulum* Ten. var. *micranthum* (Bor.) Fedde at the Point of Rocks which rise on the Antelope Plains in western Kern County. The writer collected fruiting specimens in April and noted only a few plants scattered along a fifty yard stretch of disturbed soil, either a cattle trail or weathered stratum. The habitat is a north exposed slope in a saddle among rocks and associate species are *Bromus rubens, Hordeum Stebbinsii, Schismus arabicus, Eriogonum gracillimum, Atriplex polycarpa, Salsola Kali* var. *tenuifolia, Stylomecon heterophylla, Erodium cicutarium,* and *Gutierrezia* sp.

This particular variety is native to France and Germany and was probably introduced by the Basque sheepherdsmen, who, according to Mr. McMillan, made their camp at the Point of Rocks some forty years ago. It apparently has not heretofore been reported from North America.

Another Station for the Field Marigold. In 1946, Mr. J. T. Howell reported a collection of *Calendula arvensis* L. from an orchard near Sonoma, Sonoma County, its first known occurrence in North America (Leafl. West. Bot. 4: 260). It is native to Eurasia, Africa, and the Canary Islands.

This spring, at the corner of Miradero Lane and Verde Vista Drive in Santa Barbara, this attractive weed was found abundantly naturalized in roadside grass. Since this locality borders the former experimental garden of Frederic E. Clements, it is assumed that this species was once tested by Dr. Clements and had escaped and persisted along the road. The garden has been abandoned for at least five years.

Duplicate specimens of the *Papaver* and *Calendula* are deposited at the California Academy of Sciences where they were identified by Mr. Howell.

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LEAFLETS
of
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Owned and published by
JOHN THOMAS HOWELL

THE GENUS MALACOTHAMNUS, GREENE (MALVACEAE)

BY THOMAS H. KEARNEY

It has been proposed to restrict the genus *Malvastrum* to species having indehiscent or merely apically dehiscent carpels, typified by *M. coromandelianum* (L.) Garcke (9). If this proposal is accepted, species having the carpels completely dehiscent, splitting into two valves when dry, belong to other genera, such as the South American *Nototriche* Turcz. and *Tarasa* Phil., and the North American *Malacothamnus* Greene and *Sidopsis* Rydb. Possibly additional segregates will need recognition when some of the South American species previously included in *Malvastrum* are better known.

The genus *Malacothamnus* was established by Edward L. Greene in 1906 (6) to comprise the more or less shrubby Californian plants which Gray and Robinson (5, pp. 310-313) had treated as species of *Malvastrum,* they having recognized 11 species of this group. Greene published a brief description of the genus and included in it the following species: *M. arcuatus* (Greene), *M. Fremontii* (Torr.), *M. orbiculatus* (Greene), *M. Davidsonii* (Robins.), *M. Palmeri* (Wats.), *M. aboriginum* (Robins.), *M. densiflorus* (Wats.), *M. marrubioides* (Dur. & Hilg.), and *M. fasciculatus* (Nutt.). These 9 species represent nearly the whole range of variation in the genus.[1]

Malacothamnus as a genus has not been recognized by later authors except Abrams (1) who published *M. Nuttallii* as a new species and *M. fasciculatus splendidus* (Kell.) and *M. nesioticus* (Robins.) as new combinations. The species of southern California were treated (as *Malvastrum)* by Estes (4). Eastwood (2,3) in her treatment of the Californian species (likewise as *Malvastrum)* recognized 27 species, whereas Jepson (7, pp. 497-501), who mistakenly transferred them to *Sphaeralcea,* reduced the number to 8, relegating to varietal status or to synonymy several entities which previously had been regarded as species. McMinn (11) recognized 12 species and numerous varieties of shrubby Californian *"Malvastrum."* Two species that, so far as is defi-

[1] Greene did not indicate a type-species but *M. fasciculatus,* having been the first species described (as *Malva fasciculata* Nutt.), may be designated as the lectotype.

Leaflets of Western Botany, Vol. VI, pp. 113–140, April 20, 1951.

nitely known, are confined to Baja California, have been discussed recently by Wiggins (13).

The present writer distinguishes 21 species and 6 varieties. It should be noted, however, that several of these entities are known only from a single or very few collections. With more abundant material, reduction in the status of some of them may become advisable.

The genus is wholly North American unless, as has been suggested by A. Krapovickas (personal communication), the Chilean *Malva obtusifolia* Walp. is a species of *Malacothamnus.*

Description of the Genus

Plants perennial, usually shrubby but sometimes herbaceous above the woody caudex, with numerous ascending-spreading or nearly erect branches; herbage more or less densely pubescent with mostly stellate hairs, these with arms often very unequal; leaves short- or rather long-petioled, the blades mostly shallowly to somewhat deeply 3- to 5-lobed, crenate or dentate, rounded to acutish at apex, cuneate, truncate, or cordate at base, the veins (at least the five principal veins) usually prominent beneath; flowers in axillary (or sometimes terminal) glomerules, these dense and subsessile or loose (more or less racemiform) and stalked, the flowers sessile to rather long-pedicelled; involucel of 3 subulate or filiform (in a few species broader) bractlets, these much shorter than to somewhat surpassing the calyx; calyx more or less deeply 5-lobed, sparsely to very densely pubescent with stellate (rarely simple) hairs, the lobes deltoid-ovate to lanceolate, acutish to attenuate-acuminate; petals pale to deep mauve, asymmetrically obovate, villous and often somewhat united at base; column much shorter than the corolla, the stamens numerous, crowded; style-branches of the same number as the carpels, the stigmas terminal, capitate; ovary and fruit depressed-hemispheric, usually about 10-merous; ovules solitary, ascending, the radicle inferior; carpels in fruit thin-walled, compressed, asymmetrically suborbicular or broadly ovate or obovate, muticous, very shallowly and broadly to rather deeply and acutely incised ventrally toward base, often with a stalk-like base below the sinus, sparsely to copiously stellulate apically and usually on the ventral edge, mostly glabrous dorsally and on the faces, otherwise smooth and unappendaged, completely dehiscent (splitting into two valves even before full maturity); seeds reniform, papillate-stellulate and often somewhat rugose.

The haploid chromosome number, as determined by J. M. Webber (12, p. 320) for 6 species is 17.

Habitat and Time of Flowering

These plants occur mostly, if not exclusively, on well-drained slopes and along washes and gullies, in areas now or formerly occupied by chaparral vegetation. Therefore, "Chaparral Mal-

low" would be a good choice for the common name of the genus. Since the genus, as a whole, ranges from Mendocino and Tehama counties in northern California to northern Baja California and from the coast and coastal islands to the desert-facing slopes of the Sierra Nevada, San Gabriel, San Bernardino, and San Jacinto mountains, the associated chaparral plants differ considerably as to species, but ecologically the environment is remarkably uniform. Most of the species begin flowering in late spring and early summer and, except at the higher elevations, produce few flowers, and these smaller than the early ones, after the advent of the dry season. The flowers, and often the herbage, are usually more or less fragrant.

Probable Age and Relationship of the Genus

Several of the species are very rare and local, three of them being known only from a single collection. San Luis Obispo County ranks first in the number of endemic or very nearly endemic species and not one of the widely distributed species is found in that county. Two species, *M. foliosus* and *M. paniculatus,* are known certainly only from northern Baja California.

Miss Eastwood (3, p. 188) summed up her conclusions as follows: "The different species of *Malvastrum* [*Malacothamnus*] are widely scattered in California and so often isolated that to me it seems to be an old genus once much more abundant here but now declining." This conclusion seems justified when applied to the rare and very local species and to *M. Fremontii,* which has an extensive range but with widely separated stations and very few individuals at each station. On the other hand, *M. fasciculatus,* in its several forms, is common and sometimes abundant in mainland and insular southern California, from Santa Barbara County to northern Baja California, and has developed several more or less intergrading varieties. These are scarcely characteristics of a waning species. Furthermore, the relative homogeneity of the genus might be considered as an indication that it is not a very old one.

The phylogeny of the genus is obscure. In the writer's classification (10), *Malacothamnus* belongs to the uniovulate group of Subtribe *Abutilinae* of Tribe *Malveae,* a group which may be conjectured to have descended from some pluriovulate ancestor, such as are most species of *Sphaeralcea.* The other uniovulate

genera of subtribe *Abutilinae* are *Malvastrum* (sensu stricto), *Nototriche, Tarasa,* and *Sidopsis.* The first has indehiscent or but slightly dehiscent carpels, whereas in the other three genera the carpels split into two separate valves as in *Malacothamnus.* It is improbable that any of these four genera as they now exist could have been a direct ancestor of *Malacothamnus* and it would seem more likely that it derives from some more generalized form, now extinct and not likely to have been preserved in the geological record.

Classification of the Species

There are two principal groups of closely allied species of *Malacothamnus,* one typified by *M. Fremontii* and the other by *M. fasciculatus.* The first, which includes also *M. Howellii, M. Helleri, M. marrubioides, M. orbiculatus,* and *M. niveus,* is characterized by suborbicular, shallowly incised carpels and usually by a densely lanate calyx, although in *M. marrubioides,* and commonly in *M. orbiculatus,* the calyx is more loosely and less densely pubescent.

The group which comprises *M. fasciculatus* and its varieties and with which may be associated, in various degrees of affinity, *M. mendocinensis, M. Hallii, M. arcuatus,* and *M. Parishii,* is characterized by having the calyx closely pubescent or sublepidote with very short, many-rayed hairs and often by relatively narrow, usually deeply incised carpels, although *M. mendocinensis* and *M. Hallii* are exceptions as regards the characters of the carpels.

The remaining species show no very close relationship to either of the principal groups, or to one another. Delimitation of several of the species is difficult and numerous specimens are intermediate in their characters. It is suspected that in this, as well as in *Sphaeralcea* and other genera of *Malvaceae,* interspecific hybridization is not infrequent, but experimental evidence is lacking.

Key to the Species and Varieties

The key is an artificial one and the position of a species in the key does not necessarily indicate its closest relationship. Unlike the condition in many genera of *Malvaceae,* the characters

of the fruit have proved to be of little value in distinguishing the species, most of which are represented in herbaria by very few specimens with mature fruit. In some cases it has been necessary to base the description of the carpels upon a single fruiting specimen. As often happens in the *Malvaceae* (8, p. 19), the fruits are much parasitized by insects. Furthermore, there is often as much variation within the species in the characters of the carpels as in the vegetative and floral characters. The characters that have been found to be of greatest diagnostic value are: nature of the pubescence of the herbage and calyx; shape and texture of the leaves; character of the inflorescence; shape and relative length of the bractlets of the involucel; and shape and relative length of the calyx-lobes.

1. Flowers in dense, subcapitate, terminal clusters, these conspicuously involucrate with membranous or foliaceous bracts equaling or somewhat shorter than the calyces, or a few of the flowers axillary and subterminal (2).

1. Flowers not in dense heads or, if so, then the clusters distributed along the stems and not conspicuously involucrate (3).

2. Bracts oblong-lanceolate; bractlets linear; calyx commonly about 15 mm. long; petals mostly 20–30 mm. long; leaves truncate, subcuneate, or subcordate at base, persistently pubescent or puberulent above..... .....1. *M. Palmeri*

2. Bracts oblong to broadly ovate; bractlets oblong-lanceolate; calyx commonly 10–12 mm. long; petals mostly 15–20 mm. long; leaves usually distinctly cordate at base, glabrous or glabrescent above..... .....1a. *M. Palmeri* var. *involucratus*

3. Calyx-lobes 4–8 mm. wide at base (exceptionally only 3 mm. in *M. paniculatus)* and mostly subcordate, more or less abruptly caudate-acuminate, much longer than the turbinate calyx-tube (4).

3. Calyx-lobes seldom more than 3 mm. wide at base, mostly acute or gradually acuminate but more abruptly acuminate in *M. Abbottii* and often in *M. densiflorus* and *M. marrubioides* (6).

4. Bractlets of the involucel broadly lanceolate to deltoid-ovate, often connate at base, somewhat shorter than the calyx; leaves subcordate to deeply cordate at base.....2. *M. aboriginum*

4. Bractlets subulate or filiform, distinct, ¼–⅔ as long as the calyx; leaves truncate or cuneate at base (5).

5. Leaves rather coarsely dentate; inflorescence narrowly thyrsoid, elongate, very leafy, the glomerules dense, the flowers sessile or subsessile..... .....3. *M. foliosus*

5. Leaves crenate or crenulate; inflorescence open-paniculate, the lower branches elongate and racemiform, the flowers mostly long-pedicelled .....4. *M. paniculatus*

6. Calyx conspicuously and densely white-lanate, the hairs, at least in the bud, more or less concealing the calyx-lobes. Leaves mostly suborbicular, not or very shallowly lobed; calyx not, or very inconspicuously angulate in the bud, the buds nearly globose (7).

6. Calyx not conspicuously and densely lanate, the pubescence sparser, or looser, or the hairs very short (pubescence sublepidote), not concealing the calyx-lobes, or, if the calyx rather densely lanate (sometimes so in *M. Jonesii)* then the inflorescence very narrow (subracemose) and few-flowered (11).

7. Stems closely white-tomentose with very short hairs; leaves mostly truncate or subcuneate at base, rather finely crenate or crenate-dentate (8).

7. Stems more loosely pubescent with longer hairs; leaves mostly cordate at base, coarsely crenate (9).

8. Inflorescence open-paniculate, the lower branches usually elongate and loosely few-flowered, many of the flowers relatively long-pedicelled; carpels conspicuously and broadly stalked, deeply incised; seeds copiously papillate-stellulate.....5. *M. niveus*

8. Inflorescence thyrsoid-glomerate or, if the lower branches somewhat elongate, then these many-flowered and the flowers short-pedicelled or subsessile; carpels rounded at base, very shallowly incised; seeds obscurely stellulate .....6. *M. Helleri*

9. Leaves relatively thin, sparsely to copiously but seldom densely pubescent; glomerules usually rather loosely flowered and more or less stalked .....7. *M. orbiculatus*

9. Leaves thick, velvety-tomentose; glomerules usually dense and subsessile except sometimes in *M. Howellii* (10).

10. Calyx (6) 7–8 (10) mm. long, the lobes about as long as the tube, deltoid, acute or short-acuminate; inflorescences interrupted-spicate, the glomerules and individual flowers sessile or subsessile.8. *M. Fremontii*

10. Calyx (8) 9–12 (13) mm. long, the lobes somewhat longer to more than twice as long as the tube, usually deltoid-lanceolate, acuminate (often sharply attenuate-acuminate); inflorescences more open, the glomerules often distinctly stalked and more or less racemiform, the flowers mostly pedicelled.....9. *M. Howellii*

11. Calyx and bractlets conspicuously hirsute or villous with long, few-armed (occasionally simple) hairs, the longest arm often 2 mm. or more long (12).

11. Calyx not conspicuously hirsute or villous, the hairs shorter (usually not much more than 1 mm. long) and many-armed (14).

12. Stems conspicuously shaggy-tomentose, the pubescence grayish; leaves angulately 3–5-lobed, deeply cordate at base, bicolored, soft-tomentose beneath; inflorescences not conspicuously interrupted; carpels conspicuously stellate at apex with relatively long hairs.....10. *M. clementinus*

12. Stems more closely pubescent, the pubescence yellowish; leaves not lobed or very shallowly so with rounded lobes, truncate, subcuneate, or cordate at base, not noticeably bicolored, not tomentose (usually

rather sparsely pubescent) beneath; inflorescences conspicuously interrupted; carpels minutely or obscurely stellulate (13).

13. Bractlets mostly as long as or longer than the calyx; calyx 10–14 mm. long, the lobes attenuate-acuminate (exceptionally more abruptly acuminate), 2–3 times as long as the tube.....11. *M. densiflorus*

13. Bractlets ½–⅔ as long as the calyx; calyx 7–10 mm. long, the lobes more or less abruptly acuminate from a deltoid-ovate base, somewhat longer than to at least twice as long as the tube.....11a. *M. densiflorus* var. *viscidus*

14. Inflorescences very open-paniculate, relatively few-flowered, the branches elongate, slender, somewhat flexuous, ascending-spreading to somewhat recurved (15).

14. Inflorescences contracted and short-branched or if open-paniculate and long-branched, then the branches ascending (16).

15. Bractlets broadly subulate, thick, whitish; calyx whitish-lepidote, angulate and pointed in the bud, 9–11 mm. long, the lobes 2–3 times as long as the tube, rather abruptly acuminate.....12. *M. Abbottii*

15. Bractlets narrowly subulate, thin, dark-colored; calyx dark-colored, not angulate in bud, opening before anthesis, 6–7 mm. long, the lobes less than twice as long as the tube, gradually acuminate.13. *M. gracilis*

16. Leaves usually distinctly and often somewhat angulately 3–5-lobed (17).

16. Leaves not lobed, or, if shallowly so, then the lobes rounded, exceptionally angulate (23).

17. Petioles and principal leaf-veins very stout; young branches shaggy-tomentose .....14. *M. Davidsonii*

17. Petioles and veins relatively slender; young branches closely short-pubescent to sublepidote (18).

18. Stems conspicuously angulate and striate; calyx 5–6 mm. long; petals 10–12 mm. long.....17. *M. mendocinensis*

18. Stems terete or nearly so, not conspicuously striate; calyx (5) 6–9 mm. long; petals commonly 15–20 mm. long (19).

19. Inflorescences narrowly thyrsoid-glomerate, the glomerules dense, short-stalked or subsessile or (in *M. fasciculatus* var. *catalinensis)* the lower branches sometimes up to 6 cm. long and more loosely flowered; calyx often rather loosely pubescent (subtomentose) with relatively long hairs (20).

19. Inflorescences open-paniculate (at least below), the lower branches often very long and very loosely flowered; calyx closely pubescent (sublepidote) with very short hairs (21).

20. Leaves relatively small, the largest blades seldom more than 4 cm. long, usually shallowly lobed and truncate or subcordate at base, seldom conspicuously bicolored; carpels 2.5–3.2 mm. high..21. *M. fasciculatus*

20. Leaves relatively large, the blades up to 8 cm. long and wide, commonly deeply lobed and deeply cordate at base, often conspicuously bicolored; carpels 3.2–3.8 mm. high..21b. *M. fasciculatus* var. *catalinensis*

21. Flowers in a many-branched, fastigiate panicle, the ultimate divisions rather rigid, not obviously racemose; calyx 6–7 mm. long.....21d. *M. fasciculatus* var. *nesioticus*

21. Flowers in a fewer-branched, more elongate panicle, the ultimate divisions commonly racemose; calyx 5–9 mm. long (22).
22. Leaves more or less bicolored, usually distinctly paler and more pubescent beneath, subcordate to deeply cordate at base; carpels 2–3 mm. high, nearly as wide, shallowly incised.....21a. *M. fasciculatus* var. *laxiflorus*
22. Leaves essentially concolored, both surfaces about equally pale and pubescent, subcuneate to cordate at base; carpels 3–5 mm. high and about ⅔ as wide, more or less deeply and often acutely incised.....21c. *M. fasciculatus* var. *Nuttallii*
23. Inflorescences few-flowered, subracemose, the flowers 1–3 (rarely more) at each node. Herbage whitish-pubescent; leaves suborbicular to rhombic-cuneate; carpels usually deeply and acutely incised.....19. *M. Jonesii*
23. Inflorescenses usually many-flowered, thyrsoid-glomerate to openly paniculate (24).
24. Calyx and young branches closely pubescent or sublepidote (25).
24. Calyx and young branches loosely pubescent to shaggy-tomentose (26).
25. Leaves broadly ovate to suborbicular, not noticeably bicolored; calyx 5–6 mm. long.....18. *M. Hallii*
25. Leaves rhombic-ovate, conspicuously bicolored (whitish beneath); calyx 8–9 mm. long.....20. *M. Parishii*
26. Calyx 5–7 (9) mm. long; leaves usually longer than wide..16. *M. arcuatus*
26. Calyx usually more than 7 mm. long; leaves as wide as long or wider (27).
27. Calyx-lobes abruptly short-acuminate; inflorescences conspicuously interrupted, the internodes very long...11a. *M. densiflorus* var. *viscidus*
27. Calyx-lobes acute to gradually acuminate or (in *M. marrubioides)* somewhat abruptly long-acuminate; inflorescences not very conspicuously interrupted, the internodes of moderate length (28).
28. Leaves cordate at base, mostly crenate; calyx not angulate in the bud, the buds subglobose.....7. *M. orbiculatus*
28. Leaves truncate, cuneate, or subcordate at base, dentate or crenate-dentate; calyx usually conspicuously angulate and pointed in the bud...15. *M. marrubioides*

Descriptions of the Species and Varieties[2]

1. Malacothamnus Palmeri (S. Wats.) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malvastrum Palmeri* S. Wats., Proc. Amer. Acad. 12: 250 (1877). *Sphaeralcea Palmeri* (S. Wats.) Jeps., Man. Fl. Pl. Calif. 633 (1925).

[2]The names of herbaria in which the type-specimens are deposited are abbreviated as follows: CA, California Academy of Sciences; G, Gray Herbarium of Harvard University; ND, University of Notre Dame; NY, New York Botanical Garden; Po, Pomona College; St, Stanford University; UC, University of California; US, U. S. National Herbarium. The writer is indebted to the curators of these herbaria for the loan of specimens, and to Mr. John Thomas Howell of the California Academy of Sciences for many helpful suggestions and for aid in field work.

The writer has examined the type, or one or more isotypes, of all species and varieties recognized in this paper, excepting the type of *M. orbiculatus* (Greene) Greene. An excellent photograph of the latter, obligingly supplied by Prof. Albert L. Delisle of Notre Dame University, shows clearly that this species has been interpreted correctly by California botanists.

Stems up to nearly 2.5 m. high and 6 cm. in diameter, woody below, very leafy, densely rough-pubescent; leaves long-petioled, the blades large, broadly ovate to suborbicular, usually shallowly lobed with rounded lobes, coarsely crenate, truncate, subcuneate, or subcordate at base, obtuse or rounded at apex, thin and plane to thick and rugose, permanently short-pubescent above, the larger veins prominent beneath; flowers in dense, subcapitate, terminal clusters, these conspicuously involucrate with membranous or foliaceous, oblong-lanceolate bracts equaling or somewhat shorter than the calyces; bractlets linear or narrowly lanceolate, shorter than to about equaling the calyx, these and the calyx villous or hirsute with relatively few-armed or sometimes simple hairs, the longest arm up to 3 mm. long; calyx commonly 15–20 mm. long, more or less angulate in the bud, the lobes longer than the short tube, deltoid-lanceolate from a broader base, acuminate; petals mostly 20–30 mm. long; carpels up to 4 mm. long and about ¾ as wide, distinctly stalked, deeply and rather narrowly incised; seeds 2.5–3 mm. long, rugose-papillate and rather copiously stellulate.

Type from Cambria, San Luis Obispo Co. *(Palmer 50,* in 1876, G).—San Luis Obispo Co., chiefly in the foothills of the Santa Lucia Mountains, reported also from southern Monterey Co., ranging from near sea level to 2000 ft.

Malacothamnus Palmeri is very different from all other species of the genus but is probably related distantly to *M. aboriginum.* It is, apparently, more shade-tolerant than any other *Malacothamnus.*

1a. **Malacothamnus Palmeri** var. **involucratus** (Robins.), comb. nov. *Malvastrum involucratum* Robins. in A. Gray, Syn. Fl. N. Amer. 1[1]: 310 (1897). *Malvastrum Palmeri* var. *involucratum* (Robins.) McMinn, Man. Calif. Shrubs 339 (1939).

Type from Jolon, Monterey Co. *(T. S. Brandegee,* G), cotype from between Jolon and King City, Monterey Co. *(Eastwood,* in 1893, CA).—Known from several localities in Monterey Co. and from Cuesta Pass, San Luis Obispo Co.

This variety, although intergrading rather freely with typical *M. Palmeri,* may be distinguished usually by having distinctly cordate leaves, these glabrous or glabrescent above, broader bracts and bractlets, and smaller flowers. The carpels, in the 2 fruiting specimens examined, are not stalked or shortly and broadly stalked.

2. MALACOTHAMNUS ABORIGINUM (Robins.) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malvastrum aboriginum* Robins. in A. Gray, Syn. Fl. N. Amer. 1[1]: 311 (1897). *Sphaeralcea aboriginum* (Robins.) Jeps., Fl. Calif. 2: 498 (1936).

Stems up to at least 0.75 m. high, woody below, densely shaggy-tomentose with many-armed hairs; petioles rather stout; blades up to 8 x 12 cm. but mostly much smaller, deltoid-ovate or suborbicular, shallowly to rather deeply 3-lobed, crenate or crenate-dentate, obtuse at apex, shallowly to deeply cordate at base, tomentose on both surfaces, in age thick and rugose; inflorescences spike-like, leafy or nearly naked, the glomerules dense but rather few-flowered, the flowers sessile or subsessile; bractlets broadly lanceolate to deltoid-ovate, subcordate and often somewhat connate at base, shorter than the calyx; calyx 7–9 mm. long, pointed and strongly plicate-angled in the bud, rather sparsely pubescent with very short, many-armed hairs, the lobes much longer than the tube, 5–7 mm. wide at base, abruptly acuminate; carpels 2.5–3 mm. high and about ¾ as wide, suborbicular or reniform, barely to conspicuously stalked, very shallowly to rather deeply incised; seeds minutely (often sparsely) papillate-stellulate.

Type from Indian Valley, Monterey (?) Co. *(M. K. Curran,* in 1885, CA).—Known otherwise from several localities in San Benito Co. and from Los Gatos Creek and Alcalde Canyon, western Fresno Co., at altitudes of 700 to 1400 ft.

This species, peculiar in the character of the involucel, has a very limited geographical distribution.

3. **Malacothamnus foliosus** (S. Wats.), comb. nov. *Malvastrum foliosum* S. Wats., Proc. Amer. Acad. 20: 356 (1885).

Stems apparently rather stout (height of plant unknown), shaggy-tomentose with short, many-armed hairs; petioles short, rather slender; blades suborbicular or broadly ovate, very shallowly angulate-lobed, rather coarsely dentate, acute at apex, strongly cuneate at base, thin, not rugose, copiously but not densely pubescent on both surfaces; inflorescence interrupted-thyrsoid-glomerate, very leafy to the apex, the lower glomerules more open (subracemose), the flowers sessile or short-pedicelled; bractlets filiform, about ½ as long as the calyx; calyx 12–16 mm. long, pointed and distinctly angulate in the bud, copiously but not densely pubescent with short, many-armed hairs, the lobes about twice as long as the tube, abruptly long-acuminate, 4–5 mm. wide at base; carpels 2.5–3 mm. high, about ¾ as wide, not stalked or shortly and broadly so, very shallowly incised; seeds papillate, minutely stellulate.

Type from Santo Tomás, coast of northern Baja California *(Orcutt,* in 1884, G).—Known definitely only from the type-collection.

This species was reduced by Gray (5, p. 311) to synonymy under *Malvastrum marrubioides* Dur. & Hilg. and there is some resemblance in the shape and dentation of the leaves, but *M. marrubioides* has a less leafy inflorescence and narrower, more

gradually acuminate calyx-lobes. Wiggins (13), considered it to be more nearly related to *Malvastrum densiflorum* S. Wats., as did Watson himself, but from the latter, *M. foliosus* differs in its very leafy inflorescence and broader calyx-lobes, these with shorter hairs.

4. **Malacothamnus paniculatus** (A. Gray), comb. nov. *Malvastrum marrubioides* var. *paniculatum* A. Gray, Proc. Amer. Acad. 22: 290 (1887). *Malvastrum paniculatum* (A. Gray) Wiggins, Madroño 10: 184 (1950).

Plant shrubby, 1–2.5 m. high, the stems densely shaggy-tomentose with yellowish hairs; leaves short-petioled, the blades up to 8 cm. long and nearly as wide, broadly deltoid-ovate, scarcely to shallowly 3-lobed, obtuse or acutish at apex, more or less cuneate at base, coarsely to finely crenate, rather thin, not rugose, copiously pubescent on both surfaces with short, many-armed hairs; inflorescences open-paniculate, the branches up to 30 cm. long, loosely cymose, the flowers mostly on long slender pedicels; bractlets filiform, about ½ as long as the calyx; calyx 11–15 mm. long, pointed and plicate-angled in the bud, copiously but not densely pubescent with short, many-armed hairs, the lobes about twice as long as the tube, (3) 5–8 mm. wide at the subcordate base, abruptly and sharply long-acuminate; carpels about 2.5 mm. high and nearly as wide, suborbicular, not stalked, moderately incised; seeds papillate-stellulate.

Type from Ensenada de Todos Santos, Baja California *(Orcutt,* in 1886, G).—Known definitely only from northwestern Baja California, presumably near sea level, although reported by McMinn (11, p. 345) "from the hills bordering Lake Elsinore, Riverside County."

This differs from the other species with wide calyx-lobes in the open-paniculate inflorescence and the mostly long-pedicelled flowers.

5. **Malacothamnus niveus** (Eastw.), comb. nov. *Malvastrum fragrans* Eastw., Leafl. West. Bot. 1: 218 (1936), non Gray & Harv. *Malvastrum niveum* Eastw., ibid. p. 232. *Malvastrum Fremontii* var. *niveum* (Eastw.) McMinn, Man. Calif. Shrubs 343 (1939).

A rather small shrub, the stems densely and closely white-tomentose (sublepidote) with very short hairs; leaves relatively small, the blades up to 4 x 4 cm., broadly deltoid-ovate or suborbicular, very shallowly 3-lobed, shallowly crenate or crenate-dentate, rounded at apex, truncate, subcuneate, or subcordate at base, rather thick, soft-tomentose on both surfaces; inflorescences paniculate, usually open and relatively few-flowered, the longest branchlets usually 4–5 cm. long, the flowers 1–4 on the branchlets, short- to rather long-pedicelled; bractlets subulate (exceptionally filiform), ⅓–¾ as long as the calyx, dark-colored; calyx (6) 7–8 (12) mm. long, densely white-lanate (the longest hairs mostly about 1 mm. long), the lobes as long as to

nearly twice as long as the tube, mostly deltoid-ovate or deltoid-lanceolate, acutish to short-acuminate, 2–3 mm. wide at base; petals up to 2 cm. long; carpels 2.5–3 mm. high and nearly as wide, conspicuously and broadly stalked, deeply incised; seeds copiously papillate-stellulate.

Type from El Dorado School near Santa Margarita, San Luis Obispo Co. *(M. E. Wall,* in 1933, CA).—Known from several localities in San Luis Obispo Co., where apparently not infrequent, and from Tepusquet Canyon, Santa Barbara (?) Co., in washes, at elevations of 1300 to 1500 ft.

One of the handsomest species of the genus, with large, fragrant flowers. Although relationship to *M. Fremontii* is indicated by the white-woolly calyx, *M. niveus* is very different in the character of the leaves and inflorescences. The dark-colored bractlets contrast conspicuously with the calyx.

6. **Malacothamnus Helleri** (Eastw.), comb. nov. *Malvastrum Helleri* Eastw., Leafl. West. Bot. 1: 217 (1936). *Sphaeralcea Fremontii* var. *exfibulosa* Jeps., Fl. Calif. 1: 500 (1936). *Malvastrum Fremontii* var. *Helleri* (Eastw.) McMinn, Man. Calif. Shrubs 341 (1939).

A much-branched shrub 1 m. high or higher, the younger branches densely and closely pubescent with very short, many-armed hairs; leaves mostly small, suborbicular-deltoid, not lobed or obscurely so, finely to rather coarsely crenate-dentate, very obtuse to acutish at apex, truncate, subcordate, or subcuneate at base, thickish, the veins prominent beneath; inflorescences many-flowered, narrow, with dense subsessile glomerules, or more openly paniculate with racemiform branchlets up to 6 cm. long; bractlets subulate or filiform, ½–¾ as long as the calyx; calyx (5) 6–8 mm. long, densely white-woolly, (the longest hairs up to 1.3 mm. long), the lobes about as long (exceptionally nearly twice as long) as the tube, deltoid, acute, 2–3 mm. wide at base; carpels 2.5 mm. high and nearly as wide, suborbicular, rounded at base, very shallowly incised; seeds obscurely stellulate.

Type of *M. Helleri* from Lodoga, Colusa Co., but labelled as from "near Ladoga, Lake County" *(Heller 13242,* CA), type of *S. Fremontii* var. *exfibulosa* from "Putah Creek, in gravel bed, near Winters," Yolo Co., *(Jepson 16741).*—Known also from near Lower Lake, Lake Co., and Capay Valley, Yolo Co. The type grew in the *Quercus Douglasii* belt with *"Ceanothus, Adenostoma,* and *Toxicodendron."* In the herbarium of the California Academy there are specimens of *M. Helleri* purporting to have been collected in Sespe Gorge, Ventura Co., but it is highly improbable that they were collected so far to the south.

The white-woolly calyx indicates relationship to *M. Fre-*

montii, but the close pubescence of the herbage and the shape of the leaves sufficiently distinguish *M. Helleri.* From *M. niveus* the characters given in the key afford ample distinction.

7. MALACOTHAMNUS ORBICULATUS (Greene) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malvastrum orbiculatum* Greene, Fl. Francisc. 109 (1891). *Malvastrum Fremontii* var. *orbiculatum* (Greene) Johnst., Pl. World 22: 109 (1919). *Sphaeralcea orbiculata* (Greene) Jeps., Fl. Calif. 2: 499 (1936).

Plant shrubby or the stems often herbaceous or nearly so above the caudex, up to about 2 m. high, the rather stout branches densely but rather loosely pubescent (more or less shaggy); leaves rather large, the petioles mostly short and stout, the blades up to 8 cm. long and wide, suborbicular or reniform (wider than long), nearly entire to shallowly 3–5-lobed, mostly crenate (often coarsely so), rounded or truncate at apex, subcordate to deeply cordate at base, thin, more or less copiously but not densely stellate on both surfaces, only the larger veins prominent beneath; inflorescences narrow, elongate, leafy only at base, the longest branchlets up to 10 cm. long but usually much shorter, the glomerules often rather loosely flowered or shortly racemose, the flowers subsessile or short-pedicelled; bractlets subulate or filiform, ¼–¾ as long as the calyx; calyx 7–10 (14) mm. long, woolly or (commonly) more loosely and sparsely pubescent (the longest hairs up to 2 mm. long, but usually shorter), the lobes about as long as to 2.5 (commonly at least 1.5) times as long as the tube, deltoid or deltoid-lanceolate, acute to sharply attenuate-acuminate, 1.5–3 (rarely 4) mm. wide at base; carpels 2.2–3.2 mm. high and nearly as wide, ovate to suborbicular, not or shortly stalked, very slightly to rather deeply incised; seeds sparsely to copiously stellulate and often papillate.

Type from "mountains south of Tehachapi," Kern (?) Co., *(Greene,* in 1889, ND).—Mountains of northern Ventura, Kern, Los Angeles, San Bernardino, and Inyo counties, especially abundant on the northern slopes of the San Gabriel and San Bernardino mountains and the eastern slopes of the Sierra Nevada, at elevations of (2770) 4000 to 9000 ft., attaining higher altitudes than any other species of *Malacothamnus.* The plant ascends to the pine belt (ponderosa and Jeffrey pines). West of Independence, Inyo County, it occurs as widely scattered individuals in very open chaparral of *Arctostaphylos, Castanopsis, Ceanothus,* etc., at elevations of 7000 to 8500 ft. These plants were small, less than 1 m. high, with stems entirely herbaceous above the woody caudex.

Malacothamnus orbiculatus is the most difficult species of the genus to define satisfactorily. It is related on the one hand to *M. Fremontii* and on the other to *M. marrubioides.* It differs

from the former chiefly in the relatively thin and rather sparsely pubescent leaves. The calyx also is usually more sparsely pubescent than in *M. Fremontii* and the geographical distributions apparently do not overlap, *M. Fremontii* not being known from farther south than Tulare Co. and being a plant of usually much lower altitudes. As compared with *M. marrubioides, M. orbiculatus* is distinguished by its larger, cordate, crenate leaves.

8. MALACOTHAMNUS FREMONTII (Torr.) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malvastrum Fremontii* Torr. ex A. Gray, Mem. Amer. Acad. ser. 2, 4: 21 (1849). *Sphaeralcea Fremontii* (Torr.) Jeps., Man. Fl. Pl. Calif. 633 (1925).

A straggling shrub up to about 3 m. high, herbaceous above, the stout young stems densely shaggy-tomentose with rather long, many-armed hairs; petioles short and stout; blades suborbicular or reniform (wider than long), up to 6 x 7 cm., not lobed or very shallowly lobed with rounded lobes, coarsely crenate, mostly rounded at apex, more or less cordate (or the upper ones truncate) at base, thick, velvety-tomentose on both surfaces, the principal veins usually stout, prominent beneath; inflorescences narrow, interrupted, leafy only toward base, the glomerules dense, sessile or nearly so, the flowers sessile or subsessile; bractlets subulate or filiform, mostly ½–¾ as long as the calyx; calyx (6) 7–8 (10) mm. long, conspicuously and densely white-lanate, the pubescence almost concealing the lobes at least in the (nearly globose) buds, the hairs many-armed, seldom more than 1.5 mm. long, the lobes in anthesis about as long as the tube, deltoid, acute or (exceptionally) short-acuminate, 2–3 (4) mm. wide at base; petals up to 18 mm. long; carpels 2.5 to nearly 4 mm. long, averaging ¾–⅘ as wide, suborbicular or obovate, rounded at base to distinctly stalked, shallowly (seldom deeply) incised; seeds papillate-stellulate.

Type from "interior of California" *(Frémont,* in 1846, NY).[3] —Western foothills of the Sierra Nevada from (Placer?) Amador Co. to Tulare Co., with outlying stations in the Yollo Bolly foothills, Tehama Co., and at North Butte, Sutter Co., ranging from (200?) 500 to 2500 ft. Although having a rather extensive geographical distribution, *M. Fremontii* apparently is nowhere common, the plants occurring singly or in very small colonies at each station. Near Springville, Tulare Co., it grew in association with *Quercus Wislizeni, Rhus diversiloba, Eriodictyon* sp., *Lupinus albifrons, Diplacus* sp., etc.

9. **Malacothamnus Howellii** (Eastw.), comb. nov. *Malvastrum Fremontii* var. *cercophorum* Robins. in A. Gray, Syn. Fl. N. Amer. 1[1]: 311 (1897).

[3] "Fremont probably collected the type specimens on the western slope of the Sierra Nevada, along the American Fork of the Sacramento River" (F. V. Coville, Contrib. U. S. Nat. Herb. 4: 73).

Sphaeralcea Fremontii var. *cercophora* Jeps., Man. Fl. Pl. Calif. 634 (1925). *Malvastrum Howellii* Eastw., Leafl. West. Bot. 1: 220 (1936). *Malvastrum Howellii* var. *cordatum* Eastw., ibid.

Inflorescences more or less expanded, the longest branchlets up to 10 cm. long, the glomerules usually distinctly stalked and often racemiform, the flowers mostly short-pedicelled; bractlets ⅔ as long as to about equaling the calyx, subulate or filiform; calyx (8) 9–12 (16) mm. long, densely lanate, the hairs up to 2 mm. long, the lobes somewhat longer than to more than twice as long as the tube, usually deltoid-lanceolate, acuminate, often sharply attenuate-acuminate. Similar in other characters to *M. Fremontii.*

Type from Nortonville, Contra Costa Co. *(J. T. Howell 6470,* CA), type of var. *cordatum* from Junto del Puerto Canyon, western Stanislaus Co. *(C. Dudley,* in 1935, CA), type of *M. Fremontii* var. *cercophorum* from Arroyo del Valle, Alameda Co. *(Greene,* in 1895, UC).—Contra Costa, Alameda, eastern Santa Clara, and western Stanislaus counties, also Swiss Ranch, Calaveras Co., and Bissett's Ranch, Madera Co., centered principally on and near Mount Diablo and on the east side of the Mount Hamilton Range, ranging from 500 to 3500 (4300?) ft. At Nortonville, the type-locality of *M. Howellii,* the plants were associated with *Adenostoma, Artemisia californica, Salvia mellifera, Dendromecon,* etc.

Although there is some intergradation with *M. Fremontii,* the more open inflorescences and the larger, much more deeply cleft calyx together with the mainly different geographical distribution, seem to warrant recognition of *M. Howellii* as a species. The herbage and flowers are fragrant, as is also the case in *M. Fremontii.*

10. **Malacothamnus clementinus** (Munz & Johnst.), comb. nov. *Malvastrum clementinum* Munz & Johnst., Bull. Torr. Bot. Club 51: 296 (1924). *Sphaeralcea orbiculata* (Greene) Jeps. var. *clementina* (Munz & Johnst.) Jeps., Fl. Calif. 2: 499 (1936).

A rounded shrub up to 1 m. high with numerous ascending branches, these shaggy-tomentose when young with rather long, many-armed hairs; petioles short and rather stout; blades up to 5 cm. long, somewhat wider than long, rather deeply and somewhat angulately 5-lobed, rather deeply crenate with numerous teeth, acutish at apex, cordate at base with a broad or rather narrow sinus, thin, bright green above, pale beneath, sparsely pubescent or glabrescent above, copiously but not very densely pubescent beneath with both very short and longer hairs, not prominently reticulate beneath; inflorescences thyrsoid-glomerate, not conspicuously interrupted, leafy only at base, the glomerules dense, sessile or nearly so, the flowers

sessile or subsessile; bractlets filiform, about ¾ as long as the calyx, villous; calyx 7–9 mm. long, not angulate in the bud, densely villous (especially the tube) with relatively few-armed hairs up to 2 mm. long, the lobes about as long as to twice as long as the tube, deltoid-lanceolate, gradually and sharply acuminate, 2–2.5 mm. wide at base; petals about 15 mm. long, the claws conspicuously ciliate; mature fruit not seen but the carpels described as 2.5–3 mm. high and stellate-tomentose at apex (Munz & Johnst., ibid.).

Type from Lemon Tank, San Clemente Island *(P. A. Munz 6684,* Po).—Known only from the type-locality, where it is apparently very rare, growing at the "base of rocky walls in a deep canyon on the northeast side of the island" (Estes, p. 85).

This strikingly handsome and very distinct species is not closely related to any other, although, as the authors of the species suggested, it may have some affinity with *M. fasciculatus.* It differs from all forms of that species in the long-hairy calyx and other characters. To *M. densiflorus,* with which it is associated in the key on account of the long calyx-hairs, it has no near affinity.

11. MALACOTHAMNUS DENSIFLORUS (S. Wats.) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malvastrum densiflorum* S. Wats., Proc. Amer. Acad. 17: 368 (1882). *Malvastrum densiflorum* var. *typicum* Estes, Bull. S. Calif. Acad. Sci. 24: 85 (1925). *Sphaeralcea densiflora* (S. Wats.) Jeps., Man. Fl. Pl. Calif. 633 (1925).

Stems erect, woody below, up to 2 (3?) m. high; herbage yellowish-pubescent with stellate hairs and obscurely granular-puberulent; leaves rather small, seldom more than 4 cm. long, sometimes shallowly 3-lobed, broadly ovate, rounded to acutish at apex, subcuneate, truncate, or subcordate at base, shallowly crenate or dentate, thin or thickish, not conspicuously reticulate beneath; inflorescences spike-like, conspicuously interrupted (the internodes elongate), naked or nearly so, the glomerules dense, sessile or subsessile, the flowers sessile or short-pedicelled; bractlets filiform, equaling or longer than the calyx, hirsute-ciliate; calyx 10–14 mm. long, hirsute with few-armed or simple hairs, these 2–3 mm. long, the calyx-lobes 2–3 times as long as the strongly ribbed tube, lanceolate, attenuate-acuminate, 2–3 mm. wide at base; carpels 2.2–2.8 mm. high, about ⅘ as wide, suborbicular, oval, or ovate, not stalked or very slightly so, shallowly incised; seeds minutely papillate-stellulate.

Types from the San Jacinto Mountains, Riverside Co. *(Parish Bros. 738, W. G. Wright,* in 1881, G).—Santa Ana and San Jacinto mountains, Riverside Co., to northern Baja California, 1000 to 3000 (4000?) ft.

McMinn (11, p. 345) considered *M. densiflorus* "identical to *M. marrubioides* D. & H.," but although these species superficially resemble each other, *M. densiflorus* differs from *M. marrubioides* in the longer, more interrupted inflorescence, denser glomerules, and much longer calyx-hairs, as well as in geographical distribution.

11a. **Malacothamnus densiflorus** var. **viscidus** (Abrams), comb. nov. *Malvastrum viscidum* Abrams, Bull. Torr. Bot. Club 34: 264 (1907). *Malvastrum densiflorum* var. *viscidum* (Abrams) Estes, Bull. S. Calif. Acad. Sci. 24: 85 (1925). *Sphaeralcea densiflora* var. *viscida* (Abrams) Jeps., Fl. Calif. 2: 498 (1936). *Malvastrum marrubioides* var. *viscidum* (Abrams) McMinn, Man. Calif. Shrubs 345 (1939).

Type from El Nido, San Diego Co. *(L. Abrams 3528,* St).—San Diego Co. and northern Baja California, from near sea level to 3000 ft., apparently commoner than typical *M. densiflorus.*

This variety differs usually from the species in its more deeply cordate leaves, relatively short bractlets (not more than ⅔ as long as the calyx), and smaller calyx (7–10 mm. long) with deltoid-ovate, more abruptly acuminate lobes and often shorter hairs. Intergradation with typical *M. densiflorus* is complete, however, and specimens of more or less intermediate character are about as numerous as specimens of the typical phase and of var. *viscidus.* Occasional specimens of var. *viscidus,* as was noted by Fosberg, have the calyx-lobes glabrous except toward the margin. According to Estes (4, p. 86) the plant is similar in habit and habitat to typical *M. densiflorus,* being "a slender open shrub 6–8 feet high."

12. **Malacothamnus Abbottii** (Eastw.), comb. nov. *Malvastrum Abbottii* Eastw., Leafl. West. Bot. 1: 215 (1936).

"An erect shrub 3 to 6 feet high, with white-tomentose herbage" (11, p. 349); stems densely and closely stellate (sublepidote) with very short hairs; leaves up to 6 cm. long and very nearly as wide, scarcely lobed, rounded at apex, truncate or subcordate at base, coarsely crenate with broad rounded teeth, thickish, prominently reticulate beneath; inflorescence very open, with slender, more or less flexuous branchlets often 15 cm. long or longer, the flowers cymosely or racemosely disposed, mostly distinctly pedicelled; bractlets ½–⅔ as long as the calyx, broadly subulate, thick, whitish; calyx 9–11 mm. long, angulate and pointed in the bud, whitish-lepidote, the lobes 2–3 times as long as the tube, sharply and somewhat abruptly acuminate, about 3 mm. wide at base; petals 15–20 mm. long; mature fruit unknown.

Type from "among willows on the Salinas River, Monterey Co." *(E. K. Abbott,* in 1889, CA).—An exceptionally handsome, large-flowered species, apparently known only from the type-collection.

13. **Malacothamnus gracilis** (Eastw.), comb. nov. *Malvastrum gracile* Eastw., Leafl. West. Bot. 1: 219 (1936).

An erect, rather slender-branched shrub 1–2 m. high; young stems densely and closely whitish-stellate (sublepidote); leaves slender-petioled, the blades small (less than 3 cm. long and wide, so far as known), broadly deltoid-ovate, very shallowly lobed, crenate, very obtuse at apex, truncate or subcuneate at base, thickish, rather prominently reticulate beneath; inflorescence a very open, relatively few-flowered panicle with slender, more or less flexuous branchlets up to 8 cm. long, the flowers cymosely or racemosely disposed, mostly distinctly pedicelled; bractlets about ½ as long as the calyx, narrowly subulate, thin, dark-colored; calyx 6–7 mm. long, not angulate in the bud, opening before anthesis, dark-colored, the lobes less than twice as long as the tube, gradually acuminate, not more than 2.5 mm. wide at base; petals 15–20 mm. long; carpels 3 mm. high and about ⅔ as wide, broadly short-stalked, shallowly incised; seeds stellulate in patches.

Type from between Arroyo Grande and Huasna, San Luis Obispo Co. *(Eastwood 14996,* CA).—Apparently known only from the type-collection and one from Arroyo Grande *(R. F. Hoover 7905).*

This beautiful and rare plant is evidently related to *M. Abbottii* but is readily distinguishable by the characters given in the key. It seems to be unique in the dark color and early opening of the calyx.

14. Malacothamnus Davidsonii (Robins.) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malvastrum Davidsonii* Robins. in Gray, Syn. Fl. N. Amer. 1¹: 312 (1897). *Sphaeralcea Davidsonii* (Robins.) Jeps., Man. Fl. Pl. Calif. 634 (1925).

A large shrub up to 5 m. high, with stout, shaggy-tomentose branches; petioles very stout; blades very large, up to 9 x 11 cm., mostly wider than long, usually deeply and often angulately 3–5-lobed, crenate or crenulate, rounded to acutish at apex, deeply cordate at base, thick, velvety-tomentose on both surfaces, the principal veins very stout and prominent beneath; inflorescences paniculate, mostly narrowly so, commonly leafy, the ultimate branchlets short and stout, several- to many-flowered, the flowers more or less racemosely disposed, mostly short-pedicelled; bractlets less than ½ as long as the calyx, subulate; calyx 6–9 mm. long, copiously but rather loosely pubescent with many-armed hairs, slightly angulate in the bud, the lobes about equaling to twice as long as the tube, deltoid, acute or short-acuminate, 2–3 mm. wide at base, the margins white-lanate; carpels 2.5–3.5 mm. high and ⅔–⅘ as wide, asymmetrically ovate, distinctly stalked, moderately to rather deeply incised.

Type from San Fernando Valley, Los Angeles Co. *(A. Davidson,* in 1895, G).—Los Angeles Co., especially in and near the San Fernando Valley, where apparently rather common, reported by Estes (4) also from Ojai Valley, Ventura Co., up to 1000 (1500?) ft., along washes and on dry slopes.

An apparently very local species, *M. Davidsonii* is notable in having thick, velvety-tomentose leaves (as in *M. Fremontii)* that are also rather deeply and angulately lobed (as is often the case in *M. fasciculatus).* Hybridization with the latter (var. *laxiflorus)* may occur, a collection in Pacoima Wash, Los Angeles Co. *(J. T. Howell 5169,* in part) being nearly intermediate in its characters.

15. MALACOTHAMNUS MARRUBIOIDES (Dur. & Hilg.) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malvastrum marrubioides* Dur. & Hilg., Jour. Acad. Phila. ser. 2, 3: 38 (1855). *Malvastrum gabrielense* Munz & Johnst., Bull. Torr. Bot. Club 52: 223 (1925). *Sphaeralcea densiflora* var. *gabrielensis* (Munz & Johnst.) Jeps., Fl. Calif. 2: 498 (1936).

Plant shrubby, up to about 2 m. high, the branches rather slender, densely but not closely stellate-tomentose when young; leaves (so far as known) slender-petioled, the blades rather small, usually not more than 4 cm. long and wide, suborbicular-deltoid, not or obscurely lobed, dentate or crenate-dentate, mostly acute at apex, truncate or subcordate at base, thickish, somewhat prominently reticulate beneath, copiously but not densely pubescent on both surfaces with short, many-armed hairs; inflorescences interrupted-thyrsoid-glomerate, usually short, leafy nearly to the apex or naked except at base, the glomerules few-flowered, sessile or short-stalked, the flowers sessile or short-pedicelled; bractlets ½ as long as to nearly equaling the calyx, subulate or filiform; calyx 9–12 mm. long, more or less pointed and angulate in the bud, loosely short-pubescent with many-armed hairs (the longest arm scarcely more than 1 mm. long), the lobes 1.5–3 times as long as the tube, lanceolate or lance-ovate, somewhat abruptly and sharply long-acuminate, 2–3 (4) mm. wide at base; carpels 2.5–3.5 mm. high and usually nearly as wide, obovate to nearly orbicular, truncate or rounded (exceptionally distinctly stalked) at base, shallowly (seldom rather deeply) incised; seeds copiously papillate-stellulate.

Type of *M. marrubioides* from Fort Miller (Millerton), Madera or Fresno Co. *(Heermann,* in 1853, isotypes G, US), type of *M. gabrielense* from "Arraster" (Arrastre Creek?) north slope of the San Gabriel Mountains, Los Angeles Co. *(F. W. Peirson 774,* Po).—The site of Fort Miller or Millerton is now within the Friant Reservoir and the species has not been collected since so far to the north. It is known from the mountains of Kern, Ven-

tura, and Los Angeles counties, 1500 to 7000 ft., but apparently is quite rare. A specimen in the herbarium of the University of California (*K. Curran,* in 1885), labelled as from Livermore, Alameda Co., was almost certainly collected much farther south.

Jepson (7, p. 500) reduced *M. marrubioides* to synonymy under *Sphaeralcea* [*Malacothamnus*] *Fremontii,* but it is readily distinguished from that species by its smaller, dentate rather than crenate, less tomentose leaves and less densely pubescent calyx. Also, according to J. T. Howell, who collected the plant in the Tehachapi Mountains, it lacks the characteristic fragrance of *M. Fremontii.* Although superficially resembling *M. densiflorus,* the nearest relative of *M. marrubioides* seems to be *M. orbiculatus,* which differs in its larger, thinner, cordate, crenate leaves and looser inflorescences. Specimens from Mt. Pinos, Alamo Peak, and Sespe Gorge, Ventura Co., however, approach *M. orbiculatus* in their looser, longer-stalked inflorescences. They tend also to have a smaller and less deeply cleft calyx with more gradually acuminate lobes than in typical *M. marrubioides.*

16. MALACOTHAMNUS ARCUATUS (Greene) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malveopsis arcuata* Greene, Man. Reg. S. F. Bay 66 (1894). *Malvastrum arcuatum* (Greene) Robins. in A. Gray, Syn. Fl. N. Amer. 1[1]: 311 (1897). *Sphaeralcea arcuata* (Greene) Arthur, Torreya 21: 11 (1921).

Stems up to 2 m. high, woody below, stout, copiously and loosely stellate-tomentose (more or less shaggy) with many-armed hairs; leaves suborbicular to rhombic-ovate, up to 6 cm. long, usually longer than wide, very shallowly 3–5-lobed (the lobes rounded to somewhat angulate), rounded to acutish at apex, subcuneate, truncate, or subcordate at base, coarsely crenate to rather finely crenate-dentate, sparsely to copiously but not densely pubescent on both surfaces, usually thin and plane but sometimes thickish and prominently rugose-reticulate beneath; inflorescences elongate, narrow, interrupted-thyrsoid-glomerate, usually naked except at base, the glomerules dense, few- to many-flowered, sessile or nearly so, the flowers sessile or subsessile; bractlets ⅓–⅔ as long as the calyx, subulate; calyx 5–7 (9) mm. long, not angulate in bud, rather sparsely to copiously but not densely pubescent with short, many-armed hairs, the lobes deltoid, acute, about as long as the tube; carpels about 3 mm. high and nearly ¾ as wide, obovate, more or less stalked, very shallowly to rather deeply incised, copiously stellulate apically and for a short distance ventrally and dorsally; seeds (always?) papillate-stellulate and somewhat rugose.

Type from the "Coast Range back of Belmont," San Mateo Co. *(E. L. Greene,* in 1886, UC?).—San Mateo, Santa Clara, and

Santa Cruz counties, apparently rather common on the eastern side of the Outer Coast Range, up to about 800 ft., slopes, canyons and bottom lands. A specimen in the herbarium of the California Academy of Sciences *(Eastwood 4925),* labelled as from Duarte, Los Angeles Co., seems to be typical *M. arcuatus,* but it is highly improbable that the species extends so far to the south.

This species is quite variable in its vegetative characters, the variation probably due largely to differences in habitat. Although it is placed next to *M. marrubioides* in the key, its nearest relative is probably *M. Hallii,* which, in turn, seems to be allied to *M. fasciculatus.* In fact the inflorescences of *M. arcuatus* are strikingly like those of *M. fasciculatus.* In its less woody habit, obscurely lobed leaves, and more loosely pubescent stems and calyx, *M. arcuatus* differs, however, from all forms of *M. fasciculatus.* What appears to be a form of *M. arcuatus,* with smaller and more rounded leaves, was collected on Loma Prieta, Santa Cruz Co. *(Bond,* in 1928) at the unusual elevation of 3500 ft.

17. **Malacothamnus mendocinensis** (Eastw.), comb. nov. *Malvastrum mendocinense* Eastw., Leafl. West. Bot. 2: 188 (1939).

Plant woody below, up to 2 m. high; stems erect, rather stout, striate-angulate, very closely short-pubescent (sublepidote); leaves short-petioled, the blades up to 5 cm. long and wide, ovate to suborbicular, shallowly to rather deeply and somewhat angulately 3–5-lobed, shallowly crenate, rounded at apex, cordate (often deeply so) at base, thickish, copiously and minutely stellate-pubescent on both surfaces; inflorescences elongate, leafy at least below, narrowly paniculate, the short, loosely flowered branchlets stiffly ascending, the flowers mostly short-pedicelled; bractlets barely ¼ as long as the calyx, subulate, thickish; calyx 5–6 mm. long, somewhat angulate in bud, densely sublepidote with extremely short, many-armed hairs, the broadly deltoid, acutish lobes equaling or somewhat shorter than the tube; petals 10–12 mm. long; carpels about 2.2 mm. high and very nearly as wide, not stalked, barely incised.

Types from 5 miles southwest of Ukiah, Mendocino Co., about 700 ft., "on a bank alongside the road" *(Eastwood & Howell 4582, 6092,* CA).—Known only from the type-locality or very near it.

An extremely rare and local species, apparently the only representative of the genus in Mendocino Co. It is the smallest-flowered of all *Malacothamni.* It seems to belong to the *M.*

fasciculatus group and is probably most nearly related to *M. Hallii,* from which it differs in its less woody habit, conspicuously striate-angulate stems, shorter bractlets, and smaller corollas.

18. **Malacothamnus Hallii** (Eastw.), comb. nov. *Malvastrum Hallii* Eastw., Leafl. West. Bot. 1: 216 (1936). *Sphaeralcea fasciculata* var. *Elmeri* Jeps., Fl. Calif. 1: 501 (1936).

A very woody shrub with stout, straggling to suberect stems up to 3 m. long; herbage densely and closely pubescent (sublepidote); leaves rather long-petioled, the blades up to 7 cm. long and 8 cm. wide, broadly ovate to suborbicular, shallowly 3–5-lobed with rounded (rarely somewhat angulate) lobes, coarsely to rather finely crenate, rounded (seldom acutish) at apex, deeply cordate to subcordate at base, thin and plane to thick and rugose with veins prominent beneath; inflorescences narrowly thyrsoid-glomerate with subsessile glomerules, or more openly paniculate with the longest branchlets up to 10 cm. long, the flowers mostly pedicelled; bractlets about ⅓ as long as the calyx, subulate or filiform; calyx 5–6 mm. long, not angulate in the bud, densely pubescent with very short, many-armed hairs, the lobes deltoid-ovate, acute or acutish, about as long as the tube; petals 15–17 mm. long; carpels 2–3 mm. high and about ¾ as wide, not to distinctly stalked, very shallowly (rarely somewhat deeply) incised, sparsely to densely stellulate apically and subapically; seeds papillate-stellulate and often somewhat rugose.

Type of *M. Hallii* from Mt. Diablo, Contra Costa Co. *(Hall & Essig 10131,* CA), type of *S. fasciculata* var. *Elmeri* also from Mt. Diablo *(Elmer 4395,* Jepson Herbarium?). — Mt. Diablo, Contra Costa Co., and Mt. Hamilton Range, Santa Clara and Merced counties, mostly on the western slopes of this range but extending 2 miles east of the summit of Pacheco Pass, 250 to 1200 ft. It usually grows in association with *Adenostoma, Artemisia californica,* and *Salvia mellifera.*

Malacothamnus Hallii is related to *M. fasciculatus.* It was treated as a variety of the latter by Jepson (ibid., as *Sphaeralcea)* and was reduced to synonymy under *Malvastrum fasciculatum* var. *laxiflorum* by McMinn (11, p. 348), although the inflorescences are sometimes as narrowly thyrsoid-glomerate as in typical *M. fasciculatus.* The great variability of *M. Hallii* makes it impossible to draw a sharp line between it and *M. fasciculatus,* but in general it has more shallowly lobed leaves and smaller calyces. In view of the wide geographical separation of the two species, no form of *M. fasciculatus* being known from farther

north than Santa Barbara Co., the writer considers it expedient to maintain *M. Hallii* as a species.

Specimens from the Mt. Hamilton Range tend to have more contracted inflorescences and more distinctly stalked carpels than those from Mt. Diablo. An unusual specimen, apparently a shade form, with large, thin, coarsely dentate, more or less cuneate leaves, a very open inflorescence, and a deeply cleft calyx with acuminate lobes, was collected at the base of Mt. Diablo *(Rattan,* in 1903).

19. **Malacothamnus Jonesii** (Munz), comb. nov. *Malvastrum Jonesii* Munz, Bull. S. Calif. Acad. Sci. 24: 88 (1925). *Sphaeralcea fasciculata* var. *Jonesii* (Munz) Jeps., Fl. Calif. 2: 501 (1936). *Malvastrum Dudleyi* Eastw., Leafl. West. Bot. 1: 218 (1936).

An (apparently) small shrub with nearly erect branches; herbage densely and closely whitish-tomentose (sublepidote) with very short, many-armed hairs; leaves slender-petioled, the blades up to 4.5 cm. long and nearly as wide, suborbicular to rhombic-ovate, obscurely 3–5-lobed, coarsely and irregularly crenate or crenate-dentate, rounded to acutish at apex, truncate, cuneate, or very slightly subcordate at base, thickish, slender-veined; inflorescences racemiform or very narrowly paniculate, few-flowered, the flowers 1–3 (rarely more) at each node, mostly distinctly pedicelled; bractlets ⅓–½ (exceptionally ⅔) as long as the calyx, subulate; calyx 6–8 mm. long, sublepidote to copiously but not very densely tomentose with short many-armed hairs, the lobes deltoid or oblong-lanceolate, acute or acutish, slightly to considerably longer than the tube, 2–3 mm. wide at base; carpels about 3 mm. high and nearly as wide, not to conspicuously stalked, usually deeply and acutely incised, sparsely stellulate apically-ventrally; seeds papillate-stellulate.

Type of *M. Jonesii* from Paso Robles, San Luis Obispo Co. *(M. E. Jones 223,* Po), type of *M. Dudleyi* from Fern Canyon 2 miles west of Paso Robles *(C. Dudley,* in 1929, CA).—Known only from San Luis Obispo Co. (and southern Monterey Co.?) where it has been collected also in the Santa Lucia Mountains and near Atascadero.

This insufficiently known species shows some affinity to *M. fasciculatus* although, in the occasionally somewhat woolly calyx, it resembles members of the *M. Fremontii* group, especially *M. niveus,* which has much the same geographical distribution. It is unique in its greatly reduced inflorescences. The type of *M. Dudleyi* differs from the type of *M. Jonesii* in its cuneate-flabelliform leaves and more deeply cleft calyx, but the two seem to be conspecific.

20. **Malacothamnus Parishii** (Eastw.), comb. nov. *Malvastrum Parishii* Eastw., Leafl. West. Bot. 1: 216 (1936).

Apparently a shrub, with erect branches, the younger stems very densely lepidote with minute, many-armed hairs, the pubescence apparently yellowish; leaves slender-petioled, the blades rhombic-ovate, up to 6.5 x 5.5 cm., very shallowly and obtusely 3-lobed, coarsely crenate, obtuse to acutish at apex, cuneate at base, thickish, green and glabrescent above, densely whitish-lepidote beneath, the veins prominent beneath; inflorescence a very open and rather few-flowered panicle with ascending branchlets (the lower ones elongate), nearly naked (the floral leaves much reduced), the flowers racemosely disposed on the branchlets, short-pedicelled; bractlets ¼–⅓ as long as the calyx, subulate; calyx 8–9 mm. long, angulate and pointed in bud, densely sublepidote with many-armed hairs, the lobes about twice as long as the tube, deltoid-lanceolate, very acute; petals about 15 mm. long; carpels (immature) about 3 mm. long and ⅔ as wide, conspicuously stalked, shallowly incised, stellulate at apex; seeds papillate-stellulate.

Type from near San Bernardino, San Bernardino Co., 1000 to 1500 ft. *(S. B. Parish 3804,* in 1895, CA).—Known only from the type-collection.

The material available is too scanty to permit a final conclusion as to the status of this plant. It is very similar to *M. fasciculatus* var. *laxiflorus* in characters of the inflorescence, flowers, and fruit but differs markedly in leaf-shape from any specimen of the *M. fasciculatus* complex that the writer has seen. Also the flower-buds are more angulate and pointed than is usual in *M. fasciculatus* and its varieties.

21. MALACOTHAMNUS FASCICULATUS (Nutt.) Greene, Leafl. Bot. Obs. 1: 208 (1906). *Malva fasciculata* Nutt. in Torr. & Gray, Fl. N. Amer. 1: 225 (1838). *Malvastrum Thurberi* A. Gray, Mem. Amer. Acad. ser. 2, 5: 307 (1855). *Malvastrum fasciculatum* (Nutt.) Greene, Fl. Francisc. 108 (1891). *Sphaeralcea fasciculata* (Nutt.) Arthur, Torreya 21: 11 (1921). *Malvastrum fasciculatum* var. *typicum* Estes, Bull. S. Calif. Acad. Sci. 24: 83 (1925).

Plant shrubby, up to 5 m. high, with long, relatively slender, ascending branches, these when young densely and usually closely sublepidote with many-armed hairs; leaves slender-petioled, the blades up to about 4 cm. long and wide, broadly ovate or suborbicular, usually distinctly and somewhat angulately but not deeply 3–5-lobed, crenate or dentate, rounded to acutish at apex, truncate or shallowly cordate at base, thin or thickish, copiously stellulate or sublepidote on both surfaces with many-armed hairs or glabrescent above, paler beneath; inflorescences elongate, leafy or nearly naked, interrupted-thyrsoid-glomerate, the glomerules often dense, subsessile, and many-flowered but sometimes rather loose, short-stalked, and fewer-flowered, the flowers sessile or short-pedicelled; bractlets ⅕–½ as long as the calyx, subulate; calyx 6–8 mm. long, not or but slightly angulate

in bud, densely to rather loosely subtomentose or sublepidote with short, many-armed hairs, the lobes broadly deltoid, acute or acutish, shorter than to about equaling the tube, 2–3 mm. wide at base; petals up to about 20 mm. long; carpels 2.5–3.2 mm. high and averaging about ⅔ as wide, mostly conspicuously stalked and deeply incised; seeds papillate-stellulate and often rugose.

Type of *Malva fasciculata* labelled as from Santa Barbara but probably collected at San Diego *(Nuttall,* isotype?, G), type of *Malvastrum Thurberi* labelled, as from Santa Cruz, Sonora *(Thurber,* G) but this surely is an error as to locality.—Los Angeles Co. and southwestern San Bernardino Co. to northern Baja California, common and locally abundant, mostly near the coast at low elevations but reported to range eastward as far as the San Bernardino and Santa Rosa mountains. The occurrence of typical *M. fasciculatus* as far north as Santa Barbara is doubtful.

In *M. fasciculatus* and its varieties some of the calyx-lobes occasionally cohere, giving the appearance of a bilabiate calyx.

21a. **Malacothamnus fasciculatus** var. **laxiflorus** (A. Gray), comb. nov. *Malvastrum splendidum* Kellogg, Proc. Calif. Acad. Sci. 1: 65 (67) (1855). *Malvastrum Thurberi* var. *laxiflorum* A. Gray, Proc. Amer. Acad. 22: 291 (1887). *Malacothamnus fasciculatus splendidus* (Kellogg) Abrams, Bull. N. Y. Bot. Gard. 6: 417 (1910). *Malvastrum laxiflorum* Davids. & Mox., Fl. S. Calif. 233 (1923), wrongly attributed to Gray; (A. Gray) Eastw., Leafl. West. Bot. 1: 219 (1936). *Malvastrum fasciculatum* var. *laxiflorum* (A. Gray) Munz & Johnst., Bull. Torr. Bot. Club 51: 296 (1924). *Sphaeralcea fasciculata* (Nutt.) Jepson var. *laxiflora* (A. Gray) Jepson, Man. Fl. Pl. Calif. 634 (1925).

Malvastrum splendidum, upon which Gray based his *M. Thurberi* var. *laxiflorum,* cannot be identified with certainty from Kellogg's vague description, and the type, collected by Wm. A. Wallace, presumably near Los Angeles, seems not to have been preserved. Since, however, *M. splendidum* was described as "15 to 20 feet high," there is little doubt that it was a form of *Malacothamnus fasciculatus,* and probably var. *laxiflorus.*—Ventura, Los Angeles, San Bernardino, Riverside, and Orange (probably also San Diego) counties, and in northern Baja California, usually at low elevations but up to 5500 feet in the Santa Rosa Mountains, chiefly on the coastal side of the mountains but occasionally on the desert side as at Victorville, San Bernardino Co.

In its extreme form, characterized by a very openly paniculate inflorescence with slender ascending branchlets up to 25 cm. long and with rather long-pedicelled, racemosely disposed flowers, var. *laxiflorus* seems quite distinct from typical *M. fasciculatus,* but the intergradation is complete, as was pointed out by Estes (4, p. 84). There is, perhaps, a tendency for var. *laxiflorus* to have more deeply cordate leaves, relatively longer bractlets, a larger and more deeply cleft calyx with more acuminate lobes, and less deeply incised carpels, but there is no consistent difference in these characters.

21b. **Malacothamnus fasciculatus** var. **catalinensis** (Eastw.), comb. nov. *Malvastrum catalinense* Eastw., Leafl. West. Bot. 1: 215 (1936). *Malvastrum fasciculatum* var. *catalinense* (Eastw.) McMinn, Man. Calif. Shrubs 348 (1939).

Types from near Avalon, Santa Catalina Island *(John Carlson,* in 1915, *Eastwood 6442,* CA).—Commonly supposed to be endemic on Santa Catalina Island, near sea level, but specimens collected at Point Mugu, Ventura Co., near Laguna Beach, Orange Co., and between Oceanside and San Juan Capistrano, San Diego or Orange Co., are not distinguishable from this variety.

Most of the specimens resemble typical *M. fasciculatus* in the contracted inflorescences, but some of them, including the Carlson type, have the more open inflorescences of var. *laxiflorus.* Var. *catalinensis* is characterized by large (up to 8 x 8 cm.), thin, often deeply lobed and deeply cordate leaf-blades, these sparsely stellulate or glabrescent above and usually conspicuously paler beneath. The carpels are relatively large, (3.2–3.8 mm. high) and narrow, conspicuously stalked, and deeply incised.

21c. **Malacothamnus fasciculatus** var. **Nuttallii** (Abrams), comb. nov. *Malacothamnus Nuttallii* Abrams, Bull. N. Y. Bot. Gard. 6: 417 (1910). *Malvastrum Nuttallii* Davids. & Mox., Fl. S. Calif. 233 (1923), attributed to Abrams. *Sphaeralcea fasciculata* (Nutt.) Jeps. var. *Nuttallii* (Abrams) Jeps., Fl. Calif. 2: 501 (1936). *Malvastrum fasciculatum* var. *Nuttallii* (Abrams) McMinn, Man. Calif. Shrubs 348 (1939).

Type from Casitas Pass, Ventura Co. *(Abrams,* in 1908, St).—Santa Barbara and Ventura counties, from near sea level to 1500 ft., common and sometimes abundant.

In its typical form this variety is distinguished by having very nearly concolored leaves, scarcely paler and more pubescent be-

neath than above; but a series of fine specimens collected in Ventura Co. by Henry M. Pollard shows every gradation from this state to the distinctly bicolored leaves typical of var. *laxiflorus*. The inflorescences are usually open and long-branched as in var. *laxiflorus*, but are sometimes narrow and contracted, although never so much so as in typical *M. fasciculatus*. Var. *Nuttallii* is a luxuriant form, the stems reaching a height of 6 m. and a diameter of 10 cm. at base. The petioles are long and slender, the blades up to 10 cm. long, deeply lobed, truncate to deeply cordate at base, the inflorescences long and many-flowered, the calyx up to 10 mm. long, the petals up to 25 mm. long, the carpels 3–5 mm. high, about ⅔ as wide, distinctly to very conspicuously stalked, and deeply incised.

21d. **Malacothamnus fasciculatus** var. **nesioticus** (Robins.), comb. nov. *Malvastrum nesioticum* Robins. in A. Gray, Syn. Fl. N. Amer. 1¹: 312 (1897). *Malacothamnus nesioticus* (Robins.) Abrams, Bull. N. Y. Bot. Gard. 6: 419 (1910). *Sphaeralcea nesiotica* (Robins.) Jeps., Man. Fl. Pl. Calif. 634 (1925). *Sphaeralcea fasciculata* var. *nesiotica* (Robins.) Jeps., Fl. Calif. 2: 501 (1936). *Malvastrum fasciculatum* var. *nesioticum* (Robins.) McMinn, Man. Calif. Shrubs 348 (1939).

Type from Santa Cruz Island *(Greene,* in 1886, G).—Known only from Santa Cruz Island.

This extremely local variety differs from all other forms of *M. fasciculatus* in the fastigiate character of the loosely many-flowered panicle, the numerous rather rigid branches mostly erect or strictly ascending, and the flowers cymosely disposed on the branchlets. In all other characters it resembles var. *catalinsis*, the leaves being large (up to 7 x 8 cm.), thin, rather deeply lobed, and deeply cordate at base, and the carpels being about 4 mm. high, distinctly but shortly stalked, and deeply incised.

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THE ARCTIC-ALPINE FLORA OF THREE PEAKS IN THE SIERRA NEVADA

BY JOHN THOMAS HOWELL

In 1949 and 1950 I did rather intensive field work above timberline on three peaks in the southern part of the Sierra Nevada in California, in 1949 on Mt. Guyot and Cirque Peak and in 1950 on Olancha Peak. The climbs in 1949 were made from the Base Camp of the Sierra Club on Rock Creek at 10,500 feet, the one to Mt. Guyot with Philip A. Munz; the ascent of Olancha Peak was made with Dr. Munz from our camp near the north end of Monache Meadows on the South Fork of the Kern River at 8,100 feet. I was alone in most of the work on Cirque Peak, although Dr. Munz and I collected together when we first crossed Army Pass on the north shoulder of the peak. Collections of most, if not all, of the plants listed will be found at both the California Academy of Sciences and the Rancho Santa Ana Botanical Garden under our respective field numbers.

The idea of preparing a comparative study of the floras of these three mountain tops came to me as I was studying the 1950 collection made on Olancha Peak, when constantly my thoughts were reverting to the collection of the preceding summer, since there were not only many similarities but also some notable dissimilarities. Why, for instance, did we not find a single species of *Poa* on Olancha Peak when there were five on Cirque Peak? The present study does not answer the question "why?" but it does indicate this and similar differences and suggests possible factors that may have caused them.

Since each of the three peaks has about the same altitude and since all are situated south of Mt. Whitney in the southern Sierra Nevada and are entirely granitic, there is a common physical basis for the comparison of their floras. In consideration of this basic resemblance, it is easy to understand the similarity found in the floras of the three peaks, but to explain the dissimilarity we must look to the particular geographic position of each peak and to slight meteorological differences that result, as well as to some edaphic variation.

Moreover, the present list furnishes details on several other

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floristic matters. The list of plants found on Olancha Peak is of interest in that that is the southernmost peak extending above timberline in the Sierra Nevada, and many of the plants recorded represent either the southernmost known station or the southernmost station in the Sierra Nevada. These same distributional criteria apply to some of the plants listed from Cirque Peak whose list of alpines includes several of the rarest plants of the Sierra Nevada.

Mt. Guyot

Mt. Guyot is chiefly remarkable because it stands apart from the main Sierran divide, rising from the broad forested Whitney Plateau to an elevation of 12,305 feet. Its summit ridge, which is about 800 feet above the timberline trees of *Pinus Balfouriana* Grev. & Balf., is a narrow rugged crest of granitic blocks, but immediately below these there are flat sandy areas and to the east there are steep or gradual rocky or sandy slopes that extend downward to the forested saddle between Mt. Guyot and the westernmost shoulder of Mt. Pickering. In other directions the slopes of Mt. Guyot drop nearly a vertical mile, abruptly, if not precipitously, into the Kern River Canyon and its adjacent tributaries. The grandeur of this gorge, coupled with the vast panorama of mountains encircling the upper Kern Basin or included within it, renders the view from Mt. Guyot one of the most arresting in the entire Sierra Nevada. Our botanizing on the mountain was restricted to the eastern slope above the Guyot Saddle and to the flats below the summit rocks. In this area Dr. Munz and I found 41 species and varieties of plants. The only other collection I know of from Mt. Guyot is that of H. M. Hall made in 1908. It consisted of only seven specimens, but four were plants not found by Dr. Munz and me.

Cirque Peak

Cirque Peak sprawls along the summit of the Sierra Nevada just south of Army Pass at the southern end of that part of the crest dominated by Mt. Whitney and its 14,000-foot associates. The northern and western slopes rise in a broad rounded curve to the long, gradually ascending crest line and to the summit of 12,863 feet. Much of this slope is sandy and gravelly, but near the crest it is strewn with numerous, broad, low rocks. This westerly slope is mostly unglaciated except for the northern part below Army Pass and for a small shallow cirque opening to

the southwest above Whitney Meadows. In marked contrast, the eastern side is gouged by a vast compound cirque or series of cirques, the rugged head walls of which rise abruptly to the crest and summit of the peak. On the higher slopes of the peak, I collected only in the northern and northwestern parts (I never went beyond the 12,300-foot contour on the crest), but among the collections I am listing from Cirque Peak are included all I found east and west of the summit of 12,000-foot Army Pass, since all the specimens obtained came from the southerly (i.e., Cirque Peak) side of the pass and not from the northerly side where the southern slopes of Mt. Langley rise. Army Pass, like the crest line of Cirque Peak, divides two very different geomorphic provinces. The broad, sandy and rocky, gently sloping summit of the pass is dry for the most part, but seepages from melting snow on Cirque Peak give rise to restricted boggy areas on the west slope in the Rock Creek drainage and produce a miniature alp or two on the glaciated escarpment to the east in the Cottonwood Creek drainage. On the west the timberline tree is *Pinus Balfouriana* Grev. & Balf.; eastward, quite beyond Cirque Peak and below the highest of the Cottonwood Lakes, *P. flexilis* James is the last tree, although *P. Balfouriana* is not far away. The Cirque Peak and Army Pass collections number 80 species and varieties. The only other botanists of whom I know who have visited this locality are Coville and Funston of the Death Valley Expedition in 1891, H. M. Hall and H. D. Babcock in 1904, and, more recently, C. W. Sharsmith.

Olancha Peak

Olancha Peak, like Cirque Peak which lies sixteen miles to the north-northwest, is on the summit ridge of the Sierra Nevada, but the relative positions of the two are essentially different. Whereas Cirque Peak rises on the east and west from broad meadows and montane valleys with elevations of 10,000 to 11,000 feet and is at least five miles west of the great Sierran fault escarpment, Olancha Peak is an isolated peak on the crest of the fault scarp itself, rising over 8,000 feet in five miles above Owens Valley on the east and rising 3,500 to 4,000 feet from extensive forest- and meadow-covered valleys that are traversed by the South Fork of the Kern River on the west. The summit ridge of the mountain, which attains an elevation of 12,135 feet, rises steeply in a great wave-like crest above the broad, forested, stream-dissected base on the west, and on the east it drops away

abruptly in crags and precipices to the desert below. The unobstructed view from the summit is vast, whether one searches the horizon for distant landmarks, scans the map-like expanse of Owens Valley, or explores the drainage system of the Kern River and its tributaries. No mark of glacial action was noted anywhere in the vicinity. The terrain was either sandy and gravelly or rocky, depending on the steepness of the slope, and nowhere above timberline were found moist flats or seepages. The three trees occurring at timberline, at about 11,600 feet, are *Pinus Balfouriana* Grev. & Balf., *P. flexilis* James, and *P. Murrayana* Balf. All our collecting was on the western slope and along the summit ridge which, above timberline, is somewhat over a half mile in length. In all Dr. Munz and I noted or collected 46 species and varieties at timberline or above.

The only other collectors whom I have noted as having visited Olancha Peak are J. T. Rothrock, C. A. Purpus, S. W. Austin, and Hall and Babcock. The Olancha collections of Purpus and of Austin are apparently not very numerous and most of our floristic knowledge of the mountain has come heretofore from the more extensive collections of Rothrock and of Hall and Babcock. Through the kindness of Dr. Jens Clausen, I have been able to examine a copy of Hall's field record which is in the library of the Carnegie Laboratory at Stanford University, and from this it is clear that Hall considered Olancha Peak to extend from Templeton Meadows six miles southward to Summit Meadows and from the level of Templeton and Monache meadows to the summit ridge. It was on June 28, 1904, that Hall and Babcock climbed to the summit and sixteen species are listed as having been collected at timberline or above. Rothrock lists no Olancha plant from above 10,400 feet in his report (Rpt. U. S. Geogr. Surv. under Lieut. Wheeler, vol. 6).

Timberline

The climatic, meteorologic, and edaphic conditions which limit arboreous growth at a certain elevation or latitude are anywhere complex, but in the Mt. Whitney region of the Sierra Nevada, the problem becomes even more complicated because it is apparent that in the not very distant past timberline was several hundred feet higher than it is today. Present timberline in the Rock Creek drainage is at about 11,500 feet or less and on Olancha Peak it is at about 11,600 feet. Since somewhat

farther north in the Sierra on Mono Mesa in northern Inyo County I found dwarfed individuals of *Pinus albicaulis* Engelm. and *Pinus Murrayana* Balf. at over 12,000 feet, it might reasonably be expected that tree growth would attain or even exceed that altitude farther south on Cirque and Olancha peaks.

There are three sources of evidence that indicate the lowering of timberline, perhaps during the last century. One is to be found in the fallen remains of large trees above present timberline. At Sky Blue Lake, elevation 11,500 feet, on the northern headwaters of Rock Creek, such remains are conspicuous, while the nearest living trees grow under a protecting ledge in Mitre Basin a short distance south of the lake at 11,300 feet.

The second evidence of change of timberline is the occurrence of certain plants near Sky Blue Lake which are characteristic of subalpine (i.e., Canadian Zone or Hudsonian Zone) forests, not of Arctic-alpine slopes. Not only are these plants above the present forests, but growing at 11,500 feet, they are at a higher altitude than any at which they have been heretofore reported. Among these plants are: *Luzula subcongesta* (Wats.) Jeps., *Polygonum Kelloggii* Greene, *Stellaria umbellata* Turcz., *Perideridia Gairdneri* (H.& A.) Mathias, *Cirsium tioganum* (Congd.) Petrak, and *Helenium Hoopesii* Gray. These plants undoubtedly grew in the former Hudsonian or timberline forest (the adjacent dead remains of which have already been noted), but after the depression of the timberline not so many years ago, these plants have persisted as "alpines."

The third source of evidence is historical, a statement describing timberline conditions in these parts in 1875 as given by J. T. Rothrock, the first botanist to visit the region. Rothrock writes (in Rpt. U. S. Geogr. Surv. under Lieut. Wheeler, vol. 6, p. 354) as follows:

"On the southern slope of a peak to the south of Mount Whitney, we found the present growth of trees at timber-line all dead or dying, and no younger ones taking their places, so that, in a few years, the timber-line will be several hundred feet lower than at present. I am quite unable to give any *satisfactory* explanation of the fact, *unless* it be due to a washing away of the soil by the melting snows: still, it is worth recording."

The peak of which Rothrock speaks may be Mt. Langley or Cirque Peak, on the slopes of both of which a lowered timberline is now evident. Undoubtedly the cause of this effect is not to be looked for in an edaphic change, as suggested by Rothrock, but rather in a climatic change. Since no growth of young

trees was observed about timberline during my field work in 1949, it may be surmised that the area is still affected by climatic conditions similar to those obtaining seventy-five or a hundred years ago.

Catalogue of Collections

In the list of species and varieties found at timberline or above on Mt. Guyot, Cirque Peak, and Olancha Peak, the following symbols are used to indicate the occurrence of a plant on one or more of the peaks as well as certain distributional information insofar as a given peak is concerned:

X, the occurrence is not the southernmost known in the Sierra Nevada.

SN, the occurrence is the southernmost known in the Sierra Nevada but not the southernmost in California (i.e., the plant is known from the high mountains of southern California).

SC, the occurrence is the southernmost known for California, but not the most southerly if the entire distribution of the species is considered.

SL, the occurrence is the southernmost known.

E, indicates endemic to the Sierra Nevada.

	Guyot	Cirque	Olancha	
Cystopteris fragilis (L.) Bernh.	×	—	×	Note 1
Selaginella Watsonii Underw.	×	×	SN	
Calamagrostis purpurascens R. Br.	×	×	—	
Festuca ovina L. var. brachyphylla (Schult.) Piper	×	×	SN	
Festuca ovina var. minutiflora (Rydb.) J. T. Howell	—	SL	—	Note 2
Koeleria cristata (L.) Pers.	—	×	—	
Muhlenbergia Richardsonis (Trin.) Rydb.	×	—	—	
Poa gracillima Vasey	—	×	—	
Poa Hansenii Scribn.	—	×	—	
Poa Lettermanii Vasey	—	SL	—	
Poa rupicola Nash	—	SC	—	Note 3
Poa Suksdorfii (Beal) Vasey	×	SL	—	
Sitanion Hystrix (Nutt.) J. G. Smith	×	×	×	
Stipa Elmeri Piper & Brodie	×	—	×	
Stipa pinetorum Jones	—	×	—	Note 4
Trisetum spicatum (L.) Richt.	×	—	—	
Trisetum spicatum var. Congdonii (Scribn. & Merr.) Hitchc.	—	—	SL	
Carex albonigra Mkze.	—	SC	—	
Carex arctogena H. Smith	—	×	—	

	Guyot	Cirque	Olancha	
Carex Breweri Boott	×	×	—	Note 5
Carex Congdonii Bailey (E)	—	×	—	
Carex danaensis Stacey (E)	—	SL	—	
Carex exserta Mkze.	—	×	—	
Carex Haydeniana Olney	—	SC	—	
Carex Helleri Mkze.	×	×	SL	
Carex proposita Mkze.	×	×	SL	
Carex praeceptorum Mkze.	—	×	—	
Carex Rossii Boott	×	×	SL	
Carex subnigricans Stacey	—	×	—	
Carex vernacula Bailey	—	×	—	
Juncus nevadensis Wats.	—	×	—	
Juncus Parryi Engelm.	×	—	—	
Luzula, *L. congestae* (Thuill.) Lejeune aff. (E)	—	×	—	
Luzula spicata (L.) DC. & Lamk.	—	×	—	
Eriogonum incanum T. & G. (E)	×	×	SL	
Eriogonum ovalifolium Nutt. var. nivale (Canby) Jones (E)	×	×	SL	
Eriogonum Covillei Small (E)	—	×	—	
Eriogonum Kennedyi Porter var. olanchense J. T. Howell (E)	—	—	×	Note 6
Eriogonum nudum Dougl. var. scapigerum (Eastw.) Jeps. (E)	—	×	—	Note 7
Oxyria digyna (L.) Hill	×	×	SN	Note 8
Rumex paucifolius Nutt. var. minusculus J. T. Howell (E)	—	SL	—	Note 9
Rumex triangulivalvis (Danser) Rech.f.	—	×	—	
Calyptridium umbellatum (Torr.) Greene var. caudiciferum (Gray) Jeps.	×	×	SN	
Lewisia pygmaea (Gray) Robins. subsp. glandulosa (Rydb.) Ferris (E)	—	×	—	
Lewisia sierrae Ferris (E)	—	—	SL	
Arenaria compacta Cov.	—	×	—	
Arenaria Nuttallii Pax var. gracilis Robins.	—	—	SN	
Arenaria Rossii R. Br.	—	SC	—	
Arenaria rubella (Wahl.) Smith	—	SC	—	
Silene Sargentii Wats.	×	×	SL	
Aquilegia pubescens Cov. (E)	—	—	SL	
Ranunculus Eschscholtzii Schlecht. var. oxynotus (Gray) Jeps.	×	—	SN	
Arabis Lemmonii Wats. var. depauperata (Kenn.) Rollins	×	—	SL	
Arabis repanda Wats. var. Greenei Jeps. (E)	—	—	×	Note 10
Descurainia Richardsonii (Sweet) Schulz ssp. viscosa (Rydb.) Detling	—	×	—	
Draba Breweri Wats.	×	×	SL	

	Guyot	Cirque	Olancha	
Draba Breweri var. sublaxa Jeps. (E)	—	SL	—	
Draba fladnizensis Wulf.	—	SL	—	Note 11
Draba Lemmonii Wats.	×	×	—	
Erysimum perenne (Wats.) Abrams	×	×	—	
Sedum Rosea (L.) Scop. var. integrifolium (Raf.) Berger	—	×	—	Note 12
Heuchera rubescens Torr.	×	—	—	Note 13
Ribes cereum Dougl.	×	×	×	
Potentilla Drummondii Lehm.	—	×	—	
Potentilla nubigena Greene (E)	×	×	—	
Potentilla pseudosericea Rydb.	—	×	SL	
Lupinus Breweri Gray var. bryoides C. P. Smith	—	×	×	Note 14
Viola purpurea Kell. var. grisea Jeps.	—	—	×	Note 15
Epilobium oregonense Hausskn.	—	×	—	
Gayophytum racemosum T. & G.	—	×	SN	
Oreonana Clementis (Jones) Jeps. (E)	×	×	×	
Androsace septentrionale L. var. subumbellata Nels.	—	×	SN	
Primula suffrutescens Gray	×	×	—	
Gentiana Newberryi Gray	—	×	—	
Leptodactylon pungens (Torr.) Nutt.	×	—	×	
Phlox, *P. caespitosae* Nutt. aff. (E)	×	×	SL	
Polemonium eximium Greene (E)	—	×	—	
Cryptantha circumscissa (H. & A.) Jtn. var. hispida (Macbr.) Jtn.	—	—	×	
Cryptantha circumscissa var. rosulata J. T. Howell (E)	—	×	SL	
Hackelia Sharsmithii Jtn. (E)	×	—	—	
Oreocarya nubigena Greene	×	×	SL	
Monardella odoratissima Benth. var. parvifolia (Greene) Jeps.	—	—	SC	
Castilleja nana Eastw. (E)	—	×	SL	
Mimulus stamineus Grant	—	—	×	
Penstemon Davidsonii Greene	×	×	—	
Galium Munzii Hilend & Howell var. subalpinum Hilend & Howell (E)	—	—	SL	
Sambucus racemosa L.	×	—	×	Note 16
Antennaria densa Greene	×	—	SN	
Antennaria media Greene	×	×	—	
Antennaria umbrinella Rydb.	—	×	SC	
Antennaria rosea (D.C.Eat.) Greene	—	—	×	
Aplopappus Macronema Gray	×	×	—	
Aplopappus suffruticosus (Nutt.) Gray	—	×	—	
Aplopappus suffruticosus ssp. tenuis Hall (E)	×	—	—	Note 17
Aster Peirsonii C. W. Sharsmith (E)	—	×	—	
Chaenactis, *C. nevadensi* (Kell.) Gray aff. (E)	—	×	—	

	Guyot	Cirque	Olancha	
Crepis nana Richards.	—	×	—	
Erigeron compositus Pursh var. glabratus Macoun	—	×	—	
Erigeron petiolaris Greene (E)	×	×	—	
Erigeron pygmaeus (Gray) Greene (E)	×	SL	—	
Erigeron pygmaeus var. (E)	×	×	SL	
Hieracium horridum Fries	×	—	—	Note 18
Hulsea algida Gray	×	×	—	
Orochaenactis thysanocarpha (Gray) Cov. (E)	—	—	×	
Raillardella argentea Gray	—	×	SN	
Senecio Fremontii T. & G. var. occidentalis Gray	×	×	—	Note 19
Senecio speculicola J. T. Howell	—	SL	—	
Tanacetum canum D.C.Eat.	—	—	×	Note 20

Floristic and Phytogeographic Analysis

1. *Distribution of Plants on the Three Peaks*

Total number of plants catalogued from the three peaks... 108

- Mt. Guyot 45
- Cirque Peak 80
- Olancha Peak 46

Species and varieties on all three peaks 17

On two peaks 29

- On Guyot and Cirque 14
- On Cirque and Olancha 8
- On Guyot and Olancha 7

On one peak 62

- Mt. Guyot 7
- Cirque Peak 41
- Olancha Peak 14

2. *Plants reaching a Southern Distributional Limit*

Mt. Guyot: no plant reaches a southern limit.

Cirque Peak: southern limit for nearly 18% of its alpine plants.*

- Southern limit in Sierra Nevada (SN) 0
- Southern limit in California (SC) 5
- Southern limit for plant (SL) 9
- Not southern limit (X) 66

*Because of the position of Cirque Peak at the south end of the Mt. Whitney range, a larger number of plants reaching a southern distributional limit there was anticipated. The reason for this unexpected falling-off is to be found in the relative distribution of plants on the two high ranges that flank the Kern River Basin, the Mt. Whitney range on the east and the Great Western Divide on the west. It is on the 12,000-foot summits at the headwaters of the Little Kern River near the south end of the Great Western Divide where many Sierran alpines reach their southernmost limit, not on Cirque Peak which is about 5 miles farther north.

Olancha Peak: southern limit for nearly 74% of its alpine plants.

Southern limit in Sierra Nevada (SN)	11
Southern limit in California (SC)	2
Southern limit for plant (SL)	20
Not southern limit (X)	12
Endemic (See Note 6)	1

3. *Miscellaneous Distributional Data*

Only two plants listed in the catalogue are endemic or nearly endemic to the Sierran region treated, *Eriogonum Kennedyi* Porter var. *olanchense* J. T. Howell which is known only from Olancha Peak, and *Cryptantha circumscissa* (H.& A.) Jtn. var. *rosulata* J. T. Howell which is known from east and west of Cirque Peak as well as from Army Pass and Olancha Peak. The *Cryptantha* is the only plant among all that are listed which reaches a northernmost distributional limit within the region.

Two Sierran endemics, the *Phlox* and *Hackelia,* are farther west of the Sierran crest, as they occur on Mt. Guyot, than at any other station where they have been found.

4. *Sierran Endemics*

In the catalogue, 17 species and 12 subspecies and varieties are indicated as endemic to the Sierra Nevada, but, as has already been remarked, only two varietal entities may be considered as narrow endemics within our restricted southern Sierran area. These Sierran endemics are distributed on the three peaks approximately in proportion to the size of the florula of each peak. The varieties frequently represent alpine forms of species that are common at lower elevations.

In another paper I have had occasion to contrast the proportionately smaller endemic population that is found at high elevations in the Sierra Nevada than is found at lower elevations in California (The Florula of Mono Mesa, Wasmann Collector 7: 16–21, —1947), but whereas on Mono Mesa in northwestern Inyo Co. the percentage of endemics was 13, on the southern peaks we are considering here, the percentage is 26.

In arriving at this higher percentage the rather numerous subspecies and varieties have been included, whereas varieties were not considered in the Mono Mesa figure. However, even when all the varieties on our southern peaks are not included,

the endemic species alone constitute 16% of the flora, so we must conclude that endemism is indeed higher than it is on Mono Mesa. Further studies may show that the florulas of Sierran alpine localities still farther north have relatively even fewer endemics and that there is a definite endemism gradient that decreases from south to north. But, as was pointed out in connection with the florula of Mono Mesa, these presently available endemism percentages for alpine regions are much smaller than the percentage for the flora of all California, which is 40 according to Jepson (Man. Fl. Pl. Calif., p. 11).

Notes

1. The Olancha Peak record of *Cystopteris fragilis* is based on Dr. Munz' report. The fragile fern was collected 5 miles to the west in Bakeoven Meadows on the South Fork of the Kern River at 8,100 ft. *(No. 27130)* and it occurred occasionally throughout the region.

2. **Festuca ovina** L. var. **minutiflora** (Rydb.) J. T. Howell, stat. nov. *F. minutiflora* Rydb., Bull. Torr. Bot. Club 32: 608 (1905). The type of Rydberg's species is from Colorado, but in the original description he also cites a specimen from Mt. Dana, California. I regard the following Sierran collections (all from Inyo Co.) as belonging to the small-flowered sheep fescue: Mosquito Flat, Rock Creek Lake Basin, 10,300 ft., *No. 22276;* Inconsolable Range above Thunder and Lightning Lake, about 11,800 ft., *No. 24111;* Army Pass, 12,000 ft., *No. 26058.*

3. The southern distributional limit of *Poa rupicola* Nash in California is indicated by the following collections from Cirque Peak and vicinity: Army Pass, Tulare Co., *No. 26038, 26043;* Cirque Peak, Tulare Co., *No. 26173;* Cottonwood Lakes, 11,100 ft., Inyo Co., *No. 26240.* For the determination of these and other *Poa* collections I am grateful to D. D. Keck.

4. The southernmost station for *Stipa pinetorum* Jones is apparently in this part of the Sierra Nevada. The Cirque Peak listing is based on an Army Pass collection *(No. 26030),* but one *(No. 26011)* from Siberian Pass, Tulare Co., is the southernmost record I have seen.

5. The Cirque Peak listing of *Carex Breweri* Boott is based on Coville and Funston's collection.

6. **Eriogonum Kennedyi** Porter var. **olanchense** J. T. Howell, var. nov. Dense caespitosum tegetarium var. *alpigeno* M. & J. simile, foliis 1–2 mm.

longis, inflorescentiis brevibus plerumque ramificatis 1 vel 2 ramis, involucris late obconicis vel campanulatis in sinu scariosis.

Type: Herb. Calif. Acad. Sci. No. 362,092, collected on gravelly slope at timberline, Olancha Peak, 11,600 ft., Tulare Co., *Howell 27205*.

The short, few-branched inflorescences are suggestive of a reduced form of *E. Wrightii* Torr., but the shape of the involucres, as well as their texture, definitely allies the plant to *E. Kennedyi*. The condensed mat-like habit is like that of var. *alpigenum* M. & J. which is restricted to the summit and subalpine slopes of the San Bernardino and San Gabriel mountains in southern California, but in that variety the involucres are capitate-clustered in an unbranched inflorescence.

7. The listing of *Eriogonum nudum* Dougl. var. *scapigerum* (Eastw.) Jeps. from Cirque Peak is based on a timberline collection made by Hall and Babcock in 1904 and cited by Jepson (Fl. Calif. 1: 420).

8. What is probably the southernmost station for *Oxyria digyna* (L.) Hill in the Sierra Nevada is based on the record of Dr. Munz who saw the plant on Olancha Peak but did not collect it.

9. **Rumex paucifolius** Nutt. var. **minusculus** J. T. Howell, var. nov. Herba parva alpina 2–4 (vel raro 6) cm. alta, caulibus erectis et foliis rosulatis plerumque circa aequilongis, foliis ellipticis vel linearibus.

Type: Herb. Calif. Acad. Sci. No. 357,730, rather common in sandy and gravelly soil on the north slope of Cirque Peak above Army Pass, 12,250 ft., Tulare Co., *Howell 26198*. This much-reduced alpine form of the widespread *R. paucifolius* was also collected on Mono Mesa, 12,000 ft., Inyo Co., *Howell 22723*.

10. The southernmost station for *Arabis repanda* Wats. var. *Greenei* Jeps. is perhaps just east of Olancha Pass, Inyo Co., at about 9000 ft. alt. *(No. 26732)*, several miles south of the timberline station listed in the catalogue.

11. The discovery of *Draba fladnizensis* Wulf. in a restricted seepage on the north slope of Cirque Peak at about 12,000 ft. added a species of phytogeographic distinction to the Sierran flora. A widely distributed plant of the Old and New worlds, it had not been known nearer the Sierra Nevada than the mountains of British Columbia, Utah, and Colorado. The day after making the Cirque Peak collection, I made a second collection, this time at upper Soldier Lake on the lower southwestern slope

of Mt. Langley at 11,200 ft. Both collections *(No. 26179, 26205)* are from Tulare Co.

12. On the east side of Army Pass, Western Roseroot was infected with *Puccinia Rydbergii* Garrett. According to Prof. Lee Bonar, who identified the fungus, our collection is not only the first for California but it furnishes a new host-record for the species.

13. The record of *Heuchera rubescens* Torr. from 12,100 ft. on Mt. Guyot is based on a collection made in 1908 by H. M. Hall, his *No. 8422*. This collection is cited by Rosendahl, Butters, and Lakela as var. *pachypoda* (Greene) R., B., & L.

14. The type of *Lupinus Breweri* Gray var. *bryoides* C.P. Smith was collected by Hall and Babcock on Olancha Peak at 10,400 ft. My *No. 27177* from 10,500 ft. is nearly topotypic. At that elevation the plant grows in gravelly soil in the open forest of *Pinus Balfouriana*.

15. *Viola purpurea* Kell. var. *grisea* Jeps., which reaches an altitudinal limit at timberline (ca. 11,600 ft.) on Olancha Peak, was described from plants collected in Templeton Meadows, el. 8,500 ft., which lie between the northwest base of Olancha Peak and Templeton Mt.

16. An elderberry on Olancha Peak is referred to *Sambucus racemosa* L. var. *melanocarpa* (Gray) McMinn by McMinn. Without fruiting specimens, the variety cannot be satisfactorily determined so it seems best to consider our Olancha plants as *S. racemosa,* at the southern limit of that species in the Sierra Nevada. The record from Mt. Guyot is based on Hall's collection made in 1908 at an elevation of 11,800 ft.

17. The listing of *Aplopappus suffruticosus* (Nutt.) Gray subsp. *tenuis* Hall from Mt. Guyot is based on the citation given by Hall (Gen. Haplopappus, p. 191). The typical variant, as listed from Cirque Peak, occurs at timberline below Army Pass and is common in the open timberline forest of *Pinus Balfouriana* in the vicinity.

18. H. M. Hall's timberline collection of *Hieracium horridum* Fries is the basis for the Mt. Guyot listing in the catalogue.

19. *Senecio Fremontii* T. & G. var. *occidentalis* Gray was collected by Munz and by Howell on Mt. Guyot but it is Hall and Babcock's 1904 collection from Cirque Peak that supplies the record from that peak.

20. *Tanacetum canum* D. C. Eat. reaches the southern limit

of its known distribution on Olancha Peak but somewhat south of the Arctic-alpine crest. Both this species and *Sambucus racemosa* (see Note 16) were collected on the summit ridge and also on the 11,000-foot spur between the forks of Monache Creek about one mile south of the summit.

ASTRAGALUS TEGETARIUS: A CORRECTION

Shortly after the appearance of my paper on *Astragalus tegetarius* (in Leafl. West. Bot. 6: 89–102, —1951), Dr. Arthur Cronquist kindly drew my attention to a change of wording in the International Rules adopted at the Stockholm Congress which effectively legitimizes such combinations as have been published with simple reference to the basonym, even where specific reference to its source is omitted. *Astragalus Kentrophyta* Gray (in Proc. Philad. Acad. 1863, p.60, —1863) is one of many names validated by this ruling and, being the earliest in its specific group, it must replace *A. tegetarius* Wats. (1871). The varieties defined in the cited paper, where full synonymy will be found, must assume the following names:

A. tegetarius var. *tegetarius* = **A. Kentrophyta** var. **implexus** (Canby ex Port. & Coult.), comb. nov.

A. tegetarius var. *danaus* = **A. Kentrophyta** var. **danaus** (Barneby), comb. nov.

A. tegetarius var. *Jessiae* = **A. Kentrophyta** var. **Jessiae** (Peck), comb. nov.

A. tegetarius var. *viridis* = A. KENTROPHYTA var. KENTROPHYTA.

A. tegetarius var. *neomexicanus* = **A. Kentrophyta** var. **neomexicanus** (Barneby), comb. nov.

A. tegetarius var. *ungulatus* = A. KENTROPHYTA var. UNGULATUS Jones.

A. tegetarius var. *elatus* = A. KENTROPHYTA var. ELATUS Wats.

R. C. BARNEBY
Wappingers Falls, New York

NOTE ON SOME NAMES IN SCHKUHRIA

BY S. F. BLAKE

SCHKUHRIA WISLIZENI Gray, Mem. Amer. Acad. [Pl. Fendl.] II, 4: 96 (1849).

This is the oldest available specific name for any form of the species in the broad sense in which it is interpreted by C. B. Heiser (Ann. Mo. Bot. Gard. 32: 272, —1945), whose systematic treatment is here followed. The earliest specific name given to

any form of the species, *Hopkirkia anthemoidea* DC. (Prodr. 5: 660, —1836), cannot be taken up in *Schkuhria,* as it was by Coulter (in J. D. Smith, Enum. Pl. Guat. 4: 93, —1895, in the erroneous orthography "anthemoides"), because of the earlier *Schkuhria anthemoides* Wedd. (Chlor. And. 1: 74, —1856). Heiser evidently regarded Weddell's name as not validly published, since he makes no reference to the Chloris Andina but cites the name as published in synonymy in Index Kewensis 4 (i.e., 2): 827 (1895), although the Index Kewensis at this place gives the proper reference to Chloris Andina. There can be no question that the name is effectively published in that work. On p. 73 Weddell places *Achyropappus* H. B. K. in the synonymy of *Schkuhria* Roth and confirms the reduction by a statement in his "observation." On the next page, in discussing some species of *Schkuhria,* he cites the name *Achyropappus anthemoides* and makes in parenthesis the combination *Schkuhria anthemoides* N. (Nobis), treating the plant definitely as a valid species of *Schkuhria.* The identity of the spellings *anthemoidea* and *anthemoides,* for purposes of homonymy, is covered by Art. 70, Note 4, of the International Rules.

The name *Schkuhria Hopkirkia* Gray, Smithson. Contr. Knowl. [Pl. Wright. 2:] 5[6]: 49 (1853), which I adopted in Kearney and Peebles' Flowering plants and ferns of Arizona (1942), is an illegitimate name, being based on *Hopkirkia anthemoidea* DC., and is later than *S. Wislizeni.*

Following Heiser's classification of the forms of this species, but adopting the specific name *S. Wislizeni* instead of *S. anthemoidea,* the following new names are found necessary:

Schkuhria Wislizeni var. **frustrata,** nom. nov. *Hopkirkia anthemoidea* DC. Prodr. 5: 660 (1836); see Heiser, p. 272, for further synonymy.

Schkuhria Wislizeni var. **guatemalensis** (Rydb.), comb. nov. *Tetracarpum guatemalense* Rydb., No. Amer. Fl. 34: 45 (1914); see Heiser, p. 273, for further synonymy.

Schkuhria Wislizeni forma **flava** (Rydb.), comb. nov. *Tetracarpum flavum* Rydb., No. Amer. Fl. 34: 46 (1914); see Heiser, p. 274, for further synonymy.

Schkuhria Wislizeni var. **Wrightii** (Gray), comb. nov. *S. Wrightii* Gray, Smithson. Contr. Knowl. [Pl. Wright. 2:]5[6]: 95, —1853; see Heiser, p. 274, for further synonymy.

Division of Plant Exploration and Introduction,
Plant Industry Station, Beltsville, Md.

NEW COMBINATIONS IN EQUISETUM AND PELLAEA

BY C. V. MORTON
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It appears that the large, coarse species of *Equisetum* commonly known as *E. prealtum* Raf. should not be specifically separated from the widespread *E. hyemale* L. As a variety it has been called *E. hyemale* var. *robustum* (A. Br.) A. A. Eaton (e.g. by Fernald, in Gray's Manual of Botany, 8th edition).

However, in 1843, Engelmann[1] described a plant as *E. laevigatum* var. *elatum* as follows: "Very tall; sheaths with about thirty leaves, the points linear-lanceolate, membranaceous, irregularly deciduous, leaving a ragged truncate-dentate black margin." The type was collected near New Bern, North Carolina, by Loomis and Croom. I have not seen it, but from the description there can be no doubt as to the identity of the plant. *Equisetum laevigatum* A.Br. does not grow in North Carolina nor very near it, and the characters stated exclude the variety from *E. laevigatum* as currently recognized, but the characters do agree exactly with the plant known as *E. hyemale* var. *robustum*.

Since *robustum* dates, as a variety, only from 1903,[2] the earlier varietal name must supplant it. The following new combination is necessary: **Equisetum hyemale** L. var. **elatum** (Engelm. ex A. Br.) Morton.

Pellaea atropurpurea (L.) Link var. **simplex** (Butters) Morton, comb. nov. *P. glabella* Mett. var. *simplex* Butters, Amer. Fern Jour. 7: 84 (1917). *P. Suksdorfiana* Butters, ibid. 11: 40 (1921). See also C. V. Morton, Amer. Fern Jour. 40: 248 (1950).

STIVERS LUPINE IN PLUMAS COUNTY, CALIFORNIA. The striking rose-and-yellow-flowered *Lupinus Stiversii* Kell. was collected on June 1, 1948, by W. I. and Evelyn B. Follett on the North Fork of the Feather River near Storrie, Plumas County, at an elevation of about 1800 feet. The northern limit of this species has long been given as Butte County and the northernmost station cited by Jepson (Fl. Calif. 2: 278) is Brush Creek which is 14 miles south of the Plumas County station.—JOHN THOMAS HOWELL.

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[1] Ex A. Br., Amer. Journ. Sci. 46: 87 (1843).
[2] A. A. Eaton, Fern Bull. 11: 75, 112 (1903).

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LEAFLETS
of
WESTERN BOTANY

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STUDIES IN CAREX—III: THE IDENTITY OF CAREX MENDOCINENSIS

BY JOHN THOMAS HOWELL

No recent author who has had anything to do with the coastal Californian *Carex, C. mendocinensis* Olney, has treated it consistently without change of mind. This uncertainty has been due to two factors, first, the close relationship of *C. mendocinensis* and *C. debiliformis* Mkze. *(C. cinnamomea* Olney, not Boott), and second, the existence of putative hybrids between *C. mendocinensis* and *C. gynodynama* Olney. Olney, himself, initiated the uncertainty that has been more recently associated with *C. mendocinensis* when he gave the name to an 1866 Bolander collection *(No. 4701)* from Mendocino County but did not describe the plant. The description was supplied and published by W. Boott (Bot. Calif. 2: 249,-1880) who is probably the only one who, in his writings, has not subsequently changed his concept of the species or expressed a doubt as to its specificity, as has been done by Bailey (Proc. Am. Acad. 22: 106), Kükenthal (in Engler, Pflanzenr. IV, 20: 581), and recent workers.

At first, Mackenzie tacitly accepted *C. mendocinensis* as a distinct species when he renamed *C. cinnamomea* as *C. debiliformis* (Bull. Torr. Bot. Club 37: 244,-1910). In his four floristic accounts of *Carex* in California, however, Mackenzie treated *C. mendocinensis* as a broader entity which included *C. debiliformis* (Erythea 8: 63,-1922; in Jepson, Fl. Calif. 1: 231,-1922; in Abrams, Ill. Fl. 1: 325,-1923; in Jepson, Man. 182,-1923). In his latest works, Mackenzie again distinguished between *C. mendocinensis* and *C. debiliformis* (N. Am. Fl. 18: 285,-1935; N. Am. Cariceae pl. 334, 344,-1940).

Following the publication of vol. 18, part 5, of the North American Flora (1935), Stacey also changed his mind about *C. mendocinensis*. In 1934, in the inclusive sense, he had reported *C. mendocinensis* from Mt. Tamalpais (Leafl. West. Bot. 1: 141), but subsequently in 1936 he recognized both *C. debiliformis* (ibid., 192) and *C. mendocinensis* (ibid., 232) from Marin County. Even the last record was referred to *C. debiliformis* by a herbarium annotation in 1937, so that in 1938 he recorded

Leaflets of Western Botany, Vol. VI, pp. 157-164, November 16, 1951.

what he regarded the second known collection of *C. mendocinensis* (Leafl. West. Bot. 2: 80)!

Finally the present writer, following Mackenzie and Stacey in their interpretation of *C. mendocinensis,* was able to list both *C. mendocinensis* and *C. debiliformis* from Marin County (Marin Flora, 95). Now he wishes to express a change of opinion, the explanation of which will elucidate the confusion that has attended the interpretation of *C. mendocinensis.*

A study of the type-collection of *C. mendocinensis (Bolander 4701)* as represented in the University of California Herbarium and Gray Herbarium not only discloses a plant agreeing in all details with W. Boott's original description, but also one referable to *C. debiliformis* as that species has been more broadly interpreted by recent students. On the other hand, in the type-collection of *C. mendocinensis* as represented in the Olney Herbarium at Brown University and in the U. S. National Herbarium, two kinds of plants are represented: one which is like the specimens in the University of California Herbarium and Gray Herbarium, the other which corresponds to the key-characters and description of *C. mendocinensis* as that plant was finally interpreted by Mackenzie. In the New York Botanical Garden Herbarium the two kinds of plants are also represented, one plant of each mounted on the same sheet. It was from the plant on this sheet referable to Mackenzie's *mendocinensis* that the inflorescence in Abrams Ill. Flora fig. 786 was drawn, as well as the inflorescence, scale, and perigynium in Mackenzie N. Am. Cariceae pl. 334. On the other hand, in plate 334, the base of the plant and leaves, and perhaps also the achene, were drawn from the second plant on the sheet, the one referable to W. Boott's *mendocinensis.*

In the North American Flora (18: 286), Mackenzie states that *C. mendocinensis* "has much the appearance of a hybrid between *Carex gynodynama* Olney and *Carex debiliformis* Mackenzie," and the possibility of the hybrid character of *C. mendocinensis* was repeated by Stacey (Leafl. West. Bot. 1: 192, 232). I believe that field studies show that this plant which was called *C. mendocinensis* by Mackenzie is a hybrid, intermediate in character between *C. gynodynama* and *C. debiliformis* with which Mackenzie's plant has always been found growing. To my knowledge, six collections of this hybrid are now known: *Bolander 4701* in part; *Eastwood, Howell & Stacey 4466; Eastwood & Howell 6259; Howell 21240, 21983, 23202.*

The Bolander collection, *No. 4701,* as has been stated above, consists of the hybrid element as well as the plant more recently referred to *C. debiliformis.* Bolander's *No. 4700* is the type-collection of *C. gynodynama.* Since it is not unlikely that both of Bolander's numbers, *4700* and *4701,* were collected at the same time and place, it is reasonable to conclude that the hybrid was associated with its suspected parents. Even if it should be shown that these two numbers were not collected together, I know from field work that *C. gynodynama* is one of the most common sedges on the Mendocino coastal plain, so that I am sure that that plant could have been in the immediate vicinity of the station where *No. 4701* was collected (cf. *Eastwood & Howell 2621, 2653, 2713, 6256; Eastwood, Howell, & Stacey 4399, 4414, 4469:* all *C. gynodynama* from coastal Mendocino Co.).

At the other two stations where the hybrid plant has been found, the two suspected parents have been closely associated with it. In the hills east of Point Arena, Mendocino County, Miss Eastwood, Mr. Stacey, and I found the three plants associated, together with several other sedges on May 30, 1937 (cf. Leafl. West. Bot. 2: 80). Miss Eastwood and I revisited this same place on July 11, 1938, and a second series of specimens was made. In 1945, while exploring a sedge-filled arm of Willow Meadow on the north side of Mt. Tamalpais, Marin County, I again discovered the suspected hybrid associated with *C. gynodynama* and *C. debiliformis.* In all specimens, the suspected hybrid appears to be sterile.

I now believe that I was wrong in *Marin Flora* when I followed Mackenzie and Stacey in their interpretation of *C. mendocinensis* and that that name should be typified, not by the hybrid element in *Bolander 4701,* but by the second element in that collection. Although both elements were present in Olney's specimen, none of the hybrid element was in Wm. Boott's specimen (Herb. W. Boott. in Herb. Gray.) and it was from this specimen that the original description was drawn by Boott. I therefore propose to apply the name, *C. mendocinensis* Olney ex W. Boott, to the non-hybrid element of *Bolander 4701.*

This decision raises another problem that was suggested by both Bailey and Kükenthal: is *C. cinnamomea* Olney (i. e., *C. debiliformis* Mkze.) specifically distinct from *C. mendocinensis,* as these were treated by Wm. Boott at the time he published the description of *C. mendocinensis?* A comparison of Boott's two diagnoses reveals that they differ chiefly in a single character,—

in the length of the stalk of the staminate spikelet and the resulting relative position of the staminate and the uppermost pistillate spikelets. This is the principal character used by Mackenzie to separate his *"C. mendocinensis"* and *C. gynodynama* from *C. debiliformis* and other members of the North American *Sylvaticae* (N. Am. Fl. 18: 284). The character is quite impressive when one compares the type-specimen of Olney's *C. cinnamomea (Bolander 6477)* with the type of *C. mendocinensis* which, in both the typical element as well as in the hybrid element, has the staminate spikelet subsessile or very shortly stalked.

In a long series of specimens, however, every length between extremely short and long can be found. This sort of intergradation can be found even in *Bolander 6477,* the type-collection of *C. cinnamomea,* as is disclosed by a specimen in Herb. Univ. Calif. In this specimen the staminate spikelet varies from nearly sessile to long-pedunculate, most of the half dozen or so inflorescences having staminate spikelets short-stalked, 1 cm. long or less. I have concluded, therefore, that there is no specific difference between *C. cinnamomea* Olney and *C. mendocinensis* Olney, as these were originally distinguished by W. Boott.

The following synopsis gives the nomenclatural and bibliographic matters pertaining to the entities discussed above and cites from Herb. Calif. Acad. Sci. (unless otherwise stated) representative specimens of each:

CAREX GYNODYNAMA

CAREX GYNODYNAMA Olney, Proc. Am. Acad. 7: 394 (1868); W. Boott in Wats., Bot. Calif. 2: 251 (1880); Bailey, Proc. Am. Acad. 22: 92 (1886); Kükenthal in Engler, Pflanzenr. VI, 20: 580 (1909); Mkze., Erythea 8: 61 (1922); Mkze. in Jeps., Fl. Calif. 1: 230 (1922); Mkze. in Abrams, Ill. Fl. 1: 324, fig. 784 (1923); Mkze. in Jeps., Man. Fl. Pl. Calif. 182 (1923); Mkze., N. Am. Fl. 18: 285 (1935); Mkze., N. Am. Cariceae pl. 333 (1940); Stacey, Leafl. West. Bot. 1: 192, 241 (1936), ibid., 2: 80 (1938); Peck, Man. Pl. Ore. 165 (1941); Howell, Marin Fl. 95 (1949).

Carex Blankinshipii Fern., Erythea 7: 121 (1899).

Representative collections, all from California except the first: base of Tyee Mt., Douglas Co., Oregon, *Cusick 4428;* Phillipsville, Humboldt Co., *Tracy 7969;* 8 miles from Kneeland on road to Yager, Humboldt Co., *Eastwood & Howell 4841;* 2.5 miles north of Miranda, Humboldt Co., *Ripley & Barneby 6812;* near Cleone, Mendocino Co., *Eastwood & Howell 2621;* Mendocino City, Mendocino Co., *Bolander 4700* (Herb. Olney., Brown Univ., type), *Eastwood, Howell, & Stacey 4414;* near Point Arena, Mendocino Co., *Eastwood, Howell & Stacey 4469, Eastwood & Howell 6256;* coastal plain, 2 miles south of Gualala River, Sonoma Co., *Eastwood, Howell & Stacey*

4495; near Dillons Beach, Marin Co., *Howell 21728;* Ledum Swamp on road to Pt. Reyes, Marin Co., *Howell & Stacey 12640;* Rock Spring, Mt. Tamalpais, Marin Co., *Howell 13901;* Hidden Lake, Mt. Tamalpais, *Leschke in 1942;* Pescadero, San Mateo Co., *Eastwood, Howell & Stacey No. 5255;* Empire Grade about 5 miles north of Santa Cruz, Santa Cruz Co., *Hesse 448;* Huckleberry Hill, Monterey Co., *Hoover 5900* (Univ. Calif.).

CAREX MENDOCINENSIS

Carex mendocinensis Olney ex W. Boott in Wats., Bot. Calif. 2: 240 (1880); Bailey, Proc. Am. Acad. 22: 106 (1886); Kükenthal in Engler, Pflanzenr. VI, 20: 580 (1909); Mkze., Erythea 8: 63, fig. 33 (1922); Mkze. in Jeps., Fl. Calif. 1: 231 (1922); Mkze. in Abrams, Ill. Fl. 1: 325, excl. fig. 786 (1923); Mkze. in Jeps., Man. Fl. Pl. Calif. 182, fig. 191 (1923); Mkze., N. Am. Cariceae pl. 334 in part (1940); Stacey, Leafl. West. Bot. 1: 141 (1934), ibid., 232 (1936).

Carex cinnamomea Olney, Proc.Am. Acad. 7: 396 (1868), non Boott, 1846; W. Boott in Wats., Bot. Calif. 2: 249 (1880); Bailey, Proc. Am. Acad. 22: 105 (1886); Thos. Howell, Fl. NW. Am. 704 (1903); Kükenthal in Engler, Pflanzenr. IV, 20: 598 (1909).

Carex debiliformis Mkze., Bull. Torr. Bot. Club 37: 244 (1910); N. Amer. Fl. 18: 293 (1935); N. Amer. Cariceae pl. 244 (1940); Stacey, Leafl. West. Bot. 1: 192, 232, 241 (1936), ibid., 2: 80 (1938); Peck, Man. Pl. Ore. 166 (1941); Howell, Marin Fl. 95 (1949).

Representative collections. Oregon: Grave Creek, Jackson or Josephine Co., *Thos. Howell in 1884;* near Selma, Josephine Co., *Henderson 5930;* Sexton Mt., Josephine Co., *Peck 24096;* near Snow Camp Mt., Curry Co., *Thompson 12847.*

California: Oregon Mt., Del Norte Co., *Eastwood & Howell 3714;* near Gasquet, Del Norte Co., *Eastwood & Howell 1337, 3768;* Grouse Mt., Humboldt Co., *Tracy 14086;* 5 miles east of Berry Summit on road to Burnt Ranch, Humboldt Co., *Eastwood & Howell 4866;* Trinity River Canyon between Eagle and Bear creeks, Trinity Co., *Eastwood & Howell 4979;* Coffee Creek Canyon near Union Creek, Trinity Co., *Howell 13587;* Tangle Blue Creek, Scott Mts., Trinity Co., *Howell 12808;* Mendocino Co. (probably near Mendocino City), *Bolander 4701* in part, type-collection of *C. mendocinensis* (Brown Univ. in Herb. Olney.; Herb. Gray. ex Herb. W. Boott.; N. Y. Bot. Gard.; Univ. Calif.; U. S. Nat. Herb.); Red Mountains, Mendocino Co., *Bolander 6477,* type-collection of *C. cinnamomea* (Herb. Gray. ex Herb. W. Boott.; N. Y. Bot. Gard.; Univ. Calif.; U. S. Nat. Herb.); on serpentine near Cummings, south end of Little Red Mt., Mendocino Co., *Eastwood & Howell 6129;* near Point Arena, Mendocino Co., *Eastwood, Howell & Stacey 4467, Eastwood & Howell 6257, 6258;* coastal plain, 2 miles south of Gualala River, Sonoma Co., *Eastwood, Howell & Stacey 4494;* Mt. Tamalpais, Marin Co., *Stacey in 1933;* near Bootjack, Mt. Tamalpais, Marin Co., *Howell & Stacey 12658;* Hidden Lake Fire Trail, Mt. Tamalpais, *Leschke in 1942;* Willow Meadow, Mt. Tamalpais, Marin Co., *Howell 21241;* Little Carson Falls, Marin Co.. *Howell 15535.*

CAREX GYNODYNAMA X MENDOCINENSIS

Carex gynodynama Olney x Carex mendocinensis Olney. *C. mendocinensis* sensu Mkze., non Olney, in Abrams, Ill. Fl. 1: fig. 786 (1922); N. Am. Fl.

18: 285 (1935); N. Am. Cariceae pl. 334 in part (1940); Stacey, Leafl. West. Bot. 1: 192, 241 (1936), ibid., 2: 80 (1938); Howell, Marin Fl. 95 (1949).

Collections examined, all from California. Mendocino County, *Bolander 4701* in part (Brown Univ. in Herb. Olney.; N. Y. Bot. Gard.; U. S. Nat. Herb.); near Point Arena, Mendocino Co., *Eastwood, Howell & Stacey 4466, Eastwood & Howell 6259;* Willow Meadow, Mt. Tamalpais, Marin Co., *Howell 21240, 23202;* Rocky Ridge Fire Trail near Willow Meadow, Mt. Tamalpais, Marin Co., *Howell 21983.*

NEW COMBINATIONS IN GRAMINEAE

BY ALAN A. BEETLE
Laramie, Wyoming

Agropyron spicatum (Pursh) Scribn. & Smith f. **inerme** (Scribn. & Smith) Beetle, comb. nov. *Agropyron divergens inerme* Scribn. & Smith, U. S. D. A. Div. Agrost. Bull. 4: 27 (1897).

Although almost universally treated as a species because of the obvious character (awns lacking), the evidence continues to mount that the awnless plant is but a form of *A. spicatum* (cf. Amer. Jour. Bot. 33: 528,—1946; Amer. Jour. Bot. 37: 388,—1950). Although *A. spicatum* is a common species in Wyoming, the author has never found the plant without also finding *A. spicatum* f. *inerme,* which, however, is represented by fewer individuals.

Digitaria arenicola (Swallen) Beetle, comb. nov. *Leptoloma arenicola* Swallen, Contrib. Texas Research Foundation 1, pt. 1: 1 (1950).

There are two schools of taxonomic thought current in recent papers on *Gramineae.* One is represented by A. Melderis in Svensk Bot. Tidskrift 44: 132-166 (1950), wherein a section of *Agropyron* (not a very good genus to start with, as pointed out by F. W. Gould in Nomenclatorial changes in *Elymus* with a key to the California species, Madroño 9: 120-128,—1947) is treated as the genus *Roegneria.* The other viewpoint is well represented by J. Th. Henrard in his Monograph of the genus *Digitaria* (1950). Taking his overall picture of *Digitaria* into consideration, one must agree that *Leptoloma* is logically only a section of that genus.

Panicum Ohwii Beetle, nom. nov. *Panicum parvispiculum* Ohwi, Bull. Tokyo Sci. Mus. No. 18, p. 15 (1947), not *P. parvispiculum* Nash, Bull. Torr. Club 24: 347 (1897).

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THE MESA VERDE CACTUS

BY LYMAN BENSON
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In the second edition of "The Cacti of Arizona" (University of New Mexico Press, 1950), the writer deleted at the last minute the intended publication of a new combination in the genus *Echinocactus*. This combination was withdrawn and the text changed slightly because of an opportunity to visit the region in which the cactus grows for more intensive field population study under a research grant from the Society of Sigma Xi. This study in October, 1950, confirmed the previous disposal of the species, and, consequently, the following new combination is published:

Echinocactus mesae-verdae (Boissevain) L. Benson, comb. nov. *Coloradoa mesae verdae* Boissevain, Colorado Cacti 55 (1940); *Coloradoa mesae-verdae* Boissevain ex Hill & Salisbury, Index Kewensis Suppl. 10: 57 (1947).

The known range of the Mesa Verde cactus is restricted to south slopes of nearly bare adobe hillsides at about 5,000 feet elevation. These are at the west end of Mesa Verde north of the Mancos River in southwestern Colorado. The plant is fairly abundant, and it does not show any great degree of variation from individual to individual. Since similar adobe hills continue for some distance southward, the species may occur near Shiprock, New Mexico, and possibly westward to the "four corners" of Utah, Colorado, Arizona, and New Mexico. The specimens are *L. Benson 14756,* Herbarium of Pomona College.

APLOPAPPUS CUNEATUS IN THE CALIFORNIA COAST RANGES. On Oct. 23, 1949, Robert T. Orr collected *Aplopappus cuneatus* Gray in San Luis Obispo County, 2 miles northeast of Freeborn Mt. on the edge of the Carrizo Plain where it grew in crevices of sandstone rocks at an elevation of 2500 ft. This occurrence is not a great extension of range from the Tehachapi Mts. where the plant is known to occur, but it is the first definite record I have seen from the South Coast Ranges. — JOHN THOMAS HOWELL.

POLYGONUM NEWBERRYI IN CALIFORNIA. *Polygonum Newberryi* Small was first reported in California in 1899 by C. H. Merriam in his list of plants from Mt. Shasta (N. Amer. Fauna No. 16: 145). Jepson (Fl. Calif. 1: 379,—1913) cited this reference under *P. Davisæ* Brew., indicating either that he believed *P. Newberryi* to be synonymous with Brewer's species or that he did not understand the character of the Mt. Shasta plants. In this misdetermination, Jepson was followed by W. B. Cooke in his flora of Mt. Shasta (Amer. Midl. Nat. 23: 528,—1940). Abrams (Ill. Fl. Pac. States 2: 62,—1944) credits *P. Newberryi* to California but does not include Mt. Shasta in its range: "Cascade and Olympic Mountains, Washington, south to the Lava Beds, Modoc County, California." *Polygonum Newberryi* was not included in the flora of the Lava Beds National Monument by Applegate (Amer. Midl. Nat. 19: 334-368,—1938).

In Herb. Calif. Acad. Sci. are the following California collections of *P. Newberryi,* all from Siskiyou County: Little Mt. Hoffman, *Eastwood No. 10957;* between Horse Camp and Panther Meadows, Mt. Shasta, *Cooke No. 11289;* Panther Meadows, Mt. Shasta, *Tucker No. 1760.*—JOHN THOMAS HOWELL.

AN ACCESSION IN TRIFOLIUM. An Old World clover, *Trifolium angustifolium* L., has recently come to my attention from two stations, one in Oregon, the other in California. The Oregon collection was made by Grace Cole Fleischman on a dry hillside at Oakland, Douglas Co., while the California collection was made by Ken Tweedy in Larkin Valley, Santa Cruz Co. These collections are represented in both the California Department of Agriculture Herbarium and in Herb. Calif. Acad. Sci.

In fruit this species undergoes a change not exhibited by any native clover. After anthesis, the inner wall of the calyx-tube becomes corky-thickened, filling the cup and embedding the fertilized ovary and the lower part of the corolla in a spongy mass of cells. Then the withered upper part of the corolla breaks off and the spiny-tipped, plumose calyx-lobes spread divaricately, so that by the time of maturity, the entire fruiting structure resembles nothing so much as the fruit of some campanulaceous plant. Indeed *T. angustifolium* is a remarkable clover.—John Thomas Howell.

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LEAFLETS
of
WESTERN BOTANY

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NOTES ON MALVACEAE[1] II

BY THOMAS H. KEARNEY

GOSSYPIUM DAVIDSONII Kellogg. This species of Baja California and the coast of Sonora was reduced to a variety of *G. Klotzschianum* Anderss. of the Galápagos Islands, by J. B. Hutchinson (5, pp. 22, 23). The present writer believes that, apart from the wide geographical separation of the two entities, there are good morphological characters that distinguish them. These were summarized, as a result of comparison of living plants grown at Torrey Pines, California, in the following terms (7, p. 311):

Petals only slightly plicate, short-clawed, with a conspicuous, usually solid, suprabasal spot; capsules abruptly acuminate; seeds often strongly connate, angulate, striate, densely pubescent, their hairs very closely appressed and crispate ..... *G. Davidsonii*

Petals strongly plicate, long-clawed, with an inconspicuous, striate, suprabasal spot; capsule tapering from near the base to the acuminate apex; seeds not connate, nor angulate, nor striate, nor very densely pubescent, their hairs loosely appressed and not crispate ..... *G. Klotzschianum*

Flowers and seeds of both species were illustrated in the same paper (7, figs. 8-10). Hutchinson himself (ibid.) characterized his var. *Davidsonii* (Kellogg) J. B. Hutchinson as having "bracteole teeth 6-10, capsule round," as compared with "bracteole teeth 10-15, capsule nearly twice as long as broad" in *G. Klotzschianum*. He also pointed out that the latter is arborescent and has larger leaves and flowers than *G. Davidsonii,* which is a "comparatively low-growing shrub." This difference in growth habit was also very evident in the plants grown at Torrey Pines, and the tendency in *G. Davidsonii* to produce smaller leaves and flowers is borne out by comparison of herbarium specimens. In view of these important morphological differences, the fertility of hybrids between these two species, emphasized by Hutchinson, seems an insufficient reason for reducing *G. Davidsonii* to varietal rank, especially since Hutchinson recognized *G. Harknessii* T. S. Brandeg. and *G. Armourianum* Kearney as distinct species, although they are highly inter-fertile.

GOSSYPIUM DARWINII Watt. A number of plants were grown at Riverside, California, from seeds obtained in the Galápagos Islands by A. K. Fisher. They showed much variation in nearly

[1]A previous paper with this title was published in Leaflets Western Botany 6: 51-52 (1950).

Leaflets of Western Botany, Vol. VI, pp. 165-180, February 6, 1952.

all characters, but all had lint-bearing seeds and none of them resembled the lintless *G. Klotzschianum*. Some of these plants corresponded well with Watt's description of *G. Darwinii* (19, p. 68), the type of which was collected on James or San Salvador Island, Galápagos Islands, by Charles Darwin in 1835. Others were very like plants of the South American group of cultivated cottons. The writer believes that Hutchinson was justified in reducing *G. Darwinii* to varietal status as *G. barbadense* L. var. *Darwinii* (Watt) J. B. Hutchinson (5, p. 51).

Gossypium trilobum (Moç. & Sessé ex DC.) Skovsted. This combination was published first by Skovsted in a non-taxonomic journal (13, p. 288), but two of his synonyms, *G. Thurberi* Todaro and *Thurberia thespesioides* A. Gray, should not have been included. This fact was overlooked by the writer when he republished the same combination two years later (8), and pointed out characters that distinguish the *Ingenhouzia triloba* of Moçiño and Sessé from *Gossypium Thurberi* Todaro *(Thurberia thespesioides* A. Gray), with which it had been confused. These findings were accepted by Hutchinson (5, pp. 24, 27) who concluded that *G. lanceaeforme* Miers ex Britten is a synonym of *G. trilobum*. The latter was based on Moçiño and Sessé types from somewhere in Mexico. The type of *G. lanceaeforme,* which came from Mexico, was also, presumably, part of the Moçiño and Sessé collection (14) although attributed by Britten (1) to Pavon. Standley (15, p. 784) concluded that *Ingenhouzia triloba* is specifically distinct from both *G. Thurberi (Thurberia thespesioides)* and *G. gossypioides (*Ulbr.) Standl.

A specimen with old fruit (no flowers) in the U. S. National Herbarium from near Guadalajara, Jalisco, Mexico *(Rose & Hay 6284),* may well represent *G. trilobum*. As compared with *G. Thurberi* it has less deeply cleft leaves with broader, very long-caudate-acuminate lobes, and capsules about twice as large. It is known that Moçiño and Sessé collected near Guadalajara (14, p. 424).

Malvastrum arequipense Johnst. The writer, in a recent publication (9, p. 118, footnote) suggested that this Peruvian plant may be a second species of *Urocarpidium,* but had not seen mature fruit. Krapovickas (10) has transferred this species to *Sphaeralcea* as *S. arequipensis* (Johnst.) Krapov. His illustration of a mericarp (10, fig. 1a) shows that the fruit is very different from that of *U. albiflorum* Ulbr., the type and only known species of *Urocarpidium*.

Malvastrum insulare Kearney, spec. nov. Albemarle or Isabela Island, Galápagos Islands, summit of Tagus Cove Mountain, in moist, shady, rocky places *(J. T. Howell 9570,* May 26, 1932, the type-collection, Calif. Acad. Sci. Herbarium No. 362992); Tagus Cove *(Alban Stewart 2038*[1], March, 1924).

Annua; caules gracillimi, usque ad 10 cm. longi, abundanter sed non dense stellato-pilosi, foliis et floribus paucis; petioli graciles, foliorum inferiorum usque ad 2 cm. longi et laminis multo longiores; stipulae subulatae, pilosae, 1.5–2 mm. longae; laminae deltoideo-ovatae vel suborbiculares, usque ad 3 cm. longae et latae, tenues, utrinque virides et paulum stellato-pilosae, subprofunde crenato-dentatae, obtusae vel acutiusculae, basi truncatae vel subcordatae; flores axillares, solitarii, pedunculis, filiformibus, usque ad 1 cm. longis; bracteolae involucelli filiformes, pilosae, circa ⅔ calycis longitudine; calyx campanulatus, circa 3 mm. longus, pilosus, lobis 2 mm. longis, deltoideis, acutis vel breviter acuminatis; petala circa 3.5 mm. longa; tubus stamineus circa 1 mm. longus, glaber; antherae rarae, circa 5; carpidia 8–10, suborbiculato-reniformia, minima, circa 1.3 mm. longa et fere aequaliter lata, subprofunde incisa, apice rostrata, mutica, lateribus rugosa, dorso muricata, stellato-pubescentia demum glabrescentia.

Annual; herbage copiously but not densely stellate-pilose; stems very slender, up to 10 cm. long, simple or sparingly branched, few-leaved and few-flowered; petioles slender, those of the lower leaves up to nearly 2 cm. long and much longer than the blades, the upper petioles much shorter; stipules 1.5–2 mm. long, subulate, pilose; blades deltoid-ovate to suborbicular, up to 13 mm. long and wide, thin, green and almost equally pubescent on both surfaces, conspicuously and irregularly (often doubly) crenate-dentate, sometimes very slightly lobed, rounded to acutish at apex, truncate or subcordate at base; flowers axillary, solitary, on filiform peduncles up to 1 cm. long but often much shorter; involucel extremely caducous, the bractlets filiform, pilose, about ⅔ as long as the calyx; calyx campanulate, 3 mm. long, only slightly accrescent, pilose with rather long, partly simple hairs, cleft about ⅔, the lobes deltoid, about 2 mm. wide at base, acute or short-acuminate, thin, veiny; petals about 3.5 mm. long, pink or lavender (?)[2]; stamen tube about 1 mm. long, glabrous; anthers very few, apparently only 5, on slender filaments about 0.8 mm. long; style branches about as long as the filaments; stigmas capitate; ovary and fruit discoid, 8–10-merous; ovule solitary, ascending; mericarps indehiscent, very small, about 1.3 mm. high and very nearly as wide, suborbicular-reniform, rather deeply notched, with a somewhat beak-like, obtuse or acutish, muticous apex, prominently radially ridged on the sides, conspicuously muricate on the back, black at maturity, stellate-pubescent, then glabrescent; seeds obovate-reniform, about 1 mm. long, glabrous or very nearly so.

It is somewhat hazardous to describe a new species in such a difficult and poorly understood genus as *Malvastrum,* but the writer could find no description of a published species of this genus corresponding at all closely with *M. insulare.* Of South

[1]This number was listed by Stewart (Proc. Calif. Acad. Sci. ser. 4, 1: 104) under *Sida supina* L'Hér.

[2]The color is not definitely determinable on the dried specimens.

American species, *Malvastrum tenellum* (Cav.) Hieron., based on *Malva tenella* Cav., of Chile, is perhaps related to *M. insulare,* but Cavanilles' illustration (Icon. Pl. 5: 14 t. 422, f. 3) shows a plant with deeply 3-lobed leaves and small, subterminal clusters of subsessile flowers. He did not describe the mericarps.

In *M. insulare* the mericarps resemble those of *Malvastrum exile* A. Gray *(Eremalche exilis* (A. Gray) Greene), of the southwestern United States. If *Eremalche* is to be recognized as a genus, *M. insulare* probably should be transferred to it. As compared with *M. exile,* however, the mericarps of *M. insulare* are only about half as large, being smaller than in any other species of *Malvastrum* (sensu lat.) known to the writer. Also, they have a more beak-like apex and much more prominent dorsal muri-cations. The vegetative characters of these species are quite different.

MALVASTRUM MOLLENDOENSE Ulbr. In his revision of *Palaua,* Ulbrich (17, p. 108), described a perfectly typical species of that genus, from southern Peru, *P. mollendoensis* Ulbr., which has the carpels regularly disposed in several superposed verticils. In the same year he also (18, p. 120) published *Malvastrum mollendoense,* a wholly different plant from the same region. Johnston (6, p. 260), overlooking Ulbrich's previous publication of *Palaua mollendoensis,* transferred this *Malvastrum* to the genus *Palaua* as *P. mollendoensis* (Ulbr.) Johnst. In doing this, Johnston commented: "This remarkable species has a habit more in agreement with *Palaua* than with *Malvastrum.* In its technical characters, the 'carpels' being in two incomplete superimposed series, it clearly belongs to the former genus."

This small annual with non-involucellate flowers is certainly not a typical *Malvastrum.* Neither is it a good *Palaua,* the carpels, so far as the writer could judge from examination of specimens in the Gray Herbarium annotated by Johnston *(Mexia 04180),* being uniseriate, although somewhat unequal in height. Its most striking feature is the high and narrow, deeply lobed, somewhat urceolate calyx, the slender lobes marked by a dark central stripe. What is exidently a closely related plant was collected on the "Lomas de Mollendo," Prov. Islay, Dep. Arequipa, Peru *(C. Vargas C. No. 8432).* These specimens have only very immature fruit but the carpels appear to be in one verticil. The calyx is very similar to that of *M. mollendoense* Ulbr. but the freely branching stems are much longer (up to 30 cm. long) and

the leaves are entire or very nearly so. Final disposition of *M. mollendoense* and of this apparent congener must await the collection of additional material.

MONTEIROA. This genus was published by Krapovickas (11) too recently for consideration in the writer's synopsis of the American genera of *Malvaceae* (9). Five species were included, four of them published previously as species of *Malvastrum* or *Malva* and one new species, *M. triangularifolia* Krapov. All are indigenous to southern Brazil, one of them, the type species, *M. glomerata* (H. & A.) Krapov., ranging also to Uruguay and Argentina. This group is a natural one, the plants more or less woody, with cymose inflorescences and muticous or nearly muticous, dorsally hirsute but otherwise smooth carpels, these ventrally dehiscent. According to Krapovickas (11, p. 236, fig. 1) the basic chromosome number is 10, as compared with 12 in typical *Malvastrum*, and the chromosomes are larger in *Monteiroa* than in *Malvastrum*.

PALAUA TOMENTOSA Hochr. The genus *Palaua* was recorded as limited to Chile and Peru, until Hochreutiner (3, p. 171) published this species, presumed to have been collected in Mexico by Pavon. As indicated, however, by Sprague (14, p. 419), plants supposed to have been obtained in Mexico by Pavon probably were collected by Sessé and Moçiño. In the present instance it seems more likely that the type of *P. tomentosa* really was collected by Pavon, but in Peru.

Sida salviaefolia Presl var. **submutica** J. T. Howell, var. nov. A *S. salviaefolia* typica differt carpellis breviaristatis vel submuticis, aristis 1 mm. longis et usque dimidia longitudinis carpellae sed plerumque multo brevioribus.

Galápagos Islands, type from Duncan or Pinzon Island *(John Thomas Howell 9815)*, June 7, 1932 (Calif. Acad. Sci. Herbarium No. 363018). Also, Albemarle or Isabella Island *(J. T. Howell 9499)*, Charles or Santa Maria (Floreana) Island *(Alban Stewart 2030, J. T. Howell 8806A, 9349, 9376B)*, Gardner Island *(J. T. Howell 8779)*, Indefatigable or Santa Cruz Island *(J. T. Howell 9908)*, James or San Salvador Island *(J. T. Howell 9637, 9746, 10051)*, Narborough or Fernandina Island *(Alban Stewart 2036)*, North and South Seymour Islands *(J. T. Howell 9984, 9931)*, Tower or Genovesa Island *(R. G. Taylor G120, J. T. Howell 10115)*.

The specimens cited correspond well with Presl's description of *S. salviaefolia* (Rel. Haenk. 2: 110) except that he described

the carpels as having "aristis loculo ipso aequilongis" whereas, in the Galápagos Island specimens, the awns do not exceed 1 mm. in length (averaging in the 14 specimens examined only 0.34 mm. long) and are not more than half as long as the body of the carpel. The Galápagos plants may be described further as follows:

Finely stellate-canescent, usually with no long simple hairs; stems rather strictly erect, often much-branched, up to about 1 m. high, without infra-petiolar tubercles; leaf blades narrowly lanceolate or narrowly oblong, more or less cuneate at base, serrate or serrulate; inflorescences subracemose or the flowers congested at the ends of the branches; calyx angulate, with acute or sharply acuminate lobes; petals whitish or cream-colored, brownish at base[3]; carpels 6 (the prevailing number) or 7, 1.8–2.5 mm. high exclusive of the awn,[4] conspicuously muricate, stiffly retrorse-pilose at apex and on the awns.

The type of *S. salviaefolia* Presl came from near Acapulco, Mexico. The range of the species, as stated by Standley (15, p. 764) is Sinaloa to Guerrero and Morelos in Mexico, also Jamaica, Puerto Rico, and Colombia. Much the same distribution is given by Fawcett and Rendle (2, p. 117). E. G. Baker (Jour. Bot. 30: 237) reduced *S. salviaefolia* to a variety of *S. spinosa* L. but it is distinguished from that species in the absence of infra-petiolar spines or tubercles, a somewhat inconstant character. More constant distinguishing characters, are the narrower, subcuneate leaf-bases, whitish petals, and fruit of 6 or more carpels, these conspicuously muricate on the indehiscent basal portion and with a larger dehiscent apical portion, the carpel awns retrorsely and rather stiffly pilose. In *S. spinosa,* especially as represented in the Galápagos Islands where it seems to be abundant, the (often spinescent) infra-petiolar tubercles are nearly always present, the leaves are broadly truncate, rounded or even subcordate at base (occasionally subcuneate in var. *angustifolia* (Lam.) Griseb.), the petals are yellow, the fruits are rarely, if ever more than 5-merous, and the carpels are merely rugose-reticulate (exceptionally muriculate), with antrorsely soft-pilose awns.

Svenson (16, p. 466) cited *S. salviaefolia* as a doubtful synonym of *S. campestris* Benth., the species to which he referred most of the Galápagos Island plants which Robinson (12, p. 175) had

[3]The petals of *S. salviaefolia* have been described (2, p. 117) as "pale buff colour or yellowish white veined with pale pink."

[4]In a specimen in the herbarium of the University of California of what seems to be typical *S. salviaefolia* from Culiacan, Sinaloa, Mexico *(T. S. Brandegee in 1904)* the body of the carpels is 3 mm. high and the awns 1.3-2 mm. long. A specimen from Presl in the herbarium of the British Museum, which is probably an isotype, was examined by J. T. Howell in 1935, and he found the awns to be 3 mm. long.

identified as *S. spinosa* L. and *S. angustifolia* Lam. Bentham, however, described *S. campestris* as having long, simple hairs on the stem and about 10 carpels in the fruit (type from near Guayaquil, Ecuador, Pl. Hartw. p. 113). The Galápagos Island specimens here referred to *S. salviaefolia* var. *submutica* differ from the description of *S. tenuicaulis* Hook. f. (4, p. 232), of which the type was obtained by Darwin on James or San Salvador Island, in that Hooker gave the number of carpels in *S. tenuicaulis* as "about 4" and described them as obscurely transverse-reticulate. At Mr. Howell's request, the type of *S. tenuicaulis* was examined by the late Sir Arthur W. Hill, who reported that "the soft white hairs on the beaks [of the carpels] are erect-spreading." This observation supports the conclusion of Svenson (16, p. 467) that *S. tenuicaulis* is related to and probably only a form of *S. spinosa* L.

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PUGILLUS ASTRAGALORUM XIV: NOTES ON SECT. LONCHOCARPI

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In the introduction to his Revision of North American Astragalus, Marcus Jones had occasion to refer to one of Sheldon's sections in the genus as a "botanical hodge-podge." The term can be applied with equal accuracy to § *Lonchocarpi* as enlarged and defined by Jones in the same work (p. 250); or to the equivalent genus *Lonchophaca* Rydb. (N. Amer. Fl. 24: 312,—1929). The section was erected by Gray (Proc. Amer. Acad. 6: 219,—1864) for the single, at that time anomalous *A. lonchocarpus* Torr., a species characterized by fistular, somewhat rushlike stems arising from a subterranean rootstock, free stipules, cylindric calyx gibbous at base, and pendulous, stipitate, dorsiventrally compressed pod devoid of septum. While Jones and Rydberg continued to circumscribe their section or genus as having pods of this original form, they introduced species not only at variance with the required carpological character (e. g. *A. Osterhouti* with laterally compressed, *A. kaibensis* and *A. duchesnensis* with sessile pod), but diverse in other respects and not directly related, or but remotely so, to the type-species.

It is generally admitted that the form of the pod is the most valuable single *specific* character in *Astragalus*. There are few cases of related species in which only the plant-body, or the flower, or other details of structure have diverged while the pod has remained unchanged; but the reverse is often true, or

nearly so. In fact the legume is commonly the first organ to undergo modification. This being so, the value of the pod's form as an index to relationships is always open to suspicion. From early times the direction of the pod's compression and the degree to which the valves are inflated or introverted have been elevated to positions of importance disproportionate to their worth. It has been admitted that the pod may vary, between cognate species, in texture, size, outline, pubescence, length of stipe and other factors; but the attitude assumed by the valves relative to the carpellary axis has been considered immutable. This assumption is the basic fallacy behind Rydberg's generic splitting of *Astragalus;* and has resulted in curious misalignments in every attempt at classifying the American species.

The foregoing generalities are especially relevant in the case of the species described below as *A. Ripleyi.* Here the pod is strictly "homaloboid" in form, and closely resembles that of *A. collinus* Dougl. or *A. stenophyllus* T. & G. But in every other respect, down to minute details of coloring, pubescence, and all that is summed up in the vague but expressive term of habit, the plants are conformable with the rest of § *Lonchocarpi.* Shorn of alien elements, which are enumerated at the end of this paper, the section may be redefined as follows:

ASTRAGALUS § LONCHOCARPI Gray

Coarse perennials, with fistular herbaceous stems arising from a buried root-crown (caudex none), leafless at the lower nodes; stipules free, the lowest adnate to a suppressed petiole, thus forming a united sheath, but not connate; pedicels elongate; calyx subcylindric, gibbous at base, ebracteolate; flowers nodding; pod pendulous, long-stipitate, 1-locular, dorsiventrally or laterally compressed, the long narrow body commonly arched downward.—Three or perhaps four[1] species of northern New Mexico and southern Colorado, one extending across Utah into eastern Nevada.

KEY TO THE SPECIES

a. Pod dorsiventrally compressed or dorsally sulcate, the sutures more or less approximate within.

b. Lateral leaflets not more than 6, obscurely articulate, often reduced in size or number, or absent, the upper leaves commonly composed of a naked rachis and terminal, obscurely expanded phyllodium continuous with it; pod nearly always glabrous; range of the section.....1. *A. lonchocarpus*

[1] *Astragalus platycarpus* (Rydb.) Barneby *(Tium platycarpum* Rydb.) is still known only from a fragmentary type: Oak Creek, Colorado, *Brandegee in 1873* (NY); and its affinities are therefore still unclear. The pod, though shorter and glabrous, resembles that of *A. Schmollae.* The lower part of the stem, and hence the lower stipules, are lacking.

b. Lateral leaflets 10–16 in all the leaves, prominently articulate; pod strigose; southwestern Colorado.....2. *A. Schmollae*

a. Pod laterally compressed, the valves approximate within. Leaflets linear, glabrous above; pod strigose; Taos County, New Mexico.....3. *A. Ripleyi*

1. A. LONCHOCARPUS Torr.

Astragalus lonchocarpus Torr., Pac. R. R. Rep. 4: 80(1857). *Phaca macrocarpa* Gray, Pl. Fendl. 36(1849), non *A. macrocarpus* Pall. *Lonchophaca macrocarpa* (Gray) Rydb., N. Amer. Fl. 24: 312(1929).

A. macer A. Nels., Bot. Gaz. 56: 65(1913). *Lonchophaca macra* (A. Nels.) Rydb., op. cit. 313(1929).

Despite its wide range, which extends around the flanks of the Rocky Mountains from Cañon City, Colorado, through northern New Mexico and across Utah into eastern Nevada, *A. lonchocarpus* is a fairly stable species. On the whole, perhaps, a trend can be made out from a plant with relatively slender, almost solid stems and narrow pods (about 3.5 mm. wide) which is the prevailing form in the pinyon-juniper zone of northern New Mexico, into a robust phase with stouter and more obviously hollow stems, and pod up to 5 or even 6 mm. wide, common on hot clay hills of the Colorado River basin. There is no exact geographic correlation, however, and the variation noted seems as likely due to accidents of topography and microclimate as to genetic causes. Thus *Lonchophaca macra,* in Rydberg's sense, is considered a minor variant.

It should be noted in passing that Rydberg's interpretation of *A. macer* as the more robust form exactly contradicts the original diagnosis. Nelson pointedly set off his species from *A. lonchocarpus* as being more slender and having smaller fruit, the pod "3–4 mm. wide" – ex char. An isotype (Paradox, Montsose County, Colorado, *E. P. Walker 179,* NY) confirms this. Nelson cannot have known that the type of *Phaca macrocarpa* (Santa Fe, New Mexico, *Fendler 160,* NY) was also of the slender form.

The plant collected by the Whipple Expedition on the Llano Estacado (more precisely at "Camp 49, Plaza Larga, *Bigelow*" (NY), i. e. near Tucumcari, Quay County, New Mexico), which Gray (Proc. Amer. Acad. 6: 219,—1864) noted as possibly distinct, on account of its "shorter and blunt pods," does not appear at all remarkable in *A. lonchocarpus* as the species is now known.

2. A. SCHMOLLAE C. L. Porter

Astragalus Schmollae C. L. Porter, Madroño 8: 100, Pl. 9, fig. 4–7 (1945).
A. platycarpus (Rydb.) Barneby var. *montezumae* Barneby, Leafl. West. Bot. 4: 59, Pl. 1, fig. 1–5 (1944).

The type of *A. Schmollae* has not been seen, but its identity with *A. platycarpus* var. *montezumae* can hardly be doubted, in view of their common place of origin on the Mesa Verde, and the exact agreement in the descriptions and figures. The relationship of this entity to *A. platycarpus* is still in doubt (cf. footnote above); it is, in any case, well marked, and is likely to stand in the category of species.

3. A. RIPLEYI Barneby

Astragalus Ripleyi, spec. nov., inter *Lonchocarpos* Gray juxta *A. Schmollae* C. L. Porter collocanda, sed legumine de latere (more *Homalobi* Nutt.) compresso inter affines insignis.

Herba perennis valida paucicaulis, pube basifixa appressa fere undique strigoso-cinerascens; caulibus robustis suberectis fistulosis purpurascentibus e radicis lignosae verticalis gemmis lateralibus subterraneis emissis, 4–6 dm. longis, per quartam sextamve partem inferiorem simplicibus nudis, nodis vagina brevi chartacea e stipulis coalitis (sed adversus folium deficiens omnino liberis) efformata instructis, inde foliatis et paniculatim ramosis; stipulis foliorum evolutorum herbaceis deflexis 1–1 (5) mm. longis semi-caulinis petiolo breviter adnatis, medianis late summis angustius deltoideis; foliis patulis subsessilibus 4–9 cm. longis; foliolis saepissime 6–8-jugis remotiusculis linearibus vel angustissime ellipticis, obtusis rarius apiculatis truncatisve, (3) 9–25 (35) mm. longis, pagina superiori glabrata, lateralibus articulatis, ultimo fere semper in rachin sensim decurrenti; pedunculis arcuato-adscendentibus 7–11 cm. longis; racemis laxiuscule (5) 16–45-floris secundis, post anthesin adeo elongatis, axi fructifero (2) 4–16 cm. longo, floribus nutantibus pedicello filiformi 3–7 mm. longo demum dejecto bracteam exiguam subulatam multo superanti fultis; calycis membranacei straminei albo-(nonnumquam parcius atro-) strigosi tubo profunde campanulato-subcylindrico, basi gibbo, 5–6 mm. longo, 2.5–3 mm. lato, dentibus deltoideis (ventralibus 2 quam aliis latioribus ac brevioribus) 0.5–0.7 mm. longis; petalis (quorum dimensiones apud flores serotinos parvulos in parenthesi infra notantur) pallide citrinis immaculatis; vexillo oblanceolato aliquantulum recurvo (13) 15–16 mm. longo, (4.5) circa 6 mm. lato; alis (11) 13–14 mm. longis, unguiculo (5.5) 6–7 mm., lamina oblonga obtusa integra subrecta auriculo incluso (6.5) circa 8 mm. longa, 2–2.5 mm. lata; carinae (9.5) 10–11 mm. longae unguiculis (5.5) 6.5–7 mm. longis, laminis oblique obovatis per angulum rectum in apicem obtusum sensim incurvis (4.5) 5–5.5 mm. longis, 2.2–2.5 mm. latis; legumine pendulo stipitato lineari-oblongo vel anguste lanceiformi acutissimo (14) 20–33 mm. longo, (3.5) 4–6 mm. lato, de latere valde compresso omnino 1-loçulari (suturis ambabus prominulis nec sulcatis nec introversis), basi in stipitem filiformem 8–15 mm. longum abrupte con-

tracto, valvulis primum (in vivo) carnosulis rubellis, maturis (exsiccatisque) chartaceis stramineo-viridulis reticulatis strigulosis, intus filamentosis; ovulis circa 12; seminibus rugulosis fulvo-viridescentibus 2.9–3.2 mm. longis.

New Mexico: In rich soil on sagebrush plains, 4 miles south of Tres Piedras, Taos County, alt. 8200 ft., 8 July 1950, flower and fruit, *Ripley & Barneby 10307*. Type, in Herb. Calif. Acad. Sci., No. 361752.[1] Clay bank among junipers and pinyons, 2 miles south of Questa, Taos County, alt. 7000 ft., 25 May 1947, scarcely in full flower, *No. 8237*.

While the laterally compressed pod of *A. Ripleyi* has no counterpart in the section, the plants resemble *A. Schmollae* closely in other ways. The chief points of difference are the more compact racemes, glabrous upper surface of the leaflets, short calyx-teeth and lemon-yellow rather than ochroleucous flowers.

The species is dedicated to my friend and collaborator, H. Dwight Ripley, who first discovered and recognized it as new to science.

Species Excluded from § Lonchocarpi

1. *A. kaibensis* Jones, Cont. West. Bot. 10: 64 (1902). *Lonchophaca kaibensis* (Jones) Rydb. The fresh pod is terete and sessile. The species is restricted to clay knolls about House Rock and Lees Ferry in northern Arizona, where it is isolated at the edge of the range of *A. lancearius* Gray, a species so like it in every detail except the laterally flattened pod of slightly less fleshy texture, that flowering specimens of the two are indistinguishable. There can be little question that *A. kaibensis* and *A. lancearius* (including *A. Episcopus* Wats.; cf. Leafl. West. Bot. 5: 32,–1947), even though placed in separate genera, *Lonchophaca* and *Homalobus* respectively, by Rydberg, and separated in Jones's Revision by over 170 pages of text, are derived from an immediate common ancestor and must be treated as close relatives. The idea that their pods have retained an ancestral form while every other organ has converged, at the same time and place, to a point of exact congruence, requires an inconceivable number of coincidences. This pair of species, along with the next, seem to constitute a small group of their own in the great *Homalobus* series, differing from the *Lonchocarpi* in the campanulate, scarcely oblique calyx, short pedicels and essentially sessile legume. They are probably best included in § *Genistoidei*.

[1] An ample collection insures that this will be widely distributed.

2. *A. duchesnensis* Jones, Cont. West. Bot. 13: 9 (1910). *Lonchophaca duchesnensis* (Jones) Rydb. This species, a close endemic of the Uinta Basin in northern Utah, has a campanulate, subsymmetric calyx, and sessile, albeit basally attenuate pod. Except for the dorsi-ventral compression of the pod, a character of increasingly little importance in the classification of the genus, it is pretty clearly of § *Genistoidei.*

3. *A. Osterhouti* Jones, Rev. Astrag. 251 (1923). *Lonchophaca Osterhouti* (Jones) Rydb. The stipules of this rare species, endemic to clay hills along the upper Colorado in Grand County, Colorado, are connate, and the plants, unlike *A. lonchocarpus,* are seleniferous (cf. Beath, Amer. Jour. Bot. 26: 729,—1939), with the characteristic odor and habit of the seleniferous § *Pectinati.* In habit, foliage, and flower *A. Osterhouti* closely resembles *A. Grayi* Parry of the high Wyoming plains; they are undoubtedly related, in spite of the former's stipitate pod, otherwise unknown in § *Pectinati.*

ERIOGONUM NOTES

BY JOHN THOMAS HOWELL

1. Eriogonum esmeraldense

In 1931 and again in 1932, Jean M. and Mary Ann Linsdale collected a variant of *Eriogonum esmeraldense* Wats. in the Toiyabe Mts. in central Nevada that seems distinct enough to be described and named. Since no recent notes or treatments of this relatively rare species of the Great Basin have given detailed distributional data, I am presenting herewith such information as I have gathered while studying the new variety. For this study I have had the privilege of borrowing specimens from the Dudley Herbarium of Stanford University, the University of California, and the United States National Herbarium.

Key to the varieties of Eriogonum esmeraldense

1. Internodes and peduncles glaucous and smooth, not glandular; petioles pilose, not glandular; flowers 1.75–2.25 mm. long; achene 1.5–2 mm. long ..... var. *esmeraldense*

1. Internodes and peduncles glandular on the lower part; petioles pilose and sometimes glandular; flowers mostly 2.5–3 mm. long; achenes 2.3 mm. long ..... var. *toiyabense*

Eriogonum esmeraldense var. esmeraldense. *E. esmeraldense* Wats., Proc. Amer. Acad. 24: 85 (1889). Occasional in rocky or gravelly soil or in pumice

gravel, on open flats, brushy slopes, or in open, coniferous forests: Mono and Inyo counties, California, east to Mineral, Esmeralda, and Nye counties, Nevada, 5700 to 9800 ft.

CALIFORNIA. Pumice sand, south side of Deadman Pass, 7900 ft., Mono Co., *Ripley & Barneby 5830* (CAS); pumice slope, summit between Crestview and Mono Lake, 8000 ft., Mono Co., *Howell 27459* (CAS); pumice slope, near Magee Creek, 6900 ft., Mono Co., *Keck 3884* (DS); head of Long Valley, Mono Co., *K. Brandegee* (UC); trail up Morgan Creek, 8000 ft., Inyo Co., *Ferris & Lorraine 9280* (DS); near Little Round Valley, 7000 ft., Mono Co., *Howell 14348* (CAS); Crooked Creek, 6750 ft., Mono Co., *Howell 14326* (CAS); near summit south of Seep Hole Spring, 9800 ft., Inyo Mts., Inyo Co., *Kerr 3276* (CAS, US); Waucoba Peak, 8400 ft., Inyo Mts., Inyo Co., *Jaeger in 1941* (DS).

NEVADA. Candelaria, "Esmeralda" or Mineral Co., *Shockley 543* (DS, type-collection); Montgomery Pass, 7600 ft., White Mts., Mineral Co., *Ripley & Barneby 3714* (CAS); rock slide, Queen Canyon, 8000 ft., White Mts., Esmeralda Co., *Ferris 6702* (DS); Miller Mt., 7000 ft., Esmeralda Co., *Shockley 581* (DS, UC); Quinn Canyon Range, Nye Co., *Maguire & Holmgren 25599* (UC); mouth of Pine Creek Canyon, Toquima Range, Nye Co., *Maguire & Holmgren 25780* (CAS, DS, UC, US). In the last-cited collection there are a few glands on the lower internodes but the glands are sparser or lacking in the upper part of the plant and on the peduncles. In this character of vestiture the specimens are intermediate between var. *esmeraldense* and var. *toiyabense*. The Toquima Range where this collection was made is separated from the Toiyabe Mts. by Smoky Valley.

Eriogonum esmeraldense var. **toiyabense** J. T. Howell, var. nov. A var. *esmeraldensi* differt: internodis et pedunculis glanduliferis, petiolis interdum glanduloso-pilosis; floribus plerumque 2.5–3 mm. longis; acheniis 2.3 mm. longis.

Type: Herb. Calif. Acad. Sci. No. 363,401, Mahogany Canyon, 9000 ft., Toiyabe Mts., Lander Co., *J. M. & M. A. Linsdale 550,* June 30, 1931. Only one other collection has been seen: *Linsdale & Linsdale 793,* from Ophir Canyon, 8000 ft., Toiyabe Mts., Nye Co., June 4, 1932.

2. ERIOGONUM RUBRICAULE

Since it was not clear from the original description just how *Eriogonum rubricaule* Tidestr. differed from *E. esmeraldense* var. *toiyabense,* the type of the former was borrowed from the United States National Herbarium: near Lahontan, Churchill Co., Nevada, *F. B. Headley in 1916*. From a study of that specimen the distinctness of the two species was quite evident, but incidentally it was found that *E. laetum* Stokes is exactly referable to *E. rubricaule*. That species was based on a collection made by Mrs. L. E. George in 1901 near Humboldt, Nevada (type, CAS). At the same time *E. laetum* was described, *E. rubricaule* was reduced to varietal status under *E. trichopes* Torr.

Hence it would appear that the following synonymy is pertinent:

ERIOGONUM RUBRICAULE Tidestr., Proc. Biol. Soc. Wash. 36: 181 (1923). *E. trichopes* var. *rubricaule* (Tidestr.) Stokes, Gen. Eriogonum 25 (1936). *E. laetum* Stokes, ibid., 23.

Both *E. esmeraldense* and *E. rubricaule* differ from *E. trichopes* in their glabrous perianths; *E. rubricaule* differs from *E. esmeraldense* in its more glandular leaves, ascending peduncles, ciliate cauline bracts, much larger campanulate and frequently ciliate involucres, and differently shaped yellowish perianths. Since *E. rubricaule* appears to be a very rare and little-collected plant, the citation of the following collections will add to its known distribution: dry desert foothill slopes and gravel washes, Dan Tucker Mine wash, between Eastgate and Frenchman's Station, 5000 ft., Churchill Co., *Train 180* (US); alkaline clay hills west of Eastgate, 4600 ft., Churchill Co., *Ripley & Barneby 5936* (CAS); alkaline clay bluffs, Reese River Valley 32 miles north of Austin, 5300 ft., Lander Co., *Ripley & Barneby 6186* (CAS).

3. ERIOGONUM AMPULLACEUM

With the building of the Owens River dam and the resultant flooding of Long Valley, Mono Co., by the reservoir known as Lake Crowley, the only stations where *Eriogonum ampullaceum* J. T. Howell had been found were flooded and it was feared that the species might have been completely annihilated. In July, 1950, however, Lewis S. Rose and I found this distinctive plant in a new area about 60 miles to the north near Bridgeport, Mono Co. At this station it grew in gravelly soil on a slope dominated by *Artemisia tridentata* Nutt. Although *E. ampullaceum* is obviously related to *E. mohavense* Wats., I regard it as an excellent species and not merely a subspecies as did Miss Stokes (Genus Eriogonum, p. 33). The following Herb. Calif. Acad. Sci. collections, all from Mono Co., California, are the only records I know of the species:

Dry hill slopes about Whiskey Creek, Owens River at 6700 ft., July 29, 1933, *Peirson 10740* (type); Long Valley, Hot Creek region, 6900 ft., Aug. 1, 1937, *Peirson 12155;* alkali flats of Long Valley near the Owens River east of Whitmore Tub Springs, Aug. 8, 1938, *Howell 14385;* sagebrush slopes, 2.5 miles north of Bridgeport, 6450 ft., July 27, 1950, *Howell 27405*. The two last-cited collections have been widely distributed by both Mr. Rose and me.

HALOGETON IN CALIFORNIA. Since 1937, *Halogeton glomeratus* (M. Bieb.) C. A. Mey. has been known from Nevada (cf. Field Mus., bot. ser., 17: 240, as *H. sativus;* Leafl. West. Bot. 3: 44; Torreya 41: 164), but it was 1948 before I examined specimens from northeastern California. The specimens came from Herlong in eastern Lassen County, and were collected in flower on Aug. 17 *(Pryor,* Calif. Acad. Sci.) and in fruit on Nov. 9 *(Fix,* Calif. Acad. Sci.).

In the California flora this plant is most closely related to the Russian thistle, *Salsola Kali* var. *tenuifolia,* and has, like it, the wing-like appendages on the fruiting perianth-segments. The two plants do not look alike, however, and may be readily distinguished by foliage, flower, and fruit. The gray fleshy, oblong or ovatish leaves in *Halogeton* are bristle-tipped or muticous, while the linear leaves of the *Salsola* are attenuate into a pungent tip or spine; there are 5 (or 4) stamens in the *Salsola,* but only 2 (or 3?) in the *Halogeton;* and, in *Halogeton* the seed is erect, while in *Salsola* it is horizontal.

Halogeton glomeratus is indigenous in the Old World from the Caspian Sea eastward to central Asia. An inhabitant of saline plains, it will probably become extensively naturalized in western United States where widespread areas so closely resemble its native habitat.—John Thomas Howell.

CARICES ADVENTIVE IN CALIFORNIA. Two related species of *Carex* that are native and widespread in the eastern and southern United States have recently come to my attention as weeds in southern California. They are *C. Leavenworthii* Dewey and *C. texensis* (Torr.) Bailey. Both have been found as garden or lawn weeds in Arcadia, Los Angeles Co., while the latter has also been found in Hollywood. An immature *Carex* which I found in the lawn at the Berkeley Tennis Club, Alameda Co., is probably a second collection of *C. Leavenworthii.*

Adventive or naturalized carices are rarely detected in California, the only other one known to me being *C. cephalophora* Muhl. which is introduced in Pasadena from the eastern United States according to Stacey (Leafl. West. Bot. 1: 142). It is interesting that the three species noted here belong to section *Bracteosae.*—John Thomas Howell.

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LEAFLETS *of* WESTERN BOTANY

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JOHN THOMAS HOWELL

THE GENUS PSEUDOTSUGA (DOUGLAS-FIR) IN NORTH AMERICA

BY ELBERT L. LITTLE, JR.

In North America the genus *Pseudotsuga* contains two species, which are summarized here. Douglas-fir [*P. taxifolia* (Poir.) Britton], composed of two geographical varieties, is the most important timber tree of the United States. In the following notes, chiefly nomenclatorial, the recently made combination *P. Menziesii* (Mirb.) Franco is rejected, the Rocky Mountain variety is accepted as *P. taxifolia* var. *glauca* (Beissn.) Sudw., and names by Flous and Roezl are discussed and cited in synonymy.

Pseudotsuga Carr. (Traité Gén. Conif., ed. 2, 256,—1867), Douglas-fir, is a genus of needle-leaf evergreen, pyramidal, resinous trees of *Pinaceae* related to *Tsuga, Picea,* and *Abies.* Leaves spirally arranged or somewhat 2-ranked, linear, flattened, grooved above, with prominent midrib and 2 whitish stomatal bands below, with short petioles; buds conical, acute, glabrous, nonresinous, shiny, reddish-brown; twigs slightly rough, with slightly raised oval leaf scars, broader than long; cones pendent, narrowly ovoid, acute, composed of spirally arranged, rounded, concave, rigid, persistent scales bearing 2-winged seeds and subtended by distinctive, exserted 3-lobed bracts, the middle lobe longest and awnlike. About 5 species, 2 in western North America and the others in Japan, Formosa, and China. Type-species: *P. taxifolia* (Poir.) Britton.

Most American botanists and foresters recognize a single species of Douglas-fir in western North America and a related species, bigcone-spruce [*P. macrocarpa* (Vasey) Mayr], in southern California. Both Sargent (Man. Trees No. Amer., ed. 2, 48, fig. 50,—1922) and Sudworth (Check List Forest Trees U. S. U. S. Dept. Agr. Misc. Cir. 92, 28,—1927) accepted *P. taxifolia* without named geographical varieties. However, Van Dersal (Native Woody Plants U. S. U. S. Dept. Agr. Misc. Pub. 303, 208,—1938) distinguished *P. taxifolia,* Oregon Douglas-fir, and *P. glauca* Mayr, Colorado Douglas-fir, and enumerated 14 differences between the two. Rehder (Man. Cult. Trees Shrubs, ed. 2, 18–19,—1940; Bibliog. Cult. Trees Shrubs 15–16,—1949) listed two geographical varieties, *P. taxifolia* var. *viridis* (Schwerin) Schneid.

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as the typical coast variety and var. *glauca* [Beissn.] Schneid. in the Rocky Mountains. The Canada Dominion Forest Service (Native Trees Canada, ed. 4, 56–61, illus.,—1949) accepted var. *glauca* and published maps and photographs of the two variations.

Europeans have long distinguished two species of Douglas-fir based upon plantations. In their generic monograph, Augustine Henry and Margaret G. Flood (The Douglas firs: a botanical and silvicultural description of the various species of Pseudotsuga. Roy. Irish Acad. Proc. 35 (B): 67–92, illus.,—1920) maintained *P. Douglasii* Carr. for the Pacific Coast variation, var. *caesia* Schwerin for the northern Rocky Mountain variation, and a second species, *P. glauca* Mayr, in the Rocky Mountains from Colorado to Mexico. Fitschen (in Beissner, Handb. Nadelh., ed. 3, 88–89,—1930) listed numerous horticultural varieties or forms.

PSEUDOTSUGA TAXIFOLIA (Poir.) Britton. Douglas-fir
PSEUDOTSUGA TAXIFOLIA var. TAXIFOLIA. Coast Douglas-fir (Oregon Douglas-fir)

Pinus taxifolia Lamb., Descr. Genus Pinus 1: [51], pl. 33 (1803). Non *P. taxifolia* Salisb., Prodr. 399 (1796).

Abies taxifolia [(Lamb.)] Poir. in Lam., Encycl. Méth. Bot. 6: 523 (1804, after Jan. 11). Non *Abies taxifolia* Mus. ex Du Tour, Nouv. Dict. Hist. Nat. 20: 114 (1803); *nom. illegit.* Non *Abies taxifolia* Desf., Tabl. École Bot. Mus. Hist. Nat. 206 (1804). Non *Abies taxifolia* Raf., New Fl. No. Amer. 1: 38 (1836).

Abies Menziesii Mirb., Paris Mus. Hist. Nat. Mém. 13: 63, 70 (1825); *"Menziezii."*

Pseudotsuga taxifolia (Lamb.) Britton, N. Y. Acad. Sci. Trans. 8: 74 (1889).

Pseudotsuga taxifolia (Poir.) Britton ex Sudw., U. S. Dept. Agr. Div. Forestry Bul. 14: 46 (1897).

Pseudotsuga Douglasii [var.] *viridis* Schwerin, Deut. Dendrol. Gesell. Mitt. 16: 257 (1907) [1908].

Pseudotsuga taxifolia A. *viridis* Ascherson & Graebner, Syn. Mitteleur. Fl., ed. 2, 1: 287 (1913).

Pseudotsuga vancouverensis Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 340, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 12, t. (1934).

Pseudotsuga Menziesii (Mirb.) Franco, Soc. Broteriana (Coimbra) Bol., sér. 2, 24: 74 (1950).

Pseudotsuga Menziesii var. *viridis* (Schwerin) Franco, Soc. Broteriana (Coimbra) Bol., sér. 2, 24: 77 (1950).

PSEUDOTSUGA TAXIFOLIA (Poir.) Britton. Douglas-fir. Large forest tree 20–70 m. or more (rarely to 100 m.) in height, with narrow pyramidal crown of crowded horizontal to drooping lateral branches; leaves 1.5–3.5 cm. long,

straight, usually rounded and obtuse at apex but sometimes pointed, dark yellow-green or blue-green; cones 4.5–9 cm. long, reddish-brown, with conspicuously exserted 3-lobed bracts. A variable species, one of the most widely distributed in western North America, from central British Columbia (lat. 55°) southward through Pacific Coast and Rocky Mountain regions and Mexican mountains to Hidalgo and Puebla in central Mexico (lat. 19° 15'), separated into two geographical varieties. First in total stand and lumber production among the native tree species of the United States.

Pseudotsuga Menziesii, a Synonym

Pseudotsuga taxifolia (Poir.) Britton can be maintained as the correct name of Douglas-fir, and the recently made combination *P. Menziesii* (Mirb.) Franco becomes a synonym, as discussed below. This species is still known in Europe as *P. Douglasii* (Sabine) Carr. and formerly was known also as *P. mucronata* (Raf.) Sudw. Additional synonyms have been cited by Sprague and Green (Kew Roy. Bot. Gard. Bul. Misc. Inform. 1938: 79–80,—1938), Little (Amer. Jour. Bot. 31: 594–595,—1944), and Rehder (Bibliog. Cult. Trees Shrubs 15,—1949).

In a recent article, João do Amaral Franco (Cedrus libanensis et Pseudotsuga Menziesii. Soc. Broteriana (Coimbra) Bol. sér. 2, 24: 73–76,—1950) has called attention to two overlooked names not in Index Kewensis: *Abies taxifolia* Mus. ex De Tour (1803) and *Abies Menziezii* Mirb. (1825). He regarded the former as an earlier homonym of *Abies taxifolia* Poir. (1804), the basonym of *Pseudotsuga taxifolia* (Poir.) Britton, and discovered that *Abies Menziezii* Mirb. was the next oldest name for this species. Thus, he made the new combination with corrected spelling, *Pseudotsuga Menziesii* (Mirb.) Franco, and transferred as additional new combinations three varieties and three forms. At the suggestion of John Thomas Howell, who first brought this article to my attention, I have made a further check of the nomenclature.

The binomial *Abies taxifolia* Mus. ex Du Tour appeared in a French encyclopedia under an article "Sapin" signed "(D)," identifiable from the list of authors at the front of the volume as Du Tour. The first species was listed as "SAPIN COMMUN, SAPIN ARGENTÉ, SAPIN BLANC, SAPIN A FEUILLES D'IF, *Pinus picea* Linn.; *Abies alba* Mill.; *Abies taxifolia* Mus.," followed by two paragraphs of French description, part of which was quoted by Franco. As Franco noted, Du Tour accepted *Abies* as a segregate from *Pinus* and listed *Abies* before *Pinus* at the head of the article. According to Franco, the author abbre-

ciation "Mus." referred to the Paris Muséum d'Histoire Naturelle. This species is now known as *Abies alba* Mill., though if retained in *Pinus* would be called *Pinus Picea* L., as Du Tour indicated.

Fortunately, *Abies taxifolia* Mus., third in a list following the two legitimate names for the species under *Pinus* and *Abies,* can be rejected as not validly published, either as "merely cited as a synonym" (Art. 40) or "not accepted by the author who published it" (Art. 37 bis). There is nothing in the text or typography to indicate that Du Tour was rejecting *Abies alba* Mill. and publishing *A. taxifolia* as a new, substitute name. A name "merely mentioned incidentally" (Art. 37 bis), such as a third name listed for a species in an encyclopedia, is not validly published. Citation of "Mus." as author instead of a person is further evidence of an unaccepted or unpublished museum name or horticultural name. On the next page (p. 115) appeared a similar unlisted museum name *Abies pectinata* Mus. (non Gilibert, 1792) after *Abies americana* Mill., a species now known as *Tsuga canadensis* (L.) Carr.

Mirbel (Essai sur la distribution géographique des conifèrs. Paris Mus. Hist. Nat. Mém. 13: 28–76,—1825), while summarizing the geographic distribution of all conifers then known, validly published *Abies Menziezii* Mirb. in two places as a new name for "taxifolia Lamb. non Desf." (p. 70), believing that "*Abies taxifolia* du Jardin du Roi" had priority (p. 63). Franco (p. 76) has quoted these statements in full. Mirbel cited neither *Abies taxifolia* Poir. nor *Abies taxifolia* Mus. ex Du Tour but credited the latter to Desfontaine. This museum name was validly published as *Abies taxifolia* Desf. in 1804 (also in ed. 2, 1815, and ed. 3, 1829; also Desf., Hist. Arbr. Arbriss. 2: 570,—1809) and independently by Villars (Cat. Méth. Pl. Jard. Strasbourg 378,—1807).

As it is not known which name had priority in 1804, *Abies taxifolia* Poir. or *Abies taxifolia* Desf., the former should be accepted by established custom (Art. 5). Efforts to determine the exact date in 1804 of the sixth volume of Lamarck and Poiret's encyclopedia have been unsuccessful, according to Sherborn and Woodward (Jour. Bot. 44: 318–320,—1906) and Rothmaler (Chron. Bot. 5: 438–440,—1939). It may be inferred from Rothmaler's work that the volume containing *Abies taxifolia* Poir. appeared some time after Jan. 11, 1804, the date established for the preceding volume.

By examining Menzies' type-specimen of *Pinus taxifolia* Lamb. collected on Vancouver Island in 1791, now in the British Museum of Natural History, Franco (p. 77) has clarified the identification. This species was described and illustrated without the cones, which had been lost. Some doubt whether the foliage actually represented Douglas-fir had been expressed by Valckenier Suringar (Leyden Rijks Herbarium Meded. 55: 56–59, pl. 33,—1928).

Cedrus libanensis Juss. ex Mirb., a second overlooked name adopted by Franco (p. 73) from Mirbel, is the correct name for cedar-of-Lebanon, having priority of five years over *Cedrus libani* Loud. The need continues for a rule to prevent further acceptance of abandoned, overlooked names in obscure old publications. Mirbel's two names could not have been taken up under my proposed change in the International Rules to reject as not effectively published a name which neither has been accepted by a second author nor has been listed in an index of scientific names within the first 100 years after publication (Phytologia 3: 87–89,—1949).

Varieties of Douglas-fir

If any varieties of native tree species are to be distinguished, clearly Rocky Mountain (or Colorado or blue) Douglas-fir merits separation from the typical, Pacific Coast (or Oregon) Douglas-fir of the coast. However, for some purposes these two botanical varieties need not be maintained. The silvicultural differences were long ago summarized by E. H. Frothingham (Douglas fir: a study of the Pacific Coast and Rocky Mountain forms. U. S. Dept. Agr. Forest Serv. Cir. 150, 38 p., illus.,—1909; die Douglas-fichte, ihre Küstenform und Gebirgsform. Deut. Dendrol. Gesell. Mitt. 18: 69–95, illus.,—1909), who published the first distribution map of the two varieties and five silvical variations.

Pseudotsuga taxifolia var. taxifolia. Coast Douglas-fir. Large forest tree 20–70 m. or more (rarely to 100 m.) in height; twigs pubescent; leaves thin, dark yellow-green, with odor of pineapple; cones 6–10 cm. long, with straight erect 3-lobed bracts. Pacific Coast region from southwestern British Columbia south through western Washington and western Oregon to central coastal California, east to the Cascade Mountains in Oregon and to the Sierra Nevada in California and Nevada.

Pseudotsuga taxifolia (Poir.) Britton var. *taxifolia* automat-

ically becomes the name of the typical, Pacific Coast Douglas-fir (Art. 28 bis). *Pinus Douglasii* Sabine [ex D. Don in Lamb., Descr. Genus Pinus, ed. 3 (8°), v. 2, unnumbered p. between p. 144 and p. 145, t. [47],—1832], described from Douglas' fruiting specimen from Columbia River, is the same. *Abies mucronata* Raf. and var. *palustris* Raf. (Atl. Jour. 120,—1832), the earliest named variety, briefly described as a smaller swamp form with spreading branches, apparently belong here. Rafinesque's names were based upon Lewis and Clark's published descriptions of plants from near the mouth of Columbia River, and Lewis' specimen of Douglas-fir came from the banks of that stream (Pursh, Fl. Amer. Sept. 2: 640—1814). The second varietal epithet, *Abies Douglasii* var. *taxifolia* Loud. (Arb. Frut. Brit. 4: 2319, fig. 2231, —1838) applied to plants grown from Drummond's seeds from the Northwest, probably refers to the typical variety or would be a homonym of it. *Pinus Douglasii brevibracteata* Antoine (Conif. 85, t. 33, fig. 4,—1840–47), probably also from the Northwest, was a variety with smaller cones and shorter bracts. The much later varietal epithet *viridis* belongs here, as cited above.

PSEUDOTSUGA TAXIFOLIA var. GLAUCA (Beissn.) Sudw., Rocky Mountain Douglas-fir (Colorado Douglas-fir, Blue Douglas-fir)

Abies Douglasii mexicana Hartweg ex Gord. & Glend., Pinetum 16 (1858); *pro syn.* Hartweg ex "Senilis" [J. Nelson], Pinaceae 178 (1866); *pro syn.*

Tsuga Lindleyana Roezl, Cat. Grain. Conif. Mex. 8 (1857), not seen; Roezl ex Otto, Hamburg. Gart. Blumenzeit. 13: 403 (1857); Roezl ex Schlecht., Linnaea 29: 329 (1858).

Pseudotsuga Lindleyana [(Roezl)] Carr., Rev. Hort. [Paris] 40: 152, t. (1868).

Abies Lindleyana (Roezl) A. Murray in Ravenscroft, Pinetum Brit. v. 2 (pt. 32–34), sig. 29: 4, fig. 23, 26–29 (1869); "sub-sp." of *Abies Douglasii* Lindl.

Tsuga Douglasii var. *glauca* Beissn. in Jäger & Beissn., Ziergeh. Gärt. Park., ed. 2, 446 (1884) not seen; seen in ed. 3, 446 (1889).

Pseudotsuga Douglasii [f.] *glauca* Beissn., Syst. Eintheil. Conif. 41 (1887), not seen. Hort ex Beissn., Handb. Nadelh. 419 (1891).

Pseudotsuga Douglasii var. *glauca* Mayr, Wald. Nordamer. 307, t. 6 (1890).

Pseudotsuga taxifolia var. *suberosa* Lemmon, Erythea 1: 48 (1893).

Pseudotsuga taxifolia f. *glauca* Beissn. ex Voss, Vilmorin Blumengärt., ed. 3, 1: 1240 (1896).

Pseudotsuga taxifolia [var.] *glauca* (Beissn.) Sudw., U. S. Dept. Agr. Forestry Bul. 14: 48 (1897).

Pseudotsuga glauca Mayr, Deut. Dendrol. Gesell. Mitt. 1901: 57 (1901), not seen; seen in ed. 2, 10: 319 (1910).

Pseudotsuga Douglasii [var.] *caesia* Schwerin, Deut. Dendrol. Gesell. Mitt. 16: 257 (1907) [1908].

Pseudotsuga taxifolia B. *caesia* (Schwerin) Ascherson & Graebner, Syn. Mitteleur. Fl., ed. 2, 1: 287 (1913).

Pseudotsuga taxifolia f. *caesia* (Schwerin) Schwerin, Deut. Dendrol. Gesell. Mitt. 32: 62 (1922).

Pseudotsuga taxifolia subsp. *glauca* (Mayr) Schwerin, Deut. Dendrol. Gesell. Mitt. 33: 91 (1923).

Pseudotsuga glauca var. *caesia* (Schwerin) Fitschen in Beissner, Handb. Nadelh. ed. 3, 93 (1930).

Pseudotsuga Guinieri Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 211, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 2: 1, t. (1934).

Pseudotsuga macrolepis Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 219, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 2: 9, t. (1934).

Pseudotsuga Flahaulti Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 332, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 4, t. (1934).

Pseudotsuga globulosa Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 334, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 6, t. (1934).

Pseudotsuga Guinieri var. *parvistrobus* Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 342 (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 14 (1934).

Pseudotsuga Guinieri var. *mediostrobus* Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 342, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 14, t. (1934).

Pseudotsuga Merrillii Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 366, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 8, t. (1934).

Pseudotsuga Rehderi Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 388, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 10, t. (1934).

Pseudotsuga caesia (Schwerin) Flous, Soc. d'Hist. Nat. Toulouse Bul. 71: 74, t. (1937); Lab. Forest. Toulouse Trav. tome 2, v. 4, art. 2: 42, t. (1936).

Pseudotsuga Menziesii var. *caesia* (Schwerin) Franco, Soc. Broteriana (Coimbra) Bol., sér. 2, 24: 77 (1950).

Pseudotsuga Menziesii var. *glauca* (Mayr) Franco, Soc. Broteriana (Coimbra) Bol., sér. 2, 24: 77 (1950).

PSEUDOTSUGA TAXIFOLIA var. GLAUCA (Beissn.) Sudw. Rocky Mountain Douglas-fir. Large forest tree 20–40 m. or more in height; twigs pubescent or glabrous; leaves blue-green, thickened, with odor of turpentine; cones 4–7 cm. long with erect or reflexed 3-lobed bracts. Rocky Mountain region from southwestern Alberta and central British Columbia south in Montana, Idaho, eastern Washington, eastern Oregon, eastern Nevada, Utah, Wyoming, Colorado, Arizona, New Mexico, and southwestern Texas and south in mountains of northern and central Mexico (Sonora, Chihuahua, Durango, Zacatecas, Coahuila, Nuevo León, Hidalgo, and Puebla).

Apparently *glauca* is the oldest varietal epithet for Rocky Mountain Douglas-fir. Var. *glauca* was published by Beissner for a cultivated variation with blue-green foliage and was shown by Mayr to be a geographical variation in Colorado, New Mexico, and Arizona. Additional synonymy was given by Rehder (Bibliog. Cult. Trees Shrubs 15–16,—1949), who accepted this

variety as *P. taxifolia* var. *glauca* [Beissn.] Schneid. (in Silva Tarouca, Uns. Freil. Nadelh. 269, fig. 276b, 277,—1913). Rehder's explanation is found in a footnote (Arnold Arboretum Jour. 20: 282,—1939): "Miss Flous' species [*Pseudotsuga Flahaultii* Flous] is apparently only a slight form of the Rocky Mountain Douglas fir, *P. taxifolia* var. *glauca* (Beiss.) Schneid., considered a distinct species by Mayr and by Flous, a subspecies by Schwerin, a forma by Voss and published as a straight trinomial by Sudworth." However, Sudworth should be credited as author of this varietal combination as he listed it as *"Pseudotsuga taxifolia glauca* (Beissn.), nom. nov." with synonymy as one of several variations under the heading, "VARIETIES DISTINGUISHED IN CULTIVATION." Schneider in the above reference was not making a new combination and cited no earlier authors.

One of the first collections of the inland Douglas-fir was made in 1838 by Hartweg *(No. 439,* also type-collection of *P. macrolepis* Flous) at Moran near Pachuca, Hidalgo, Mexico. Bentham (Pl. Hartweg. 57,—1840) in determining this as *Abies Douglasii* remarked that he saw no difference between this and Douglas' specimen. Hartweg's varietal name *mexicana* was published in synonymy. In 1857 Roezl introduced seeds from the same area to Europe under the new name *Tsuga Lindleyana,* as discussed below.

Nuttall (No. Amer. Sylva 3: 129–131, t. 115,—1849) knew this variation, since he described and illustrated the cone bracts of *Abies Douglasii* as reflexed and included Rocky Mountain localities in the distribution. United States exploring expeditions in the West, beginning with Frémont in 1844, collected the Rocky Mountain variation but did not recognize it as distinct. According to Sargent (Silva No. Amer. 12: 91,—1898), in 1863 C. C. Parry sent seeds from Colorado to Harvard College. In 1872 Roezl introduced quantities of seeds from Colorado to Europe, according to André (Rev. Hort. [Paris] 57: 485,—1885).

Andrew Murray (Abies Douglasii. *In* Ravenscroft, Pinetum Brit. v. 2 (pt. 32–34), sig. 29, 28 pp., illus.,—1869–74) was the first to recognize the two broad geographical variations of Douglas-fir, one on the Pacific Coast as *Abies Douglasii* and the other in the Rocky Mountains and Mexico as "sub-sp." *Abies Lindleyana* based on Roezl's name *"Abies lindleyana."* His lengthy account with a table and illustrations showing the differences has seldom been cited by later workers.

Another early varietal name, *Pseudotsuga taxifolia* var. *suberosa* Lemmon, applied to a variation with thick corky bark first detected in 1884 on San Francisco Mt., northern Arizona. Lemmon's specimen of cut pieces of thick bark from that locality, perhaps an isotype, has been examined (U. S. Nat. Herb.).

Varietal characteristics are not evident in some herbarium specimens, especially when the natural color of the foliage is lost. Besides differences noted under the descriptions, the Rocky Mountain variety generally has smaller cones and often shorter needles. Doubtful specimens can be placed according to locality. Those from California and western parts of British Columbia, Washington, Oregon, and Nevada may be referred to the Pacific Coast variety, while all others, including those from eastern parts of British Columbia, Washington, Oregon, and Nevada, to the Rocky Mountain variety.

Sometimes sterile specimens of *Pseudotsuga* and *Abies* are confused in herbaria. Needles of *Pseudotsuga* are definitely narrowed into short petioles at the base, are not emarginate (except in Asiatic species), have stomata only on the lower surface, and have a single vascular bundle. Also, the leaf scars in *Pseudotsuga* are oval, broader than long, and slightly raised forming slightly rough twigs, while leaf scars in *Abies* are round and level on smoothish twigs.

Though *Pseudotsuga* is closely related to *Picea* and *Tsuga*, genera also with pendent cones having persistent scales, specimens are easily distinguished. Specimens of *Picea* and *Tsuga* shed their needles upon drying, leaving the twigs rough with peg-like stalks called sterigmata. In *Pseudotsuga* the old twigs are only slightly roughened.

PSEUDOTSUGA MACROCARPA (Vasey) Mayr. Bigcone-spruce

Abies Douglasii var. *macrocarpa* Torr. in Ives, Rept. Colo. R. pt. 4: 28 (1860); *nom. nud.*

Abies macrocarpa Vasey, Gard. Monthly and Hort. 18: 21 (Jan., 1876).

Abies Douglasii var. *macrocarpa* Torr. ex Vasey, Cat. Forest Trees U. S. 33 (1876); U. S. Comm. Agr. Rpt. 1875: 181 (1876).

Tsuga macrocarpa Torr. ex Lemmon, Pacif. Rural Press 17: 75 (Feb. 1, 1879).

Tsuga Douglasii var. *macrocarpa* Vasey ex Lemmon, Pacif. Rural Press 17: 75 (Feb. 1, 1879).

Pseudotsuga Douglasii var. *macrocarpa* (Vasey) Engelm. in S. Wats., Bot. Calif. 2: 120 (1879).

Pseudotsuga macrocarpa [(Vasey)] Mayr, Wald. Nordamer. 278, t. 6, 8, 9 (1890).

Pseudotsuga macrocarpa Lemmon, Calif. Board Forestry Bienn. Rpt. 3: 134, t. 12 (1890?, after Nov. 10).

Pseudotsuga californica Flous, Soc. d'Hist. Nat. Toulouse Bul. 66: 330, t. (1934); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6: 2, t. (1934).

PSEUDOTSUGA MACROCARPA (Vasey) Mayr. Bigcone-spruce. Medium-sized forest tree 10–20 m. or more in height, with open, broad, pyramidal crown of large, very long, spreading, horizontal or slightly drooping lower branches; leaves 1.5–3 cm. long, slightly curved, rigid, pointed, bluish-gray; cones 11–17 cm. long, reddish to dark brown, with rigid scales and slightly exserted, straight, 3-lobed bracts. Mountains of southern California.

The irregular nomenclatorial history of this distinct species is summarized above. Torrey's varietal name was *nomen nudum,* apparently validly published by Vasey with a brief description. However, as Vasey's publication of the new species *Abies macrocarpa* probably appeared earlier in 1876 than that of the variety, Vasey should be cited as original author. Mayr's publication of the combination *Pseudotsuga macrocarpa* appeared before Lemmon's, as Sudworth (U. S. Dept. Agr. Div. Forestry Bul. 14: 49,—1897) indicated. The report containing Lemmon's binomial quoted from letters dated as late as Nov. 5 and 10, 1890 (pp. 51, 61). Mayr did not cite Vasey or Torrey but mentioned Engelmann's varietal name, through which this combination may be traced irregularly back to Vasey.

I have examined the type collected by J. S. Newberry with the Ives Colorado Expedition in mountains near San Felipe, Nov. 16–17, 1857, and consisting of a sterile branch and a detached cone 15 cm. long (U. S. Nat. Herb.). The first collection of this species was made in 1850 by C. C. Parry on mountains east of San Diego, California, but was identified as *Abies Douglasii* Lindl. by Torrey (U. S. Mex. Bound. Surv. Bot. 21, 210,—1859).

Bigcone-spruce is endemic to southern California. The report from San Pedro Martir Mountains, Lower California, Mexico, by Sudworth (Forest Trees Pacific Slope 105,—1908) was not supported by specimens and apparently resulted from an error in compiling data. Later records from the same locality by Standley (Trees Shrubs Mex. 59,—1920), Munns (U. S. Dept. Agr. Misc. Pub. 287, map 39,—1938), and others probably were based upon that reference. This species is absent from published lists of the conifers of that area by T. S. Brandegee (Zoe 4: 199-210,—1893), Edward A. Goldman (U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium 16: 309–371, illus.,—1916), and Ira L. Wiggins (N. Y. Bot. Gard. Jour. 41: 267–269, illus.,—1940). No specimens

of this species from Mexico are known. Martínez (Mex. Inst. de Biol. An. 20: 146, 181,—1949) found no confirmation of this species from Mexico.

Flous' Names in Pseudotsuga

F. Flous (Révision du genre *Pseudotsuga*. Soc. d'Hist. Nat. Toulouse Bul. 71: 33–164, illus.,—1937; preprinted as Lab. Forest. Toulouse Trav. tome 2, v. 4, art. 2, 132 pp., illus.,—1936) accepted for western North America 12 species and 1 variety of *Pseudotsuga*. Botanists and foresters in the United States have not taken this interpretation seriously. However, Martínez (Mex. Inst. de Biol. An. 20: 129–184, illus.,—1949) followed her in accepting 4 species and 1 variety for Mexico. All of Flous' segregates have been placed in the lists of synonyms in this article, and most were cited as synonyms by Rehder (Bibl. Cult. Trees Shrubs 15–16,—1949). An evaluation of these names follows.

Earlier, Flous and Gaussen (Soc. d'Hist. Nat. Toulouse Bul. 64: 483–492,—1932 (not seen); Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 20, 10 pp., illus.,—1932) accepted 2 species of Douglas-fir, *P. Douglasii* and *P. glauca*. In 1934 Flous published an article containing 2 new American species of *Pseudotsuga* (Soc. d'Hist. Nat. Toulouse Bul. 66: 211–224, illus.,—1934; Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 2, 14 pp., illus.,—1934) and another with 6 new species, 1 new variety, keys, and a distribution map based upon the 125 specimens studied (Soc. d'Hist. Nat. Toulouse Bul. 66: 329–346, illus.,—1934; Lab. Forest. Toulouse Trav. tome 1, v. 2, art. 6, 18 pp., illus.,—1934).

It seemed curious indeed to her (*op. cit.*, p. 329; p. 1) that only 1 species of *Pseudotsuga* was admitted for western North America, while the related genus *Abies* had 11 species and *Picea* 4 species in the same territory. Introduced into Europe, this so-called species presented different biological types distinguished by foresters and horticulturists. Then after segregating 8 new species and 1 variety, she noted that, as she had naturally supposed, *Pseudotsuga* did have nearly as many species as *Abies* in that region!

This long monograph contained detailed anatomical descriptions well illustrated by drawings. Apparently the only herbaria in the United States from which specimens were cited were those at New York Botanical Garden and Arnold Arboretum, while

larger collections in western herbaria were not consulted. Cultivated trees in arboreta were examined, but no field work was done in the United States. In the introduction to her monograph *(op. cit.,* p. 33; p. 1), Flous explained that anatomical study had revealed the existence of a large number of species with geographic distribution well individualized. Two keys were presented (pp. 161–164; pp. 129–132), one based on morphological characters, such are variations in cone bracts, arrangement of leaves, and pubescence of twigs, and the other on anatomical characters of leaves and twigs.

The first objection to Flous' work is that anatomical characters have limited application in the classification of trees. Specific differences in these large plants must be based primarily upon characters of gross morphology, chiefly of the reproductive organs, which can be preserved in herbarium specimens and be readily observed. Other criteria, such as microscopic leaf and wood anatomy, chromosome numbers, chemical composition, hardiness, disease resistance, etc., though often important in phylogeny, identification of incomplete specimens, and economic aspects, are of secondary value and of minor importance in classification unless correlated with macroscopic characters. Though most species of *Pinus* can be identified by microscopic examination of the needles, it does not follow that less distinct variations in leaf anatomy in *Pseudotsuga* demonstrate different species. Tree populations differing only in internal characteristics would remain within the same species on the basis of external gross morphology.

Obviously, the macroscopic characters used by Flous to distinguish segregates in *Pseudotsuga* are minor, inconspicuous, or inconstant. Otherwise they could not have escaped notice of numerous resident botanists and foresters who have observed the vast forests of these trees in western United States during the past century. Surely these persons who have made field studies of wild trees over large areas are qualified to detect specific variations in *Pseudotsuga.*

One serious objection to Flous' segregates is that for the most part they are not geographically separate or individualized but have overlapping ranges. In her map *(op. cit.,* p. 345; p. 17), Flous showed 3 species of *Pseudotsuga* with overlapping ranges in Colorado, 4 in Utah, 5 in New Mexico, and 6 in Arizona (plus a seventh, *P. macrocarpa,* from Arizona in a note on the follow-

ing page). Later Kearney and Peebles (Ferns Fl. Pl. Ariz. 65,—1942; Ariz. Fl. 55–56,—1951) accepted only one species, *P. taxifolia,* for Arizona, as did I (Southwest. Trees. U. S. Dept. Agr. Handb. 9: 18–19, illus.,—1950) for New Mexico and Arizona. She indicated 4 or 5 species of *Pseudotsuga* from Mexico, which Martínez accepted. However, the latter's map (Mex. Inst. de Biol. An. 20: 146, fig. 20,—1949) showed 2 to 4 species occurring together at most localities, a peculiar distribution.

I have examined in the U. S. National Herbarium of the United States National Museum duplicates of specimens cited by Flous, including isotypes and topotypes, as well as her types at the New York Botanical Garden, and fail to find differences meriting specific segregation.

Three of Flous' segregate specific names probably are nomenclaturally superfluous, apparently including the types of older species. *Pseudotsuga vancouverensis* Flous is a synonym of the typical variety of *P. taxifolia,* as the types of both came from Vancouver Island. As noted by Martínez (Mex. Inst. de Biol. An. 20: 146–150,—1949) and confirmed below, *P. Lindleyana* (Roezl) Carr. is an older name for *P. macrolepis* Flous, since the types of both came from near Pachuca, Hidalgo. For *P. macrocarpa* (Vasey) Mayr she cited only cultivated specimens, referring all 8 specimens of that species from southern California to her new species *P. californica,* though she saw only a fragment of a cone among these (Soc. d'Hist. Nat. Toulouse Bul. 71: 47,—1937; Lab. Forest. Toulouse Trav. tome 2, v. 4, art. 2: 15,—1936). As cited above, the seven remaining species segregated by Flous are here regarded as synonyms of Rocky Mountain Douglas-fir, *P. taxifolia* var. *glauca* (listed by Flous as *P. glauca).*

That the large number of species cannot be maintained in *Pseudotsuga* is confirmed by examination of Flous' lists of specimens studied. The 125 North American specimens examined were cited in full with various errors in spelling of collectors and localities, apparently a result of transcribing and typesetting in a foreign language. (Thus, "E. MARCUS, A.-M. JONES" were listed as collectors.) Five of the 8 new species from North America were based upon fewer than 10 specimens each, and *P. vancouverensis* upon only 3 sheets.

In several instances specimens from one locality were cited under 2 or 3 species. For example, collections from Cloudcroft (variously misspelled), New Mexico, were divided among these

3 species: *P. Flahaulti, P. Guinieri, P. Guinieri mediostrobus,* and *P. Rehderi.* Specimens from San Francisco Mt., Arizona, were listed under 3 species: *P. Flahaulti, P. globulosa,* and *P. Guinieri mediostrobus.*

In 3 cases duplicate specimens bearing the same collector's number but borrowed from different herbaria were cited by the monographer under different "species"! *J. A. Moore & J. A. Steyermark 3471* from Guadalupe Mts., Culberson Co., Texas, was listed under both *P. Flahaulti* and *P. Guinieri mediostrobus. C. H. Mueller 7950* from Chisos Mts., Texas, appeared under *P. Flahaulti* and also by number without collector's name under *P. macrolepis. J. H. Sandberg & J. B. Leiberg 643,* Lake Wenatchee, Washington, was cited under *P. Douglasii,* while another specimen under *P. caesia* had the same number and other data without collectors' names.

Roezl's Names Referred to Pseudotsuga

A few names given to conifers of central Mexico by Roezl in 1857 and 1858 should be identified in a search for the oldest varietal and specific names for the Rocky Mountain or inland Douglas-fir. Benedict Roezl (1824–1885), a noted Czech plant collector and horticulturist, introduced to European gardens tons of tropical American plants, especially orchids and bulbs, and quantities of seeds during about 16 years of strenuous and hazardous field work from Mexico south to Peru and Bolivia. Interesting biographical notes have appeared in horticultural and botanical journals (Gard. Chron., new ser., 2: 73, portr.,—1874; Belg. Hort. 1880: 5–12, portr.,—1880; Rev. Hort. [Paris] 57: 485, 543–547,—1885; Gartenflora 34: 330–331,—1885; Bot. Gaz. 44: 414,—1907; etc.). The son of a gardener, he began his horticultural career in his thirteenth year as an apprentice in gardens in Bohemia. After working on estates in different European countries, he became associated with the Belgian Government horticultural school. In 1854 he went to Mexico and founded a nursery for introducing European fruit trees while sending back tropical plants. He collected seeds in western United States in 1870 and 1872. At Denver in 1872 a hotel bookkeeper ran away with his savings of $2,000, in one of seventeen times all his possessions were stolen. (He never carried a gun and earlier had lost his left arm.) Not discouraged, he obtained in Colorado seeds of wild flowers and other plants including a

rich collection of Douglas-fir cones which served to introduce the inland variant to Europe. Then from California he introduced to Europe the popular ornamental palm, California Washingtonia [*Washingtonia filifera* (Linden) H. Wendl.].

Roezl wrote little, leaving the naming of his novelties to others. His 34-page commercial "Catalogue des Graines de Conifères Mexicains," by B. Roezl & Cie. (not seen), published in Mexico City in 1857, contained brief descriptions of 82 new species of *Pinus,* 1 of *Juniperus,* and *Tsuga Lindleyana* Roezl. Otto (Hamburg. Gart. Blumenzeit. 13: 401–410,—1857) promptly published German translations of these. In another catalog Roezl (Cat. Grain. Conif. Mex. 1858–59: 5,—1858; not seen) published *Abies glaucescens* and *A. tlapalcatuda* from Monte de Las Cruces near Mexico City and several more new pines. Schlechtendal (Linnaea 29: 326–356, 399–404,—1858) translated descriptions from both catalogs into Latin, expressing doubt that there were so many species.

If transferred to *Pseudotsuga,* Roezl's epithets must be retained for his specimens (Art. 54). Many of these specimens may have been neglected or lost, according to Shaw (Pines Mexico 3, table,—1909), who showed that Roezl's 82 species of *Pinus* published in a commercial seed catalog belonged to 6 or 7 previously named species, based upon independent interpretations of authentic material by three contemporaneous monographers of conifers, Gordon, Carrière, and Parlatore.

These three monographers all agreed that *Tsuga Lindleyana* Roezl represented a variation of Douglas-fir and all united Roezl's new names in *Abies* under one species or variety of *Abies.* Gordon and Glendinning (Pinetum 149,—1858; Sup. Gord. Pinetum 47,—1862) combined the two species of *Abies* listed above, *A. glauca* Roezl "in Gard. Chron.," and *A. hirtella* Roezl all under *Picea glaucescens* (Roezl) Gord., using *Picea* in the modern sense of *Abies.* They placed *Tsuga Lindleyana* under *Abies Douglasii taxifolia* Loud. (Pinetum 16,—1858). Parlatore (Coniferae. *In* DC., Prodr. 16 (2): 430, 420,—1868) cited *Tsuga Lindleyana* under *Pinus Douglasii* Sabine and Roezl's species of *Abies* as synonyms of *Pinus religiosa* H. B. K.

Carrière (Traité Gén. Conif., ed. 2, 274,—1867) reduced Roezl's species of *Abies* to a new variety, *Abies religiosa* var. *glaucescens* (Roezl) Carr., but published in synonymy the doubtful combination (?) *Pseudotsuga glaucescens.* From Roezl's de-

scription he placed this variation from the mountains of Las Cruces, Mexico, under *Abies* but noted that plants from seeds sent by Roezl agreed with *Pseudotsuga* though lacking cones. Another new variety *A. religiosa* var. *Lindleyana* Carr. (p. 275) was described there from Roezl's plants based upon *A. Lindleyana* Roezl, a name published in synonymy there. Though he erected the new monotypic genus *Pseudotsuga* Carr. (p. 256) in the same volume, Carrière retained *Tsuga Lindleyana* as a little known species of *Tsuga* (p. 254).

A year later, Carrière (Pseudotsuga Lindleyana. Rev. Hort. [Paris] 40: 152, t.,—1868) published the new combination *Pseudotsuga Lindleyana,* citing *Tsuga Lindleyana* and his quotation of Roezl's description (Carr., Traité Gén. Conif., ed. 2, 254,—1867) though not mentioning Roezl. This emended description confirming the generic position was accompanied by an excellent colored plate showing two cones. He explained that now he had seen branches with cones sent to l'Exposition Universelle by the Rovelle Brothers, Italian horticulturists. He observed that this species was related to *P. Douglasii,* of which it was probably only a form, but mentioned the smaller cones with narrower, serrulate, reflexed bracts. (Evidently plants from Roezl's seeds distributed eleven years earlier had now borne cones.)

Other contemporary specialists confirmed that *Tsuga Lindleyana* represented Douglas-fir. Lindley (Gard. Chron. 1859: 829,—1858), whom the name honored, in an editorial note mentioned this as a Mexican form of Douglas-fir. J. Nelson ("Senilis," Pinaceae 223,—1866) cited *Tsuga Lindleyana* under Douglas-fir. A. Murray (in Ravenscroft, Pinetum Brit. v. 2 (pt. 32–34), sig. 29: 4, fig. 23, 26–29,—1869) reduced Roezl's name *"Abies Lindleyana"* to a subspecies of *Abies Douglasii* Lindl., for the geographical variation in the Rocky Mountains and Mexico.

Bailly (Pseudotsuga glaucescens. Rev. Hort. [Paris] 67: 88–90, t.,—1895) posthumously made the combination *Pseudotsuga glaucescens* (Roezl) Bailly based upon *Abies glaucescens* Roezl. Though leaving the question to be settled by botanists, he stated that if he were qualified to decide he would call this a Mexican variety of Douglas-fir as did Hartweg and would name it *P. Douglasii glaucescens* (p. 89). In an editorial note following discussion of Bailly's article, André (Rev. Hort. [Paris] 67: 159–160,—1895) stated that this was not the old variety *glauca* of

Douglas-fir which turned up spontaneously in seedlings from seeds from northwestern California but admitted that it might be the same as that introduced about 1872 by Roezl from Colorado as *P. Douglasii glauca.*

Sargent (Silva No. Amer. 12: 91,—1898), noting that plants of Douglas-fir from Colorado and mountains of Mexico had a blue and glaucous foliage, regarded *P. glaucescens* Bailly as a form. Elwes and Henry (Trees Great Brit. Ireland 4: 815,—1909) united *Pseudotsuga Lindleyana* Carr., raised from Mexican seeds sent by Roezl, and *P. glaucescens* Bailly under *P. Douglasii* var. *glauca* Beissn., explaining that plants grown in Europe from these Mexican seeds did not seem to differ from the Colorado variety.

In their revision of *Abies,* Viguie and Gaussen (Soc. d'Hist. Nat. Toulouse Bul. 58: 502–503,—1929; Lab. Forest. Toulouse Trav. tome 2, v. 2, art. 1: 324–325,—1929) listed Roezl's species of *Abies* as synonyms of *Abies religiosa* (H.B.K.) Schlecht. & Cham. Franco (Abetos. 260 pp., illus.,—1950) in a recent treatment cited Roezl's catalog but not his names. Roezl's names were placed as doubtful synonyms under *Pseudotsuga* in the revision of that genus by Flous (Soc. d'Hist. Nat. Toulouse Bul. 71: 92,—1937; Lab. Forest. Toulouse Trav. tome 2, v. 4, art. 2: 60,—1936) and by Rehder (Arnold Arboretum Jour. 20: 282–283,—1939). Flous *(op. cit.,* pp. 36, 92,—1937; pp. 4, 60,—1936) was uncertain which of her three later segregates was the same as *Tsuga Lindleyana* Roezl, which possibly was a *Tsuga,* and placed the latter doubtfully and *P. Lindleyana* Carr. probably as synonyms of *P. Flahaulti* Flous.

Through field studies of Mexican conifers, Martínez has helped clarify Roezl's names. In his monograph of the genus *Abies* in Mexico, Martínez (Mex. Inst. de Biol. An. 19: 11–104, illus.,—1948) placed Roezl's species of *Abies* from Monte de Las Cruces under *A. religiosa* (H.B.K.) Schlecht. & Cham. (pp. 49–50). Monte de Las Cruces, where the latter does occur but where *Pseudotsuga* is unknown, is located about 35 kilometers west of Mexico City. I have collected *A. religiosa* near there also.

In monographing *Pseudotsuga* in Mexico, Martínez (Mex. Inst. de Biol. An. 20: 129–184, illus.,—1949) placed *Tsuga Lindleyana* Roezl, collected near Real del Monte, near Pachuca, Hidalgo, as a synonym of *P. macrolepis* Flous because that was the only species of *Pseudotsuga* in that locality (pp. 147–150). He

noted that the genus *Tsuga* does not occur in Mexico but followed Flous in passing over Roezl's briefly described name. In a letter Martínez kindly has informed me that in the State of Hidalgo *Pseudotsuga* and *Abies* grow intermixed but when not bearing cones can be distinguished by the buds, inner bark, and leaf cross section.

Thus, *Pseudotsuga Lindleyana* (Roezl) Carr. is the name for the Rocky Mountain and Mexican Douglas-fir if accepted as a distinct species, replacing *P. glauca* Mayr. Though not mentioning the peculiar cone bracts of *Pseudotsuga,* Roezl in his brief original description of *Tsuga Lindleyana* recorded the cones as persistent after seeds are shed and the leaves as petiolate. Both characters indicate *Pseudotsuga* rather than *Abies.* After eighteen years of horticultural experience in European gardens, surely Roezl was qualified to place his cone-bearing wild trees of *Tsuga* and *Abies* in the proper genera. Likewise, in the absence of Roezl's specimens, it seems best to follow his contemporaries in retaining the early varietal epithets *Abies religiosa* var. *glaucescens* (Roezl) Carr. and var. *Lindleyana* Carr. in *Abies* rather than to transfer either to *Pseudotsuga.*

Forest Service, United States Department
of Agriculture, Washington, D.C.

ERIOGONUM NOTES II: E. POLYPODUM SMALL

BY JOHN THOMAS HOWELL

In the southern Sierra Nevada above middle elevations, broad areas covered with a coarse arkosic sand are a distinctive and characteristic feature in unglaciated parts. This sand commonly occurs on mesas and plateaus, on level valley floors, or on gentle bounding slopes, but occasionally it is also found on steeper slopes where it is freshly derived from disintegrating granitic rocks and crags. Below timberline the slopes and meadow borders in these sandy places are usually forested with an open growth of either *Pinus Balfouriana* or *P. Murrayana,* but since the substratum is so very porous and dry and nearly devoid of humus, very few shrubs and perennial herbs are found beneath the trees. *Castanopsis sempervirens* and *Arctostaphylos patula* are perhaps the commonest shrubs in these woods and among

the herbaceous perennials may be noted *Stipa Elmeri, Allium tribracteatum, Arenaria congesta* var. *suffrutescens, Arabis pygmaea, Potentilla santolinoides, Lupinus oreocharis, Oreonana Clementis,* and *Hulsea vestita.* It is in this specialized subalpine habitat where *Eriogonum polypodum* Small is usually found.

Eriogonum polypodum was based on a collection made by Edward Palmer in the Kern River drainage in 1888. Partly due to a mistaken detail or two in the original description and to Small's subsequent confusion of the plant with *E. marifolium* T. & G., *E. polypodum* has been variously interpreted, but since it belongs to the patently difficult *E. umbellatum* complex it is not surprising that the systematic position of the plant is scarcely fixed even yet.

In the original description in 1898 Small described the filaments and achenes as glabrous, but as Dr. Abrams has noted on the type sheet (annotated, December, 1937) and has later indirectly indicated in his flora, the filaments are densely pilose on the lower half and the ovary is sparsely hairy near the top. In 1899, basing his report on specimens determined by Small, C. H. Merriam reported *E. polypodum* as "the commonest and most widely distributed *Eriogonum* of the higher slopes" of Mt. Shasta. As disclosed by a specimen in Herb. N. Y. Bot. Gard., the Merriam plant is *E. marifolium* T. & G. From *E. polypodum, E. marifolium* and the closely related *E. incanum* T. & G. may be distinguished by the short (less than 1 mm.) styles which in *E. polypodum* (and the *E. umbellatum* group) are 2 mm. or more long. Jepson correctly identified the Shasta buckwheat but, perhaps as a result, erroneously referred *E. polypodum* to synonymy under *E. marifolium* in his Flora.

Miss Stokes, in her revision of the genus, preceded Abrams in removing *E. polypodum* from *E. marifolium* and in referring it to the *E. umbellatum* group, but herbarium annotations and later determinations show that this name and transfer were applicable in her usage to a related but quite different plant, *E. Covillei* Small. That plant is a yellow-flowered subalpine dwarf of the southern Sierra Nevada, but, though it is also related to *E. umbellatum,* it is essentially different from *E. polypodum* in many details. Plants of *E. polypodum,* on the other hand, were regarded by Miss Stokes as related to *E. ursinum* Wats., and in her revision and annotations these plants are accounted for in that species under the varietal names, var. *Covillei* (Small) Stokes and var. *venosum* Stokes.

This confusion came to my attention in 1942 when I first found *E. polypodum* near Sand Meadow on Chagoopa Plateau and my collection was determined by Miss Stokes as *E. Covillei* (cf. Base Camp Botany 1942, p. 12, under "Eriogonum sp."). By annotation at that time I tentatively referred the plant to *E. polypodum,* noting, however, that the hairy filaments and ovary did not agree with the original description. The type of *E. polypodum* was not then available because of air-raid precautions in force at the New York Botanical Garden, so my specimen was filed and the matter forgotten until I again found the plant in the southern Sierra Nevada on the 1949 Sierra Club Base Camp outing. This time I reported the plant as related to *E. umbellatum* var. *versicolor* Stokes (Base Camp Botany, 1949, p. 12). That name, however, applies to plants of the desert ranges, particularly those in the Panamint Mts., and, though the coloration of the flowers in that variety and in *E. polypodum* is similar the two names now seem applicable to different plants.

Perhaps it is too soon to decide what name the plant under consideration should have, but several taxonomic matters are very clear. Certainly the plant is not referable to *E. marifolium* T. & G., which is dioecious and brachystylous. Nor do I believe it closely related to *E. ursinum* Wats., a plant which differs more or less in details of habit, involucral lobes, perianth-segments, pubescence of filaments, ovary, and achene. Rather, *E. polypodum* appears closely related to *E. umbellatum,* that widespread western American complex which embraces so many diverse elements.

Diverse as *E. umbellatum* is — from the tall erect shrubs of *E. dumosum* Greene to the compact subprostrate mats of *E. Covillei* Small and from the ochroleucous or rose-tinged flowers of *E. subalpinum* Greene and var. *versicolor* Stokes to the sulphur-yellow and rubiginose flowers of *E. polyanthum* Benth. and *E. speciosum* Drew — yet, *E. polypodum* seems a thing apart. Just as Miss Stokes consistently referred plants of *E. polypodum* to a species other than *E. umbellatum,* I too, believe it should be separated specifically. Its prostrate habit, its ovatish leaves with rounded or cordate base, and its chalky-white flowers with reddish midvein give it a different appearance. These features, together with the more technical character of the short, triangular-deltoid, mostly ascending involucral lobes, perhaps do not entirely separate *E. polypodum* from one or another of

the less frequent variants in *E. umbellatum,* but in the character of its achene it appears to be quite different.

Species of *Eriogonum* subgenus *Eueriogonum* that are related to *E. umbellatum* have achenes whose pericarps generally exhibit two kinds of cellular texture. The upper part tends to be smooth, somewhat brittle (crustaceous), a little shiny, and more or less utricular-turgid, while the lower part is wrinkled, membranous, dull, and usually, but not always, closely adherent to the base of the achene. The proportion between these two parts varies from almost (or quite?) none in some forms of *E. umbellatum* to a very short triangular-cuneate base in *E. ursinum* and to a somewhat more extended base (about 1/4 to 1/3 the length of the achene) in certain variants of *E. umbellatum*. In all these, the achene is generally equally 3-sided, although it tends to be compressed at the base.

The achene of *E. polypodum* differs in several details from all others examined. In it the wrinkled adherent part is over half the length, and the upper beak-like part, conspicuously cellular-papillose, is free from the seed but not at all turgid. The lower part is strongly compressed, and below the 3-sided beak, there is scarcely an indication of the three angles which are so prominent in the beak. Whereas the lower part of the pericarp is mostly longitudinally wrinkled or folded in the *E. umbellatum* type, in *E. polypodum* the pericarp is rather finely wrinkled both longitudinally and transversely.

As in so many groups of plants, fruiting specimens in the *E. umbellatum* complex are not too numerous, but in the Herb. Calif. Acad. Sci. collection of more than 400 specimens from all western states and British Columbia, a sufficient number of fruiting plants among the different variants has been examined, it is believed, to advance the specificity of *E. polypodum* on the character of its achene and the other features noted above. However, so close is the relationship between it and *E. umbellatum,* future study of more abundant fruiting material may show it better accepted as a subspecific taxon of that polymorphic assemblage. On the other hand, adequate fruiting collections in the general *E. umbellatum* assemblage may disclose one or more other specific lines of cleavage within the complex, a possibility definitely suggested by variations in achene morphology observed in my brief and restricted study.

The following summarizes the taxonomic and bibliographic data presented above:

ERIOGONUM COVILLEI Small. *E. umbellatum* var. *polypodum* sens. Stokes. in herb., not *E. polypodum* Small.

ERIOGONUM MARIFOLIUM T. & G. *E. polypodum* C. H. Merriam, N. Amer. Fauna 16: 143 (1899), not Small.

ERIOGONUM POLYPODUM Small, Bull. Torr. Bot. Club 25: 46 (1898); Abrams Ill. Fl. 2: 27 (1944), under *E. umbellatum* Torr. var. *minus* Johnston, as *"E. polycladon." E. marifolium* in small part, not T. & G.: Jepson Fl. Calif. 1: 428 (1913); Smiley, Univ. Calif. Publ. Bot. 9: 165 (1921). *E. ursinum* Wats. var. *venosum* Stokes ex Smiley, ibid. 164; Stokes, Gen. Eriogonum 114 (1936). *E. ursinum* var. *Covillei* (Small) Stokes, ibid. 115, sens. Stokes. in herb., not *E. Covillei* Small. *E. umbellatum* var. *polypodum* (Small) Stokes, ibid. 113, as to name and type only. *Eriogonum* sp. J. T. Howell, Base Camp Botany, 1942, p. 12 (1942). *E. umbellatum* var. *versicolor* J. T. Howell, Base Camp Botany, 1949, p. 12 (1949), not Stokes.

Representative collections, all except the last from Tulare County, California: Long Meadow, 8000 to 9000 ft., June 7–14, 1888, *Palmer No. 204* (N. Y. Bot. Gard., type; Herb. Gray., U. S. Nat. Herb.); near Sand Meadows, Chagoopa Plateau, about 10,000 ft., July 31, 1942, *Howell No. 17496;* granitic sand under *Pinus Balfouriana,* Mt. Guyot near timberline, about 11,000 ft., July 22, 1949, *Howell No. 25594;* Rock Creek, 10,500 ft., Aug. 11, 1949, *Howell 26221;* Siberian Pass Creek, 11,000 ft., July 25, 1949, *Howell 25720;* Golden Trout Creek, 9650 ft., July 26, 1949, *Howell 25793;* the Tunnel to Ramshaw Meadow in granitic gravel of open pine forest, 8900 ft., July 30, 1949, *Howell 25905;* near Buck Rock, 8000 ft., July 6, 1940, *H. & M. Dearing 4408* (Herb. Univ. Calif.); Mt. Silliman, 9800 ft., Fresno County, Aug. 22, 1905, *K. Brandegee* (Herb. Univ. Calif. No. 77754, type of *E. ursinum* var. *venosum* Stokes).

For permission to examine specimens, I am grateful to the curators of the following herbaria: Dudley Herbarium, Gray Herbarium, New York Botanical Garden, United States National Herbarium, and the University of California. Unless otherwise indicated, cited collections are represented in the herbarium of the California Academy of Sciences.

THE LITTLE SUR MANZANITA, A NEW SPECIES

BY JOHN THOMAS HOWELL

Arctostaphylos Edmundsii J. T. Howell, spec. nov. Frutex humilis subprostratus, 1–5 dm. altus, 2.5–3.5 m. latus, ramis radicantibus, cortice squamata, ramulis pubescentibus pilis tenuibus albis patentibus eglandulosis plerumque 0.5–1 mm. longis, trichomatibus elongatis crassis nullis; foliis haud stomatiferis supra, foliis maioribus 2–3 cm. longis, 1.5–2.3 cm. latis, late ovatis ellipticis vel subrotundis, obtusis subobusisve, saepe mucronulatis, basi cordatis vel raro truncatis, viridibus, glabris vel subglabris, margine piloso-ciliatis, breviter petiolatis, petiolis 2–4 mm. longis, pilosellis; inflorescentia parva compacta simplici vel interdum pauciramosa, rhachidibus

pilosis haud glandulosis, bracteis foliaceis infra, supra minoribus et squamiformibus, pilosis et interdum paululum glandulosis, pedicellis tenuiter glanduloso-puberulis, 3–4 mm. longis; sepalis reflexis post anthesin; corolla 5 mm. longa, carnea; ovario glabro; drupis fulvis, depressis, circa 8 mm. diametro, nuculis separatis.

Type: Herb. Calif. Acad. Sci. No. 369850, collected by Louis L. Edmunds on an ocean bluff near the mouth of the Little Sur River, Monterey County, California, Nov. 29, 1951.

Mr. Edmunds writes of his plant as follows: "During the summer of 1949, I visited the Little Sur River on the Monterey coast to collect seed of *Ceanothus griseus* var. *horizontalis* and discovered a colony of low-growing manzanitas which were unlike any I had previously encountered. There were possibly a dozen plants in the colony and they varied in height from six to eighteen inches. . . . On Nov. 28, 1950, and on Nov. 29, 1951, I again visited the colony and both times found the manzanita in bloom. . . . I have never seen this plant elsewhere on the Monterey coast but, of course, I have gone over only a small fraction of the area and the plants may occur elsewhere. The plants are free-flowering and the color of the flowers is flesh-pink. The bright green leaves, especially on the younger foliage, are tinged red on margins and midrib. The plant may be an undescribed species or it may be a hybrid; I am calling it the Little Sur Manzanita." According to Mr. Edmunds, *Adenostoma fasciculatum, Rhamnus californica,* and *Salvia mellifera,* as well as the *Ceanothus,* grow in the vicinity.

Arctostaphylos Edmundsii appears to be most closely related to *A. pechoensis* Dudley, a species restricted to coastal hills and mountains in San Luis Obispo County, but differs in its broad subprostrate habit, subglabrous leaves that are stomatiferous only on the lower side, glandular-puberulent pedicels, and glabrous ovary. However, the spreading habit, the pilose pubescence of the stems and inflorescence, and the disposition of the stomata correspond to those details in *A. Uva-ursi* as that widespread species occurs along the central and northern California coast. It would seem that *A. Edmundsii* may be related to both species.

Although *A. Edmundsii* should be too far distant from present-day members of both the *A. pechoensis* and *A. Uva-ursi* groups to predicate a hybrid origin for so isolated a plant, I believe it not unreasonable to assume that it may have been derived from an ancient cross between those two groups. *Arcto-*

staphylos Uva-ursi is not now known so far south, but *A. pumila,* a close relative, is not too far away on dunes at the north end of the Santa Lucia Mts., while *A. pechoensis* is now restricted to the south end of the same range. Perhaps these two species-types have not always been separated by the length of the Santa Lucia Mts. but may have once grown together.

However *A. Edmundsii* may have originated, it is a most interesting and provocative plant well deserving specific recognition, and horticulturally, as the Little Sur Manzanita, it should become a valued and cherished garden subject. I am grateful for the opportunity to name it in honor of Mr. Edmunds who is not only a keen student of California perennials but also a discriminating grower of our native plants.

Parsley for Marin County. On May 30, 1951, I found the common cultivated parsley, *Petroselinum crispum* (Mill.) Mansfeld, abundantly naturalized on the estate of the late Ralston E. White, in upper Blithedale Canyon, Mount Tamalpais, my *No. 2893.* Here it was common about a seepage area and was also becoming established on a stone wall and by roadsides. It is undoubtedly persisting here, for as far as I am able to discover, it is no longer in cultivation in the immediate neighborhood. While this widely cultivated plant may well be expected to occur commonly in the vicinity of neglected gardens, it is apparently as yet quite a rare weed, and has been collected only a few times in California.—Peter H. Raven.

Arrival of Chorispora in California. *Chorispora tenella* DC. has been known for some years from many of the western states except California: Oregon (Peck, Man. p. 338); Washington (Yakima Co., *Thompson 11,314);* Idaho (Nez Perce Co., *Sharsmith 4005);* Nevada (Nye Co., *Ripley & Barneby 3552);* and, Arizona (Coconino Co., *Story in 1950).* This Old World peregrinator has now arrived in California: grainfield weed on the Dougherty Ranch, 1 mile northwest of Gazelle, Siskiyou Co., *S. D. Nelson in 1951.* It is a mauve-flowered annual mustard and can be distinguished from all others in California by its indehiscent, long-beaked, slender silique which breaks transversely into 2-seeded lomentaceous fragments.—John Thomas Howell.

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THE ALBERT PRAGER HERBARIUM OF THE CALIFORNIA ACADEMY OF SCIENCES

BY ALICE EASTWOOD

On Sept. 10, 1920, Oscar Prager came to me with a letter of introduction from Otto von Geldern, who for many years was Vice-President of the California Academy of Sciences. Mr. Prager came to consult me about the purchase by the Academy of one of the largest private herbariums in Europe, known as the Albert Prager Herbarium of Leipzig, Germany. On Sept. 20, I received a letter from Oscar Prager enclosing Albert Prager's statement written in German and signed by him. This told the history of his herbarium and described the very important collections made by famous scientists in many parts of the world that were included in it. A free translation of this statement, written by Albert Prager in Leipzig in May, 1920, follows:

Herbarium Albert Prager

The Herbarium was founded in 1878 through my own collections in Germany, the Alps, and northern Italy. It had its first important enlargement through the purchase of the Herbarium Hampeanum. This collection, a legacy of Prof. Hampe, I purchased in 1886 at a rather high price from the son of the deceased Dr. Hampe. The herbarium contained, aside from German and Mediterranean plants, a great rarity, the authentic herbarium of the flora of South Africa and the Cape region collected by Ecklon and Zeyher in 1843 and 1844, containing about 1200 species of which a great many kinds were until then unknown.[1] The famous expedition of these two botanists is considered the foundation of the botanical exploration of South Africa. There are only a few sets of these specimens and they are now hardly anywhere for sale.

In 1886 and 1892, my herbarium was enlarged, besides my own collections, by the purchase of two scientific herbaria, namely, the herbarium of Prof. Stengler and the very important herbarium of Prof. Schlechtendahl. The latter is especially important as it contains the collections of the botanical expeditions of Prof. Willkom (Spain), of Professors Fischer and Meyer (Mediterranean countries and Algeria), of Prof. Spruner's first scientific expedition to Greece and Asia Minor (with many, until that time, unknown species), and, the most important of all, the great Arabia-Sinai-Egypt expedition collections of Prof. Schimper. This expedition of Schimper, which

1. The plants collected by Ecklon and Zeyher are characteristically ticketed by a small printed label which carries the name of the plant and two Arabic numerals. The first number refers to the locality where the plant was collected, the second gives the date when it was collected. The catalogue for locality data was published in Linnaea 19: 582-598 (1847), and 20: 258 (1847).

within two years, 1825 and 1826, traversed botanically very little-known countries, was a botanical triumph. It was only made possible through kindness of the Turkish rulers such as was never before shown to a Christian expedition. At that time no globe-trotters went to Arabia, and the country was strictly barred to all unbelievers. This complete collection probably cannot be purchased at all at the present day.

A new period of growth came to the Herbarium Prager through a new correspondent, Dr. Betche, the recently deceased Assistant of the Botanical Institute in Sydney. This notable authority of the flora of Australia sent me, within ten years, one of the largest collections of Australian plants. He sent me besides so many sets of Australian duplicates that I was able through exchange to acquire many plants which could not have been obtained otherwise. I exchanged with the universities of Greifswald, Upsala (Norwegian and Lapland plants), Agram (Rumelian plants collected by Iriwaldsky), Prague (Carpatian plants), Würzburg, and even with St. Petersburg, whence I obtained the collections of the Central Asiatic Expedition to Saisang-Nor, of Hohenacker's Caucasian expedition, and Pallas' Kamtschatka and north Siberian Expedition.

Furthermore, I obtained from Dr. Betche his complete collection of Samoan ferns, mainly from Upolu, gathered by him there during two years. This is the most complete collection of Samoan ferns in existence.

Also the Director of the Botanical Gardens in Port Darwin, North Australia, Mr. Forsyth (now Director of the Botanical Gardens in Adelaide), sent me 400 species of the very little-known flora of northern Australia and a large amount of exchange material. These exchange plants enabled me to acquire two collections: Dr. Schaffner's 300 specimens from Mexico and Baron von Egger's 300 specimens from the West Indies.[2]

In this way the Herbarium Albert Prager grew and now in my seventy-fourth year I am able to send it all away: *Phanerogamae,* 20,800 species; *Filices,* 660 species; *Musci,* 475 species; *Algae,* 520 species; *Lichens,* 280 species; *Fungi,* 3140 species; to which I added 950 microscopic plant preparations.

The collection is one of the largest private herbaria of Germany. The late Prof. Schlechtendahl spoke of it to me as a treasure that can never be diminished, because so many noted scientists are here represented by their collections. The successor of Prof. Schlechtendahl at the University of Leipzig, Prof. Pfeffer, who died during the war, told me after he had looked through the herbarium: "It is indeed a treasure, a great treasure, but I am not able to buy it for the university. Our budget for botanical collections is, unfortunately, too small." I am selling the collection only because at seventy-four years of age I am no longer able to make use of it.

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2. Among the many botanists and collectors whose specimens are represented in the Prager Herbarium, the following should perhaps also be noted, together with the region from which their specimens came: Boissier (Spain and perhaps elsewhere); Endress (Pyrennes); Fleischer (Egypt and Smyrna in 1826, 1827); Frank (central United States); Heuffel (Banat, the plants were the basis of his Flora Banata); Meyen (Chile and perhaps elsewhere, probably collected on Captain Wendt's voyage around the world on the *Princess Louise* in 1830 to 1832); Scheele (miscellaneous specimens including some from North America); Sieber (Crete, Senegal, and elsewhere). Of local interest is a California collection made in 1851 by a German named Bauer; probably he was a visitor, with a botanical proclivity, on the trail of the California Argonauts.
The collection of *Fungi* includes Baron von Thümen's classical distribution, Mycotheca Universalis, while among the various cryptogams are many Rabenhorst collections.

The price was $1000 at the current rate of exchange. On receipt of the money by Albert Prager, the herbarium and its catalogue would be packed and sent, the cost of packing and transportation, as well as incidental expenses, to be paid by the purchaser. At that time the finances of the California Academy were at a low ebb and to take that sum from its annual budget seemed impossible. I felt the great importance of this herbarium and would have bought it myself by cashing one of my thousand dollar Victory Bonds. This was not necessary, because on my appeal to some of the wealthy members of the Academy, the thousand dollars was raised and at once sent to Albert Prager.[3] An additional $300 needed for the packing and transportation was contributed by Wm. H. Crocker and Wm. F. Herrin, both good friends of mine.

The old Academy herbarium had been destroyed in the 1906 disaster, the precious types only having been saved as a nucleus for a hoped-for future one. During the years from 1906 to 1911 I had been studying at the Gray Herbarium, Harvard University. In 1911 I went to England to study in the important herbariums the collections made by early explorers in the Pacific and other areas of western North America. These were the Royal Herbarium at Kew, the British Museum Herbarium in South Kensington, the Lindley Herbarium at Cambridge University, and the important Coulter collection at the University of Dublin in Ireland.

I returned from England in 1912. Among the letters awaiting me when I landed in Boston was one from the officers of the California Academy of Sciences, asking me to return to reestablish the Academy herbarium. Looking forward to the future greatness of San Francisco, I wanted this new herbarium to be a great one, founded on a broad basis, a herbarium containing not only plants of North America, but of the whole world. The acquisition of the Prager Herbarium in 1920 was a magnificent step forward in the realization of this ideal.

3. Those who contributed to this fund were: J. C. Augsbury, W. H. Crocker, W. M. Fitzhugh, J. D. Grant, W. F. Herrin, A. F. Morrison, and W. C. Van Antwerp.

PLANT NOTES FROM SAN FRANCISCO, CALIFORNIA

BY PETER H. RAVEN

In so densely populated an area as San Francisco, it is not surprising to find a number of recent plant immigrants becoming established in out of the way corners and vacant places. It is surprising, however, to find native plants which have been collected only a few times still persisting in the places where they were first found, and where they have resisted the advance of civilization.

The following notes are the results of my work in and about San Francisco during the past few years and the numbers mentioned, unless otherwise stated, are my field numbers. All of the collections cited are in the herbarium of the California Academy of Sciences.

On Some Local Manzanitas

Immediately south of the city of San Francisco rises San Bruno Mountain of San Mateo County, which is visible from many points on a clear day. Running east and west, contrary to the common trend of the Santa Cruz Mountains which is north and south, this disjunct mountain mass reaches a height of 1315 feet and is about 5 miles long. It was at one time a favorite collecting field for botanists, but in late years many farms have been established on the fertile lower slopes, and their owners made it practically impossible to reach the wind-swept summits. More recently, however, a KRON television station and a KNBC radio station were built at the top, and a graded road was put in leading up to this station from San Francisco, so that now the summit is accessible to anyone.

Arctostaphylos imbricata Eastw., of the *A. Andersonii*-group, has been known to occur here since 1915, when it was collected by Mrs. Marion L. Campbell and Mrs. Ernest Meiere and given to Miss Alice Eastwood, who described it later (Proc. Calif. Acad. Sci., ser. 4, 20: 149,—1931).

I found it in several places about the crest, where it forms beautiful gardens when in full bloom in February *(1383, 2733)*. It is pollinated largely by the common California bumblebee,

Bombus vosnesenskii Rad. Forming spreading mats or mounds up to about 20 feet across, it is associated with prostrate forms of *Vaccinium ovatum* and *Baccharis pilularis,* as well as other plants typical of the coastal chaparral.

Although *A. imbricata* has been known here since 1915, I found associated with it at the summit two other types of low-growing manzanitas. One, with coriaceous, rounded leaves from 9–11 mm. long, grows prostrate in the grass, and is clearly *A. Uva-ursi* (L.) Spreng. *(2748).* This, too, was collected here by Mrs. Meiere and Mrs. Campbell, but since it was filed under *A. franciscana* Eastw. in the Academy herbarium, it was not recognized until now. It has stomata on the lower side of the leaf only,* and the leaf-bases are rounded or shortly cuneate. This is a southern distributional record on the Pacific Coast for this widely distributed plant of the Northern Hemisphere, since it was formerly believed to range only to Point Reyes, Marin County. It blooms here in April.

The third form found on San Bruno Mountain has shortly cuneate leaf-bases, rather thin leaves, 1.5–2 cm. long, with slight points at the apex, and stomata on the lower side. It blooms in March and is intermediate between the other two in habit *(2732, 2743).* Although it can also be referred to *A. Uva-ursi,* it may be a hybrid between *A. Uva-ursi* and *A. imbricata. Arctostaphylos Uva-ursi* hybridizes freely with other manzanitas north of San Francisco, so it would not be too surprising in this case. Mr. J. T. Howell suggested to me that perhaps some ancestor of the *A. Andersonii*-group crossed with *A. Uva-ursi* to produce *A. imbricata* in the first place. In any case, *A. imbricata* seems to be fairly well stabilized today. The nearest members of the *A. Andersonii*-group, *A. pallida* Eastw. in the southern Berkeley hills and *A. regismontana* Eastw. in the mountains of San Mateo County to the south, are far enough away to account for this.

On April 10, 1952, on a serpentine area about 400 feet above Baker's Beach at the west end of the San Francisco Presidio, I found one shrub of another interesting prostrate manzanita *(3972),* growing in close association with prostrate *Ceanothus thyrsiflorus* Esch. var. *repens* McMinn. It has stomata on both

*In *A. imbricata,* stomata occur on both sides of the leaf but are more numerous on the lower side. Cf. J. T. Howell, Concerning stomata on leaves in Arctostaphylos, Wasmann Collector 6: 57–65 (1945).

sides of its small, rounded, coriaceous, sharply pointed leaves.

The characters of the plant, together with the locality where it was found, seem to point to *A. franciscana* Eastw., and indeed it is a good match for a collection from Mt. Davidson *(Colleena Steward in 1918),* which is mentioned by Miss Eastwood (Leafl. West. Bot. 1: 114,—1934). However, it is also a good match for *Eastwood 3165,* which is *A. montana* Eastw. from the chaparral of Mt. Tamalpais. However, the present plant seems very close to *A. franciscana* as described by Miss Eastwood *(l.c.),* and it should perhaps be left under that species. If it is referable to that species, the rediscovery of this plant is important since more recently *A. franciscana* has been believed to be extinct.

At first I thought this to be a new locality for the plant, but I found in Zoe 2: 363 (1892), under the name *A. pungens* HBK., the following interesting notation by Katharine Brandegee: "Mr. C. A. Michener collected it last year somewhere between Lobos Creek and Fort Point." This is undoubtedly the locality in question, and perhaps the remark concerns the very same shrub.

Some Interesting Introductions

Pinus radiata Don. The Monterey pine, widely planted as a windbreak, was found on the sandy flats near Lincoln Boulevard at the west end of the San Francisco Presidio, reproducing itself rather sparingly by means of seedlings *(2616).* This picturesque tree now has a broken distribution along the coast from Año Nuevo Point into Lower California, but formerly it ranged north at least to Tomales Bay, according to H. L. Mason (Carnegie Institution of Washington Publ. 415: 148,—1933). Mason also says *(op. cit.,* p. 103) that it is becoming sparingly naturalized in the Berkeley Hills.

Cupressus macrocarpa Hartw. A neighbor of the Monterey pine on the hills at Monterey, the Monterey cypress is also associated with it on the sandy flats along Lincoln Boulevard at the west end of the San Francisco Presidio *(2751).* It reproduces here much more freely than does the pine.

Sporobolus Poiretii (Roem. & Schult.) Hitchc. This tropical Asian grass, commonly naturalized in the Americas, particularly in the warmer regions, was found as a common lawn weed just inside Golden Gate Park at the Tenth Avenue entrance on Fulton Street *(2715).* There is a specimen in the California Academy of Sciences, determined by J. R. Swallen, from West Beach Park, Santa Barbara *(H. M. Pollard in 1950),* and the

smutgrass may be expected to occur more widely in the weedy lawns of coastal California.

IBERIS UMBELLATA L. The garden candytuft, a native of the northern Mediterranean, was found as a garden fugitive near a seepage in a canyon draining into the east side of Lake Merced just north of the San Mateo County line *(2603A)*. While *I. amara* L. is known to be naturalized in the eastern United States, this appears to be the first record from North America of *I. umbellata* growing without cultivation.

ALBIZZIA LOPHANTHA (Willd.) Benth. This fetid-smelling native of Australia, reported by J. T. Howell from Marin County (Marin Flora, p. 163), grows on moist slopes at the west end of the Presidio near Lincoln Boulevard where it reproduces very freely *(2620)*.

PELARGONIUM VITIFOLIUM (L.) Ait. This native of South Africa grows rankly in a vacant lot on Twenty-sixth Avenue near El Camino del Mar *(2726)*. According to J. T. Howell, it is a rank weed along the coast of San Mateo County in suitable places.

PELARGONIUM ZONALE (L.) Ait. This common garden geranium was found as an escape in a vacant lot on Twenty-fifth Avenue near Lake Street *(2723)*; Twenty-sixth Avenue near El Camino del Mar *(3987)*. This is a native of South Africa. It is a weed at various places in coastal California, such as at Monterey.

VERONICA FRANCISCANA Eastw. On the moist ocean bluffs just west of Baker's Beach, this garden plant forms a dense covering *(2705)*. Here it has become well established from cultivated specimens at the top of the bluffs. This species was described from cultivated specimens but the origin of the plant is uncertain. It is much cultivated for hedges in the San Francisco Bay region.

VERONICA SPECIOSA R. Cunn. Sparingly naturalized in a vacant lot on Fulton Street near Twenty-first Avenue is this striking native of New Zealand *(2727)*. It is used for hedges about San Francisco, but is not nearly as popular as the violet-flowered *V. franciscana*. These two species and other shrubby veronicas of the Southern Hemisphere are members of the subgenus *Hebe* which, by many botanists, is separated as a distinct genus.

COPROSMA BAUERI Endl. Twenty-fifth Avenue near Lake Street *(2724)*. The mirrorbush of the New Zealand coast also forms a dense covering on the bluffs west of Baker's Beach, in company with *Veronica franciscana*. It is a common fixture of San Francisco gardens.

MINERAL KING AND SOME OF ITS PLANTS

BY JOHN THOMAS HOWELL

Mineral King, situated in a deep narrow valley near the headwaters of the East Fork of the Kaweah River in the high southern Sierra Nevada of California, is perhaps best known to mountaineers who here begin or end their trips into the Kern River Basin or to the Mt. Whitney region. That is the way in which I was first introduced to this picturesque hamlet and its fine mountain valley, when the Sierra Club began and ended its 1942 Base Camp outing at the Mineral King pack station. At that time the region impressed me, not only as an outstanding Sierran botanical area, but also as one of the most interesting centers in the mountains for a varied and scenic vacation.

The store and clustering cottages that constitute the settlement are in the lower part of the Canadian Life Zone and are the immediate center of one of the richest botanical areas above middle elevations in the Sierra Nevada. The altitude of Mineral King is 7831 feet but within a few miles there are peaks in the Arctic-alpine Zone with elevations exceeding 12,000 feet. While this range of altitude with the accompanying diversity of habitat contributes to the richness of the flora, a second reason for the variety of plants is to be found in the occurrence of both metamorphic and granitic rock types in the region. Although this upper valley of the East Fork of the Kaweah River is entirely walled with metamorphic rocks, the 12,000-foot peaks along the summit of the Great Western Divide immediately to the east are granitic and to the west it is only a mile or so to other areas of granite. Thus, as geologists would express it, the Mineral King area lies as a ceiling pendent of metamorphic rock on the granitic slopes of the Sierra. The ecologic diversity that results from the varied physiographic and geologic features of the region finds botanical expression in the unusual richness of its flora.

In 1942 I was in the vicinity of Mineral King for only about three days, but that was long enough for me to resolve on a return visit. The summer of 1951 seemed the appropriate time botanically, since my study of the alpine flora of three Sierran peaks south of Mt. Whitney had directed my attention at that

time to the distribution of alpine species on the Great Western Divide (cf. Leafl. West. Bot. 6: 141–154). In that study I had learned that the southernmost station for certain alpine plants was not on Cirque Peak at the south end of the Mt. Whitney Range but rather on the Arctic-alpine summits of the Great Western Divide near Mineral King and at the headwaters of the Little Kern River immediately to the south. So, in July, 1951, Lewis S. Rose and I spent a botanically and scenically rich week in and about Mineral King. The following plant notes concern collections made in 1951. My 1942 collections were reported in "Base Camp Botany, 1942" that was prepared and distributed in that year under the auspices of the Sierra Club.

Southern Range Extensions

Four species which I reported in 1951 as occurring at a southernmost distributional limit on or near Cirque Peak at the south end of the Mt. Whitney Range were found south of Mineral King in 1952 at what are the presently known southernmost stations for the plants, at least in California. Two of the species, *Stipa pinetorum* Jones *(27858)* and *Arenaria rubella* (Wahl.) Smith *(28058)*, grew on the marble ridge in the White Chief region southwest of Mineral King, while the other two, *Carex albonigra* Mkze. *(28037)* and *Senecio speculicola* J. T. Howell *(28047)* grew on the dark metamorphic rocks of the unnamed peak east of Farewell Gap. The 1951 report of these plants in the Mt. Whitney Range is in Leafl. West. Bot. 6: 146, 147, 149, and 151. Their discovery so far south on the Great Western Divide reduces the percentage of plants that reach a southern limit on Cirque Peak from 18% to 16% (cf. p. 149).

The White Chief District

One of the most interesting walking trips that can be taken from Mineral King is to the canyon which lies to the north of Mt. Vandever and in which is situated the White Chief Mine. In this district the rocks are both metamorphic and granitic, and the scenery is brightened and the flora diversified by a rather extended ridge of white marble. The marble is not a large enough geographic feature to have "selected" an endemic limestone flora, but the plants growing in the crevices and hollows are interesting and produce a beautiful and unusual rock garden for the Sierra Nevada where marble is not a common

rock type. The specimens of *Aquilegia pubescens* Cov. *(28060),* here growing at the type-locality of the species, were especially numerous and showy. *Antennaria umbrinella* Rydb. *(28061)* formed silvery mats, and, together with the *Stipa* and *Arenaria* noted in the preceding paragraph, seemed to be quite restricted to the marble.

Nearby in a rubble of dark slaty metamorphic rocks *Arabis Lyallii* var. *nubigena* (Macbr. & Pays.) Rollins *(28072)* was locally common. This White Chief station is not far from Farewell Gap which is the type-locality of *A. paupercula* Greene, a name reduced to synonymy under var. *nubigena* by Rollins. Growing in the same sort of place as the *Arabis* was an unusual relative of *Castilleja pilosa* (Wats.) Rydb. *(28073),* but one which I have not yet been able to determine.

Adjacent to the area of metamorphic rocks and at the base of the high granitic ridge to the west, a small subalpine meadow bordered a noisy brook. Here I found *Carex subnigricans* Stacey *(28084)* and, though the species is to be expected still farther south in similar places along the Great Western Divide, this is the southernmost station I now know for the plant. Growing with the *Carex* was *Scirpus Clementis* Jones *(28080)* which here approaches the southern limit of its known distribution. One collection has been reported from a few miles farther south and to the west: the Hockett Meadow collection in the Dudley Herbarium which was reported by Britton as *S. pumilus* (Abrams Ill. Fl. 1: 272). A third notable plant in this little meadow was *Gaultheria humifusa* (Grah.) Rydb. *(28076),* never before known from so far south, even in the Rocky Mountains. It, too, is to be expected still farther south along the Great Western Divide.

The Annuals of The Monarch Lakes Trail

One of the most interesting plant societies discovered in the vicinity of Mineral King was a rather weedy-appearing garden in which annuals were the most prevalent. This little garden was discovered on the trail to Monarch Lakes at the base of some granitic bluffs where the plants grew on a gentle slope in sandy soil kept moist by a seepage of water from melting snow high above. Although this place was at an altitude of about 8500 feet, well within the Canadian Zone, it was on a southern slope and high enough on the canyonside to escape the cooling effect

of the down-draught of cold air from the alpine summits of the Great Western Divide to the east. Here I found more than a dozen annuals growing together, and at least five were at an elevation higher than any at which they have heretofore been reported.

Several of the annuals growing here that are usually found at about this altitude, or even higher, included *Juncus capillaris* Hermann *(27956)*, *Linanthus ciliatus* (Benth.) Greene *(27959)*, *Phacelia Eisenii* Bdg. *(27961)*, *Mimulus Breweri* (Greene) Cov. *(27965)*, and *Madia minima* (Gray) Keck *(27963)*. *Scribneria Bolanderi* (Thurb.) Hack. *(27968)*, *Deschampsia danthonioides* (Trin.) Munro *(27967)*, and *Juncus sphaerocarpus* Nees *(27957)* were plants found here which are more characteristic of much lower elevations, but I have previously reported each of these three at elevations one to two thousand feet higher than where they were now growing. Finally there were the plants which I have never seen before at an elevation so high: *Stellaria nitens* Nutt. *(27960)*, *Athysanus pusillus* (Hook.) Greene *(27977)*, *Boisduvalia stricta* (Gray) Greene *(27964)*, *Gilia capitata* Dougl. *(27975)*, and *Madia exigua* (Smith) Greene *(27958)*. Upper elevation limits for the *Stellaria*, *Athysanus* and *Madia* have been given by Jepson at 4000 feet or lower, while the upper limits for the *Boisduvalia* and *Gilia* have been set by him at 5000 and 8000 feet respectively. Peter Raven *(3800)* also collected the *Boisduvalia* at 8500 feet in 1951 in Madera County.

At an elevation of about 8000 feet along the Monarch Lakes Trail below this remarkable assemblage of annuals, I found three other annuals that should be noted: *Festuca megalura* Nutt. *(27947)*, *Montia perfoliata* (Donn) Howell *(27954)*, and *Clarkia rhomboidea* Dougl. *(27952)*. The *Montia* and *Clarkia* are here a thousand feet higher than they have been reported by Jepson. No elevation data have been seen for the *Festuca*, but I believe the present record may establish an upper altitudinal limit.

Rare or Otherwise Noteworthy Plants

Agrostis lepida Hitchc. White Chief Trail at 9300 feet, *27841*. A. S. Hitchcock reports this rare grass from south of Farewell Gap.

Oryzopsis Bloomeri (Boland.) Ricker. Franklin Pass Trail at 10,000 feet, *27882*. The present aspect of this hybrid repre-

sents a cross between *Oryzopsis hymenoides* (R. & S.) Ricker *(27880)* and *Stipa occidentalis* Thurb. *(27881)*.

Carex praeceptorum Mkze. Eagle Lake, 10,000 feet, *27814*. This is the species that was reported by Coville in the report of the Death Valley Expedition as *C. canescens dubia* Bailey, a record based on a plant from "above Mineral King, near a mountain lakelet."

Brodiaea volubilis (Kell.) Baker. Along the road just west of Mineral King at 7700 feet elevation, *28111*. According to Jepson, the upper altitudinal limit is at 2500 feet.

Arabis inyoensis Rollins. White Chief Trail, 8500 to 9000 feet, *27823*. This collection is the southwesternmost that I have seen for the species.

Dentaria corymbosa Jeps. Eagle Lake Trail, 9000 to 9500 feet, *27799;* Franklin Pass Trail, 9500 feet, *27877;* White Chief Trail, 8500 feet, *28050*. None of these collections appears to be var. *grata* Jeps., the type of which came from Timber Gap near Mineral King and a topotype of which I collected in 1942 *(17292)*.

Draba cruciata Pays. *D. nivalis* var. *californica* Jeps. This narrow endemic was collected twice: Eagle Lake Trail in red fir forest, 9000 to 9500 feet, *27798;* White Chief Trail, 8500 to 9000 feet, *27830*. In 1942 I made collections on the Eagle Lake Trail, *17156,* and at Timber Gap, *17282*.

Floerkea proserpinacoides Willd. Eagle Lake Trail, 8600 feet, *27791*. Jepson cites the plant as from Placer County northward and below 7500 feet. Another Tulare County specimen from still farther south was made by me (and Dr. Munz) in 1950 in Bakeoven Meadows, *27133*.

Gayophytum diffusum T. & G. Along the road west of Mineral King two forms grew together, the usual kind with petals about 3 mm. long *(28113),* and a beautiful, large-flowered form with petals over 5 mm. long *(28112)*. These extremes are allowed for in diagnoses of the species but they are not generally found growing together.

Oreonana Clementis (Jones) Jeps. West side of Franklin Pass, 11,000 feet, *27904*. This is the first collection I have seen from the western slope of the Great Western Divide.

Linanthus oblanceolatus Eastw. ex Jeps. This rare plant was found to be locally common along the White Chief Trail at 9300 feet, *27842*. Hockett Meadows, the type-locality of the

species, is less than five miles southwest of the White Chief region.

This plant has been called *L. tularensis* (Brand) Mason, since Prof. Mason maintains that the name *L. oblanceolatus* Eastwood "was never validly published" (Madroño 9: 254,—1948). I regard the name validly published and the plant adequately described and delimited by Jepson (Man. Fl. Pl. Calif. 806,—1925). Since the name is there published as "**L. oblanceolatus** Eastw.," not as *L. oblanceolatus* (Brand) Eastw., I believe the name should rest on the plant Miss Eastwood named *in herbario,* that is, on *Culbertson 4221* from Hockett Meadows, and not on *Hall & Babcock 5554* which is the type of *Gilia oblanceolata* Brand (Pflanzenreich IV, 250: 136,—1907; Jepson, Fl. Calif. 3: 218,—1943). Since the type of *G. oblanceolata* var. *Culbertsonii* Brand is also *Culbertson 4221,* Brand's variety is an exact synonym of *L. oblanceolatus* Eastw.

PHACELIA AUSTROMONTANA J. T. Howell. Franklin Pass Trail, 8300 feet, *27982.* This *Phacelia,* which occurs rarely in the Sierra Nevada, here reaches its presently known northwestern distributional limit.

PHACELIA OROGENES Brand. This rare endemic of the southern Sierra Nevada was collected at the type-locality on the Eagle Lake Trail, *27789,* and again on the White Chief Trail at about 9000 feet, *27832.* I collected it several times in the region in 1942 (cf. Amer. Midl. Nat. 33: 487,—1945).

HETEROCODON RARIFLORUM Nutt. This delicate annual was collected at 7400 feet on the road below Mineral King, *28120.* In 1942 I collected the plant at an even higher altitude, Cliff Creek at 8000 feet, *17330.* Jepson gives the upper altitudinal limit as 5500 feet.

RAILLARDELLA SCAPOSA Gray. Along the Farewell Gap Trail, 9000 to 9500 feet, typical *R. scaposa* with discoid heads *(27988)* was found growing with the much rarer radiate var. *Pringlei* (Greene) Jeps. *(27989).* Some of the plants in the vicinity showed considerable variation in the size and number of rays.

THE FALSE TIMBERLINE OF FAREWELL GAP

Farewell Gap, the spectacular v-shaped pass south of Mineral King, appears to be above timberline although its elevation is only 10,588 feet, fully a thousand feet lower than timberline should be in this latitude of the Sierra Nevada. Not only are

trees absent from the immediate vicinity of the gap but the alpine effect of the scene is heightened by the occurrence there of herbaceous plants usually characteristic of a much higher elevation, such as *Polemonium eximium* Greene, *Penstemon Davidsonii* Greene, *Crepis nana* Richards., and others. Although the alpine effect may have resulted meteorologically from the proximity of the pass to the high peaks on either side, 11,600 feet to the east and 11,900 feet to the west, I have for a long time thought that what we were witnessing was a local depression of timberline induced by some factor other than those of altitude and climate.

This matter came to my attention first in 1942, so, in 1951, when I revisited the gap, I observed timberline conditions as critically as possible in the short time I was there. On my second visit I contoured eastward from the gap to the small tarn east of the 11,600-foot peak and then traversed the summit of the peak on my return to the gap. From what I observed, I believe the metamorphic rock of the region is the chief factor in effecting a reduced timberline. The slopes of the two peaks and of the gap between are mostly covered, even at steep angles, by large or small, loose, metamorphic rocks. Occasionally there are outcrops of the parent rock, but these are limited in extent and are scarcely noticeable in the landscape. Above 10,000 feet few trees grow in this rocky expanse and practically none above 10,500 feet.

On the east side of the 11,600-foot peak I was traversing, I came upon dwarfed shrubby individuals of *Pinus Balfouriana* Grev. & Balf. *(28044)* growing on solid rock at 11,500 feet. These, I concluded, were representatives of the species at true timberline, while the nearest other trees were about 1000 feet lower down where they demarked the false timberline I have been describing.

Looking southeast across the cirque to the unnamed peak west of Shotgun Pass, I was able to observe the apparent effect of rock types on the growth of trees. This mountain, which has an altitude of over 12,200 feet, is metamorphic on its lower western slopes but above 11,000 feet it is granitic, the two rock types being readily distinguishable. On the westerly slopes of this mountain, the trees reach what appears to be a timberline in the metamorphic zone at about the 10,000-foot contour. How false this timberline really is can be deduced from the fact that above

the 11,000-foot contour on the granite, the trees appear again in goodly number. Finally at about 11,500 feet these subalpine groves reach real timberline and above that point I could see only granite.

As a result of these observations, I have concluded that the timberline effect at Farewell Gap results from a combination of climatic and edaphic factors, and is not dependent on climate alone.

APIUM LEPTOPHYLLUM IN CALIFORNIA

BY JOHN THOMAS HOWELL

Two weedy California collections of *Apium leptophyllum* (Pers.) F. Muell.* that have come to my attention recently, one as a lawn weed in Salinas *(Raynor in 1944)* and the other as a garden weed in Berkeley *(Howell 23247* in 1947), raise the question as to the indigenous or introduced character of the plant in California. Two references to the California occurrence of the plant cite it as if indigenous: Coulter and Rose, Contrib. U. S. Nat. Herb. 7: 86, 87 (1900); Mathias and Constance, N. Amer. Fl. 28B: 129, 130 (1944).

Coulter and Rose base their California record on a collection made by David Douglas. I have inquired at both U. S. National Herbarium and Gray Herbarium for a Douglas collection that those authors may have examined, but there is none at either. Jepson (Madroño 1: 126,—1922) excludes the plant from the California flora with the remark that the Douglas record "may be due to an error in herbarium records, or possibly the plant may have been a casual escape at a Mexican settlement at the time of Douglas' visit and did not persist. There is no other record of it and we have seen no California specimens." I have thought the Douglas plant may have been a misdetermined specimen of *Apiastrum angustifolium* Nutt. (which I know Douglas did collect in California), but I have had no assurance that my speculation is sound.

*The name of this plant is sometimes incorrectly given as *Apium Ammi*, the proper authorship for which is (Jacq.) Urban, not (L.) Urban. A discussion of the nomenclatural problems involved is given by Sprague, Jour. Bot. Brit. & For. 61: 129-133 (1923); for full synonymy, see Mathias & Constance, N. Am. Fl. 28B: 129.

I believe that Mathias and Constance (and perhaps also Coulter and Rose) are entirely right in including California in the distribution of *Apium leptophyllum,* but I do not believe that it should be treated as native. The only California collections that I have seen, aside from the two cited above, are from Humboldt Co., and they too seem to represent weedy occurrences: occasional near cultivated field, near Hydesville, *Tracy 944* in 1900 (Herb. Univ. Calif.); local in small area near road ("perhaps introduced?"), Blue Slide on Van Duzen River, *Tracy 8333* in 1927 (Herb. Univ. Calif.); Carlotta, *Eastwood in 1921.* (It has also been collected in Lower California: creek bed, 2 miles northwest of Todos Santos, *Johansen 572.)*

The only other reports of the plant I know of from western United States are those of Mathias and Constance for Arizona and Oregon: in Kearney and Peebles Fl. Pl. Ferns Ariz., p. 645, where it is recorded as a lawn weed in Tempe, Maricopa Co., Arizona; and in N. Am. Fl. 28B: 130, where it is recorded from ballast in Oregon. In these states the plant is obviously not native; I believe that it is also an introduction in California.

Further California Records of Pityopus. Dr. H. F. Copeland has written of three collections of the rare *Pityopus californicus* (Eastw.) Copel. and these records should be added to the data recently published (Leafl. West. Bot. 6: 57–61):

"There are three specimens of *Pityopus californicus* in the Dudley Herbarium where for years they were filed as *Monotropa.* The specimens are: Humboldt County, *Rattan in 1875;* trail to Gold Bluffs, Humboldt Co., *Kildale No. 2110,* June 6, 1926; California side of California-Oregon line on the coast, Del Norte Co., *L. B. Kildale No. 9409a,* Mar. 16, 1930."

In June, 1950, I received a specimen of *P. californicus* from Mr. J. R. Helfer who collected it near Mendocino, Mendocino Co. His plant was accompanied by the following field notes: "The plants were growing up through the needles of *Pinus muricata* and *Pseudotsuga taxifolia* in rather open ground about forty feet from the edge of a peat bog. The locality is about a mile from the ocean and well within the fog belt."—John Thomas Howell.

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WESTERN BOTANY

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SENECIO SAXOSUS KLATT IN THE GREAT BASIN

BY CALVIN MC MILLAN
University of Nebraska, Lincoln

When Dr. Greenman (1) reported his work on *Senecio*, Section *Tomentosi* Rydb., he cited the distribution of *Senecio saxosus* Klatt as "Rocky Mountains at high altitudes, Montana and Idaho, south to Colorado." Three of Greene's species, *S. petrophilus, S. petrocallis,* and *S. pentodontus,* as well as *S. petraeus* Klatt, *S. alpicola* Rydb., and *S. aureus* L. var. *alpinus* Gray, were reduced to synonymy. At the same time, he proposed a new taxon, *S. saxosus* Klatt var. *toiyabensis* Greenm., limited to the mountains of northeastern Nevada and south central Idaho. The specific localities cited for the new variety were: Bunker Hill, Toiyabe Range, Nevada, and the Lost River Mountains, Blaine County, Idaho. Actually Bunker Hill is misleadingly placed by Greenman in northeastern Nevada. It may have been that the geography of this state was not clear to Greenman, since Bunker Hill, located in the northern part of the Toiyabe Range, is in Lander County and more nearly in the central part of the state. At any rate, the originally ambiguous distribution given for the variety has been subsequently documented by a collection of Maguire and Holmgren (2) from the mountains of the northeastern part of the state: Jarbidge Peak, Jarbidge Mountains, Elko County, Nevada.

The Great Basin variety reportedly differs from the Rocky Mountain material in lacking ray flowers. Specimens fitting var. *toiyabensis* were collected in the Deep Creek Range of Juab County in the western part of Utah during a floristic survey by the present author (3): divide between Fifteenmile and Trout Creek canyons, rocky quartzite ridge, 11,000 ft., July 2, 1947, *McMillan 956;* Ibapah Peak, south-facing granitic slope, 11,900 ft., August 7, 1947, *McMillan 1276.* However, if this material be compared with that from another Basin range which lies sixty miles south of the Deep Creek Range in White Pine County, Nevada (Theresa Lake, rocky granitic slope below the crest of Mt. Wheeler, Snake Range, 9500 ft., June 30, 1946,

Leaflets of Western Botany, Vol. VI, pp. 221–240, November 26, 1952.

McMillan, et al. 547), it will be found that the material from the more southern point is unlike the variety in possessing ray flowers. The Snake Range material is apparently the only known collection of the species from Nevada which has ray flowers, the characteristic of typical Rocky Mountain material. Likewise, the collections from the Deep Creek Range are the only known ones from Utah representing var. *toiyabensis.* The three collections cited above have been deposited in the University of California Herbarium.

Inasmuch as representative material of both taxa is to be found in proximity in the Great Basin, the significance and origin of these two dissimilar elements need be considered. Plants with heads which are discoid and those which possess ray flowers appear to be randomly distributed in some composite species, *Erigeron compositus* Pursh being an example found in both mountain ranges under discussion. Perhaps this contrasted character, which seemed to be of significance when the known distribution of the two taxa of *Senecio* were geographically widely separated from each other, in the light of more recent collections, is of little systematic significance. Such a hasty conclusion, however, would not take into consideration the possibility that the alpine floras of the two ranges, although separated by only sixty miles, may have had quite different origins. For instance, the *Senecio* in the Snake Range may have been Rocky Mountain in origin with that of the Deep Creek Range being more closely related to plants of Nevada. As evidence, the fact that several common alpine plants of the Deep Creek Range are unreported from the Snake Range might be cited. *Synthyris laciniata (*Gray) Rydb. subsp. *ibapahensis* Pennell represents a highly disjunct population of a species of the high plateaus of central Utah and is reportedly restricted to the Deep Creek Range. In contrast, another alpine species, *Castilleja lapidicola* Heller, is frequent in both the Snake and Deep Creek ranges, although it is unreported from other Basin ranges except for the type specimen which was reportedly from the East Humboldt Mountains but was not recollected by Holmgren in his extensive study of the flora of northeastern Nevada (4).

The alpine areas in the Great Basin have not been thoroughly investigated and it is to be expected that further records for

Senecio saxosus will subsequently be reported. However, of the Basin ranges, the Deep Creek and Snake ranges bear the greatest environmental similarity, being largely granitic in their highest portions and both reaching elevations over 12,000 ft., and it is not surprising that they have a striking floristic similarity. It was not anticipated therefore that the variation mentioned in *Senecio saxosus* would be found in plants of very similar environments in these two ranges. The retention of Greenman's treatment of the species will possibly be of value until later investigations of the Great Basin provide further records which may allow a more judicial determination of the value of the presence or absence of ray flowers as a means of separating the two varieties. In the meantime, these notes point to an exceedingly interesting distributional problem in the Basin range floras.

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2. MAGUIRE, B., AND A. H. HOLMGREN. 1946. Botany of the Intermountain region. I. Leafl. West. Bot. 4: 261-267.
3. MCMILLAN, C. 1948. A taxonomic and ecological study of the flora of the Deep Creek Mountains of central western Utah. Unpublished Master's Thesis. University of Utah.
4. HOLMGREN, A. H. 1942. Handbook of the vascular plants of northeastern Nevada. Utah State Agricultural College and the Grazing Service. (Mimeographed.)

THE GLABRATE FORM OF WYETHIA ARIZONICA

BY WILLIAM A. WEBER
University of Colorado, Boulder

Wyethia arizonica A. Gray *(Compositae: Heliantheae)* is a close relative of *W. amplexicaulis* (Nutt.) Nutt., differing from the latter species by its smaller stature, coarse hirsute pubescence, and petiolate upper cauline leaves. *Wyethia amplexicaulis,* the most widespread species of the genus, is always totally glabrous with sessile or semiamplexicaule cauline leaves. It inhabits the northern Rocky Mountain area and Great Basin ranges of the United States, while *W. arizonica* replaces it in the Colorado Plateau Province. Over its range, *W. amplexicau-*

lis is strikingly uniform as to its total lack of pubescence, except in areas where it meets and hybridizes with *W. helianthoides* or *W. arizonica,* in which areas the variation pattern is that of a hybrid population, exhibiting recombinations of various parental characters. *Wyethia amplexicaulis* and *W. arizonica* show evidence of hybridization in northern Colorado, where the ranges of the two species overlap, but *W. amplexicaulis* has never been found in the southwestern quarter of the state, where *W. arizonica* abounds.

The discovery of glabrate individuals in herbarium material of *W. arizonica* from the southwestern part of Colorado, therefore, was both unexpected and noteworthy. In my monograph on *Wyethia*[1] I wrote,

> "These individuals are referable to *W. arizonica* on the basis of the petiolate cauline leaves (a condition often approached in the other species), the habit, and the sparse pubescence. Apparently these individuals occur in colonies of the normal type, but no one has yet made this point clear. This much may be said, however. The glabrate specimens occur far to the south of any colonies of *W. amplexicaulis*. . . . It is probably safe to assume that the glabrate forms are not the result of genic contamination, at least in recent time, by *W. amplexicaulis*. Field studies are necessary to clear up this problem satisfactorily."

Subsequent field observation up to 1950 failed to throw much additional light on the problem. Populations in the field seemed to be as enigmatic as the herbarium material. However, the glabrate individuals were usually distinctly larger than those of typical *W. arizonica,* and it appeared that this fact had been obscured by the selection, by collectors, of the most convenient-sized specimens for the herbarium. In fact, the majority of the glabrate individuals could have been well within the variation range of *W. amplexicaulis* save for a small amount of pubescence at the base of the head. The glabrate individuals were not evenly distributed in the colonies of *W. arizonica,* but formed more or less distinct patches within certain colonies. Continued search has failed to reveal the presence of any individuals of true *W. amplexicaulis* which might be responsible for this peculiar variation pattern.

In the spring of 1950, however, I made a field trip into the

[1]Weber, W. A. A taxonomic and cytological study of the genus *Wyethia,* with notes on the related genus *Balsamorhiza.* Amer. Midl. Nat. 35: 400-452 (1946).

region in hope of obtaining cytological material of both the typical and the glabrate form. This field trip was the first of a number of very discouraging excursions because the southwestern drought became critical at about that time. As we approached Durango I began to sample heads of *W. arizonica* for meiotic material, and found that a heavy unseasonable frost had nipped every plant. The flowers were blackened and withered, utterly unusable. The search for good meiotic material almost had been given up, when, upon reaching the crest of Mancos Hill, I suddenly came upon a colony of *W. arizonica* of which some individuals had somehow escaped the frost and were in full bloom. It took only a few minutes to determine that the blossoming specimens were of the glabrate form. Moreover, specimens of typical *W. arizonica* were close by and all of these had been destroyed by the frost.

An environmental accident of this kind which reveals a previously unknown quality in a problematical taxon such as this seems to be worth reporting. The glabrate *W. arizonica* now appears to be earlier-blooming and more frost-resistant than the typical form. A plausible hypothesis as to its origin might be the following. At some former time both *W. amplexicaulis* and *W. arizonica* coexisted in the area and hybridized. Because of environmental changes, the southern border of the range of *W. amplexicaulis* subsequently moved northward, leaving hybrid derivatives among colonies of *W. arizonica*. The characteristics which were contributed by *W. arizonica* enable the hybrid derivatives to survive in the area occupied by *W. arizonica*, and the frost resistance and earlier blooming period may have survival value also. Chromosome counts show that *W. amplexicaulis, W. arizonica*, and the glabrate form all have the same haploid number, n = 19. No irregularities in meiosis were observed.

ERIOGONUM NOTES III: CONFUSIONS IN E. URSINUM

BY JOHN THOMAS HOWELL

From 1875 when *Eriogonum ursinum* was described by Watson to 1921 when *E. ursinum* var. *venosum* Stokes was published by Smiley, botanists were unanimously agreed that *E. ursinum*

Wats. was a simple specific entity the variations of which were not worthy of nomenclatural recognition. Miss Stokes, however, in her study of the genus in 1936 departed widely from this concept, proposing a complex of seven varieties besides the typical one. In an earlier paper in which I discussed the possible specificity of *E. polypodum* Small (Leafl. West. Bot. 6: 198–202), I indicated that *E. ursinum* var. *venosum* Stokes is the same as *E. polypodum* and that a confusion existed between *E. Covillei* Small and Miss Stokes' interpretation of her *E. ursinum* var. *Covillei*. In the present paper I shall further discuss Miss Stokes' varieties of *E. ursinum*, a species which, I believe, should be maintained as the well-circumscribed entity originally proposed by Watson, with possibly one variety recognized.*

Eriogonum ursinum in this restricted sense is a plant of northern California and southern Oregon and is clearly related to the far-ranging and variable *E. umbellatum* Torr. From that complex, however, *E. ursinum* may be readily distinguished by the copiously woolly-tomentose filaments, which in *E. umbellatum* are conspicuously hairy but with hairs that are coarser, stiffish, and relatively sparser. As shown by the pubescence of the filaments in an isotype in Herb. Univ. Calif., *E. ovatum* Greene is referable to *E. ursinum* (just as Miss Stokes treated it), rather than to *E. umbellatum* var. *bahiaeforme* (T. & G.) Jeps. where Jepson (Fl. Calif. 1: 425) referred Greene's species or to *E. umbellatum* subsp. *polyanthum* (Benth.) Stokes where Abrams (Illus. Fl. 2: 27) referred it. The plants of *E. ursinum* frequently develop rather extended fruticulose leafy mats but are usually devoid of any prolonged scaly rhizomes. Only on Snow Mt., Lake Co., California, does *E. ursinum* develop a markedly rhizomatous habit, which, together with an abbreviated peduncle and congested inflorescence, seems to demark a distinct geographic variety, Miss Stokes' var. *nervulosum*. The only specimens I have seen of var. *nervulosum* are those collected by Katharine Brandegee in August, 1902 (type, Univ. Calif.; isotype, Calif. Acad. Sci.).

Eriogonum ursinum is perhaps closest to *E. ternatum* Howell, a plant nearly related to *E. umbellatum* and having the same

*In his Illustrated Flora, Abrams restored *E. ursinum* to this original concept but he did not account for several of Miss Stokes' varieties which have continued to be a source of doubt and confusion.

coarse-hairy filaments but seemingly specifically distinct in its few-rayed, frequently bracteolate inflorescences and large turbinate involucres with erect broadly triangular teeth. Comparison of the types of *E. ternatum* (Herb. Univ. Oregon) and of *E. ursinum* var. *confine* Stokes (Herb. Univ. Calif.) shows them to be the same, and it was in this way that Abrams treated them in his Illustrated Flora. Although *E. ternatum* is found both in northwestern California and southwestern Oregon, the plant was apparently overlooked by Jepson, and by Peck it was probably submerged without reference in *E. umbellatum*. Miss Stokes, wishing to treat Howell's name as a synonym of *E. umbellatum* subsp. *Hausknechtii* (Dammer) Stokes, erroneously cited it as "*E. umbellatum* var. *ternatum* How." (Gen. Eriog. p. 112). The type of *E. ternatum* was collected by Howell "along Rough and Ready Creek near Waldo, Oregon," in June, 1884.

Eriogonum ursinum var. *Congdonii* Stokes, with its narrow, revolute, *Ledum*-like leaves and few-rayed inflorescences, is a distinctive looking plant, seemingly intermediate between *E. ternatum* and *E. umbellatum*, but certainly not referable to *E. ursinum* as that species is accepted here. Although the extended fruticulose base and the ebracteolate involucres are reminiscent of *E. umbellatum*, the few-rayed inflorescence, the turbinate involucres, and the erect broadly deltoid involucral teeth are like those of *E. ternatum*, so I am treating it as a variety of the latter. I know the plant from only three California collections: Mt. Eddy Trail, Siskiyou Co., *Congdon in 1900* (type, Calif. Acad. Sci.); Scott Mt., Siskiyou Co., *Parker 222* (Univ. Calif.); near head of Bear Creek, elevation about 7000 feet, Trinity Co., *Cantelow 1874* (Calif. Acad. Sci.).

Eriogonum siskiyouense Small is a plant whose proper systematic position I have not satisfactorily determined. It should not be treated as a variety of *E. ursinum* as was done by Miss Stokes, but whether it can be maintained specifically distinct from *E. umbellatum* as has been attempted by Jepson and by Abrams will require further study. The plant is usually described as having 1-rayed flowering stems (the condition obtaining in the type-collection, N. Y. Bot. Gard., Herb. Gray.), but I collected material from the region of the type-locality on the summit ridge of Scott Mt. between Trinity and Siskiyou coun-

ties, California, in which the flowering stems are 1-, 2-, or 3-rayed.

As I have already pointed out in my discussion of *E. polypodum* Small (Leafl. West. Bot. 6: 198–202), Miss Stokes misapplied the name *E. ursinum* var. *Covillei* to plants of that species. As disclosed by the type-collection (U. S. Nat. Herb., Univ. Calif. Herb.) and by annotations by C. W. Sharsmith in Herb. Calif. Acad. Sci., *E. Covillei* Small represents the extreme alpine reduction of *E. umbellatum* in the southern Sierra Nevada. *Eriogonum Covillei* was not mentioned by Jepson, while Abrams restored it to the *E. umbellatum* complex, treating it as a dwarf form between var. *minus* Johnston and subsp. *polyanthum* (Benth.) Stokes.

Eriogonum rosulatum Small, as shown by the type-collection in U. S. Nat. Herb., represents the extreme alpine reduction in *E. incanum* T. & G. In the original description Small described the filaments as glabrous, but actually they are hairy below the middle. In spite of this error, Jepson correctly related *E. rosulatum* to *E. incanum,* of which *E. rosulatum* may be regarded as an alpine variety. It is not easy to understand how Miss Stokes could treat this dioecious plant with short styles as a variety of *E. ursinum* since that species has perfect flowers and elongate styles.

Nomenclatural Summary

Eriogonum Covillei Small, Bull. Torr. Bot. Club 25: 42 (1898). *E. ursinum* var. *Covillei* (Small) Stokes, Genus Eriogonum 115 (1936). A reduced subalpine variant of *E. umbellatum* Torr.

Eriogonum incanum T. & G., Proc. Amer. Acad. 8: 161 (1870). *E. rosulatum* Small, op. cit., 46. *E. ursinum* var. *rosulatum* (Small) Stokes, op. cit., 115.

Eriogonum polypodum Small, op. cit., 46. *E. umbellatum* var. *polypodum* (Small) Stokes, op. cit., 113. *E. ursinum* var. *venosum* Stokes ex Smiley, Univ. Calif. Publ. Bot. 9: 164 (1921).

Eriogonum siskiyouense Small, op. cit., 44. *E. ursinum* var. *siskiyouense* (Small) Stokes, op. cit., 114.

Eriogonum ternatum Howell, Fl. NW. Amer. 570 (1902). "*E. umbellatum* var. *ternatum* How.," Stokes, op. cit., 112, in synonymy. *E. ursinum* var. *confine* Stokes, op. cit., 114.

Eriogonum ternatum var. **Congdonii** (Stokes) J. T. Howell, comb. nov. *E. ursinum* var. *Congdonii* Stokes, op. cit., 114.

Eriogonum ursinum Wats., Proc. Amer. Acad. 10: 347 (1875). *E. ursinum* var. *typicum* Stokes, op. cit., 114. *E. ovatum* Greene, Pittonia 5: 69 (1902).

Eriogonum ursinum var. nervulosum Stokes, op. cit., 114.

KEY TO TAXA SUMMARIZED

1. Plants dioecious; styles 1 mm. long or less ..... *E. incanum*
1. Plants usually monoecious, the flowers perfect or uniserxual; styles more than 2 mm. long 2
2. Involucres more or less deeply lobed, the lobes usually reflexed in age. Filaments coarsely hairy; achenes more or less utricular-turgid... 3
2. Involucres toothed, the teeth slender to broadly deltoid, erect..... 4
3. Rays of inflorescence 1 to 3, elongate, if more than one then 1 or 2 with secondary whorl of bractlets ..... *E. siskiyouense*
3. Rays of inflorescence several, short, ebracteolate ..... *E. Covillei*
4. Filaments tomentulose-hairy, the hairs numerous, long, slender, and tangled. Achenes utricular-turgid except near the base..... 5
4. Filaments rather sparsely and coarsely hairy, not tomentulose-hairy... 6
5. Plants forming fruticulose mats..... *E. ursinum*
5. Plants producing rhizomes ..... *E. ursinum* var. *nervulosum*
6. Flowers whitish or rose-tinged; achenes scarcely at all utricular-turgid, the pericarp adherent to the seed ..... *E. polypodum*
6. Flowers yellow; achene utricular-turgid and free from the seed except near the base 7
7. Leaves plane, ovatish to obovatish; branches of the inflorescence bracteolate below the involucres ..... *E. ternatum*
7. Leaf-margins revolute, narrowly elliptic or oblongish; branches of the inflorescence ebracteolate ..... *E. ternatum* var. *Congdonii*

SOME ALTITUDINAL RECORDS FROM THE SOUTHERN SIERRA NEVADA, CALIFORNIA. Among the phytogeographic data which I assembled for my study on "The Arctic-alpine Flora of Three Peaks in the Sierra Nevada" (Leafl. West. Bot. 6: 141–154), I recorded several plants from Army Pass and from Olancha Peak at elevations apparently higher than any previously reported. Since these altitudinal data were not specially noted at that time, I shall record them now, together with my field numbers:

The following three plants are perhaps at their altitudinal limit in the vicinity of Army Pass: *Carex praeceptorum* Mkze. at 11,500 ft., *No. 26028; Eriogonum Covillei* Small at 11,600 ft., *No. 26166; Epilobium oregonense* Hausskn. at 11,500 ft., *No. 26027.*

Seven plants apparently reach their altitudinal limit on Olancha Peak: *Lewisia sierrae* Ferris at 12,000 ft., *No. 27221; Arabis repanda* Wats. var. *Greenei* Jeps. at 11,600 ft., *No. 27199; Viola purpurea* Kell. var. *grisea* Jeps. at 11,600 ft., *No. 27200; Gayo-*

phytum racemosum T. & G. at 12,000 ft., *No. 27241,* also from Army Pass at same elevation, *No. 26201; Cryptantha circumscissa* (H.& A.) Jtn. var. *hispida* (Macbr.) Jtn. at 12,000 ft., *No. 27245; Mimulus stamineus* Grant at 12,000 ft., *No. 27242;* and *Orochaenactis thysanocarpha* (Gray) Cov. at 11,600 ft., *No. 27201.*—John Thomas Howell.

ERRATA

Page 4, line 7; delete "Abundant on Lassen Peak at 5000 ft., *Brewer* (Lesq., 1868);".

Page 21, lines 34 and 35; for author of and reference to *Meesia triquetra* substitute "(Turn.) Ångstr., Nov. Act. Soc. Upsal. 12: 357 (1844)."

Page 27, line 4; for *North Pacific Basin* read *Pacific Coast.* Line 7; for *Pacific Coast* read *North Pacific Basin.*

Page 29, line 46; for *lanceolata* read *lanceolatum.*

Page 31, lines 19 and 37, and page 40, line 19; for *Pseudoisothecium* read *Pseudisothecium.*

Page 40, line 7; for *Ephermerum* read *Ephemerum.*

Page 111, line 33; for *Aragallus Cusickii* read *Oxytropis Cusickii.*

Page 148, line 18; for *septentrionale* read *septentrionalis.*

Page 167, lines 8 and 9; for *3 cm.* read *13 mm.* Line 11, delete comma after *pedunculis.*

Page 174, lines 30 and 31; for *Montsose* read *Montrose.*

Page 179, line 18; for *6186* read *6185.*

N. B. In LEAFLETS OF WESTERN BOTANY, vol. 5, p. 10, line 38, for *Hordeum brachyanthemum* Nash read *Hordeum brachyantherum* Nevski.

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