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THE GENUS MYOSURUS L. (RANUNCULACEAE) IN NORTH AMERICA

By GLORIA R. CAMPBELL*

INTRODUCTION

This paper presents the results of the study of *Myosurus* through herbarium material. A few forms were also grown in the greenhouse.

In North America the author recognizes four species for the genus, namely *Myosurus minimus*, *M. aristatus*, *M. nitidus* and *M. cupulatus*. *M. minimus*, with eight taxa of subspecific rank, is the most widespread, occurring in North and South America, Europe, Australia and New Zealand. A new subspecies is described as *M. minimus* ssp. *montanus*, occurring at elevations of from 5000 to 15,000 feet in western United States. *M. aristatus* Benth., of western North America is found to be distinct from *M. apetalus* described earlier by Gay (Flora Chilena, i, p. 31, tab. 1, fig. 1, 1845) from 11,200 feet, Patos, Coquimbo, Chile. Chilean material collected by Reiche in the area of the type location, at 3000 m., Illapel and Santiago, was studied when the type could not be located. These specimens collected by Reiche appear to be characteristic of those used for Gay's plate. Comparison of the two collections of *M. apetalus* and a quantity of material of *M. aristatus* shows numerous differences between the two species of North and South America. In the specimens of *M. apetalus* studied, more than 50 achenes are present per spike; achene beaks are extended about 0.5 mm. beyond the body of the achene; scapes are only slightly exceeding leaves; sepal blades are 3- or 5-nerved; and flower parts are retained on mature fruiting spikes. Plants of *M. aristatus* produce less than 50 achenes per spike; achene beaks are extended 1-1.5 mm. beyond the body of the achenes; scapes are 2 to 3 times longer than leaves; sepal blades are single-nerved; and flower parts are usually absent on mature fruited spikes. On flowers of both *M. aristatus* and *M. apetalus* petals are present, although these are easily lost as is common throughout the genus.

The fruiting spikes, achenes, and seeds have supplied many more of the diagnostic characters than have the vegetative and floral parts. Particularly useful in distinguishing taxa have been the shape of the achene back and the outline of the achene from the side view.

Cultivation of *M. minimus* subsp. *minimus*, subsp. *montanus* and var. *filiformis* has been accomplished. Repeated attempts to germinate seeds more than two to three years old proved unsuccessful. Under greenhouse conditions of continuous moisture and a rather constant temperature, new generations have been produced month after month from a single planting of seeds.

The following is a list of symbols, as given by J. Lanjouw and F. A. Stafleu,

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"Index Herbariorum Part I—The Herbaria of the World," *Regnum Vegetabile*, 2: 106-117, 1952, used to designate the herbaria in which specimens examined and cited in this paper are located:

- CAS—California Academy of Sciences, San Francisco, California.
 GH—Gray Herbarium of Harvard University, Cambridge, Mass.
 JEPS—W. L. Jepson Herbarium, Berkeley, California.
 NY—New York Botanical Garden, New York, New York.
 ORE—University of Oregon, Eugene, Oregon.
 POM—Pomona College, Claremont, California.
 RSA—Rancho Santa Ana Botanic Garden, Claremont, California.
 UC—University of California, Berkeley, California.
 US—National Museum, Smithsonian Institution, Washington, D.C.

To those in charge of the above named institutions and to Rebeca Acevedo de Vargas of the Museo Nacional de Historia Natural, Santiago, Chile, for sending material of *M. apetalus*, I am grateful for their kindness and cooperation.

Drawings of achenes and seeds were prepared by Mr. J. D. Laudermilk.

MYOSURUS L.

Glabrous, acaulescent annuals, commonly with elongated primary root and fibrous secondary roots; plant 2.5–18 cm. tall. Leaves basal, entire, erect, linear-filiform, somewhat dilated at base, 2–8.5 cm. long, ca. 1 mm. wide. Flowers borne singly on scapes, which are shorter or longer than leaves. Floral parts persistent or deciduous at fruiting time. Sepals green, 5, spurred, hyaline when dry; blade 1–3 mm. long, 1-, 3-, or 5-nerved; spur 0.5–3 mm. long, rounded or acute. Petals 5 or fewer, inconspicuous, linear, 1.25–3 mm. long, broadest near tip and narrowed to base, easily detached from flower. Stamens 5–10, in length 1.5–4.5 mm.; anthers linear or broadly-linear. Achenes 20–200 or more per spike, crowded on long, slender spike-like receptacle, spirally arranged, green becoming yellow or brown in age, deciduous or persistent, 1–3 mm. long, 0.3–2 mm. across back, 0.5–1 mm. across in side view¹; backs of achenes rhombic, 6-sided, elliptic, round or compressed laterally, with central ridge ending in a beak, with or without lateral ridges; side view highly variable: rectangular with nearly truncate base and apex, square, or tapered along ventral edge and broad base to tip, sometimes slightly puberulent or pubescent; ventral surface of achene reduced to an edge; achene beaks extended 0.0–1.5 mm. beyond body of achene; beak varying from closely appressed to spike to divergent from spike, awn-shaped or triangular in side view. Seed green, smooth, flattened laterally, elliptic or ovate in outline, 0.5–1.5 mm. long, 0.25–0.6 mm. wide².

KEY TO NORTH AMERICAN MYOSURUS

- A. Scapes surpassing leaves.
 B. Achene back (with exception of beak) orbicular or suborbicular in outline.
 C. Scapes 5–20 per plant; beak of achene triangular in side view and extended 0.5–0.6 mm. beyond body of achene 3. *M. cupulatus*

¹Dorsiventral measurement.

²In reference to seed measurements the term "length" is used to describe distance from apex to base of seed; and "width" is used for the dorsiventral measurement, from front to back of seed.

- CC. Scapes less than 4 per plant; beak of achene not triangular in side view and extended about 1 mm. beyond body of achene 4. *M. nitidus*
- BB. Achene back (with exception of beak) longer than broad, not orbicular or suborbicular in outline.
 - C. Mature achene compressed laterally, 0.25–0.5 (0.8) mm. across, very little of the achene body except ridge visible on spike surface.
 - D. Length of leaves same as scape or only 1 cm. shorter; spike 1–1.5 cm. long. Harney Co., Oregon 1d. *M. minimus* subsp. *major* var. *clavicaulis*
 - DD. Length of leaves $\frac{1}{2}$ – $\frac{3}{4}$ that of scapes; spike 1.5–4 cm. long. Scattered points; w. Washington; Marion Co., Oregon; and Siskiyou Co., California 1d. *M. minimus* subsp. *major*
 - CC. Mature achene not compressed laterally, 0.5–1.25 mm. across, full back of achene visible on spike surface.
 - D. Beak of achene extended less than 0.5 mm. beyond body, not divergent from spike.
 - E. Achene body 0.5–1.5 mm. longer than deep (depth seen in side view); sepal blade 3- (rarely 5-) nerved, naked receptacle appearing undulate.
 - F. Mature achene truncatish at base in side view and lateral ridges lacking on back, achene usually over 1.5 mm. long; spike 2–3 (1.5) mm. thick at base 1a. *M. minimus* subsp. *minimus*
 - FF. Mature achene rounded at base in side view and usually tapered to apex, lateral ridges present on back, achene usually under 1.5 mm. long; spike 1–1.5 mm. thick at base 1b. *M. minimus* var. *filiformis*
 - EE. Achene body as long as deep (depth seen from side view); sepal blade 5-nerved; naked spike only scarred, not undulate 1f. *M. minimus* subsp. *Pringlei*
 - DD. Beak of achene extended 0.5–1.5 mm. beyond body of achene, divergent from spike.
 - E. Sepal blade 1-nerved; spike 3–9 mm. long; achene back nearly elliptic or slightly broader below middle; seed $\frac{1}{2}$ or less than $\frac{1}{2}$ as long as wide, much wider at base than at apex. Below 7000 ft. elevation. . . 2. *M. aristatus*
 - EE. Sepal blade faintly 3-nerved; spike 6–25 mm. long; achene back rhombic; seed 2–4 times longer than wide, narrowly elliptic. Elevation 5,000–15,000 ft. 1c. *M. minimus* subsp. *montanus*
- AA. Scapes shorter than or rarely equalling leaves.
 - B. Flower parts and achenes readily shed when mature. Harney Co., Oregon 1d. *M. minimus* subsp. *major* var. *clavicaulis*
- BB. Flower parts and achenes persistent when fruits matured.
 - C. Mature achenes not compressed laterally, 0.75–1.5 mm. long, achene beak extended 0.25 mm. beyond body; sepal spur 0.5–1.5 mm. long, rounded or obtuse. San Diego and Riverside cos., Calif. 1e. *M. minimus* subsp. *apus*
 - CC. Mature achenes somewhat compressed laterally, 1.75–2.25 mm. long, achene beak extended 0.5–1.25 mm. beyond body; sepal spur 0.25 (0.5) mm. long and rounded. Central Valley, California, and Umatilla Co., Oregon 1e. *M. minimus* subsp. *apus* var. *sessiliflorus*

1a. *M. MINIMUS* L. subsp. *minimus*

M. minimus L., Sp. Pl. 284, 1753.
M. Shortii Rafin., Am. Journ. Sci., I, 1: 379, 1819. (Type: "Dr. Short of Kentucky, who discovered it in the neighborhood of Hopkinsville, in Christian County, West Kentucky.") Type not seen but specimens by Short from Kentucky were examined.
M. minimus genuinus Greene, Bull. Calif. Acad. of Sci., 1: 276, 1885.
M. apetalus var. *lepturus* Gray, Bull. Torrey Club 13: 2, 1886. The specimens cited by Gray were examined.
M. minimus typicus Huth in Engl., Bot. Jahrb. 16: 284, 1893.
M. minimus var. *Shortii* (Rafin.) Huth in Engl., loc. cit.
M. breviscapus Huth in Engl. *ibid.*, p. 285. Type not seen.
M. breviscapus californicus Huth in Engl., loc. cit.
M. tenellus Greene, Pittonia 3: 258, 1898. Type not seen.
M. tenellus var. *amphioxys* Greene, loc. cit. (*Piper* 2283, from Spokane May 16, 1896, (GH), indicated as "Duplicate type," was studied.)
M. lepturus Howell, Fl. N. Am. 1: 12, 1903
M. aristatus var. *lepturus* Jeps., Fl. Calif., 1: 531, 1922.

Figs. A and B

Leaves 2–8.5 cm. long, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the scapes; scapes 3.5–18 cm. tall; sepals 5, blade 2–3 mm. long, faintly 3- (rarely 5-) nerved, spur 1–3 mm. long, acute; petals linear, 2–3 mm. long; stamens usually 10, occasionally 5, 1.5–3 mm. long; spike 1 (0.5)–6 cm. long, 2–3 mm. in diameter at base, tapered to tip, naked receptacle showing undulations; achenes 70 or more per spike, 1–2.5 mm. long, 0.75–1 mm. across, 0.75–1 mm. deep in side view, dorsal surface rhombic or 6-sided, main central ridge present, arising at a point $\frac{1}{4}$ – $\frac{1}{2}$ the way up from base of the achene, ending in appressed beak extending 0.25 mm. beyond body of achene, lateral ridges lacking, edges of achenes closely fitting, forming smooth solid covering on spike, achene in side view quite rectangular with horizontal base and almost horizontal apex; seed green, moderately closely inclosed by achene. (In Oreg., Wash., northern Calif. excluding the Great Valley, some of Ariz., and Utah, and in Mont. the seed is narrowly ellipsoid, 2–3 times as long as wide, 0.66–1.5 mm. long, 0.25–0.6 mm. wide. In the Great Valley of California and on Mt. Eden, eastern U. S., Europe, Australia and some of Ariz. and Utah, the seed is oblong-ovate to broadly ovate in outline, or the seed is about 2 times or less as long as wide (0.75–1 mm. long, 0.5–0.7 mm. wide). Seeds mature March–June in N. Hemisphere; Aug.–January in S. Am., Australia, N. Zealand.

Type locality, "habitat in Europae collibus apricis aridis."

Occurring below 5000 ft., (7700 ft., Sublette Co., Wyo.). Moist places, drying in summer; from B. C. south to southern Calif., east to Ontario and Georgia; So. Am., Europe, Australia, N. Zealand.

Material seen: CANADA: British Columbia: Vancouver Island, *Carter*, May 18, 1918 (GH); *Macoun 21* (GH), *Macoun 77,358* (POM), *Macoun*, May 30, 1893 (GH), *Macoun 50* (GH) (cited by Gray as *M. apetalus* var. *lepturus*); Ontario: Belleville, *Macoun 982* (GH); Alberta: 5 mi. w. of Pincher Creek, *Moss 943* (GH); Assiniboia: Wood Mt., *Macoun 10063* (GH); Maple Creek, *Macoun 2962* (GH).

WASHINGTON: Clallam Co.: Olympic Mts., *Elmer 2674* (POM, UO); San Juan Co.: Stuart Id., *Lawrence 77* (UC); Island Co.: Camano Id., *Gardner*, May 1896 (UC); Whatcom Co.: Lummi Rocks, *Muenschner 9711* (GH, UC), *9750a* (GH); Okanogan Co.: Rim Rock, *Fiker 2398* (POM); Kittitas Co.: e. of Cle Elum, *Thompson 9031* (RSA, POM, GH, UC), *McGee 231* (CAS); Klickitat Co.: Rockland, *Suksdorf*, April 10, 1886 (GH); Columbia River, *Suksdorf 2344* and *492* (GH); Bingen, *Suksdorf 5575* (ORE); Lincoln Co.: near Creston, *Thompson 9164* (GH, UC, POM); Spokane Co.: Hangman Creek, *Sandberg and Lieberg 3* (UO, UC, GH); Spokane, *Sandberg and Lieberg*, May 1893 (POM), *Piper 2283* (UC, GH); Whitman Co.: Pullman, *G. N. Jones 1267*, *Piper 1459* (GH), *A. D. E. Elmer 184, 4*, and June 1896 (POM); Bonnie Lake, *Sharsmith 3569* (UC, POM); Rock Creek, *Piper 2790* (GH); Rock Lake, *Sandberg and Lieberg 112* (CAS, GH, UC); 10 mi. n. of Colfax, *Hitchcock and Samuel 2599* (POM, RSA, ORE, CAS).

OREGON: Sauvies Id.: *Drake & Dickson*, April 1, 1887 (GH), *Henderson*, April 1, 1882 (ORE), *T. Howell*, April 26, 1893 (UC, ORE); Josephine Co.: *Eastwood and Howell 1379* (CAS); Jackson Co.: Camp White, *Peck 24846* (UC); Wasco Co.: The Dalles, *T. Howell*, May 29, 1882 (ORE), *Suksdorf*, April 12, 1886 (GH), *Peck 5711* (GH), *Thompson 11358* (GH, CAS, UC, POM); Morrow Co.: Rock Creek, *Leiberg 71* (ORE, UC, GH); Umatilla Co.: *J. T. Howell*, May 8, 1882 (ORE), May 20, 1882 (GH) (cited as *M. apetalus* var. *lepturus* by Gray); Wallowa Co.: near Flora, *Eastwood and Howell 3275* (CAS); Malheur Co.: Owyhee, *Leiberg 2177* (GH, UC, ORE, POM); Klamath Co.: Keno, *Peck 24958* (UC); Lake Co.: Quartz Mt., *Peck 25450* (UC); county unknown: w. side of coast mts., *Howell*, May 1886, "Wahlamet," *J. A. Lowell* (GH).

IDAHO: Valley Co.: 5 mi. n. of Cascade, *R. J. Davis 1907* (POM); Elmore Co.: 2 mi. w. of Prairie P. O., *Hitchcock 15483* (UC, RSA); Custer Co.: head of Morgan Creek, *Hitchcock & Muhlich 9415* (GH); Blaine Co.: 5 mi. w. of Carters, *R. J. Davis 3085* (POM).

CALIFORNIA: (collections with seeds with outline narrowly ellipsoid, the length 2–3

times the width): Siskiyou Co.: Yreka, *Butler 551* (UC); Modoc Co.: "Pot Hole Springs," *Mrs. R. M. Austin*, June 1894 (UC); near Perez, *Eastwood and Howell 8274* (CAS); Buffalo Canyon, *Lemmon 5* (GH); Lassen Co.: Dixie Mts., *Baker* in 1894 (UC); Butte Co.: 11 mi. n. of Chico, *Heller 11775* (GH, CAS); Glenn Co.: Willows, *Eastwood 10169* (CAS); Lake Co.: w. base Mt. Konocti, *Benson 6596* (POM); 3.8 mi. n.e. of Lower Lake, *Baker 8213* (CAS); Contra Costa Co.: near Antioch, *K. Brandegee*, May 1884 (GH); Antioch and Marsh Creek, *K. Brandegee*, April 24, 1909 (UC, CAS); Alameda Co.: near Livermore, *Howell 10869* (CAS), *10870* (CAS, POM); Hemet Valley, *Peirson 3035* (RSA); Kenworthy, *Munz & Johnston 5461* (UC, CAS, POM); San Diego Co.: Camp Kearney Mesa, *E. A. Purer 7228* (UC, RSA), *6859* (POM), *Youngberg 22* (POM); county unknown: *Lemmon 1* in 1874 (GH) (cited by Gray as *M. apetalus* var. *lepturus*).

CALIFORNIA: (collections bearing seeds oblong-ovate to broadly ovate in outline, about 2 times or less as long as wide): Butte Co.: *Heller & Brown 5443* (POM, GH); Solano Co.: Susan, *Eastwood 10429* (CAS); Haas Slough, *W. L. Jepson*, July 5, 1891, Vacaville, *Jepson* in 1891 (JEPS); Contra Costa Co.: s. of Byron, *Wiggins 4580* (UC, POM); Alameda Co.: Mt. Eden, *Cannon*, May 1893 (CAS), *T. S. Brandegee*, June 16, 1893 (POM, GH), *Brandegee*, April 27, 1889 (UC), *W. H. Brewer 1193* (3035, UC, CAS); San Joaquin Co.: near San Joaquin, *Hoover 4367* (UC); Stockton, *Stanford 809, 152* (POM), *Piper*, May 26, 1921 (UC), *Quick*, March 30, 1929 (CAS); Stanislaus Co.: Arroyo del Puerto, *Sharsmith 1644* (UC); Merced Co.: 9 mi. w. of Los Banos, *Hoover 1649* (UC); Fresno Co.: rd. from Mendota to Fresno, *Lyon 839* (UC); Kings Co.: Coalinga-Hanford Rd., *Wolf 6410* (GH, RSA, UC); San Bernardino Co.: Rabbit Springs, *J. & L. Roos 4724* (RSA).

MONTANA: Lake Co.: Ronan, *M. E. Jones*, July 19, 1909 (POM); 1 mi. s. of Charlo, *Hitchcock 17773* (RSA, UC); Gallatin Co.: Spanish Creek, *Vogel*, July 12, 1901 (GH); Bozeman, *Blankinship 9* (POM).

WYOMING: Crook Co.: 7 mi. n.w. of Hulett, *Ownbey 548a* (UC); Sublette Co.: New Fork Lakes, *E. B. Payson and L. B. Payson 4431* (GH); county unknown: *Parry 11* in 1873 (GH) (cited by Gray as *M. apetalus* var. *lepturus*).

UTAH: Cache Co.: 1 mi. w. of Logan Air Port, *Maguire 2319* (POM, UC, GH), 1.5 mi. w. of Logan Air Port, *Muenschler and Maguire 2318* (UC, POM); 3 mi. w. of Logan, *Maguire 3374a* (UC, GH); Summit Co.: *E. B. & L. B. Payson 4851* (POM, UC, GH).

ARIZONA: Coconino Co.: Flagstaff, *M. E. Jones*, Aug. 12, 1884 (POM); s. San Francisco Mts., *Lemmon 3268* (GH); Yavapi Co.: Prescott, *Rusby*, May 1883 (GH); Pima Co.: Tucson, *Thorner 4321* (POM); Navajo Co.: Betatakin, *Howell 24463* (CAS).

COLORADO: El Paso Co.: Colorado Spgs., *M. E. Jones 88* (POM).

NEW MEXICO: *C. Wright 7305* (GH).

SOUTH DAKOTA: Mellette, *Brenckle 47-504* (CAS).

TEXAS: Taylor Co.: Camp Barkeley, *Tolstead 41872* (GH), *6952* (UC); Wichita Co.: 5 mi. n. of Wichita Falls, *Warnock 44-10* (UC); Travis Co.: Pedernales River, *Tharp & Warnock 46075* (UC); Austin, *M. S. Young*, March 29, 1914 (UC); Lake Austin, *Tharp*, March 21, 1929 (GH), April 2, 1929 (GH, CAS, UC); Wharton Co.: Wharton, *Palmer 4885* (POM); Hungerford, *Palmer 4845* (POM); county unknown: Columbia, *Bush 1256* (GH).

OKLAHOMA: Woods Co.: near Alva, *Stevens 3012* (GH); Kingfisher Co.: *L. A. Blankinship*, April 10, 1896 (GH); Comanche Co.: Fort Sill, *Mrs. J. Clemens 11582* (GH); Payne Co.: e. of Stillwater, *Davies 15* (CAS), *Waterfall 9269* (RSA); Cleveland Co.: Norman, *Demaree 11858* (GH).

NEBRASKA: Hamilton Co.: Aurora, *Kiener 18654* (GH); Kearney Co.: *Hapeman*, May 1914 (UC).

Representative specimens: KANSAS: Ellis Co.: n.w. of Hays, *Bondy 522* (CAS); Pottawatomie Co.: *A. S. Hitchcock 602* (GH); Miami Co.: *Oyster*, April 25, 1883 (UC) and May 1884 (CAS).

IOWA: Muscatine Co.: e. of Salisbury bridge, *Shimek*, April 27, 1925 (UC).

ILLINOIS: St. Clair Co.: 15 mi. s.e. of St. Louis, *Goodman & Hitchcock 1065* (POM), Falling Spring, *Greenman 4263* (GH); county uncertain, Augusta, *Mead* in 1842 (GH), *Wetang, Vasey*, May 16, 1861 (GH).

MISSOURI: Jackson Co.: Independence, *Bush 21* (UC); St. Louis Co.: St. Louis, *Geyer*, April 1842 (GH, UC), *Eggert*, April 26, 1874 (UC); near Eureka, *M. & R. P. Ownbey*, April 10, 1938 (UC).

ARKANSAS: Pulaski Co.: *Hasse*, April 1886 (ORE); Hot Springs Co.: Cove Creek Station, *Palmer 29706* (GH); Conway Co.: near Plummerville, *Palmer 33246* (GH); Jefferson Co.: Pine Bluff, *Demaree 14449* (GH); Drew Co.: Monticello, *Demaree 20795a* (UC, CAS), *16675* (GH).

LOUISIANA: New Orleans, *Drummond* in 1832 (GH); *Short* in 1840.

INDIANA: Knox Co.: 2 mi. n. of Mt. Carmel, *Friesner 21364* (GH, UC).

KENTUCKY: Lexington, *Short* (GH); Union Co.: Shacklette farm, *Shacklette 256* (GH).

TENNESSEE: Obion Co.: Walnut Log, *Eyles 7806* (GH); Shelby Co.: Memphis, *Palmer 17286* (GH).

VIRGINIA: Princess Anne Co.: Virginia Beach, *Williamson*, April 18, 1908 (UC), *Bartram*, April 18, 1909 (GH); Sussex Co.: Stony Creek, *Fernald & Long 11833* (GH), *Jarrett, Fernald & Long 11834, 14153* (GH); Southampton Co.: *Fernald & Long 9726* (GH).
 NORTH CAROLINA: Durham Co.: *Blomquist*, April 10, 1934 (GH).

1b. *M. MINIMUS* var. *FILIFORMIS* Greene

M. minimus var. *filiformis* Greene, Bull. Calif. Acad. Sci. 1: 277, 1885.

Fig. C

Leaves 1–8 cm. long, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the scapes; scapes 1–18 cm. tall; sepals 5, blade 1.25–2.5 mm. long, faintly 3-nerved, spur 0.5–2.5 mm., elongate and acute; petals linear, 2–3 mm. long; stamens usually 5, occasionally up to 10, 1.5–2 mm. long; spike 13–35 mm. long, 1–1.5 mm. in diam. at base, slightly tapered toward tip, naked spike only scarred, very rarely showing undulations in receptacle; achenes ca. 30–100 per spike, 1–1.5 mm. long, 0.5–0.75 mm. across, 0.5–0.75 mm. deep in side view, back elliptic or ovate, rarely rhombic, lateral ridges present, achenes often loosely arranged on spike and allowing some of receptacle to show, rounded or tapered to base in side view, beak appressed, not extended or extended up to 0.25 mm. beyond body of achene; seed very closely invested by achene-coat, 0.5–0.8 mm. long, 0.25–0.6 mm. wide, length less than twice the width, broadest at base, narrowed to a sub-acute or obtuse apex; mature seeds last of March to early May.

Wet or drying places with mosses, grass; California: Mendocino, Alameda, Santa Clara, San Joaquin, Stanislaus, Monterey, Merced, Tulare, and Kern cos. and San Diego City; in Lower California and on Guadalupe Island, Mexico; elevations up to 2300 ft.

Backs of basal achenes on a collection from 10 mi. e. of Stockton, San Joaquin Co., *Mason 5548* (UC, GH) are rhombic in outline (like *M. minimus minimus*) while outline of achene backs higher on the same spike are ovate or nearly elliptic.

Type locality "the extreme state, with long filiform heads, found by the writer on Guadalupe Island, . . ." A collection by Greene made April 19, 1885, on Guadalupe Island is at the Gray Herbarium.

Material studied: CALIFORNIA: Mendocino Co.: 8 mi. n. of Ukiah, *M. S. Baker 12015* (UC, CAS); N. Fk. of Eel River, *Duran 3400* (UC, CAS, POM, RSA, GH); Sacramento Co.: Rio Linda, *Mason 7936* (UC); San Joaquin Co.: 0.6 mi. n. of Colledgeville on road toward Lockeford, *Kamb and Chisaki 1985* (RSA); Santa Clara Co.: Pacheco Pass, *J. T. Howell 24293* (CAS); Colorado Creek, *H. K. Sharsmith 3454* (UC, POM); Stanislaus Co.: 4 mi. s. of Oakdale, *Hoover 2009* (UC); Mt. Hamilton Range, *Sharsmith 1638* (UC, GH, POM); Alameda Co.: Arroyo Mocho, *Sharsmith 1731* (UC, POM); Merced Co.: 2 mi. n. of Snelling, *Hoover 1726* (UC); 3 mi. n.w. of Merced, *J. T. Howell 4209* (CAS); Monterey Co.: Soledad, *M. E. Jones 3135* (CAS, GH, ORE, POM); Tulare Co.: near Lemon Cove, *L. Benson 7571* (POM); Kern Co.: near Onyx, *F. A. MacFadden 13547* (CAS); San Diego Co.: San Diego, *T. S. Brandegee 3407* (GH, POM), *Gander 1122* (POM); county uncertain: *Hartweg 1629* (GH).

MEXICO: Baja California: *Orcutt*, April 17, 1886 (UC); Guadalupe Island, *E. L. Greene*, April 19, 1885 (GH) (type locality).

1c. *M. MINIMUS* subsp. *montanus* subsp. nov.

Figs. D and E

Leaves linear-filiform, 1.5–6 cm. long; scapes 1.5–9 (12) cm. tall, twice or more than twice the length of the leaves; sepals 5, 2.75–3.5 mm. long, spur elongate and acute, 1–1.5 mm. long, blade 1.5–2 mm. long, faintly 3- (rarely 5-) nerved; petals linear, 1.25–2.5 mm. long; stamens 5–10, 1.5–2 mm. long;

spike 6–25 mm. long, ca. 2 mm. thick at base, tapered to tip, naked spike showing undulations in receptacle; achenes 25–100 per head, 2–3 mm. long, 0.5–1.25 mm. across back, 0.5–1 mm. deep in side view, back rhombic, main central ridge originating slightly above base of achene and ending in beak, lateral ridges lacking; sides of achene puberulent and showing nearly parallel dorsal and ventral margins, truncate or broad-obtuse at base and nearly so at apex, beak divergent from body of achene, extended 0.5–1 mm. beyond body of achene; seed 0.75–1.75 mm. long, 0.33–0.75 mm. wide, 2–4 times longer than wide, outline of seed narrow-elliptic; mature seeds from middle of June through July.

Sepala 2.75–3.5 mm. longa; calcaribus sepalorum elongatis acutisque, 1–1.5 mm. longis; laminis sepalorum 1.5–2 mm. longis, parum 3- (5-) nervatis; spicis 6–25 mm. longis, base ca. 2 mm. crassis, attenuatis; achaeniis 25–100, 2–3 mm. longis, dorso 0.5–1.25 mm. latis, latere 0.5–1 mm. altis; dorsis achaeniorum rhombicis, lateribus achaeniorum puberulentis, cum marginibus dorsalibus et ventralibus subparallelis, base truncatis et apice subtruncatis; rostris achaeniorum divergentibus, 0.5–1 mm. extensis; seminibus 0.75–1.75 mm. longis, 0.33–0.75 mm. latis, anguste ellipticis.

Occurring at 5000–15,000 ft. (4100–4500 in Lake and Klamath cos., Oregon); mountain plateaus and meadows; in extreme southern Oregon; California: Trinity Co.; Sierra Nevada and San Bernardino Mts.; Saskatchewan: Wood Mt., Assiniboia; mountains of Montana, Arizona, Utah, Nevada, Wyoming and Colorado; at Kenmare, Ward Co., South Dakota.

Type specimen: Hwy 395, 3 mi. northwest of Bridgeport, Mono Co., *P. A. Munz 11811*, May 16, 1947, RSA 38649; also at CAS, NY, and University of Washington.

Material studied: OREGON: Klamath Co.: Klamath Marsh, *Peck 21963* (UC); Lake Co.: 16 mi. n. of Button Springs, *Leiberg 363* (ORE, GH, UC).

CALIFORNIA: Trinity Co.: Big Flat, *J. T. Howell 13216* (CAS); Plumas Co.: Big Meadows, *Mrs. R. M. Austin* in 1879 (UC); Portola, *Eastwood 7060* (CAS); between Vinto and Beckwith, *Heller and Kennedy*, July 2, 1907 (CAS); Placer Co.: Tahoe City, *Eastwood 467* (GH, CAS, UC); Mono Co.: 3 mi. n.w. of Bridgeport, *Munz 11811* (RSA) (type collection); Tuolumne Co.: Eagle Meadow, *Hoover 1538* (UC); Madera Co.: Garnet Creek to San Joaquin Mt., *J. T. Howell 16853* (CAS); Tulare Co.: Bakeoven Meadows, *J. T. Howell 26917* (CAS); Monache Meadows, *Munz 15200* (RSA); Inyo Co.: Cottonwood Creek, *J. T. Howell 25464* (CAS), *Munz 14036* (RSA); San Bernardino Co.: Bear Valley, *Parish 1789* (GH); Bear Lake, *M. E. Jones*, June 24, 1926 (POM); Bluff Lake, *Munz 10535* (UC, POM), *C. B. Wolf 8053* (GH, RSA); So. Fk. Santa Ana, *Peirson 3110* (POM, RSA); county not known: *Leemmon*, in 1875 (GH), 2, 796 (UC); Sierra Valley, *Leemmon* in 1873 (GH).

NEVADA: Washoe Co.: n.w. of Virginia City, *T. C. Adams 192* (UC); Carson City, *S. Watson 13* (GH); Nye Co.: 5 mi. s.e. of Millett, *J. M. and M. A. R. Linsdale 714, 933* (CAS).

MONTANA: Monida, *M. E. Jones*, July 14, 1908 (POM).

CANADA: Assiniboia, Wood Mt., *Macoun 10062* (GH).

NORTH DAKOTA: Ward Co.: Kenmare, *Hotchkiss 6687, 6701* (UC).

UTAH: Tooele Co.: Stansbury Id., *S. Watson 13* (GH); Utah Co.: Salamander Lake, *Harrison 11272* (UC), *A. O. Garrett 3375* (GH); San Juan Co.: 5 mi. w. of Monticello, *Carter 1575* (POM, UC); county uncertain: Gilbert's Meadow, *Porter*, July 28, 1873 (GH).

WYOMING: Sweetwater Co.: Wind River Mts., *Ripley & Barneby 7942* (CAS); Carbon Co.: Big Creek, *E. B. & L. B. Payson 2512* (UC, GH); county uncertain: near Leckie, *Merrill & Wilcox 589* (GH).

COLORADO: Delta Co.: Leroux Creek, *Cowen 2, 16* (GH); Larimer Co.: Log Cabin, *Ware 11033* (UC).

ARIZONA: Mohave Co.: San Francisco Mts., *Lemmon 3269* (GH); Coconino Co.: Kaibab Plateau, *Goodding 311-49, 177-49* (CAS); Leroux Springs, *Leiberg 5568* (ORE, UC); Mormon Lake, *MacDougal 108* (UC, GH); Grand Cañon, *MacDougal 236a* (US).

1d. *M. MINIMUS* subsp. **major** (Greene) stat. nov.

M. major Greene, Pittonia, 3: 257, 1898. (Type collection: Greene, Siskiyou Co., Calif. in 1876, which was studied.)

M. minimus var. *major* (Greene) Davis, A Tax. Study of N. Am. Ranunculaceae, 102, 1900.

Fig. F

Leaves 2–8 cm. long, about $\frac{1}{2}$ – $\frac{3}{4}$ the length of the scapes; scapes 5–16 cm. tall; sepals 5, spur elongate and acute, blade 2.5–3 mm. long, spur 1–2.5 mm. long, blade faintly 3-nerved; petals 3 mm. long, linear; stamens usually 5, 2–3 mm. long; spike 1.5–4 cm. long, 2–3 mm. broad at base, tapered to tip, naked spike showing undulations in receptacle; achenes 70 or more per spike, 1.75–2.5 mm. long, 0.3–0.8 mm. across, 0.5–1 mm. deep in side view, back narrow, commonly compressed laterally causing little of back to show aside from ridge, main central ridge arising at or near base and extending into divergent beak which extends 0.25–0.5 mm. beyond body of achene, lateral ridges lacking, achenes glabrous on sides and back, nearly rectangular in side view of outline, puberulent on sides; seed moderately closely invested by achene, 1–1.25 mm. long, 0.5 mm. wide, seed outline broadly elliptic, obtuse at base and tip; seeds maturing from April through July.

Below 3000 ft., rare; Washington: Whidby and San Juan Islands, w. Klickitat Co.; Oregon: Chemawa, Marion Co.; California: Shasta Valley, Siskiyou Co.

Type collection: "Excellent typical specimens of *M. major* were distributed by me from Siskiyou Co., California, in 1876; . . .," wrote Greene.

WASHINGTON: Kanaka Bay, San Juan Islands, *S. M. & E. B. Zeller 1203* (GH); Whidby Island, *Gardner 4* (UC); Columbia River, W. Klickitat Co., *Suksdorf 2343* (GH).

OREGON: Chemawa, *J. C. Nelson 1206* (GH).

CALIFORNIA: Shasta Valley near Edgewood, Siskiyou Co., *Heller 13900* (UC).

M. MINIMUS subsp. **MAJOR** var. **clavicaulis** (Peck) stat. nov.

M. clavicaulis Peck in Torreyia, 32: 149, 1932. Type examined.

Fig. G

Shorter than subsp. *major*; leaves 2–3 cm. long, about same length as scapes or 1 cm. shorter; scapes 2.5–5 cm. tall; spike 1–1.5 cm. long, 2 mm. broad at base, tapered to tip; achenes 1.5–2.25 mm. long, 0.25–0.5 mm. across, 0.5–0.75 mm. deep in side view.

Material seen: OREGON: Harney Co.: *Peck 13886*, 7 mi. w. of Riley, (GH, UC) (type collection); *Peck 20906*, 7 mi. n. of Wagontire (UC).

1e. *M. MINIMUS* subsp. **apus** (Greene) stat. nov.

M. minimus var. *apus* Greene, Bull. Calif. Acad. Sci. 1: 277, 1885. Type examined.

Fig. H

Leaves 2–9 cm. long, 0.5–3.0 cm. longer than scapes; scapes 2–7 cm. long; sepals 5, spur somewhat elongate and obtuse, 0.5 mm. long, blade 2.5–3.5 mm. long, faintly 3-nerved; petals 2–3 mm. long; stamens ca. 10 in number, 2.5 mm. long; spike 0.8–3.0 cm. long, 2–3 mm. in diameter at base, tapered toward tip; achenes 70 or more per spike, achenes and flower parts not readily shed,

some remaining long after fruit matured, naked spike showing undulations in receptacle; achenes 0.75–1.5 mm. long, 0.3–0.7 mm. across back, 0.5–0.8 mm. deep in side view, back of achene rhombic in outline, one main central ridge arising above the base about $\frac{1}{4}$ – $\frac{1}{2}$ of the length of the achene and ending in appressed beak which extends up to 0.25 mm. beyond body of achene, nearly rectangular in side view, achenes closely fitted, forming smooth surface on spike; seed broadly ovate with obtuse to subacute apex, 0.6–0.8 mm. long, 0.4–0.6 mm. wide, mature seeds in May.

In dessicating pools at low elevations (up to 1350 ft.), southern California: extreme western Riverside Co. and vicinity of San Diego, San Diego Co.

Type collection: "The var. *apus* is from the table-lands back of San Diego, where it was collected by Mr. Orcutt, April 10, 1884."

Material studied: CALIFORNIA: Riverside Co.: Menifee Valley, *Peirson 4171* (RSA), *Munz and Johnston 5379* (POM, UC); s. of Lake Elsinore, *Munz 5061* (UC, CAS, POM), *Peirson 2945* (RSA); March Field, *Munz and Johnston 5162* (POM); San Diego Co.: San Diego, *Orcutt* in 1886 (UC), *K. Brandegee* (UC), Cleveland, May 1882, *Orcutt*, April 10, 1884 (CAS) (type collection).

In central California from Glenn and Colusa cos. south to San Luis Obispo Co. there occur with *M. minimus* subsp. *minimus* some highly variable plants which have many characters in common with *M. minimus* subsp. *apus* but which have larger achenes (1.5–2 mm. long). The leaves are either longer or shorter or of the same length as the scapes; and the plants are taller than in *M. minimus* subsp. *apus* var. *sessiliflorus*. The sepal spurs are 0.25–1 mm. long, varying in length on an individual flower, and with some of the spurs acute and some broadly obtuse. The achenes are smaller than those of var. *sessiliflorus*, being 1.25–1.75 mm. long, 0.5–0.8 mm. across, 0.5–0.75 mm. deep in side view, nearly rectangular in side view. The achene back is rhombic and is not compressed laterally as in var. *sessiliflorus*. The achene beak is exceedingly variable, spreading to appressed, extended 0.0–0.5 mm. beyond body of achene. Seeds mature in late March or April.

Material of this variable population includes: between Princeton and Norman, *Eastwood 11188* (CAS); Livermore Valley, Alameda Co., *Eastwood & Howell 5267* (CAS); 10 mi. w. of Modesto, Stanislaus Co., *Hoover 388, 3083, 3084* (UC); 10 mi. s. of Modesto, Stanislaus Co., *Hoover 363* (UC); 7.5 mi. s.w. of Merced, Merced Co., *Howell 4143* (CAS); near Hollister, San Benito Co., *Eastwood & Howell 5302* (RSA, CAS); w. of Fresno, Fresno Co., *Mason 8171* (UC); 1 mi. n. of Soda Lake, San Luis Obispo Co., *Ferris 9110* (UC).

M. MINIMUS subsp. *APUS* var. *sessiliflorus* (Huth) stat. nov.

M. sessilis S. Wats. in Proc. Am. Acad. 17: 362, 1882. Type seen.

M. alopecuroides Greene, Bull. Calif. Acad. Sci. 1: 278, 1885. Greene cites the collection by Mrs. M. K. Curran from Antioch in 1884. This specimen seen.

M. aristatus var. *sessiliflorus* Huth, Revision in Engl., Bot. Jahrb. 16: 286, 1892. Type: "California, North-Western Solano (W. L. Jepson 1891)." Several collections by Jepson from this area were examined.

Fig. I

Leaves narrowly linear 0.7–7 cm. long, 1.5–5 cm. longer than scapes, very rarely of same length as scapes; scapes 0.5 (spike sessile)–5.5 cm. long; sepals 5–10, spur 0.25 mm. long, rounded or broadly obtuse, blade 2–3.5 mm. long; petals not seen; stamens ca. 5; spike 0.5–2.5 cm. long, 3–4 mm. broad at base,

tapered toward tip; achenes 70 or more per spike; achenes and flower parts persistent in age, receptacle very narrow; achenes 1.75–2.25 mm. long, 0.35–0.75 mm. across back, 0.75–1 mm. deep in side view, back of achenes irregular shapes due to being compressed laterally, one main central ridge arising abruptly near base and ending in strongly divergent beak which commonly curls away from spike and extends 0.5–1.25 mm. beyond body of achene, achene rectangular to square in outline of side view, achenes not forming smooth covering on spike; seed green, variable in shape, oblong to broadly ovate, 0.6–1.0 mm. long, 0.3–0.6 mm. wide, seeds maturing late March to early May.

Oregon: under sagebrush, alkali flat, Umatilla Co. California: Glenn, Colusa, Yolo, Solano, Contra Costa, Stanislaus, San Joaquin, Merced, San Benito, and Fresno cos.

Type collection: "California, North-Western Solano (W. L. Jepson, 1891 H Hh)." One of the collections made by W. L. Jepson in Solano County in 1891, and cited below, is probably of the type collection.

Material studied: OREGON: Umatilla Co.: alkali flat, *Howell*, May 10, 1882 (ORE, GH, CAS) (type collection of *M. sessilis*).

CALIFORNIA: Colusa or Glenn Co.: between Princeton and Norman, *Eastwood 11188a* (CAS); Glenn Co.: Willows, *Eastwood 10196* (CAS); Yolo Co.: 12 mi. n. of Dixon, *C. B. Wolf 2149, 2150* (RSA); Solano Co.: near Vacaville, *Greene*, May 1, 1892 (UC), *W. L. Jepson*, May 2–6, 1891 (JEPS); Little Oak Farm, *W. L. Jepson*, March 24, 1892 (JEPS); Little Oak, *Jepson* in 1891 (UC); Contra Costa Co.: between Antioch and Marsh Creek, *K. Brandegee*, May 1909 (UC); Antioch, *Curran* in 1884 (type collection of *M. alopecuroides*) (GH, CAS); Stanislaus Co.: 10 mi. w. of Modesto, *Hoover 3085, 387* (UC); 7 mi. w. of Modesto, *Hoover 3078*; San Benito Co.: near Hollister, *Eastwood and Howell 5303* (CAS, RSA); 1.5 mi. s.e. of San Benito, *J. T. Howell 6014* (CAS, RSA); San Joaquin Co.: Stockton, *Davy* in 1893, near San Joaquin, *Hoover 4366* (UC); Merced Co.: 9 mi. w. of Los Banos, *Hoover 1650* (UC); Fresno Co.: near South Dos Palos, *Eastwood and Howell 5102* (CAS, RSA).

lf. *M. MINIMUS* subsp. *Pringlei* (Huth) stat. nov.

M. Pringlei Huth in Engl., Bot. Jahrb. 16: 285, 1893. Type seen.

Fig. J

Leaves 3–4 cm. long, expanded toward apex to 2 mm. wide, only slightly exceeding scapes; scapes 3–4 cm. tall; flower parts persistent on mature-fruited spike, sepals 5, blades 3 mm. long, faintly 5-nerved, spur 1 mm. long and acute; petals not seen; stamens ca. 10, 1.5–2 mm. long; spikes 1–1.5 cm. long, rather uniform in length, 2 mm. broad at base, tapered to apex, naked receptacle showing scars but not undulate; achenes 200 or more per spike, 1 mm. long, 0.5 mm. across back, 1 mm. deep in side view, back rhombic, main central ridge present, arising about $\frac{1}{4}$ way up from base of achene, ending in spreading beak which is extended slightly (0.2 mm.) beyond body of achene; lateral ridges lacking on achene, edges of achenes closely fitted, forming smooth, solid covering on spike, achene in side view square; seed 0.7 mm. long, 0.4 mm. wide, broadly elliptic, obtuse in outline, moderately closely inclosed by achene.

MEXICO: Chihuahua, *C. G. Pringle* in 1886 (type collection) (GH, UC); Puerto de St. Diego, Chihuahua, *Hartman 619*, April 12, 1891 (GH).

2. *M. ARISTATUS* Benth.

M. aristatus Benth. in Hook. Lond. Journ. Bot. 6: 459, 1847. Type not seen.
M. aristatus var. *typicus* Huth in Engl., Bot. Jahrb. 16: 286, 1893.

Fig. K

Leaves 1–7 cm. long; scapes 1.5–10 cm. tall, 2–3 times as long as leaves; sepals 5, spur elongate and acute; blade 0.75–1.75 mm. long, spur 0.75–1.0 (1.25) mm. long, single-nerved; petals 1.5 mm. long; stamens about 5, 1.5–2 mm. long; spike 3–9 (10) mm. long, 2 mm. in diameter at base, naked spike showing undulations in receptacle; achenes less than 50 per spike, 1.75–3.0 mm. long including beak, 0.5–1 mm. across back, 0.5–1.0 mm. deep in side view, sides puberulent, back of achene-body elliptic or slightly broadened below middle in outline, one main central ridge arising near base and ending in widely spreading beak which extends 1–1.5 mm. beyond body of achene, outline of side of achene body variable below middle, always tapered on ventral side above middle to narrowed tip, slightly pubescent on sides; seed 0.6–1 mm. long, 0.5–0.75 mm. wide, length twice or less than twice the width, broadest at base, dorsal side flattened, ventral side tapered above the middle to the obtuse tip, seeds maturing from April to May.

In sagebrush, grass and other low herbs in open fields and on streamsides; up to 2500 ft. southern B.C., central and eastern Wash.; up to 5000 ft. elevation east of the Cascade Mts. in Oregon; 5000 to 7000 ft. elevation in California: Fallen Leaf Lake (Eldorado Co.); Modoc Co.; and Doble in the San Bernardino Mts.; widely distributed in western and southern Idaho; Missoula Co., Montana; western edge of Wyoming; Washoe, Elko, and Nye cos., Nevada; northeastern Utah. One collection in Nye County, Nevada, was made at 11,000 ft. *Maguire and Holmgren 25836*).

Type collection: "Borders of pools in the Camass Prairie of the Coeur d'Aleine, Rocky Mountains. Geyer, (n. 322, in part.)," hence probably in or near Sanders Co., Montana.

Material studied: CANADA: British Columbia: 2–3 mi. e. of Oliver, *McCabe 5834* (UC, POM); Fraser Valley, *Macoun*, May 19, 1875 (GH).

WASHINGTON: Yakima Co.: Logy Creek, *Hitchcock and Martin 3385* (CAS, RSA); Klickitat Co.: Rockland, *Suksdorf 834* (GH); Grant Co.: Grand Coulee, 8 mi. n. of the Dry Falls, *Rogers 286* (GH, POM, UC, CAS); Ferry Co.: *G. N. Jones*, April 9, 1926 (GH); Lincoln Co.: Sprague, *Sandberg and Leiberg 136* (POM, GH, UC, ORE); Davenport, *M. E. Jones*, May 20, 1905 (POM, UC); Stevens Co.: 10 mi. s. of Kettle Falls, *Sharsmith 4010* (UC, CAS, GH); Adams Co.: 2 mi. s.w. of Ritzville, *Rogers and others 229* (POM, GH, CAS, UC); Walla Walla Co.: Waitsburg, *Horner R182B37* (GH); Whitman Co.: Pullman, *Elmer 292* (POM), *Piper 1555* (GH); Rock Creek, *Piper 2796*, *Cotton 956* (GH); Almota, *Piper 2789* (GH); county uncertain: T. S. *Brandegee*, May 1883 (UC), J. T. *Howell*, April 20, 1882 (CAS, ORE).

OREGON: Wasco Co.: The Dalles, *Sheldon 10021* (POM, GH, ORE); near Dalles City, *Suksdorf 834* (UC, GH); Kingsley, *Sheldon 9073* (ORE); Gilliam Co.: Arlington, *Peck 19862* (CAS); Deschutes Co.: Cline Falls, *Detling 2635* (ORE, UC); Redmond, *Detling 2601* (ORE); Klamath Co.: Link River, *Henderson 9364* (ORE, CAS); Lake Co.: 10 mi. s. of Lakeview, *Peck 25017* (UC); 12 mi. w. of Lakeview, *Ripley and Barneby 6039* (CAS); 8 mi. w. of Lakeview, *Peck 25018* (UC); mouth of Loveless Creek, *Loveless*, May 7, 1931 (ORE); Morrow Co.: near Lexington, *Leiberg 14* (UC, ORE, GH); Crook Co.: near Fife, *Ingram B 783* (ORE); Umatilla Co.: Columbia River, J. & T. J. *Howell 382* (GH); Grant Co.: Beach Creek above Mt. Vernon, *Henderson 5145* (GH, CAS, ORE); Union Co.: Catherine Creek, *Cusick 2194* (UC, ORE, GH); Harney or Malheur Co.: *Henderson 9042* (CAS, ORE); Malheur Co.: 16 mi. n. of Jordan Valley, *Peck 20564* (UC); Ontario, *Leiberg 2007* (UC, GH); near Vale,

Thompson 11332 (POM, UC, GH, CAS, RSA); county uncertain: Bridge Creek, *J. and T. J. Howell*, May 1880 (ORE).

CALIFORNIA: Modoc Co.: Canby, *Bettcel*, April 25, 1923 (CAS); 2.5 mi. n. of boundary Modoc Nat'l Forest, *E. K. Balls 14693* (RSA); Eldorado Co.: Fallen Leaf Lake, *Smiley 142a* (GH); San Bernardino Co.: above Doble, *Peirson 4557* (POM, RSA).

IDAHO: Nez Perces Co.: Lewiston, *A. A. and E. G. Heller 2960* (UC), *Sandberg, MacDougal, & Heller 159* (POM, GH); Lewiston Falls, *Sandberg*, May 1892 (UC); Washington Co.: Weiser, *M. E. Jones*, March 10 and April 18, 1900 (POM), *Cleburn*, May 5, 1883 (POM); Canyon Co.: Falks Store, *Macbride 766* (GH, UC, POM); Twin Falls Co.: e. of Rogerson, *Piemeisel 43* (RSA); Bannock Co.: *G. Williams*, April 23, 1941 (RSA); Chinks' Peak, *Cronquist 2248* (GH); county unknown: *Sandberg 159* (CAS).

MONTANA: Missoula Co.: Rattlesnake Canyon, *Keilman 3* (POM), *Demorest 21* (ORE, CAS); Fort Missoula, *Kirkwood 1109* (UC, GH); Blackfoot Valley, *Hitchcock 1561* (CAS, POM).

WYOMING: Yellowstone National Park: Obsidian Creek, *A. & E. Nelson 6074* (GH); Uinta Co.: Evanston, *A. Nelson 4546* (POM, GH).

NEVADA: Washoe Co.: n. of Reno, *Heller 9988* (GH, UC, CAS, POM); Alkali Lake, *Hillman*, May 16, 1896 (POM); Washoe Hill, *Archer 5102* (UC); Reno, *Hillman*, May 10, 1896 (POM); 8 mi. n.w. of Reno, *Canby 73* (POM); Nye Co.: head of Pine Creek Canyon, *Maguire & Holmgren 25836* (GH, UC); Elko Co.: 3 mi. s.e. of Jiggs, *Holmgren 897* (UC).

UTAH: Box Elder Co.: Hot Springs, *W. W. Jones 384* (GH); Salt Lake Co.: w. of Salt Lake City, *Garrett 3094, 3116* (GH); Salt Lake City, *Garrett 2808* (UC); Murray, *W. W. Jones 383* (GH); county unknown: City Creek, *M. E. Jones 1681* (POM).

3. *M. CUPULATUS* S. Wats.

M. cupulatus S. Wats. in Proc. Am. Acad. 17: 362, 1882. Type examined.

Fig. 1

Leaves 0.7–5 cm. long; scapes usually 5–20 per plant, 2–15 cm. tall, 2–3 times longer than leaves; sepals 5, spur elongate and acute, blade 2–3 mm. long, faintly 3-nerved, spur 1–2 mm. long; petals 2–2.5 mm. long; stamens about 5, 2–4.5 mm. long; spike 0.7–4 cm. long, 2–3 (rarely 4) mm. in diameter at base, tapering toward tip, naked spike showing scars in receptacle; achenes 20–200 per spike, 1–1.5 mm. long, 0.8–1 mm. across back, 0.8–1 mm. deep in side view, back of achene body round in outline, center usually depressed, beak arising abruptly from base of depression, beak triangular in side view and spreading upward and outward from spike to about 0.5 mm. beyond body of achene, edges of achenes not closely fitting allowing spaces between achenes, body of achene in side view nearly square, puberulent; seed 0.7–0.9 mm. long, 0.4–0.5 mm. wide, length twice the width, seed in outline flattened dorsally, broader at base than tip, mature seeds from April–July (collected during May only in California).

Occurring at elevations of 3500 to 5000 ft., on shady canyon slopes in deserts of southeastern California, Kingston, Little San Bernardino, Providence and New York Mts.; moist or dry alkaline hillsides and plateaus, 1200–7000 ft. elevation in western Utah, Millard and Washington cos.; widely spread in Arizona; at Naturita, Montrose Co., Colorado; and western New Mexico in Grant and Sierra cos.

Type collection: "Arizona; hills between the Gila and San Francisco Rivers, Rev. E. L. Greene; on the Santa Catalina Mts., at 8,000 feet altitude, J. H. Lemmon, found by both collectors in April, 1880."

Material studied: CALIFORNIA: San Bernardino Co.: Kingston Mts., *Abrams 14097* (GH), *C. B. Wolf 10426* (RSA); Providence Mts., *R. Hoffman*, May 15, 1930 (POM); *Munz, Johnston & Harwood 4152* (POM), *C. B. Wolf 9672* (RSA); New York Mts., *Alexander and Kellogg 1355*

(UC, GH), 1324 (UC); Little San Bernardino Mts., Fosberg, May 1, 1930 (POM); Kelso, M. E. Jones, May 2, 1906 (POM).

UTAH: Millard Co.: 10 mi. w. of Fillmore, Cottam & McMillan 9573 (RSA); Washington Co.: 11 mi. n. of St. George, Gould 1496 (GH, UC).

ARIZONA: Mohave Co.: Peach Spring, Lemmon 3243 (type collection) (GH), Lemmon and wife, July 1884 (UC, GH); Coconino Co.: 9 mi. e. of Sedona, Carter 2755 (RSA); San Francisco Mts., M. E. Jones, June 4, 1890 (POM); Pinal Co.: Picacho Pk., Ripley and Barneby 4255 (CAS); Pima Co.: Santa Rita Mts., Eastwood 8095 (CAS), L. Benson 10927 (POM), Gould & Haskell 3047a (UC, GH); Santa Catalina Mts., Shreve 5135 (UC, GH), Lemmon, May 1881 (UC), Benson 10726 (POM); Quitobaquito, Gould, Darrow, Haskell 2986 (UC); near Tucson, Eastwood 17751, 8168 (CAS), A. & R. Nelson 1430 (GH, UC); Tucson Mts., Darrow, March 20, 1937 (UC, POM); Tanque Verde Creek, Brass 14190 (GH); Baboquivera Mts., Pringle, April 8, 1884 (GH, CAS); Gila Co.: between Payson and Pima, Eastwood 17192 (CAS); Santa Cruz Co.: n.w. of Nogales, K. M. & M. C. Wiegand 578 (GH); Nogales, Orcutt, May 3, 1902 (UC); 4 mi. s.w. of Patagonia, Cutler 4753 (GH); county uncertain: Santa Cruz, Parish 225 (GH); between the Gila and San Francisco rivers, Greene, April 19, 1880 (type collection) (GH); Mt. Ord, E. G. Smith 11532 (CAS).

4. *M. NITIDUS* Eastw.

M. nitidus Eastw. in Bull. Torr. Bot. Club 32: 194, 1905. Type studied.

M. Egglestonii Wootton and Standley in Contrib. U. S. Nat. Herb. 16: 123, 1913. Type examined and cited below.

Fig. M

Leaves 5–15 mm. long; scapes 1–2 cm. tall, only 0.5–1 cm. longer than leaves; sepals 5, spur elongate and acute, 2.5–3 mm. long, blade 1.5–2.5 mm. long, blade faintly 3-nerved; petals not seen; stamens 5–10, 2 mm. long; spike 5–20 mm. long, 3 mm. in diameter at base, tapering slightly toward tip, 4 or less per plant, naked spike showing scars in receptacle; achenes 50–100 per spike, 1.5–2 mm. long, 0.8–1.0 mm. across, 0.8–1.0 mm. deep in side view, back of achene-body suborbicular or broadly ovate in outline, back not or only slightly depressed at base of ridge, edges of achenes not closely fitted, thus allowing spaces between, body of achene in side view slightly taller than wide or square, beak of achene spreading outward and upward, extended ca. 1 mm. beyond body, beak not triangular in outline of side; seed 0.7 mm. long, 0.3–0.5 mm. wide, about twice as long as wide, seed in outline flattened dorsally, slightly broader at base than at tip, mature seeds April–May.

Occurring at about 7000 ft. elevation, Rio Arriba Co., New Mexico; Kaibab Plateau, Arizona; and Mancos, Colo.

Type collection: "Collected by the author at Mancos, Colorado, growing under sage-brush, June 1891."

Material studied: NEW MEXICO: Rio Arriba Co.: Tierra Amarilla, Eggleston 6472 (type collection of *M. Egglestonii*) (US, GH).

ARIZONA: Jumpup Divide, Kaibab Plateau, Goodding 24-49 (CAS).

COLORADO: Mancos, Montezuma Co., Eastwood, June 1891 (CAS) (type collection *M. nitidus*).

ILLUSTRATIONS OF MYOSURUS

For each group of 3, from left to right: back and side view of achene, and the seed. Magnification about 13X.

A: *M. minimus* L. ssp. *minimus*; Modoc Co., California, *R. M. Austin*, June 1894.

B: *M. minimus* L. ssp. *minimus*; Merced Co., California, *Hoover 1649*.

C: *M. minimus* var. *filiformis* Greene; Stanislaus Co., California, *Hoover 2009*.

D: *M. minimus* ssp. *montanus* Campbell; Tulare Co., California, *J. T. Howell 26917*.

E: *M. minimus* ssp. *montanus* Campbell; Coconino Co., Arizona, *Leiberg 5568*.

F: *M. minimus* var. *major* (Greene) Campbell; Siskiyou Co., California, *Heller 13900*.

G: *M. minimus* ssp. *major* var. *clavicaulis* (Peck) Campbell; Harney Co., Oregon, *Peck 20906*.

H: *M. minimus* ssp. *apus* (Greene) Campbell; Riverside Co., California, *Munz 5061*.

I: *M. minimus* ssp. *apus* var. *sessiliflorus* (Huth) Campbell; Contra Costa Co., California, *Brandegee*, May 1909.

J: *M. minimus* ssp. *Pringlei* (Huth) Campbell; Chihuahua, Mexico, *Hartman 619*.

K: *M. aristatus* Benth.; Malheur Co., Oregon, *Leiberg 2007*.

L: *M. cupulatus* S. Wats.; San Bernardino Co., California, *Wolf 10426*.

M: *M. nitidus* Eastw.; Montezuma Co., Colorado, *Eastwood*, June 1891.

