

in California and Nevada. In southern Arizona and adjacent Mexico this is replaced by var. *carnosus*, with larger heads, the involucre mostly 7–8 mm high, and with 20–35 flowers.

It should be noted that in the current (Berlin) version of the *International Code of Botanical Nomenclature*, Gilibert's *Flora Lituaniensis* (1781–1782) is outlawed because it did not consistently use

a binomial system of nomenclature (Article 23.6, example 11). Therefore the name *Aster carnosus* Gilib. Fl. Lit. Inc. 1: 214. 1781–1782, although itself a binomial, cannot illegitimize the later name *Aster carnosus* (A. Gray) A. Gray ex Hemsl. Botanists who retain the species in *Aster* should therefore call it *Aster carnosus* (A. Gray) A. Gray ex Hemsl., instead of *A. intricatus* (A. Gray) S. F. Blake.

## 79. MACHAERANTHERA Nees

Annual, biennial, or perennial herbs or shrubs from a distinct taproot that is often surmounted by a branched caudex; leaves alternate, spinulose-tipped, entire or more often spinulose-dentate to pinnatifid or pinnately dissected; heads solitary to numerous, terminating the stems (and branches), small to rather large, usually radiate, the rays mostly pistillate and fertile (neutral and sterile in one species), anthocyanic to sometimes white, or seldom (mainly in *M. grindelioides* and one variety of *M. shastensis*) wanting and the heads thus discoid; involucre of several series of broad or rather narrow bracts, these herbaceous (or at least greenish) above the middle or toward the tip, generally chartaceous or coriaceous toward the base, loose or squarrose or squarrose-tipped to appressed; receptacle flat or a little convex, naked but often strongly alveolate; anthers entire or nearly so at the base; style-branches flattened, with ventromarginal stigmatic lines and a short to elongate, externally short-hairy appendage; achenes glabrous to more often thinly hairy or densely woolly-villous, turbinate to linear-oblong, mostly several-nerved, often with a few irregularly spaced principal nerves and more numerous fine or obscure intermediate ones; pappus of more or less numerous, markedly unequal barbellate bristles, often brownish, that of the rays reduced or wanting in a few species;  $x = 4, 5, 6, 9$ . (*Dieteria*; *Eriocarpum*; *Psilactis*; *Xylorhiza*)

About 35 species, native mainly to w. U.S., overlapping into n. Mex. and s. Can. (Name from the Greek *machaira*, sword, and *anthera*, anther, from the shape of the anther-tips.)

For many years after 1873 *Machaeranthera* was often included in *Aster*, following Bentham's treatment in *Genera Plantarum*. Current opinion, dating from Cronquist and D. D. Keck in 1957, holds that *Machaeranthera* is more closely related to *Haplopappus* (in the broad sense of H. M. Hall) than to *Aster*. Generic organization of the Asteraceae is beset with problems, but for most of the species of these three genera it can be said that *Aster* is fibrous-rooted and herbaceous and has anthocyanic to white rays, *Machaeranthera* is taprooted and herbaceous or woody and has anthocyanic to white rays, and *Haplopappus* is taprooted and herbaceous or woody and has yellow rays. Discoid species of *Haplopappus* and *Machaeranthera* must be assigned to one or the other genus on the basis of their apparent relationships. See further comment on the generic delimitation under *M. kingii*.

B. L. Turner takes a very broad view of *M. canescens*, reducing to varietal rank the taxa here treated as *M. linearis*, *M. rigida*, and *M. shastensis*. This treatment is defensible on the basis of the intergradation among these taxa, but it has its own problems. By the same criterion the specific limits could be extended to include *M. asteroides*, *M. bigelovii* (A. Gray) Greene, *M. commixta*, and *M. mucronata*, making the limits of *M. canescens* coterminous with those of the section *Hesperastrum*. The species would then indeed be sharply limited, but it would encompass so much diversity as to lose conceptual utility.

### References:

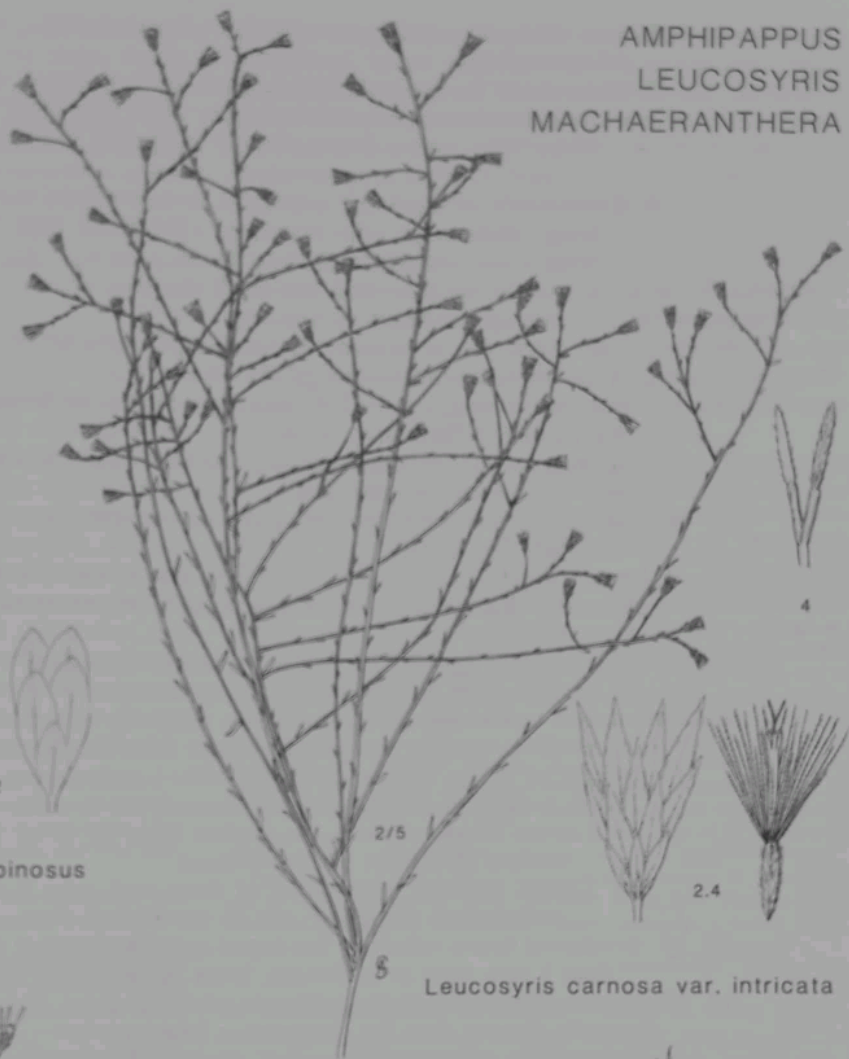
- Cronquist, A., and D. D. Keck. 1957. A reconstitution of the genus *Machaeranthera*. *Brittonia* 9: 231–239.  
Hartman, R. L. 1976. A conspectus of *Machaeranthera* (Compositae: Astereae) and a biosystematic study of the section *Blepharodon*. Ph.D. thesis. Univ. Texas, Austin.  
———. 1990. A conspectus of *Machaeranthera* (Asteraceae: Astereae). *Phytologia* 68: 439–465.  
Turner, B. L. 1987. Taxonomic study of *Machaeranthera*, sections *Machaeranthera* and *Hesperastrum* (Asteraceae). *Phytologia* 62: 207–266.  
———, and D. Horne. 1964. Taxonomy of *Machaeranthera* sect. *Psilactis* (Compositae—Astereae). *Brittonia* 16: 316–331.  
Watson, T. J. 1977. The taxonomy of *Xylorhiza* (Asteraceae—Astereae). *Brittonia* 29: 199–216.  
———. 1978. Chromosome numbers in *Xylorhiza* Nuttall (Asteraceae—Astereae). *Madroño* 25: 205–210.

- 1 Long-lived perennials with a stout taproot that may be surmounted by a branching caudex, sometimes shrubby at the base.
- 2 Heads discoid; achenes small, only 2.5–3 mm long (sect. *Blepharodon*) ..... 1. *M. grindelioides*
- 2 Heads radiate; achenes longer, mostly 3–6.5 mm long, except in *M. kingii*.
- 3 Leaves basally disposed, the basal and lowermost cauline ones the largest, the others few and reduced; low plants, up to ca 1 dm tall; Wasatch and Canyon mts. of Utah ..... 11. *M. kingii*
- 3 Leaves all cauline, though sometimes borne mainly near the base; larger plants, generally 1–8 dm tall; not of the Wasatch and Canyon mts. (sect. *Xylorhiza*).
- 4 Leaves, or many of them, toothed.
- 5 Leaves sharply spinulose-toothed; rays lavender or seldom white, relatively numerous, (15) 18–60 (85); Canyonlands and s. Utah to Ariz. and s. Calif. .... 17. *M. tortifolia*
- 5 Leaves inconspicuously few-toothed, or some of them entire; rays white, few, mostly 13–17; local in Kane Co., Utah ..... 16. *M. cronquistii*
- 4 Leaves usually all or nearly all entire.
- 6 Leaves narrow, mostly 1–2 mm wide, very numerous and crowded, the internodes averaging only 2–3 mm long; Garfield and Kane cos., Utah ..... 15. *M. confertifolia*
- 6 Leaves wider, mostly (2) 2.5 mm wide or more, not so numerous and crowded, the internodes averaging at least 4 mm long.
- 7 Leaves linear-oblong, not or scarcely narrowed to the truncate or rounded-auriculate base; n. San Juan, s. Grand, e. Wayne, and Garfield cos., Utah ..... 14. *M. linearifolia*

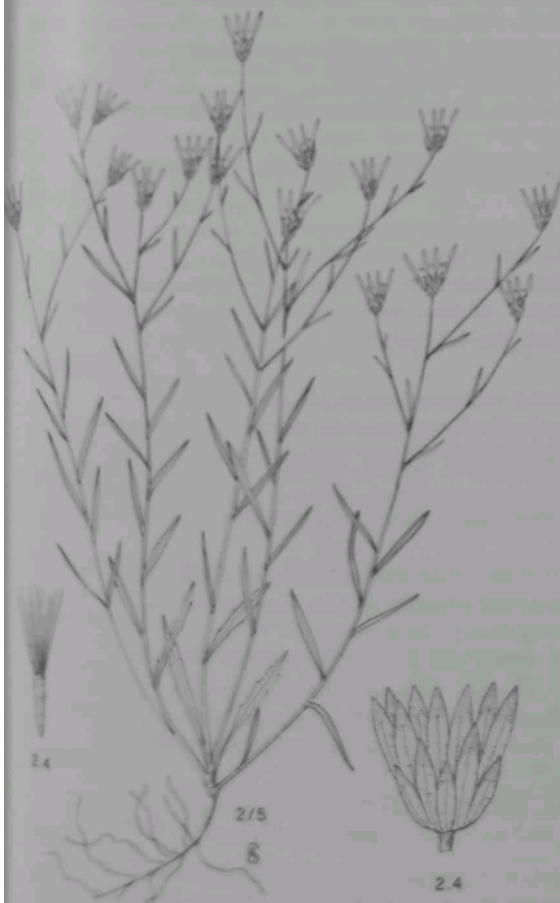
AMPHIPAPPUS  
LEUCOSYRIS  
MACHAERANTHERA



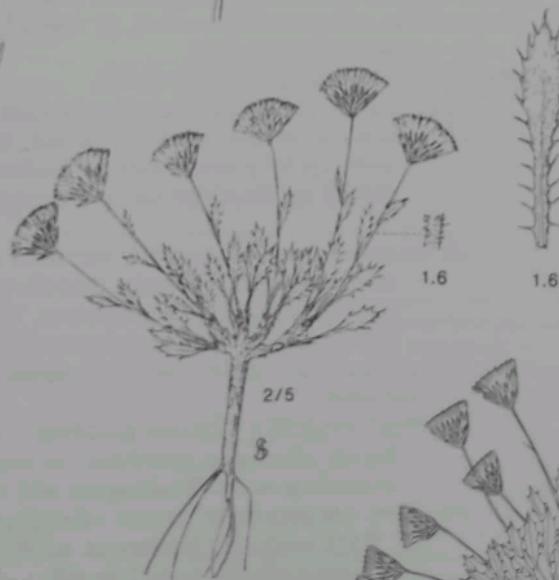
*Amphipappus fremontii* var. *spinosus*



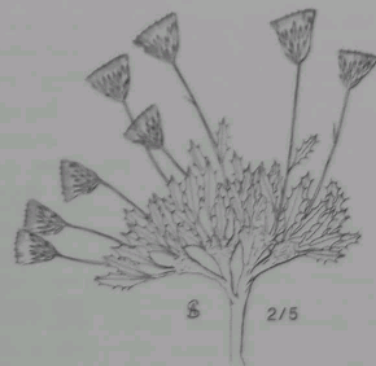
*Leucosyris carnososa* var. *intricata*



*Machaeranthera shastensis*



var. *grindelioides*



var. *depressa*

*Machaeranthera grindelioides*



- 7 Leaves evidently tapering to an often subpetiolar base, often wider in form than in *M. linearifolia*.
- 8 Stems leafy for more than two-thirds of their length, the peduncles up to ca 6 cm long; heads smaller, the involucre 7–14 mm high, the disk mostly 12–25 mm wide; Wyo. and s. Mont., barely extending into Utah (Daggett Co.) and Colo. .... 13. *M. glabriuscula*
- 8 Stems leafy in the lower one-third to two-thirds, the peduncles mostly 6–20 cm long; heads larger, the involucre 12–20 mm high, the disk mostly 20–35 mm wide; Canyonlands and Uinta Basin, e. to w. Colo. .... 12. *M. venusta*
- 1 Annual, biennial, or short-lived perennial, not at all shrubby.
- 9 Pappus of the rays strongly reduced, or wanting.
- 10 Heads middle-sized, the involucre 6–10 mm high; biennial or short-lived perennial; leaves entire or merely toothed; vicinity of Mt. Shasta, Calif. .... 2. *M. shastensis*
- 10 Heads small, the involucre only 3–6 mm high; annual or winter-annual; leaves toothed to pinnatifid; more southern (sect. *Arida*).
- 11 Herbage copiously stipitate-glandular; southern desert species; approaching our range in s. Nev. (*M. ammophila* Reveal) .... *M. arida* B. L. Turner & D. Horne
- 11 Herbage glabrous or only obscurely glandular; southern species; barely reaching our range in San Juan Co., Utah .... 10. *M. parviflora*
- 9 Pappus of the rays normally developed, similar to that of the disk-flowers.
- 12 Leaves pinnatifid to pinnately dissected; annual or winter-annual (sect. *Machaeranthera*) ... 9. *M. tanacetifolia*
- 12 Leaves entire or often toothed, varying to sometimes lacinate, but scarcely pinnatifid; mostly biennial or short-lived perennial (sect. *Hesperastrum*).
- 13 Herbaceous tips of the involucre bracts relatively elongate, those of the middle bracts from about as long as to distinctly longer than the chartaceous base.
- 14 Involucre bracts numerous (ca 60–100+) and narrow, the middle ones up to ca 1 mm wide at midlength; southernmost Utah to Ariz.
- 15 Leaves entire, narrow, the cauline ones up to ca 5 mm wide; peduncles only seldom glandular; Kaibab Plateau .... 7. *M. mucronata*
- 15 Leaves toothed, often some of them well over 5 mm wide; peduncles usually prominently glandular; not on the Kaibab Plateau .... 8. *M. asteroides*
- 14 Involucre bracts relatively few (up to ca 50) and broad, the middle ones usually more than 1 mm wide at midlength; Utah Plateaus and Henry Mts. .... 6. *M. commixta*
- 13 Herbaceous tips of the involucre bracts relatively short, those of the middle bracts usually distinctly shorter than the chartaceous base.
- 16 Rays sterile and generally neutral, or wanting; Cascade-Sierran species, just entering the w. part of our range .... 2. *M. shastensis*
- 16 Rays pistillate and potentially fertile.
- 17 Leaves more or less canescent-puberulent, sometimes also glandular.
- 18 Involucre bracts relatively broad, the middle ones distinctly more than 1 mm (up to 2 mm) wide at midlength; peduncles beset with short, stout, spreading, multicellular, gland-tipped hairs; Utah Plateaus and Henry Mts. .... 6. *M. commixta*
- 18 Involucre bracts generally narrower and not more than about 1 mm wide at midlength, but if broader then the peduncles without the short, stout, gland-tipped hairs of *M. commixta*; widespread in our range, except for the Canyonlands and the Arizona Strip .... 3. *M. canescens*
- 17 Leaves essentially glabrous on both sides, or stipitate-glandular, but not canescent-puberulent.
- 19 Stem evidently stipitate-glandular, at least near and above the middle, the leaves often also glandular; in our range mainly in the Canyonlands, but extending w. to Washington and Iron cos., Utah .... 5. *M. rigida*
- 19 Stem not glandular, except often just under the heads; leaves not glandular.
- 20 Rays relatively numerous, mostly 30–40+ in well developed heads; stiffly erect plants, up to 1 m tall, with numerous heads when well developed; occurring mainly to the e. of our range, but entering Utah in the La Sal Mts. .... 4. *M. linearis*
- 20 Rays fewer, not more than ca 25; plants smaller, up to 5 dm tall, with mostly fewer heads; mts. of c. and n. Utah, c. and ne. Nev., and c. and s. Idaho .... 3. *M. canescens*

# 1. *Machaeranthera grindelioides* (Nutt.) Shinnery

*Eriocarpum grindelioides* Nutt. Trans. Amer. Philos. Soc. II. 7: 321. 1841. *Aplopappus nuttallii* Torr. & A. Gray, Fl. N. Amer. 2: 242. 1842; not *Aplopappus grindelioides* DC. 1836. *Aster nuttallii* Kuntze, Revis. Gen. Pl. 1: 318. 1891; not Torr. & A. Gray, 1842. *Sideranthus grindelioides* Britton, Bull. Torrey Bot. Club 27: 620. 1900. *Machaeranthera grindelioides* Shinnery, Field & Lab. 18: 40. 1950. (Nuttall, on shelving rocks in the Rocky Mountain range, Oregon; holotype at BM!)  
*Haplopappus nuttallii* var. *depressa* Maguire, Amer. Midl. Naturalist 37: 144. 1947. *Machaeranthera grindelioides* var. *depressa* Cronquist & D. D. Keck, Brittonia 9: 237. 1957. (Maguire 20839, 5 mi. sw. of Desert Range Experiment Station Headquarters, Millard Co., Utah; holotype at NY!)

Perennial with a stout taproot and branching caudex, up to 3.5 dm tall; herbage tomentulose or strigose to subglabrous or even somewhat glandular; leaves firm, spinulose-toothed, up to 4 cm x 10 mm, oblanceolate (especially in var. *depressa*) to oblong or oblong-spatulate; heads several or solitary, campanulate, yellow, strictly discoid; involucre 7–10 mm high, its bracts well imbricate, green or more often merely green-tipped, obscurely to evidently glandular and somewhat pubescent; disk-corollas mostly 6–8 mm long; style-appendages from somewhat shorter to somewhat longer than the stigmatic portion; achenes densely white-hairy, narrowly turbinate, only 2.5–3 mm long;  $2n = 8, 16$ .

Dry, open places, often on alkaline clays, up to 2400 m elev.; s. Sask. and s. Alta. to Mont. and w. Nebr., w. almost throughout Wyo., s. through w. Colo. to nw. N.M., and w. to n. Ariz. and across Utah (except the nw. part) to e. Nev. (as far w. as Eureka and Nye cos.). May–July.

This species has traditionally been referred to *Haplopappus* or one of its segregates. In *Haplopappus* it is called *H. nuttallii* Torr. & A. Gray. Shinnery's transfer of it to *Machaeranthera* in 1950 has subsequently become widely accepted, on grounds of its probable relationships. The color of the rays (anthocyanic or white vs. yellow), otherwise a useful distinction between *Haplopappus* and *Machaeranthera*, obviously cannot be used for discoid species. Hartman (1976) maintains that the flavonoids ally it to the white-rayed *M. blephariphylla* (A. Gray) Shinnery, and he notes a single white-rayed specimen of *M. grindelioides* from Wyoming.

The species consists of two ecogeographically well marked varieties:

- 1 Low plants, up to ca 1 dm tall, with solitary heads; leaves mostly clustered at or near the base, the stem otherwise appearing only sparsely leafy or subnaked; relatively western, occurring in e. Nev. (n. to White Pine Co., and as far w. as Eureka Co.), e. to w. and sw. Utah (Millard and Beaver cos.) and nw. Ariz. (n. Coconino Co.)  
..... var. *depressa* (Maguire) Cronquist & D. D. Keck
- 1 Taller plants, mostly 1–3.5 dm tall, with 1–several heads; leaves well scattered along the stems, the lowest ones usually wanting at anthesis; more eastern, but extending w. to Millard Co., Utah and to the Highland and White Rock ranges in Lincoln Co., Nev.  
..... var. *grindelioides*

# 2. *Machaeranthera shastensis* A. Gray

*Machaeranthera shastensis* A. Gray, Proc. Amer. Acad. Arts 6: 539. 1865. *Aster shastensis* A. Gray, Bot. Calif. 1: 322. 1876. *Machaeranthera canescens* var. *shastensis* B. L. Turner, Phytologia 60: 79. 1986. (Brewer 1385, Mt. Shasta, Calif.; holotype at GH!)  
*Aster shastensis* var. *eradiatus* A. Gray, Syn. Fl. N. Amer. 1(2): 174. 1884. *Machaeranthera eradiata* Howell, Fl. N. W. Amer. 314. 1900. *Aster eradiatus* Frye & Rigg, N. W. Fl. 384. 1912. *Machaeranthera shastensis* var. *eradiata* Cronquist & D. D. Keck, Brittonia 9: 238. 1957. (Greene 1000, Scott Mts., Siskiyou Co., Calif.; holotype at GH!)

Biennial or short-lived perennial; stems 1–4 dm tall, simple or much branched; herbage canescent-puber-

ulent to subglabrous or partly glandular; leaves entire or toothed, small, the oblanceolate to spatulate basal ones seldom over 5 cm long and 1 cm wide, the cauline ones smaller and generally narrower in shape; heads few to numerous; involucre 6–10 mm high, canescent or glandular or both, its bracts evidently imbricate but in only a few (mostly 3 or 4) series, relatively broad, mostly 1–1.6 mm wide, green-tipped and usually  $\pm$  strongly suffused with anthocyanin, mostly not so strongly and regularly squarrose as in *M. canescens*; rays few, typically ca 8 or ca 13, sterile and mostly neutral, often with reduced or no pappus, or the rays wanting and the heads discoid; style-appendages equaling or a little longer than the stigmatic portion; achenes 3.5–5.5 mm long, thinly hairy;  $2n = 8$ .

Dry, open places in the mts. and adjoining plains, 1200–2900 m elev.; Cascade-Sierran region, from c. Oregon to the vicinity of Sonora Pass in the Sierra Nevada of Calif., sometimes extending shortly onto the adjoining plains, and at an outlying station in the Trout Creek Mts. of Malheur Co., Oregon. July–Sept.

Typical *M. shastensis*, with reduced or no pappus on the ray-flowers, is confined to the immediate vicinity of Mt. Shasta. The more common and widespread form of the species has sterile rays with a well developed pappus; such plants occur even on Mt. Shasta. This phase has been called var. *glossophylla* (Piper) Cronquist & D. D. Keck, but it now appears that the name does not properly apply. The almost equally widespread rayless form, called var. *eradiata* (A. Gray) Cronquist & D. D. Keck, enters our range at Steamboat Hot Springs, south of Reno in Washoe Co., Nevada. Whether these three phases of the species should be given formal taxonomic recognition is a matter of taste.

Plants with the involucre of *M. shastensis* but with normal, fertile rays occur at scattered montane stations in the range of *M. canescens*. These are here referred to the latter species.

The amount of populational intergradation between *M. shastensis* and *M. canescens* merits careful attention in the field. Perhaps B. L. Turner is right that *M. shastensis* is better considered a variety of *M. canescens*.

# 3. *Machaeranthera canescens* (Pursh) A. Gray

*Aster canescens* Pursh, Fl. Amer. Sept. 547. 1814. *Dieteria canescens* Nutt. Trans. Amer. Philos. Soc. II. 7: 300. 1841. *Machaeranthera canescens* A. Gray, Pl. Wright. 1: 89. 1852. (Nuttall, on the banks of the Missouri, perhaps near Fort Mandan; holotype at BM!) The type represents the more canescent, less glandular phase of the species.  
*Diplopappus incanus* Lindl. Edward's Bot. Reg. 20: t. 1693. 1834. *Dieteria incana* Torr. & A. Gray, Fl. N. Amer. 2: 100. 1841. *Machaeranthera canescens* var. *incana* A. Gray in Wilkes, U.S. Expl. Exped. 17(2): 340. 1874. *M. incana* Greene, Pittonia 3: 62. 1896. (Horticultural plants, from seeds collected by Douglas along the Columbia River.)  
*Dieteria pulverulenta* Nutt. Trans. Amer. Philos. Soc. II. 7: 300. 1841. *Machaeranthera pulverulenta* Greene, Pittonia 3: 23. 1899. (Nuttall, arid plains towards the sources of the Platte; holotype at PH!) = var. *canescens*.  
*Dieteria divaricata* Nutt. Trans. Amer. Philos. Soc. II. 7: 301. 1841. *Machaeranthera divaricata* Greene, Pittonia 4: 23. 1899. (Nuttall, denuded plains of the Rocky Mts., and Oregon; the apparent holotype at GH!) = var. *canescens*.  
*Dieteria sessiliflora* Nutt. Trans. Amer. Philos. Soc. II. 7: 301. 1841. *Machaeranthera sessiliflora* Greene, Pittonia 3: 60. 1896. *M. canescens* var. *sessiliflora* B. L. Turner, Phytologia 60: 78. 1986. (Nuttall, denuded plains of the Rocky Mts., and Oregon; holotype at BM!)  
*Dieteria viscosa* Nutt. Trans. Amer. Philos. Soc. II. 7: 301. 1841. *Aster canescens* var. *viscosus* A. Gray, Syn. Fl. N. Amer. 1(2): 206. 1884. *Machaeranthera viscosa* Greene, Pittonia 4: 22. 1899. *M. canescens* (subsp.) *viscosa* Piper, Contr. U.S. Natl. Herb. 11: 575. 1906. (Nuttall, near Scott's Bluff, on the Platte; holotype at BM!) = var. *canescens*.  
*Aster leucanthemifolius* Greene, Erythra 3: 119. 1895. *Machaeranthera leucanthemifolia* Greene, Pittonia 3: 61. 1896. *M. canescens* var. *leucanthemifolia* S. L. Welsh, Great Basin



- Naturalist 43: 316. 1983. (Shockley 268, near Candelaria, Esmeralda Co., Nev.; holotype at CAS!)
- M. montana* Greene, Pittonia 3: 60. 1896. *M. shastensis* var. *montana* Cronquist & D. D. Keck, Brittonia 9: 238. 1957. (Bolander 6147, near Mono Lake, Mono Co., Calif.; lectotype by Shinnery in herb. and accepted by B. L. Turner, at NDG!) = var. *canescens*.
- M. laetevirens* Greene, Pittonia 3: 60. 1896. *Aster leiodes* S. F. Blake, Contr. U.S. Natl. Herb. 25: 563. 1925; not *Aster laetevirens* Greene, 1900. (Greene s.n., foothills of the Clover Mts., Nev., July 1894; holotype at NDG! B. L. Turner takes the locality to be in Lincoln Co., but I take it to be in Elko Co., where Greene collected extensively. The mountains presently known as the East Humboldt Range were called the Clover Mts. by S. Watson when he collected for the King Expedition.) A phase of var. *canescens* with wholly glabrous leaves.
- Machaeranthera subalpina* Greene, Pittonia 4: 23. 1899. (A. Nelson 904, Bacon Creek, Teton Co., Wyo.; holotype at NDG!) = var. *canescens*.
- M. spinulosa* Greene, Pittonia 4: 24. 1899. (Cusick 1811, Powder River Mts., Baker Co., Oregon; holotype at US!) = var. *canescens*.
- M. linearis* Rydb. Mem. New York Bot. Gard. 1: 398. 1900; not Greene, 1897. *M. angustifolia* Rydb. Bull. Torrey Bot. Club 37: 147. 1910. (Letterman s.n., Yellowstone Natl. Park, 6 Aug 1885; holotype at NY!) = var. *canescens*.
- Aster glossophyllus* Piper, Bull. Torrey Bot. Club 29: 646. 1902. *Aster shastensis* var. *glossophyllus* Cronquist, Univ. Wash. Publ. Biol. 17(5): 94. 1955. *Machaeranthera shastensis* var. *glossophylla* Cronquist & D. D. Keck, Brittonia 9: 238. 1957. (Cusick 2680a, Black Butte, Jefferson or Deschutes Co., Oregon; holotype at US!) A phase of var. *canescens* with a few-seriate involucre suggesting that of *M. shastensis*, but with pistillate rays.
- M. verna* A. Nelson, Bot. Gaz. 37: 267. 1904. (Goodding 757, Big Bend of Virgin River, Mohave Co., Ariz.; holotype at RM!) = var. *ambigua*.
- M. glabella* Greene ex Rydb. Fl. Colorado (Agric. Exp. Sta. Agric. Coll. Colorado Bull. 100) 358. 1906. (C. F. Baker 701, Cerro Summit, Gunnison Co., Colo.; lectotype by B. L. Turner, at NY!) = var. *canescens*.
- M. latifolia* A. Nelson, Proc. Biol. Soc. Wash. 20: 38. 1907. *M. canescens* var. *latifolia* S. L. Welsh, Great Basin Naturalist Mem. (Utah Fl.) 9: 213. 1987; not A. Gray, 1853. *M. canescens* var. *monticola* Dorn, Vascular Pl. Wyo. 295. 1988. (Garrett 1933, Big Cottonwood Canyon, Salt Lake Co., Utah; holotype at RM!) = var. *canescens*, a montane, broad-leaved phase approaching *M. commixta*.
- M. paniculata* A. Nelson, Proc. Biol. Soc. Wash. 20: 38. 1907. (Garrett 2083, mts., Parley's Park, Salt Lake Co., Utah; holotype at RM!) = var. *canescens*.
- M. leptophylla* Rydb. Bull. Torrey Bot. Club 37: 147. 1910. (Rydb. s.n., Logan, Cache Co., Utah, 9 Aug 1895; holotype at NY!) = var. *canescens*.
- M. magna* A. Nelson, Bot. Gaz. 53: 227. 1912. (Macbride 729, Payette River, near Falk's Store, Canyon Co., Idaho; holotype at RM!) = var. *sessiliflora*.
- M. scoparia* Greene, Leaf. Bot. Observ. Crit. 2: 227. 1912. (Jardine & Hill s.n., northwest of Turkey Tanks, Coconino Co., Ariz.; lectotype by B. L. Turner, at US!) = var. *ambigua*.
- M. canescens* var. *ambigua* B. L. Turner, Phytologia 60: 77. 1986. (H. C. Hanson A7, Flagstaff, Ariz.; holotype at TEX!)

Biennial or short-lived perennial (in var. *leucanthemifolia* sometimes apparently winter-annual), 1–5 dm tall, or in more robust forms up to 1 m, subsimple to freely or even diffusely branched, with 1–several stems from the base; herbage usually finely canescent-puberulent, sometimes also stipitate-glandular, especially in the inflorescence, varying to seldom wholly glabrous; leaves saliently toothed, the teeth and apex spinulose-tipped, varying to sometimes entire; basal leaves linear-oblongate to spatulate or subrotund, up to 10 cm long (including the petiole) and 1 or even 2 cm wide, often deciduous before anthesis, the cauline

ones smaller, often linear; heads several to more or less numerous, terminating the branches, the disk mostly 6–15 (20) mm wide; involucre (5.5) 6–10 (12) mm high, canescent-puberulent or glandular or both, its bracts well imbricate in (3) 4–8 series, all appressed to more often many or most of them evidently squarrose-tipped, with a relatively short green tip, that of the middle ones usually evidently shorter than the chartaceous base, some of the bracts sometimes somewhat anthocyanic; rays mostly 8–25 (or more in var. *ambigua* and *incana*), bright bluish-purple, 5–15 mm long, pistillate and fertile, or the ray-flowers very rarely wanting; style-appendages equaling or longer than the stigmatic portion; achenes 3–4 mm long, thinly hairy (or glabrous in var. *ambigua*);  $2n = 8$ .

In a wide variety of mostly open and rather dry habitats, from the lowlands to more than 3000 m in the mts., but more common at lower elev.; widespread in w. U.S. and adj. Can., mainly e. of the Cascade-Sierran summits, e. to N.D., S.D., and Nebr., and s. to s. Calif., s. Nev., c. Ariz., and c. N.M.; missing from most of the Canyonlands, but otherwise ubiquitous in our range. May–Sept.

A wide-ranging, highly variable species, beset with ecotypic partial differentiation that is difficult to organize into a coherent taxonomic scheme. Four ecogeographically significant varieties are here recognized in our range. A fifth, var. *incana* (Lindl.) A. Gray, occurs mainly near the east end of the Columbia River Gorge in Oregon and Washington. It is characterized by its robust habit and large heads with relatively numerous (up to 50) rays.

In contrast to our other varieties (each of which has a fair degree of morphologic-ecologic-geographic coherence), the wide-ranging var. *canescens* is internally so diversified as to invite further taxonomic segregation. Some additional ecotypic varieties might possibly be extracted from that variety as here treated, but none of these has a range or habitat it can call its own to the exclusion of more characteristic materials of var. *canescens*.

Perhaps the most noteworthy of the possible segregates from var. *canescens* is a group of plants with the leaves (and often also the major part of the stem) perfectly glabrous. These occur locally at middle and upper elevations in the mountains of parts of Nevada (Elko Co., and the Toiyabe Mts. in Nye Co.), Utah (Wasatch Mts.), Idaho (Mt. Harrison in Cassia Co., and the mts. of c. Idaho), and even Colorado. The names *M. laetevirens* Greene and *M. glabella* Greene ex Rydb. apply to such plants. Intergradation with more typical, canescent-puberulent plants of var. *canescens* is complete. No varietal combination has been properly validated, and none is here proposed.

Another possible segregate from var. *canescens* consists of rather low but robust plants with broad basal leaves and broad involucral bracts (more than 1 mm wide at midlength), occurring at middle elevations in the Wasatch Mountains Section and on the Utah Plateaus. These have been called var. *latifolia* (A. Nelson) S. L. Welsh, but the name *M. canescens* var. *latifolia* is preoccupied by a name proposed in 1853 by A. Gray for some quite different plants from New Mexico, here referred to *M. asteroides* (Torr.) Greene. These Utah plants are similar in aspect to plants of *M. commixta* with relatively short green tips on the bracts, but they lack the characteristic glandular vestiture on the peduncles of *M. commixta*. The name *M. canescens* var. *monticola* Dorn is available for this phase.

Furthermore, some of our montane plants of var. *canescens* resemble the more western *M. shastensis* in having the involucral bracts only 3- or 4-seriate and evidently anthocyanic, but unlike *M. shastensis* they have fertile rays. The name *Aster glossophyllus* Piper was based on such plants from central Oregon, but no infraspecific combination is available in *M. canescens*, and none is here proposed.

The four varieties here recognized within *M. canescens* in our range were treated in the same rank by B. L. Turner, but I draw the boundary between var. *leucanthemifolia* and var. *canescens* somewhat differently than he did. Based on the habit, habitat, and geography I include in var. *leucanthemifolia* some plants that lack the characteristic stipitate-glandular pubescence found on the stem of most members of this variety. Turner referred these plants to var. *canescens*.

Our four varieties may be imperfectly characterized as follows:

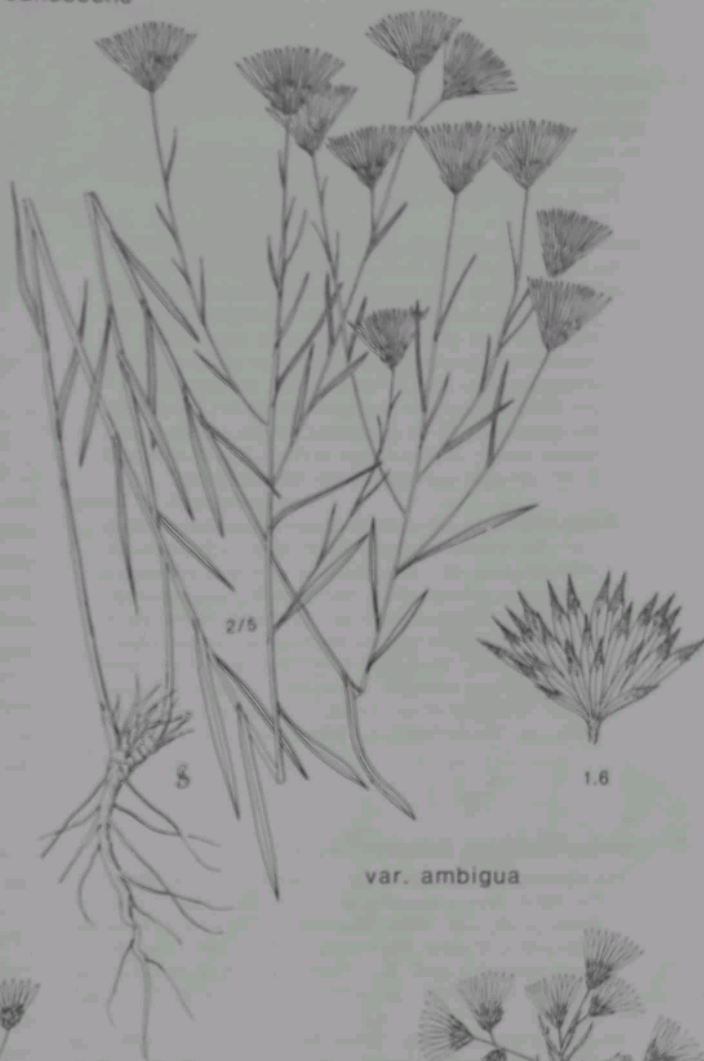
1. Cauline leaves, except those nearest the base, generally more or less strongly reduced and bract-like, but relatively broad, mostly 1.5–4 times as long as wide; stem usually but not always prominently stipitate-glandular; heads averaging smaller than

MACHAERANTHERA

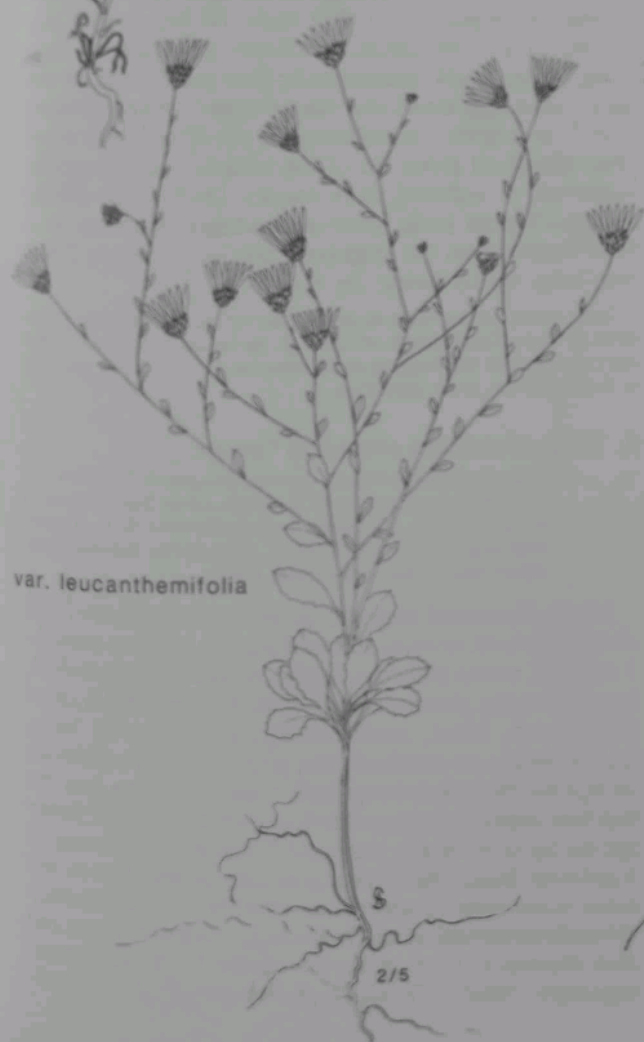
*Machaeranthera canescens*



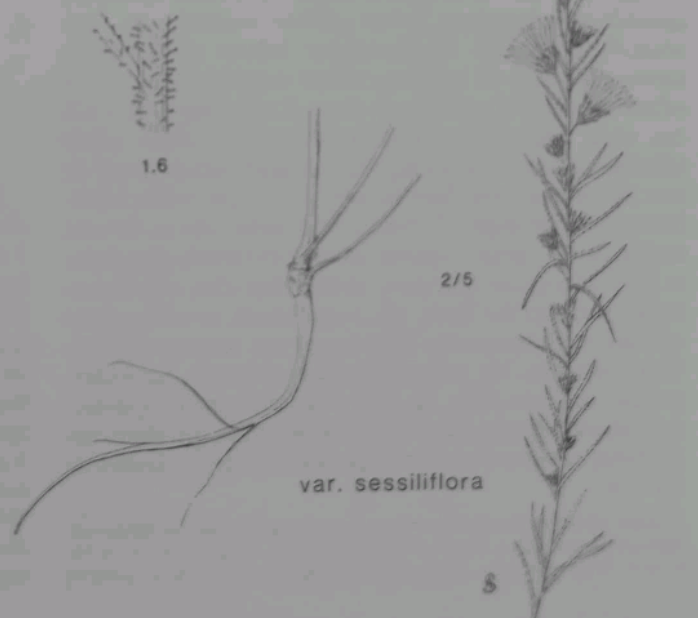
var. *canescens*



var. *ambigua*



var. *leucanthemifolia*



var. *sessiliflora*



in the other vars.; from the *Larrea* zone up into the pinyon-juniper or the oak-brush zone, 500–2200 (2900) m elev.; s. Nev. (as far n. as Nye Co.) and adj. Utah (w. Millard Co. to w. Washington Co.) to se. Calif. (Mojave Desert and the lower parts of the White Mts.); disjunct to near Denio, Nev.

- ..... var. *leucanthemifolia* (Greene) S. L. Welsh  
 1. Cauline leaves either well developed, or more than 4 times as long as wide, usually both; more northern or eastern, or at higher altitudes.  
 2. At least the upper half of the stem prominently stipitate-glandular as well as canescent-puberulent; lower Snake River Plains and vicinity, in Idaho, as far e. as Blaine Co. ....  
 ..... var. *sessiliflora* (Nutt.) B. L. Turner  
 2. Stem usually not obviously glandular, except often just under the heads; mostly not in the range of var. *sessiliflora*.  
 3. Involucral bracts with merely canescent-puberulent, often wholly appressed green tips, these averaging longer and narrower than in the next var., often approaching *M. asteroides* in this regard; achenes often glabrous; heads averaging larger than in the next var., the disk often 1.5 cm wide or more, the involucre mostly 8–12 mm high, the rays mostly 18–41 in number; robust, narrow-leaved plants; mostly of pine forests in the n. half of Ariz. and N.M.; entering our range in the Arizona Strip .....  
 ..... var. *ambigua* B. L. Turner  
 3. Plants differing in one or more respects from the preceding var., the involucral bracts more often with obviously reflexed green tip, often glandular as well as canescent-puberulent; achenes thinly hairy; heads averaging smaller, the disk seldom as much as 1.5 cm wide, the involucre 6–10 mm high, the rays mostly 8–25 in number; plants large or small, often with broader basal and/or lower cauline leaves; widespread, but mostly not in the range of var. *ambigua* or var. *sessiliflora*, and at higher elev. than var. *leucanthemifolia* where their ranges overlap .....  
 ..... var. *canescens*

#### 4. *Machaeranthera linearis* Greene

*Machaeranthera canescens* var. *glabra* A. Gray, Pl. Wright. 1: 89. 1852. *Aster canescens* var. *viridis* A. Gray, Syn. Fl. N. Amer. 1(2): 206. 1884. *Machaeranthera canescens* subsp. *glabra* B. L. Turner, Phytologia 62: 239. 1987. (Wright 262 [field number 1258], Rio Grande Valley at Presidio, San Elizario, Dona Ana Co., N.M.; lectotype by B. L. Turner, at GH!)

*M. linearis* Greene, Bull. Torrey Bot. Club 24: 511. 1897; not Rydb. 1900. *Aster linearis* Cory, Rhodora 38: 407. 1936; not S. F. Blake, 1924. (Wootton 444, Mesilla Valley, Dona Ana Co., N.M.; lectotype by B. L. Turner, at NDG!)

Stiffly erect biennial up to ca 1 m tall, with 1–several stems from the base; stems freely branched upwards, canescent-puberulent, often rather coarsely so, but scarcely or not at all glandular; leaves of flowering stems generally all cauline, rather numerous, entire or often saliently toothed, up to ca 7 cm long and 1 (2) cm wide, glabrous or nearly so on both sides, often ciliate-puberulent along the margins; heads more or less numerous, the disk mostly 1–1.5 cm wide; involucre 6–9 mm high, its bracts well imbricate in several series, shortly green-tipped, usually evidently glandular at least along the margins, sometimes also canescent-puberulent on the back, all  $\pm$  appressed, or often some of them with squarrose or reflexed tip; rays mostly 30–40+ (often ca 34) in well developed heads, lavender-purple, ca 1 cm long, up to 2 mm wide; style-appendages about equaling or a little longer than the stigmatic portion; achenes 3–4 mm long, thinly hairy or glabrous;  $2n = 8$ .

Open places in the plains, valleys, and foothills, often in sandy soil; high plains and adj. e. slopes of the Rocky Mts., from s. Wyo. to N.M., e. to w. Kansas, s. to w. Texas and Chihuahua, w. into Ariz.; entering

our range on the lower slopes of the La Sal Mts. in Grand Co., Utah, July–Oct.

Intergrades with *M. rigida* and *M. canescens* var. *ambigua*.

#### 5. *Machaeranthera rigida* Greene

*Aster canescens* var. *aristatus* Eastw. Proc. Calif. Acad. Sci. 11: 6: 296. 1896. *Machaeranthera canescens* var. *aristata* B. L. Turner, Phytologia 60: 78. 1986. (Eastwood 45, Willow Creek, San Juan Co., Utah; holotype at CAS!)

*M. rigida* Greene, Pittonia 4: 25. 1899. (Zuck 41, Kern's Canyon, Navajo Co., Ariz.; holotype at NDG!)

*M. cichoriacea* Greene, Leaff. Bot. Observ. Crit. 1: 148. 1905. *Aster cichoriaceus* S. F. Blake, Contr. U.S. Natl. Herb. 25: 563. 1925. (C. F. Baker 918, bottom of canyon, Deer Run, Mesa Co., Colo.; holotype at NDG!; isotype at NY!)

*Machaeranthera pulverulenta* var. *vacans* A. Nelson, Bot. Gaz. 56: 70. 1913. *M. canescens* var. *vacans* S. L. Welsh, Great Basin Naturalist 43: 316. 1983. (Walker 360, Paradox, Geyser Basin, San Juan Co., Utah; lectotype by B. L. Turner, at RM!)

Biennial (sometimes annual?) with 1–several stems 2–8 dm tall; stem (at least near and above the middle) evidently stipitate-glandular, or beset with short, stout, stiffly spreading, gland-tipped multicellular hairs, sometimes also puberulent, sometimes glabrous or nearly so toward the base; leaves often stipitate-glandular like the stem, otherwise essentially glabrous or merely ciliate along the margins, entire or often saliently toothed, narrow, up to ca 8 cm long and 12 mm wide, the basal ones generally withering before anthesis; heads usually more or less numerous, terminating the branches, relatively small, the disk ca 1 cm wide or less; involucre 6–10 mm high, its bracts well imbricate in several series, evidently glandular at least along the margins, occasionally also puberulent on the back, relatively small and narrow, seldom any of them over 1 mm wide, sometimes all appressed, but more often the short green tip of the middle and outer ones squarrose or reflexed; rays mostly 16–31, blue-lavender, 9–15 mm long; style-appendages equaling or a little longer than the stigmatic portion; achenes 2.5–3 mm long, thinly hairy;  $2n = 8$ .

Open, sandy places, wash-bottoms, and margins of streams, 1100–2000 m elev.; Canyonlands of Utah (n. as far as Emery and Grand cos.), and w. into Washington and s. Iron cos., s. to n. Ariz., and e. to w. Colo. and nw. N.M. July–Oct.

#### 6. *Machaeranthera commixta* Greene

*Machaeranthera commixta* Greene, Pittonia 4: 71. 1899. *M. canescens* var. *commixta* S. L. Welsh, Great Basin Naturalist 43: 316. 1983. *M. bigelovii* var. *commixta* B. L. Turner, Phytologia 60: 77. 1986. (M. E. Jones 5695y, Bromide Pass, Henry Mts., Utah; holotype at US!)

Single-stemmed biennial, or more often a short-lived perennial with several stems from the base, mostly 1–5 dm tall; stems glabrous below, or merely puberulent, but becoming glandular upwards, the peduncles beset with short, stout, multicellular, gland-tipped hairs; leaves entire or toothed, the principal ones glabrous except for the often irregularly ciliate margins, but the bracteal upper ones generally somewhat glandular; lower leaves up to ca 6 cm long and 1 cm wide, tapering to a petiolar base, the others generally sessile but in the same size-range or somewhat smaller; heads generally several, terminating the branches, relatively large, the disk mostly 1–2 cm wide; involucre 10–12 mm high, copiously beset with short, stiffly spreading, multisel-