28. HETEROTHECA POSTPETRINIS Nesom, **sp. nov. TYPE**: **Utah**. Grand Co.: Pritchett Canyon, 1200 m, 3 Jul 1911, *P.A. Rydberg and A.O. Garrett 8517* (holotype: NY-Fig. 153; isotypes: US-Fig. 155; UT-Fig. 154).

Distinct in its combination of reduced habit, slender and lax, stems unbranched or few-branched near the apex, spatulate-obovate, petiolate cauline leaves, and small, few-flowered, solitary heads subtended by a capitular bract.

Stems slender, probably trailing or reclining, unbranched or branched only in the caudex region and distalmost portion, 14–20 cm long, sparsely hirsute. **Leaves** cauline, basal not persistent or not present, largest at midstem or above, ascending, elliptic-oblanceolate to oblanceolate-obovate or spatulate-obovate, basally attenuate to a narrow petiolar region, with a rounded to obtuse-rounded apex, proximal small and becoming larger distally, largest at ca. midstem, 12–16 mm long, blades 3–5 mm wide, even-sized from midstem up to the involucres, surfaces and margins hirsute, marginal cilia of petiole slightly longer, minutely glandular adaxially. **Heads** solitary, subtended by a capitular bract or bracts similar to the distal cauline leaves. **Involucres** 4.5–6 mm wide (pressed); phyllaries in 3–4 graduate series, narrowly oblong-lanceolate with prominently white-scarious-rimmed margins, inner 6–8 mm long. **Ray flowers** ca. 8–10. Known only from the type collection.

The hirsute vestiture and white-margined phyllaries of *Heterotheca postpetrinis* are similar to *H. incensa*, which grows abundantly in relatively close-by localities. *Heterotheca hirsuta* also occurs in the area, though apparently more rarely. The lax habit and very small heads subtended by capitular bracts of *H. postpetrinus* are like those of the central Coloradoan *H. paniculata*.

The epithet alludes to the locality of *Heterotheca postpetrinis* in Pritchett Canyon, which forms the southeastern border of the Behind The Rocks Wilderness Study Area, immediately south of Moab. Pritchett Canyon (Fig. 152) is essentially east- to west-trending, descending from its upper portion at about 1400 meters to the river at 1200 meters — the label elevation of 1200 meters (ca. 3900 feet) puts the collection locality at the very base of the canyon. The lax stems suggest that the plants are pendent from the sandstone walls of the canyon.

Figure 151. Behind The Rocks Wilderness Study Area, looking east to the La Sal Mountains. Pritchett Canyon forms the southeastern boundary of the WSA. BLM photo.

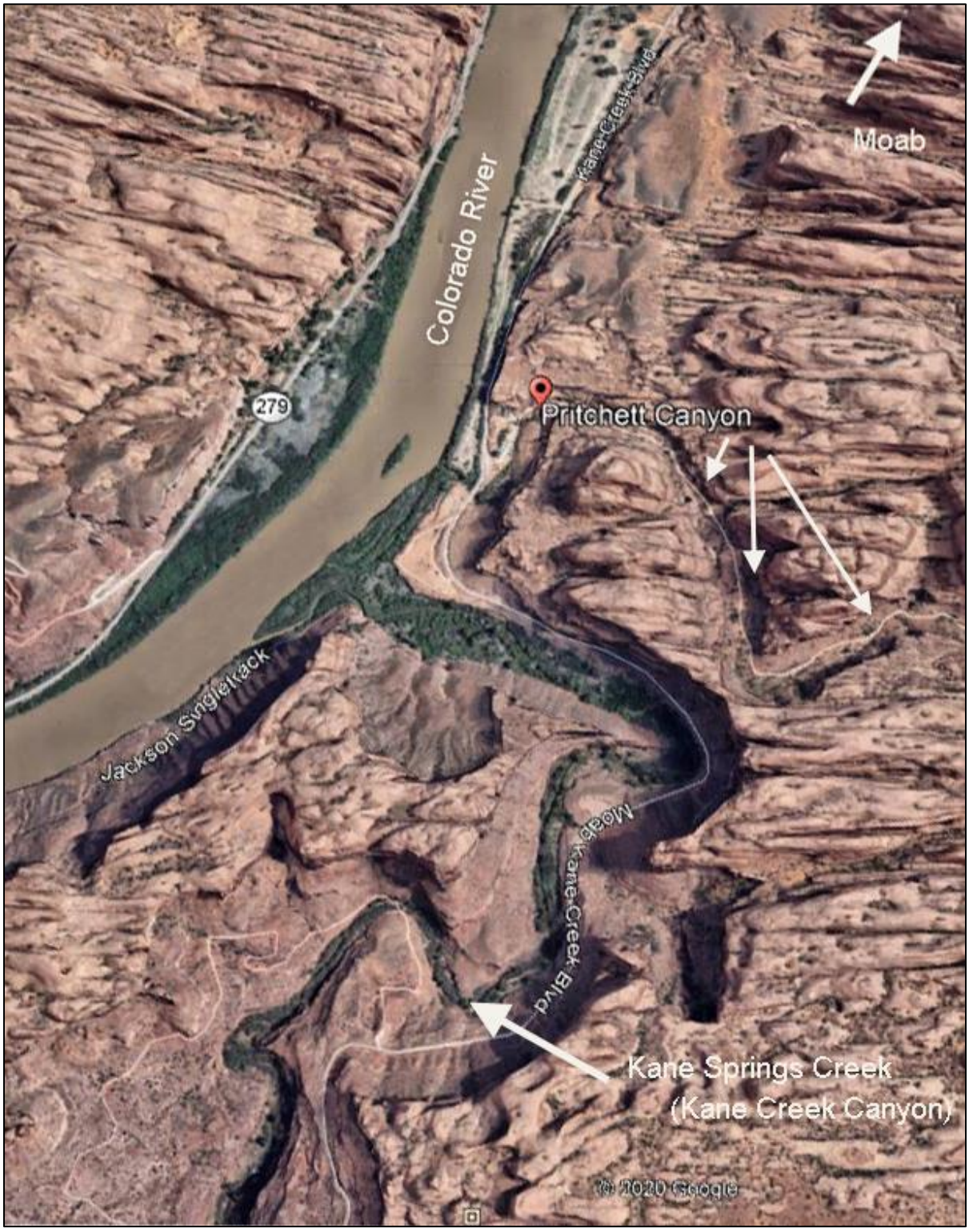

Figure 152. Pritchett Canyon, Grand Co., Utah, type locality of *Heterotheca postpetrinis*. The town of Moab is about 3 miles northeast of the locality. See Map 16 and Fig. 210 for a map in larger context.

Figure 153. *Heterotheca postpetrinis*, holotype (NY).

Figure 154. *Heterotheca postpetrinis*, isotype (UT).

Figure 155. *Heterotheca postpetrinis*, isotype (US).

29. HETEROTHECA HARTMANII Nesom, **sp. nov. TYPE**: **Wyoming**. Carbon Co.: Sierra Madre, Red Mountain, T14N R85W S31,32, dry mountainside amongst rocks, 10,100 ft, 27 Jul 1988, *N. Kastning 792* (holotype: RM!, Fig. 156).

Similar to *Heterotheca pedunculata* in its antrorsely oriented (mostly strigose) stem vestiture, oblanceolate leaves, and loosely clustered, pedunculate heads but distinct in its geography (north-central Colorado and adjacent Carbon Co., Wyoming), strongly taprooted habit, production of capitular bracts, and narrower phyllaries.

Plants perennial, from a woody taproot. **Stems** 12–45 cm, crowded from the caudex apex, ascending, vestiture loosely strigose, less commonly spreading-ascending to nearly puberulent (perhaps reflecting gene flow from *H. hirsutissima*), eglandular. **Leaves** cauline (basal withered by flowering), ascending, equably distributed, mostly oblanceolate to oblong-oblanceolate or elliptic-oblanceolate, mostly without a distinct petiolar region (except in the largest), largest at midstem or above, midcauline 15–45 x 3–9(–15) mm, axillary tufts of small leaves often evident, surfaces moderately hirsute-villous with arching hairs, both surfaces eglandular. **Heads** few in a loose corymb or loose panicle, peduncles 3–20(–45) mm; prominent capitular bracts usually present, narrowly lanceolate to oblanceolate, shorter to longer than the involucre; involucres 7–11 mm wide, phyllaries narrowly lanceolate, inner 6–8 mm long, sparsely strigose-hirsute to hirsute-villous, eglandular. **Ray flowers** 12–18, laminae 1.2–2.0 mm wide. **Chromosome number**, 2*n*=36 (*Semple 5773*, Routt Co., Colorado).

Flowering (Jun–)Jul–Aug(–Sep). Spruce, spruce-fir, aspen, lodgepole pine, sagebrush, Gambel's oak, pinyon-juniper, meadows, roadsides, cliffs, ridges, talus, rocky hillsides, volcanic outcrops, roadsides; (6900–)8200–10,100 ft. For Dr. Ronald L. Hartman, 1945-2018, who knew while he was still with us that this species would be named for him.

Heterotheca hartmanii is remarkably distinct, especially because of the prominent capitular bracts. It might be confused with *H. pumila* because of their elevational overlap, but the two occur in different habitats and there is no indication that they hybridize. *Heterotheca hirsuta* also is sympatric with *H. hartmanii* and produces capitular bracts, but it differs in vestiture. The discrete geographic range of *H. hartmanii* also supports its standing as an evolutionarily coherent entity.

Heterotheca hartmanii is compared with *H. pedunculata* in the diagnosis, but unlike the ovate-lanceolate phyllaries of *H. pedunculata*, *H. incensa*, and *H. depressa*, those of *H. hartmanii* are linear-lanceolate, more like those of *H. hirsutissima*. The latter is sympatric with *H. hartmanii* and gene flow apparently occurs where they overlap in elevation (at the lower range of *H. hartmanii*). Examples of probable hybrids or introgressants are *Read 96* (Eagle Co.), *Hartman 73380* (Jackson Co.), and *Nelson 55418* (Routt Co.).

Figure 156. *Heterotheca hartmanii*. Carbon Co., Wyoming. Holotype (RM).

Figure 157. *Heterotheca hartmanii*. Routt Co., Colorado. *Randolph 67* (COLO).

Figure 158. *Heterotheca hartmanii*. Jackson Co., Colorado. *Hartman 70421* (COLO).

Figure 159. *Heterotheca hartmanii*. Garfield Co., Colorado. *Vanderhorst 4416* (BRY).

Collections examined. **Colorado**. Eagle Co.: Gore Range, Big Horn Creek area, FS Trail 2013, ca. 4 air mi E of Vail, 8600-10,600 ft, 13 Jul 2000, *Holt 2151* (BRIT, RM); Sawatch Range, W slope of Continental Divide, Missouri Lakes Trail, ca. 16 air mi S of Avon, spruce-fir/lodgepole pine, 10,200-11,200 ft, 15 Jul 2000, *Holt 2272* (BRIT); Lime Park, 9500 ft, 2 Aug 1916, *Keefe 146* (RM); White River Natl Forest, cliffs uphill from Taylor Creek, ca. 2 air mi ENE of Christine State Wildlife Area and ca. 5 air mi ENE of Basalt, sandstone cliffs and loose slopes with scattered pinyon-juniper and mixed shrubs, 7400-7800 ft, 20 Jun 2010, *Kirkpatrick 1726* (RM); Gore Range, White River Natl. Forest, Eagles Nest Wilderness, Deluge Lake Trail, ca. 7 air mi NNW of Vail Pass, rocky aspen hillsides, 8800-10,200 ft, 2 Aug 2010, *Kirkpatrick 3738* (RM); Sawatch Range, White River Natl Forest, Holy Cross Wilderness, Eagle Lake Trail to Halfmoon Lake, between Eagle and Avalanche peaks along Lime Creek, ca. 18 air mi SSE of Eagle, subalpine riparian corridor, seeps, and scree slopes, 10,100-10,400 ft, 21 Jul 2011, *Kirkpatrick 7708* (RM); Flat Tops/White River Plateau, ca. 18 mi NNE of Eagle, dry hills above Colorado River, pinyon-juniper, 6900 ft, 15 Jul 1991, *Vanderhorst 3338* (RM). Garfield Co.: Uintah Basin, S slope of S rim, head of East Salt Creek, 7500 ft, 16 Jun 1935, *Graham 9704* (UC); ca 4 air mi NW of New Castle, Flat Tops/White River Plateau, Main Elk Creek, E exposure and ridge top, red shale and white sandstone, juniper and oak, 6250 ft, 23 May 1990, *Hartman & Vanderhorst 24520* (COLO); E of Coffee Pot Springs, White River Plateau, rim of Deep Creek Canyon, limestone outcrop, 10100 ft, 29 July 1963, *Miller 54* (COLO); White River Plateau, cutoff to Grizzly Creek Road from Coffee Pot Road, 1/2 mi NW Crne Park, 10,500 ft, 30 Jul 1963, *Miller 295* (COLO); ca 12 air mi N of Glenwood Springs, Flat Tops/White River Plateau, headwaters of Grizzly Creek, meadows and rocks around lake, with *Dugaldia*, *Salix*, clumps of *Abies*, and *Picea*, 10,700 ft, 22 Jul 1990,*Vanderhorst 1212* (KANU); ca 12 mi NE of Glenwood Springs, Flat Tops/White River Plateau: Deep Creek Overlook, top edge of north-facing cliffs and talus slopes above canyon, patchs of *Pinus flexilis* and *Pseudotsuga menziesii*, and unforested rock, 10,000 ft, 23 Jul 1990, *Vanderhorst 1307* (KANU, COLO); Flat Tops/White River Plateau, Grizzly Creek, ca. 4 air mi E of Glenwood Springs, canyon bottom with cottonwood, Douglas fir, spruce, and dogwood, 6000-6200 ft, 24 Aug 1990, *Vanderhorst 1913* (KANU, RM); Flat Tops/White River Plateau, N rim of Deep Creek Canyon around Balixburg Spring, ca. 14 air mi NE of Glenwood Springs, limestone rimrock with limber pine, Douglas fir, and *Selaginella*, 9400 ft, 23 Jul 1991, *Vanderhorst 3510* (COLO); ca 13 air mi N of Glenwood Springs, Flat Tops/White River Plateau, limestone ridge above Bison Lake, exposed limestone with pockets of poorly drained soil, northern exposure, with scattered spruce,11,000 ft, 6 Aug 1991, *Vanderhorst 3868* (KANU); ca 17 air mi NNW of Glenwood Springs, Flat Tops/White River Plateau, Flat Tops Wilderness, Blair Mountain, limestone rimrock, E exposure with ferns, columbine, and willows, 11,200 ft, 24 Aug 1991, *Vanderhorst 4416* (BRY). Jackson Co.: Park Range, Rainbow Lake Trail, ca. 17 mi WSW of Walden, spruce forest, 8800-8900 ft, 7 Aug 2000, *Hartman 69393* (RM); Park Range Newcomb Park Trail, 0.5-2.5 trail mi W of trailhead (to granitic domes and Newcomb Creek, angling NW), 20-21 air mi SW of Walden, meadows and woodland, pond edges, 8800-8900 ft, 17 Aug 2000, *Hartman 70021* (RM); Medicine Bow Mts, Forest Rd 895 at private land and W to North Platte River, then NE 1.5 air mi, ca. 6-7 air mi N of Cowdrey, 7800-8500 ft, 9 Sep 2000, *Hartman 70421* (COLO); Park Range, Lake Percy and Round Lake, around lakes, 10,130 ft, 28 Aug 2001, *Hartman 74030* (RM); Park Range, ca. 2 air mi N of Red Elephant Mtn, spruce-fir, 9250 ft, Aug 1988, *Kastning 1212* (RM); Park Range, ca. 6.5 air mi SSE of Mt. Ethel, sagebrush grassland, 8750 ft, 18 Aug 1988, *Kastning 1315* (RM); Park Range, ca. 16 air mi W of Walden, dry meadows by lodgepole pine forest, 8850 ft, 3 Sep 1988, *Kastning 1375* (RM); Park Range, ca. 18 air mi WSW of Walden, Norris Creek, Livingston Park area, mixed lodgepole pine and aspen stands, 8925 ft, 15 Aug 1989, *Kastning 2643* (RM); Grizzle Creek Ranger Station pasture, sagebrush, 8500 ft, 5 Aug 1930, *Kutzleb K129* (RM); Park Range, Lake Percy and along creek below, ca. 1/4 mi E of the Continental Divide, ca. 4 air mi NW of Rabbit Ears Peak, 26-27 air mi SW of Walden, open slope with scattered willows, 9400-10,060 ft, 17 Aug 2000, *Nelson 51929* (RM); Park Range, below Rabbit Ears Peak on N and E sides, ca. 27 air mi SW of Walden, roadside and along logging roads, 9800-10,100 ft, Aug 2000, *Nelson 52032* (RM); Park Range, along Continental Divide above Manzanares Lake, ca. 26 air mi W of Cowdrey, ca. 30.5 air mi NW of Walden, stony ridge with scattered conifers, 9900-10,350 ft, 1 Aug 2001, *Nelson 55147* (RM); Rabbit Ears Range, along Continental Divide ca. 0.5-1 air mi NW of Chimney Rock, ca. 8 air mi ESE of Muddy Pass, ca. 27.5 air mi SSW of Walden, volcanic outcrop, 9480-9800 ft, 20 Aug 2001, *Nelson 55918* (RM); Hog Park Ranger Station pasture, 8500 ft, 13 Aug 1923, *Rose 121* (RM); Medicine Bow Mts, Colorado State Forest, East

Sand Hills Natural Area, ca. 10 mi E of Walden, W-facing sand dunes with *Artemisia*, 8200-8400 ft, 1 Jul 2001, *Nunn 2365* (BRIT); Park Range, near jct of FS Roads 600 and 689, ca. 0.5 mi N of Big Creek Lake, ca. 22 air mi NW of Walden, large clearing in lodgepole pine forest, 8900 ft, 6 Aug 1989, *Snow 5265* (RM). Moffat Co.: Danforth Hills, Rte 40, SW of Cross Mtn, along draw, sagebrush, 6500-6600 ft, 30 Jun 1938, *Pennell & Schaeffer 22471* (PH). Rio Blanco Co.: vicinity of Aldrich Lake, meadow, 22 Jul 1937, *Ramaley & Johnson 719* (RM); Flat Tops/White River Plateau, Yellow Jacket Pass, ca. 12 air mi NE of Meeker, W-facing slopes above pass, Gambel oak, 7500-8400 ft, 9 Jul 1990, *Vanderhorst 881* (RM); ca. 17 air mi E of Meeker, Flat Tops/White River Plateau, ridge between Big Beaver and Fawn Creeks, rocky, gentle S-facing slope, 8500 ft, 14 Aug 1990, *Vanderhorst 1723* (COLO); ca. 19 mi E of Dinosaur, sandstone outcrops, disturbed salt desert shrub comm., silty sandy clay soil, 10 Aug 1979, *Welsh 320* (BRY). Routt Co.: Park Range, Mt. Zirkel Wilderness, along trail to Gold Creek Lake, near Wilderness boundary, open bank along trail, 8800 ft, 6 Aug 1988, *Flock 2019* (RM); Steamboat Springs, open, stony flats, 22 Jul 1903, *Goodding 1655* (PH-2, RM); Park Range, Middle Fork Elk River, 21 air mi WNW of Walden, spruce-fir, 9000 ft, 21 Jul 1989, *Kastning 2406* (RM); Park Range, ca. 15.5 air mi N of Steamboat Springs, dry meadow, 8170 ft, 27 Aug 1989, *Kastning 2710* (RM); 18 mi NW of Steamboat Springs, Day Creek Ranch, meadows in open aspen-conifer, 8500 ft, 3 Aug 1991, *Keil 22485* (OBI); 5 mi W of Grand Co. line on Hwy 40, Rabbit Ear Pass, pine-Douglas fir, roadside, 9426 ft, 3 Aug 1982, *Luckow 958* (OBI); Park Range, along Service Creek, ca. 4 air mi above the Yampa River, ca. 15.5 air mi SSE of Steamboat Springs, meadow, 8400 ft, 3 Aug 1989, *Nelson 17602* (BRIT, RM); Elkhead Mts, N of Dry Fork Elkhead Creek, ca. 1 air mi SW of Elkhead, ca. 10 air mi N of Hayden, stony sagebrush hills, 6920-7040 ft, 29 Jun 2000, *Nelson 50118* (RM); Park Range, along a tributary of Tennessee Creek E and below Shield Mtn, 6.5-7 air mi NW of Columbine, sandy-rocky knoll with aspen and chokecherry, 8000-8300 ft, 7 Aug 2000, *Nelson 51483* (RM); Park Range, head of Harrison Creek, ca. 2 air mi E of Walton Peak, ca. 3 air mi SW of Rabbit Ears Pass, lodgepole pine on volcanic substrate, 9760-9800 ft, 24 Jul 2001, *Nelson 54545* (RM); Park Range, Walton Peak and vicinity, 4-5 air mi SW of Rabbit Ears Pass, stony ridge on volcanic substrate, 9920-10,560 ft, 24 Jul 2001, *Nelson 54475* (RM); Park Range, N end of Crane Park just above Middle Fork Little Snake River, ca. 6.5 air mi NNE of Columbine, sagebrush, 8240-8360 ft, 31 Jul 2001, *Nelson 55009* (RM); Park Range, at head of Middle Fork Little Snake River and along the Continental Divide, ca. 1-2 air mi ENE of Big Red Park, ca. 8-9 air mi ENE of Columbine, stony ridge with scattered conifers, 9120-10,360 ft, 1 Aug 2001, *Nelson 55116* (RM); Park Range, along old logging road S and E above Rock Creek, 1.5-2.5 air mi ENE of Long Park, 15-16 air mi SE of Yampa, roadside and adjacent lodgepole pine forest, 8800-8900 ft, 8 Aug 2001, *Nelson 55375* (RM); Park Range, along Forest Rd 443 and Trail 1164 between Three Island Creek and S Fork Elk River, ca. 19.5 air mi NNE of Steamboat Springs, roadside in old logged area, 8400-9000 ft, 21 Aug 2001, *Nelson 56021* (RM); Park Range, along Forest Rd 443 and Trail 1164 between Three Island Creek and S Fork Elk River, ca. 19.5 air mi NNE of Steamboat Springs, along trail and in adjacent moist, open spruce-fir-aspen forest, 8400-9000 ft, 21 Aug 2001, *Nelson 56097* (RM); Park Range, along Forest Rd 441 to Floyd Peak above Reed Creek, 5-6 air mi E of Clark, along road through mixed conifer forest, 8900-9200 ft, 22 Aug 2001, *Nelson 56142* (RM); Conger Mesa just N of McCoy, moss-covered rock outcrop, 7700 ft, 7 Jul 1984, *Randolph 67* (COLO); US Hwy 40 SE of Steamboat Springs, foothills 1.5 mi W of Routt Natl Forest boundary, 31 Aug 1981, *Semple 5773*, **2n=36** (MO); Park Range, along Mad Creek Trail, *Quercus gambelii*, *Pinus*, 7600 ft, 3 Aug 1989, *Snow 4799* (RM); Park Range, Gold Creek drainage, near Mt. Zirkel Wilderness boundary, ca. 21 air mi NE of Steamboat Springs, aspen grove, 8500 ft, 10 Aug 1989, *Snow 5706* (RM); open ridge above Micah Lake, 8500 ft, 26 Jul 1926, *Towne 17* (RM); Routt Natl Forest, 28 mi N of Soda Springs, vicinity of Seedhouse Campground, along N Fork Elk River, 8000 ft, 15 Jul 1951, *Weber 6708* (WTU). **Wyoming**. Carbon Co.: Sierra Madre, ca. 4 air mi SSW of Blackhall Mtn, along Encampment River, spruce-fir forest, 8450 ft, 28 Jul 1988, *Kastning 863* (RM) and *Kastning 873* (RM); ca. 10 km N of Wyo Hwy 70, Forest Rd 801 by Forest Rd 801.18, open aspen-pine woods, 9916 ft, 25 Aug 1995, *Semple & Zhang* 10416 (MO).

Several collections, apparently made in close proximity, of near-typical *Heterotheca hartmanii* seem out of range. **Wyoming**. Albany Co.: Laramie Range, N of Laramie ca. 6 mi S of Hwy 34 on Sybille Rd, occasional near roadside on slope, 27 Jun 1991, *Keil 21876* (OBI); Laramie Mts, Medicine

Bow Natl Forest, sandy alpine prairie by I-80, ca. 8600 ft, 1 Sep 1976, *Kral 58965* (MO); Laramie, small, open clumps on loamy sunny slopes, 18 Jun 1913, *Macbride 2478* (RM).

Variants (x *H. hirsutissima* ?). **Colorado**. Eagle Co.: Derby Mesa, N of mill, 8000 ft, 21 Aug 1925, *Read 96* [x *H. hirsutissima* ?] (RM). Jackson Co.: Medicine Bow Mts, Forest Rd 204, 0.7 road mi SE of Forest Service boundary, ca. 1 air mi from Kings Canyon, 8511 ft, 3 Aug 2001, *Hartman 73380* [x *H. hirsutissima* ?] (BRIT, RM); Medicine Bow Mts, Forest Rd 889, 0.1 road mi E of Colo Hwy 127, sagebrush, 8700-8800 ft, 6 Aug 2001, *Hartman 73567* [x *H. hirsutissima* ?] (RM); Medicine Bow Mts, County Rd 8A, 1 mi from Co. Rd 8, then SE on hogback to gap, sagebrush, 8400-8600 ft, 6 Aug 2001, *Hartman 73702* [x *H. hirsutissima* ?] (RM). Routt Co.: Park Range, along Horse Creek to Rock Creek and the ridge to the N, 1.5-2 air mi E of Long Park, 15-16 air mi SE of Yampa, sagebrush, 8550-8880 ft, 8 Aug 2001, *Nelson 55418* [x *H. hirsutissima* ?] (RM).

30. HETEROTHECA HIRSUTISSIMA (Greene) Nesom, **comb. nov.** *Chrysopsis hirsutissima* Greene, Pittonia 4: 154. 1900. **LECTOTYPE** (Semple 1996): **Colorado**. Archuleta Co.: Arboles, 5 Jun 1899, *C.F. Baker 650* (NDG 53929 image!; isolectotypes: E, F, G fragment, GH, K, MO, NDG 53920, NDG 53921, NY, POM-2 sheets!, RM-2 sheets!, UC!, US). Images! of all types.

Semple (1996, p. 126-127) noted that "Some of the type material is close to or covarietal with var. *pedunculata*; thus the type population may have included hybrids between var. *minor* and var. *pedunculata*." It is not clear to me, however, what features led Semple to this conclusion, because all plants and branches on all the type sheets (excluding the G fragment) have essentially identical aspect and vestiture, including spreading hairs (2-storied) on the stem. It seems plausible that all were collected from the same population — none appear to show introgression from *H. pedunculata*.

Chrysopsis villosa var. *minor* Hook., London J. Bot. 6: 244. 1847. *Heterotheca villosa* var. *minor* (Hook.) Semple, Novon 4: 54. 1994. **TYPE**: **Wyoming**. [Natrona Co.]: Protologue: "Oregon Territory, Rocky Mts, granite masses of the Sweet Water River, only fringing the fissures," Jul 1843, *C.A. Geyer 7* (holotype: K; isotypes: GH image!, NY image!).

Semple (1996) noted that the Geyer collection was made in Sweetwater County, but the site where the Sweetwater River crosses granite masses is in southwestern Natrona County, at the Devil's Gate — this narrow gorge was a significant landmark along the Oregon Trail (Plants and Rocks 2014; and see Wikipedia entries for "Devil's Gate (Wyoming)" and "Independence Rock (Wyoming)"). Geyer collected along the Oregon Trail in Wyoming in 1843 with W.D. Stewart's expedition.

Chrysopsis canescens var. *nana* A. Gray, Mem. Amer. Acad. Sci. 4 [Pl. Fendl.]: 78. 1849. *Heterotheca villosa* var. *nana* (A. Gray) Semple, Novon 4: 54. 1994. **TYPE**: **New Mexico**. [Mora Co.]: Protologue: "Elevated rocky region 2 mi E of the Mora River; August. (391c.)," 17 Aug 1847, *A. Fendler 391c* (holotype: GH image!, Fig. 98; isotype: MO!).

Fendler made the collection returning to St. Louis from collecting in the vicinity of Santa Fe, New Mexico, October 1846 through early August 1847. The Santa Fe Trail crossed the Mora River in the vicinity of the present community of Watrous (now along Interstate 25) and Fendler's group was there on 17 August, 1847 (Shaw 1982). The MO isotype gives the name with the number "362," which is the listing number of the species in Gray's published account; "391" is in handwriting at the upper left corner of the label, as is "391c" on the holotype label.

Chrysopsis horrida Rydb., Bull. Torrey Bot. Club 31: 648. 1905. *Heterotheca horrida* (Rydb.) Harms, Wrightia 4:17. 1968. **TYPE**: **Colorado**. [Weld Co.]: New Windsor, 8 Aug 1900, *G.E. Osterhout 2326* (holotype: NY image!; isotypes: RM-3 sheets! images!).

Chrysopsis asprella Greene, Leafl. Bot. Observ. Crit. 1: 150. 1905. **TYPE**: **Colorado.** Montrose Co.: Black Cañon, 7000 ft, 8 Jul 1901, *C.F. Baker 379* (holotype: NDG 53766; isotypes: CORD, DS!, E, GH, MIN, MO!, NY, RM-2 sheets!, RSA-2 sheets, US, VT). Images! of all types except DS. The holotype is a plant of *H. hirsutissima*; some isotypes (e.g., NY) apparently show

introgression from *H. paniculata* or are best identified as *H. paniculata* (see comments under *H. paniculata*).

Chrysopsis compacta Greene, Leafl. Bot. Observ. Crit. 1: 150. 1905. **TYPE**: **Colorado**. [Gunnison Co.]: Jack's Cabin [ca. 5 miles NE of Almont], 8280 ft, 26 Jul 1901, *C.F. Baker 608* (holotype: NDG 53781; isotypes: E, GH, MIN, MO!, NY, RM-2 sheets!, RSA, UC-2 sheets!, US, VT). Images! of all types. The holotype is a plant of *H. hirsutissima*; some isotypes apparently show introgression from *H. paniculata* (see comments under *H. paniculata*).

Chrysopsis arida A. Nels. in Coult. & Nels., Man. Bot. Rocky Mts., 492. 1909. **TYPE**: **Wyoming**. Albany Co.: Tie City, dry sandy hills and cliffs, 20 Jul 1900, *A. Nelson 8224a* (holotype: RM!; isotypes: NEB, NY, VT). Images! of all types.

Heterotheca hirsutissima has a distinct geographic range and usually can be unambiguously identified. The concept here of *H. hirsutissima*, at least in morphology, is essentially the same as that of Harms (1963, 1968), who identified it as *H. horrida*. Plants are characterized by a loosely corymboid capitulescence, lack of capitular bracts, eglandular, (1–)2-storied stem vestiture, the overstory hairs deflexed-spreading and 1–3(–4.5) mm long, and obovate, subpetiolate leaves sessile-glandular on both surfaces. Involucres 8–18 mm wide (pressed), with inner phyllaries 5–9 mm long, eglandular. Ray flowers 12–25.

All chromosome counts for *Heterotheca horrida* /*H. villosa* var. *nana* — except two — are diploid, fide Harms (1963, 1967) and Semple (1996, 2008). A tetraploid count is reported from Taos Co., New Mexico (*Semple & Heard 8055*, see comments below); a triploid is reported from Jefferson Co., Colorado (*Semple 2256*, not seen; Semple 1977). Semple (1996, p. 128) noted that "head size suggests the type [of var. *minor* = *H. horrida* = *H. hirsutissima*] is probably a diploid."

The new combination *Heterotheca hirsutissima* incorporates an earlier name for what has been identified as *Heterotheca horrida* and *H. villosa* var. *nana*, and, in part (including the type), *H. villosa* var. *minor*. Semple placed *Chrysopsis hirsutissima* and *C. arida* as synonyms of *H. villosa* var. *minor*. His concept of var. *nana* is a fairly close match for what is identified here as *H. hirsutissima*; his var. *minor* includes *H. hispida* and many collections of *H. hirsutissima* with upper leaves narrowly to braodly oblanceolate on relatively longer internodes (vs. linear to broadly obong on relatively shorter internodes) and slightly less glandular.

Plants of the type collections of *Heterotheca villosa* var. *minor* (see NY isotype) and *Chrysopsis arida* produce small capitular bracts at low frequency. Plants of *H. hirsutissima* in Baca, Cimarron, and Union counties (Colorado, Oklahoma, New Mexico) produce narrow capitular bracts at a low frequency within populations (ca. 5–10%, pers. observ. in the field) and on individual plants. *Bennett 8787*-BRY (Bernalillo Co.) and *Holmgren 7189*-BRY (Taos Co.) have the habit, leaf morphology, and vestiture of *H. hirsutissima* but have relatively small heads and are atypical of *H. hirsutissima* in producing well-developed, elliptic-oblanceolate capitular bracts (no species in this region of north-central New Mexico consistently produces capitular bracts).

A collection from Valencia Co., New Mexico, has the habit of *Heterotheca hirsutissima* but atypical vestiture — densely glandular with reduced non-glandular vestiture: ca. 5 mi SE of Grants, rest stop on N side of US 40, Malpais lava beds, 24 Jun 1986, *Kass 2465* (BRY).

Semple (1996, p. 142) recognized the similarity between var. *nana* and var. *minor*: "The determination that the type of *Chrysopsis horrida* was more similar to the type of *Diplopappus hispidus* than previously recognized resulted in the recommendation that the two be treated as conspecific and possibly even convarietal (Semple 1990)" but in 1996 he segregated *C. villosa* var. *nana* (including *C. horrida*) and *C. villosa* var. *minor* (including *C. hispida*). "Variety *nana* is distinguished by its linear

to broad oblong, often patent, upper stem leaves and stems with short internodes ... versus narrowly to broadly oblanceolate upper stem leaves in var. *minor* on stems with longer internodes ... Forms of var. *minor* with oblong to ovate leaves generally have stems with longer internodes and fewer leaves" (1996, p. 141; his key on p. 31 separates them essentially in the same way).

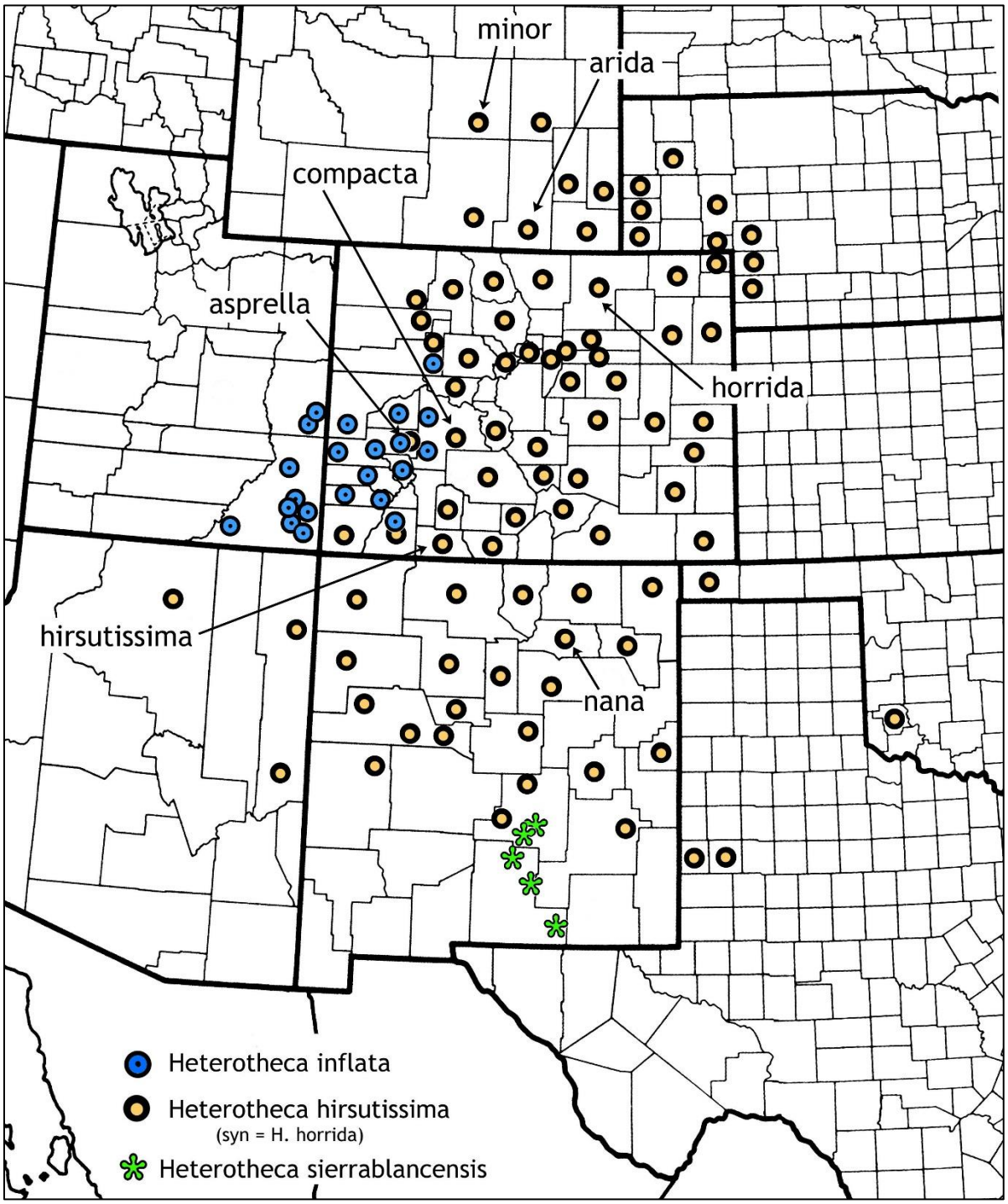

Figure 160. Distribution of *Heterotheca inflata*, *H. hirsutissima*, and *H. sierrablancensis*. Representative outlying collections are cited in the text. Names with arrows are of synonyms of *H. hirsutissima*.

Plants of *Heterotheca hirsutissima* small in stature with small heads and exceptionally small leaves occur in central New Mexico. Gray's *Chrysopsis canescens* var. *nana* is one of these — his varietal epithet ("nana") surely alluded to the small stature (3–4 inches high) of the type and its small leaves and heads ("caulibus 3–4 pollicaribus; foliis capitulisque parvis minus incanis," as in the protologue). The GH type of var. *nana* (like *Cutler 2112* from Valencia Co.) has silvery-sericeous leaves, which is presumably the feature that influenced Gray to place this as a variety of *H. canescens*. Leaves of the MO isotype are strigose-hirsute with shorter hairs but other features are the same.

Collections examined of unusually small-leaved, small-stature plants. **New Mexico**. Lincoln Co.: 2 mi SW of Corona, 15 Jul 1935, *Hubricht et al. B1483* (MO). Torrance Co.: 6.5 km NE of Duran on NMex Hwy 3, rocky broken prairie with scattered juniper, 2 Oct 1995, *Semple 10518* (MO; dups indicated on label as "WAT, BALT, MO, NMC, MONTU"). Valencia Co.: 16 mi N of Trechado, frequent among rocks, 10 June 1938, *Cutler 2112* (CAS, MO).

Exceptionally tall plants of *Heterotheca hirsutissima* occur in north-central New Mexico — these are generally 25–50 cm tall (on herbarium sheets, where probably under-represented in height by collections of small plants) and up to about 100 cm (personal observation, see label comments on *Nesom FW172* from Bernalillo Co.). They appear to be sympatric with plants of typical morphology and may represent a tetraploid race (e.g., see *Semple & Heard 8055*).

Representative collections examined of unusually tall/robust plants. **New Mexico**. Bernalillo Co.: Sandia Mts, Las Huertas Cañon, hillside, 8000 ft, Jul-Aug 1914, *Ellis 211* (MO); Sandia Mts., Allen's Ranch, dry hillsides and among bushes, 7200 ft, 24 Aug 1914, *Ellis 350* (MO); city of Bernalillo, E side of town near Hwy 25, side of large drainage through urban area, plants up to 3 ft tall, with many erect-ascending stems from the base, common, 25 Jul 2002, *Nesom FW172* (BRIT). San Juan Co.: 4 mi SE of Nageezi, 8 mi W of Lybrook Indian Mission, 7000 ft, 20 Jul 1977, *Peabody 1637* (BRY). San Miguel Co.: 2.3 mi SE of Rowe, road cut, red silty clay, 7 Aug 1955, *Shinners 21004* (SMU). Sandoval Co.: 5 mi SE of Cuba, head of El Cajete Canyon, 9000 ft, 10 Aug 1977, *Sears 315* (BRY). Santa Fe Co.: Cerro Negros area, ca. 10 km E of Santa Fe, pinyon pine-scrub, 27 Jul 1983, *Crosby 14689* (MO-2 sheets); Santa Fe Creek valley, rocky hillsides, Jun-Aug 1847, *Fendler 360* (MO); 1/2 mi S of Santa Fe, juniper association, 23 Jul 1961, *Harms 1921* (KANU); 4 mi E of Santa Fe, along Santa Fe Creek, 7500 ft, 3 Jul 1899, *Heller 3807* (MO). Taos Co.: Valley of Rio Pueblo near Picturis Pueblo, 7300 ft, 10 Aug 1966, *Bennett 8785* (BRY); 12.0 km N of Pilar on NM-68, sage, pinyon, juniper scrub, 20 Sep 1985, *Semple & Heard 8055*, **2n=36** (NMC).

Representative outlying collections in Arizona, New Mexico, Oklahoma, Texas, and Utah. **Arizona**. Apache Co.: Canyon de Chelly Natl Mon., dry areas, 5700 ft, 13 Sep 1955, *Demaree 38585* (RSA); Navajo Indian Reservation, P.O. Fort Defiance, rocky dry areas, 7000 ft, 15 Jul 1961, *Demaree 44621* (SMU); Navajo Indian Reservation, P.O. Fort Defiance, dry rocky ridge, open woods, 7000 ft, 15 Jul 1961, *Demaree 44623* (CAS); Petrified Forest Natl Monument, 3 mi N of Puerco Ranger Station, gravel barpits along hwy, 5600 ft, 19 Jun 1941, *Fleming 145* (CAS); Richville Valley, sedimentary badlands, Aug 1938, *Gentry 3825* (RSA). Navajo Co.: 3 mi S of Holbrook, grassland, 5200 ft, 6 May 1981, *Butterwick 7564* (CAS). **Colorado**. Baca Co.: Colorado Road 8 at first creek crossing N of Oklahoma state line, ca. 9-10 mi N of Kenton, abundant on sandstone ledges along S side of creek, with *Ulmus pumila*, 4400 ft, abundant, in early flower, many decumbent-ascending stems from the base, 28 Jul 2015, *Nesom het2015-3* (BRIT, TEX, 3 dups). **New Mexico**. Chavez Co.: Helena Rd [Co. Rd. 11] off Hwy 82, gravelly soil in *Yucca-Gutierrezia-Opuntia* community, 4882 ft, 7 Sep 2002, *Atwood 29008* (BRY). Union Co.: NMex Hwy 551 up Toll Gate Canyon, 1.4 mi N of jct with NMex Hwy 456, ca. 9 mi S of Branson, roadside pullout area, *Juniperus*, *Cercocarpus*, and scattered ponderosa pine on slopes, *Populus* along stream, sandstone area, 6200 ft, abundant along both sides of road, in full flower, 29 Jul 2015, *Nesom het2015-6* (BRIT, TEX, 6 dups). **Oklahoma**. Cimarron Co.: Ca. 2.2 mi E of Kenton on Hwy 325, where hwy passes through large sandstone outcrops, N-facing sites along N side of hwy on small spur road, juniper with scattered oaks and *Cercocarpus*, 4450 ft, abundant in crevices and at base of rock, well into flower, 28 Jul 2015, *Nesom het2015-2* (BRIT, TEX, 9 dups); ca. 5 road mi N of Kenton, rocky canyon, 25 Sep 1976, *Taylor 23751* (LSU image!). Greer Co.: N edge of Granite, from a granite rock, 9 Jul 1976, *Taylor 22526* (BRIT). **Texas**. Terry

Co.: Fitzgerald Ranch Preserve, ca. 1.2-1.3 mi E of FM 1780 along internal road from gate 5.1 road mi N of jct with FM 2196, occasional in sandsage-Havard oak-dropseed vegetation, on and around low dunes, 3570 ft, 10 Sep 2008, *Carr 27128* (TEX); Wellman, sandy soil dominated by slum oak, 8 Jul 1934, *Reed 3787* (TEX). Yoakum Co.: Ca. 0.2-0.3 mi E of FM 1780 from a point 5.1 road mi N of its jct with FM 2196, occasional in sandsage-Havard oak-dropseed vegetation on low hummocky topography on essentially level part of Holocene sand sheet, 3585 ft, 9 Sep 2008, *Carr 27080* (TEX, Fig. 168).

The long-disjunct collection from Greer Co., Oklahoma, is confidently identified as *Heterotheca hirsutissima*. In Texas, the Yoakum Co. collection of *H. hirsutissima* is typical in morphology; in Terry Co., the vestiture of both collections suggests an influence from *H. angustifolia*; a collection of *H. angustifolia* from Terry Co. (10 Jul 1941, *Tharp 42-83*, LL) is typical except for elongate peduncles, which suggests reciprocal gene flow with *H. hirsutissima*. Similar introgression appears to occur in southwestern Colorado (e.g., Las Animas Co.).

Apparent distantly disjunct collection. MEXICO. **Nuevo León**. Ca. 1.5 mi below the microwave station on Cerro Potosí, N of Galeana, in douglas fir and oak forest, Sep 1970, *Norris 17744* (CAS) — 3 plants on the sheet. This collection is far out of range but provisionally identified here as *Heterotheca hirsutissima*, although the densely leafy stems, very short peduncles (2–10 mm long), and thin-based hairs are not characteristic of that species. Semple annotated the specimen in 1987 as *H. horrida*; he cited it in 1996 as H. "aff. harmsiana." There is no Mexican species to which the Norris collection is closely similar, nor any (besides *H. hirsutissima*) in Texas or New Mexico. It seems unusual that only a single collection has been made, since numerous botanists have collected on Cerro Potosí, but the three plants on the Norris sheet are consistent in morphology and apparently were representative of a population. No species of *Heterotheca* has been reported from the summit area of Cerro Potosí (Beaman & Andresen 1966; Garcia & González 1991).

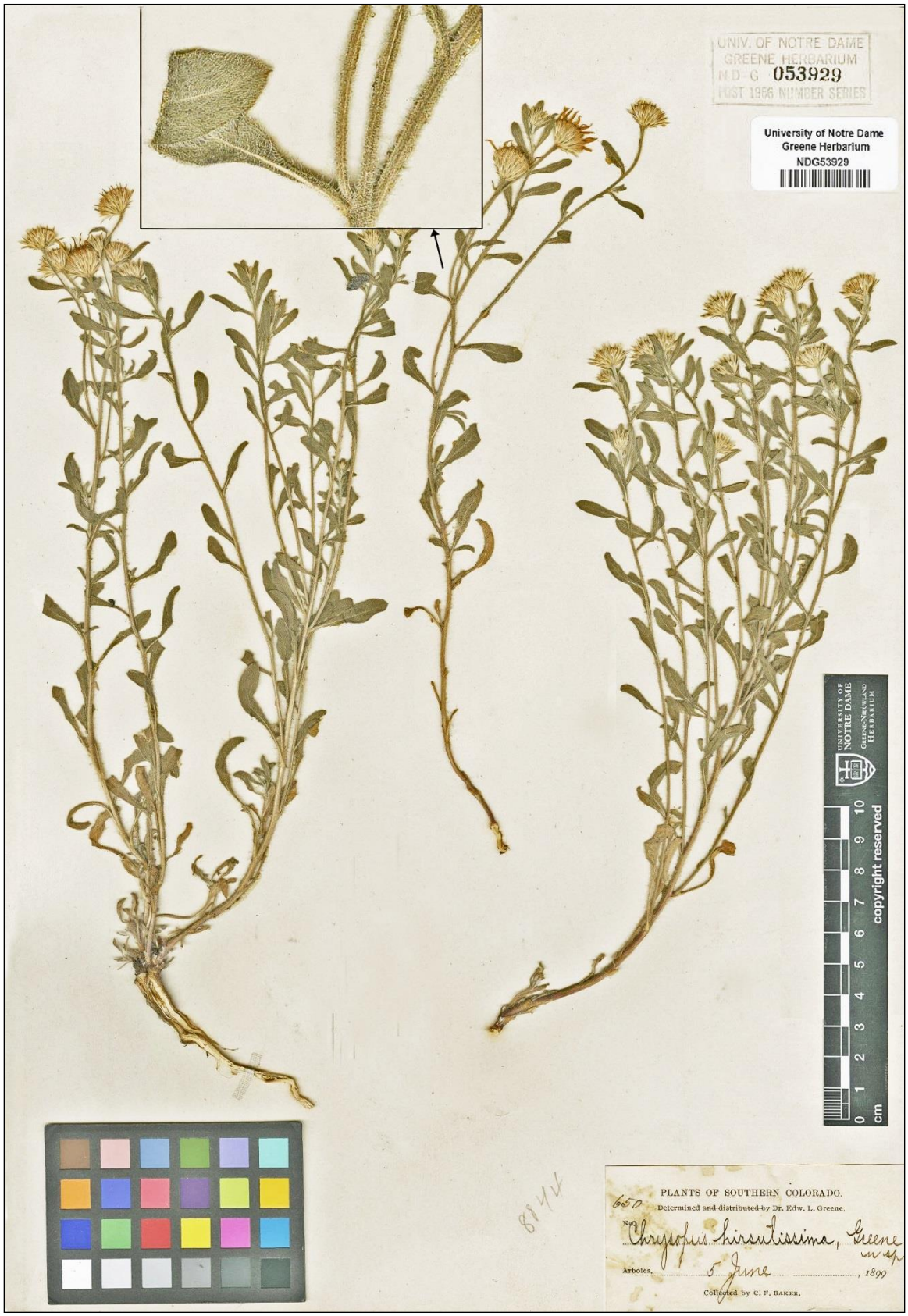

Figure 161. *Heterotheca hirsutissima*, holotype NDG.

Figure 162. *Heterotheca hirsutissima*. Washington Co., Colorado. *Stephens 5052* (KANU).

Figure 163. *Heterotheca hirsutissima*. Santa Fe Co., New Mexico. *Harms 1922* (KANU). Typical morphology; diploid by chromosome count.

Figure 164. *Heterotheca hirsutissima*. Santa Fe Co., New Mexico. *Harms 1921* (KANU). Robust plant with unusual morphology ("large offsets from root"), perhaps tetraploid (see text).

Figure 165. *Heterotheca hirsutissima*. Bernalillo Co., New Mexico. *Holmgren 7404* (KANU).

Figure 166. *Heterotheca hirsutissima*. Colfax Co., New Mexico. *Legler 10398* (UNM).

Figure 167. *Heterotheca hirsutissima*, probably Mora Co., New Mexico. Holotype of *Chrysopsis canescens* var. *nana* (GH).

Figure 168. *Heterotheca hirsutissima*, Yoakum Co., Texas. *Carr 27080* (TEX).

31. HETEROTHECA SIERRABLANCENSIS (Semple) Nesom, Sida 22: 374. 2006. *Heterotheca villosa* var. *sierrablancensis* Semple, Univ. Waterloo Biol. Ser. 37:146. 1996. **TYPE**: **New Mexico**. Lincoln Co.: Sierra Blanca, NM Hwy 532, road to Ski Resort, 8.5 km W of NM Hwy 48, rocky outcrop and face of roadcut at switchback directly below scenic overlook, 2 Oct 1995, *J.C. Semple 10513-A*, 2*n*=18 (holotype: WAT; isotypes: MO!, UC!). Semple (1996) cited the isotype distribution also to NMC, RM, and WAT.

Heterotheca sierrablancensis apparently is closely related to *H. hirsutissima*, perhaps directly derived from it or sharing an immediate common ancestor. Both species have spreading stem vestiture and characteristically lack capitular bracts. *Heterotheca sierrablancensis* is distinct in its larger, mostly oblanceolate-oblong to lanceolate-oblong cauline leaves densely strigose and with densely glandular leaf surfaces, its relatively long ray flowers (10–14 mm) with broad (1.5–3 mm) ligules, and closely and finely strigose phyllaries. Stems are mostly 20–35(–46) cm (including field observations by Semple) and erect from the base, usually single- or few-stemmed (compared to the caespitose habit of *H. hirsutissima*). It is endemic to Lincoln and Otero counties, mostly in the White Mountains and most abundantly in the Sierra Blanca area, at 7200–11,500 feet elevation. The few collections of typical *H. hirsutissima* that have been made in Lincoln County appear to be morphologically and ecologically distinct from *H. sierrablancensis*. Chromosome number, 2*n*=18 (*Harms 1801-1*, *Semple 10513-A*, *10513-B*, Lincoln Co.).

Additional collections examined: **New Mexico**. Lincoln Co.: Capitan Mts, Lincoln Natl Forest, 3 mi E of Capitan Pass, 10 mi NE of Capitan, 2500-2700 m, 26 Jul 1964, *Baad 893* (WTU); Sierra Blanca, at N border of Mescalero Indian Reservation, 10 mi NW of Ruidoso, E-facing slope, 24 Jul 1964, *Baad 948* (WTU); 3 km NNW of central Ruidoso, Cedar Canyon 1.9 km SE of its confluence with Musket Ball Canyon, secondary *Pinus ponderosa* forest, 6950 ft, 16 Aug 2015, *Baker 18428* (ASC); Capitan Mts, Seven Cabins Spring (Rd 256) to W Lucero Canyon (Rd 616), 23 Aug 1992, *Dale & Sanderson s.n.* (BRIT); Gray's Peak, 6500 ft, 25 Jul 1900, *Earle & Earle 167* (MO-2 sheets, NMC, POM); Lincoln Natl Forest, White Mts Trail, 8200 ft, 1925, *Ewing E-93* (RM); White Mts, 1.7 mi N of Ruidosa, abundant in roadside clearing in ponderosa pine woods, 7 Jul 1961, *Harms 1801-1*, **n=9** (KANU); White Mts, Skyline Picnic area, 1 mi S of Monjeau Lookout, gravel loam, ca. 9000 ft, 2 Jul 1969, *Hutchins 2220* (UNM image!); White Mts, vicinity of Bonita Lake, gravel loam, ca. 7400 ft, 5 Sep 1971, *Hutchins 3655* (UNM image!); E slopes of Sierra Blanca on road toward ski area (Hwy 532), 11 mi W of Alto, area of spruce and douglas fir, 10,600 ft, 23 Jul 2002, *Nesom FW167* (BRIT); Sierra Blanca, western slope, 18-20 Oct 1922, *Pilsbry s.n.* (PH); Sierra Blanca, NMex Hwy 532, roadway to Ski Resort, 8.5 m from NMex Hwy 48, rocky face and roadcut directly below overlook, 2 Oct 1995, *Semple 10513-B*, **2n=18** (NY); Sierra Blanca, W of Alto on NMex Hwy 532, E of Windy Point Vista, igneous roadcut and exposed rocky slope, 21 Sep 1985, *Semple & Heard 8116* (BRIT, NY); Capitan Mts, R15E, T85, Sec. 16, ponderosa pine-gambel oak, 2160 m, 2 Oct 1982, *Sivinski s.n.* (UNM image!); White Mts, Eagle Creek Canyon, ca 6 air mi NW of Ruidoso, where the creek bends to the SE, granitic outcrop 200 ft above the creek, mixed conifer-oak forest, 8200 ft, crevices in cliff faces, 17 Jun 1981, *Soreng & Ward 1608* (NMC); Sierra Blanca, Lincoln Natl Forest, open slope above Windy Vista Point, grassy slope with scattered *Pinus flexilis*, ca. 3000 m, 28 Aug 1976, *Wagner & Sabo 2506* (UNM); White Mts, 6800 ft, 31 Jul 1897, *Wooton 263* (MO, NMC, NY-2 sheets, POM, RM, UC); White Mts, 6200 ft, 20 Aug 1897, *Wooton 366* (MO-2 sheets, NY); White Mts, White Mtn Peak, 1 Aug 1901, *Wooton s.n.* (NMC); White Mts, 7400 ft, 25 Aug 1907, *Wooton & Standley 3419* (DS, IND, NMC, RM); White Mts, SE slope of Nogal Peak along hiking trail 25, grassy open area on rock outcrop, 9000 ft, 22 Aug 1979, *Worthington 5065* (COLO, UTEP). Otero Co.: Sacramento Mts, James Canyon, 31 Aug 1952, *Dittmer 8073* (UNM image!); Guadalupe Mts, W side of Guadalupe's, 3 mi W of Lincoln Natl Forest, 5800 ft, 10 Aug 1977, *Fletcher 2472* (UNM image!); 15S, 14E, Sec 4, aspen hillside, 17 Aug 1938, *Humphrey 36* (UNM); 9 mi W of Ruidoso on Hwy 70, gravel loam of roadside, 7200 ft, 5 Sep 1971, *Hutchins 3691* (UNM); Apache Indian Reservation SW of Ruidoso, 3.7 mi along US 70 NE of jct with NM Rte 24, ponderosa pine with scattered Douglas fir, white pine, and Gambel's oak, roadside, ca. 7400 ft, 7 Sep 1988, *Keil 14159* (OBI); 6 mi NE of Mescalero, weed patch near Rte 70, 14 Sep 1960, *Martin 4505* (UNM); Monjeau Peak, 500 ft below Monjeau Lookout, 4 mi N and 5 mi W of Ruidoso, 10,000 ft, 14 Sep 1960, *Martin 4514* (UNM

image!); SW of Ruidoso on US Hwy 70 at jct of NMex Hwy 24, road embankment, 22 Sep 1985, *Semple & Heard 8155* (UC); NM Hwy 24, 1/2 mi S of jct Hwy 130, toward Weed, 8 Sep 1979, *Soreng & Spellenberg 594* (NY); along Tularosa Creek, 30 Jul 1897, *Wooton s.n.* (NY); Tularosa Creek, 18 Aug 1899, *Wooton s.n.* (NMC).

Hutchins 3655 from Bonita Lake in Lincoln County is atypical of *Heterotheca sierrablancensis* — it has sessile-petiolate leaves and heads loosely paniculate with small capitular bracts, perhaps reflecting genetic influence of *H. cryptocephala* or *H. fulcrata*. Heads are large with relatively broad rays and stem vestiture is spreading. *Keil 14159* from Otero County has narrow capitular bracts but otherwise matches H. *sierrablancensis*.

Figure 169. *Heterotheca sierrablancensis*. Lincoln Co., New Mexico. *Wagner & Sabo 2506* (UNM).

Figure 170. *Heterotheca sierrablancensis*. Lincoln Co., New Mexico. *Baker 18428* (ASC).

Figure 171. *Heterotheca sierrablancensis*. Monjeau Lookout area, Otero Co., New Mexico. *Hutchins 2220* (UNM).

Figure 172. *Heterotheca sierrablancensis*. Monjeau Lookout area, Otero Co., New Mexico. *Findley s.n.* (UNM).

Figure 173. *Heterotheca sierrablancensis*. Monjeau Lookout area, Otero Co., New Mexico. *Martin 4514* (UNM).

32. HETEROTHECA RUTTERI (Rothr.) Shinners, Field & Lab. 19: 71. 1951. *Chrysopsis villosa* var. *rutteri* Rothr., Rep. U.S. Geogr. Surv., Wheeler, Vol. 6, Botany 6: 142. 1879. *Chrysopsis rutteri* (Rothr.) Greene, Erythea 2: 96. 1894**.** **TYPE**: **Arizona.** [Cochise Co.]: Protologue: "Sanoita Valley, Arizona (662)," *C. Wright 662*(?) (holotype: GH image!). Annotation by W.T. Kittredge in 2008, following Wright's field notes: "Field #513, 2nd coll., '14 Sept., valleys of Sonora, few branches from root' between San Pedro and Sonoita Rivers, Cochise Co., Arizona."

Heterotheca rutteri is characterized by its relatively dense, silvery-sericeous to light green vestiture and few, large heads nearly completely obscured by large, lanceolate-ovate capitular bracts. Ray flowers 15–35. Plants rarely are more greenish with reduced vestiture (e.g., *Reeves R1037* from the Santa Rita Mts). The species is known only from Pima Co., Santa Cruz Co. and Cochise Co. (Huachuca Mts) and localities in closely adjacent Sonora (representative collections cited below). Semple (1996, p. 81) noted that "It is one of those species that once seen is never confused with another taxon."

MEXICO. **Sonora**. 6 mi S of Nogales, open field along RR tracks, ca. 4000 ft, *Matthews 481* (COLO image!); N of Cananea, Los Fresnos cienega, *Warren et al. s.n.* (ARIZ, as cited by Semple 1996).

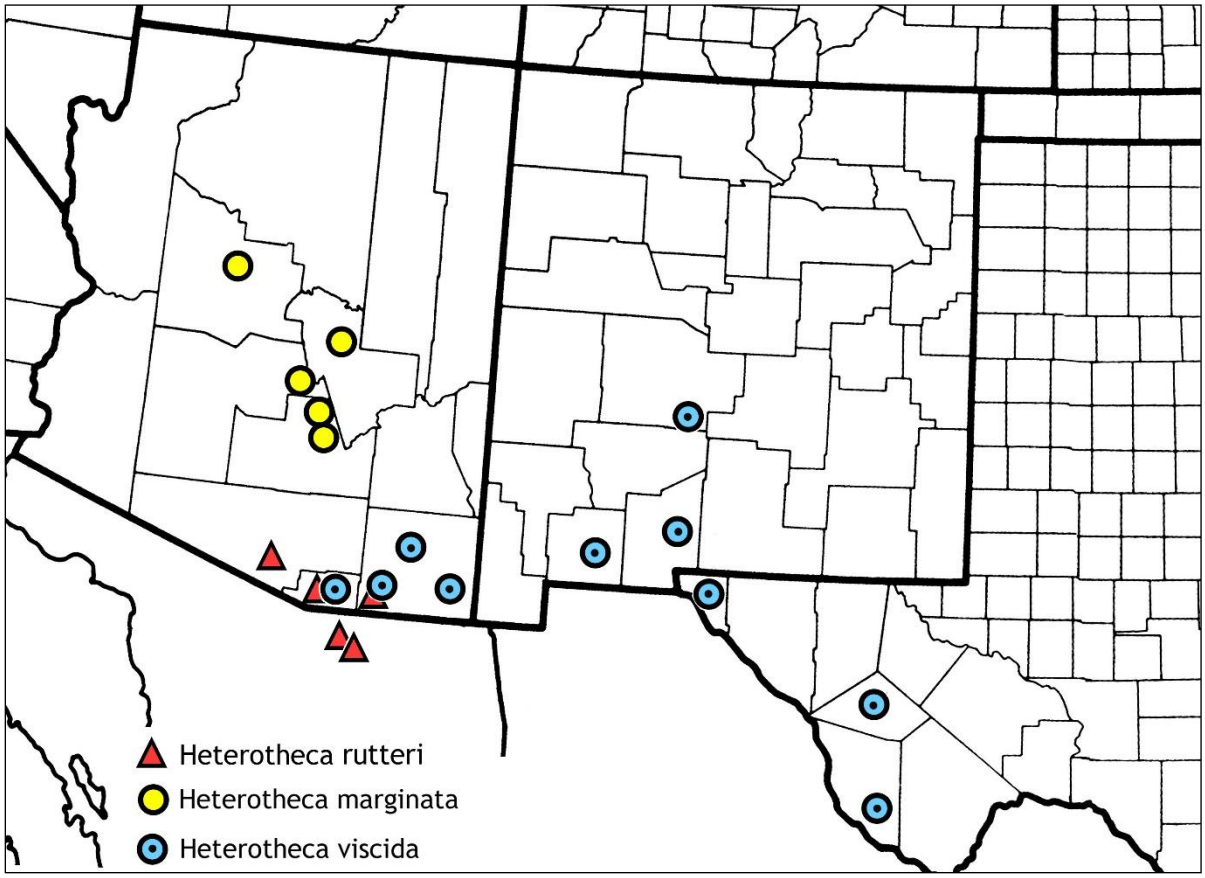

Figure 174. Distribution of *Heterotheca rutteri*, *H. marginata*, and *H. viscida*.

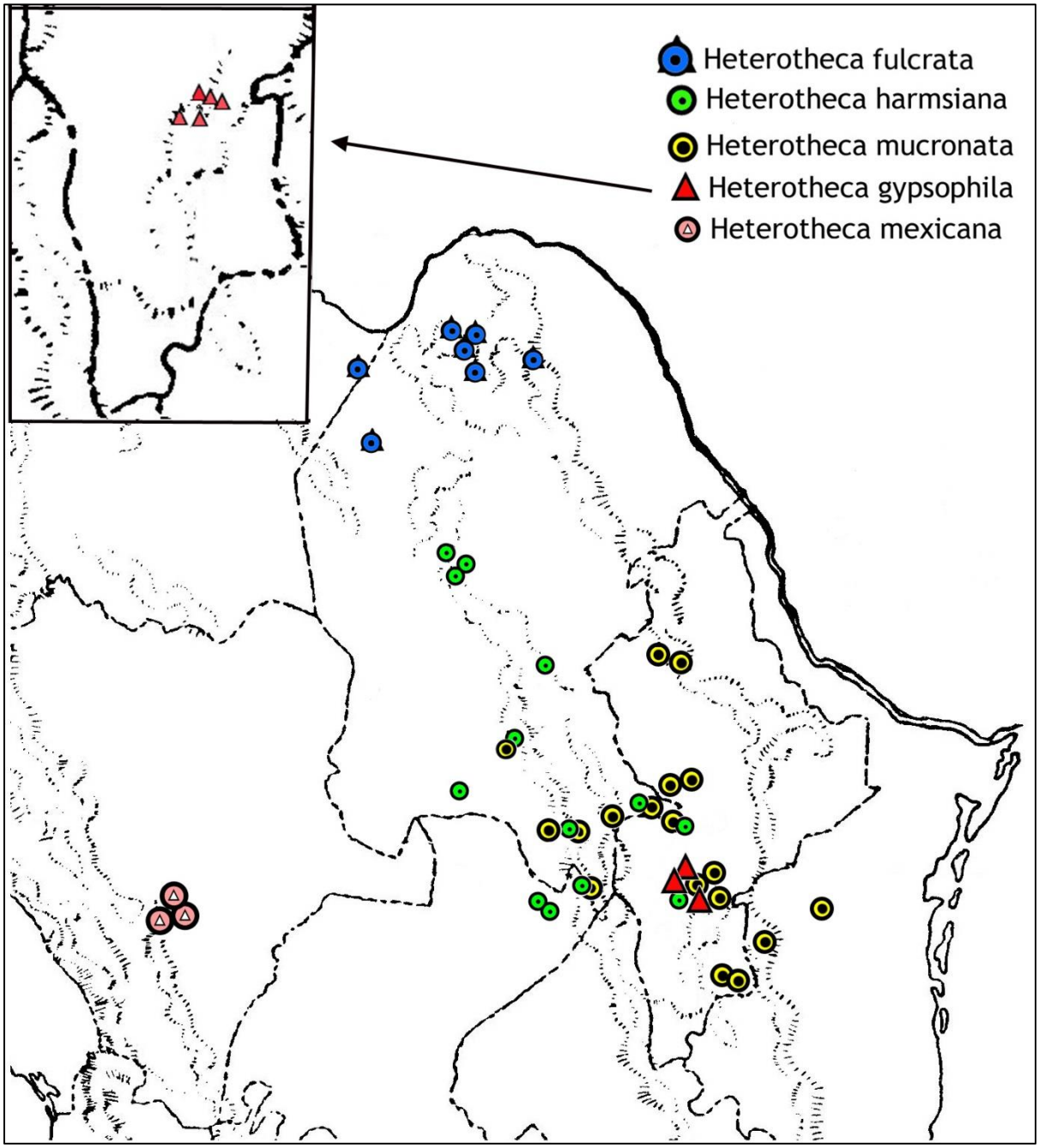

Figure 175. Distribution of Mexican species of sect. *Chrysanthe*. Distribution of *H. fulcrata* in the USA is shown in Fig. 235.

33. HETEROTHECA MUCRONATA Harms ex Turner, Phytologia 55: 205. 1984. **TYPE**: **MEXICO**. **Nuevo León**. Puerto de Santa Ana, ca 15 mi SW of Galeana, common on an unwooded slope, 28 Jun 1934, *C.H. Mueller 934* (holotype: TEX!; isotype: A image!).

Plants of *Heterotheca mucronata* are characterized by their colonial habit from rhizomes or slender, fibrous-rooted caudex branches, producing decumbent-ascending, often unbranched (or 1–2-branched) stems. Stems are loosely strigose to villous, with antrorse or retrorse hairs. Leaves obovate to elliptic-obovate or spatulate-obvate, 4–15 mm wide, entire or with 1–3 pairs of shallow teeth, surfaces loosely strigose to strigose-sericeous, usually sessile-glandular surfaces. Plants from Tamaulipas and from near Linares, Nuevo León, tend to have eglandular leaves and a more densely sericeous vestiture of thinner-based trichomes (more like *H. gypsophila*) than those elsewhere. Heads on ebracteate or minutely bracteate peduncles 1–5 cm long; involucres 8–16 mm wide, 8–11 mm high; ray flowers 12–30, ligules often drying with an abaxial purple midstripe.

Rocky or gravelly habitats, usually in limestone, oak and pine-oak woodlands; 6000-11,600 ft. Chromosome numbers 2*n*=18, 36.

A collection from the Sierra de la Paila, where typical *Heterotheca harmsiana* is known to occur, has long peduncles and densely strigose leaves more like *H. mucronata*, but the upper branching is more like *H. harmsiana*. Root and caudex were not collected. **Coahuila**. Mpio. Ramos Arizpe: Sierra de la Paila, Ejido El Cedra, camino hacia el valle de parreños, oak-pine-juniper, 1800-1900 m, 4 Oct 1989, *Villarreal 5341* (BRIT, MO, TEX-2 sheets).

34. HETEROTHECA GYPSOPHILA B.L. Turner, Phytologia 55: 206. 1984. **TYPE**: **MEXICO**. **Nuevo León**. [Mpio. Galeana], 4 mi N of Pablillo, on bank of gypsum arroyo in pinyon forest, 21 Jul 1958, *D.S. Correll & M.C. Johnston 19919* (holotype: LL image!; isotypes: NY image!, TEX-2 sheets!).

Heterotheca gypsophila has been collected only in a small area of exposed gypsum south of Galeana (vicinity of Pablillo), Nuevo León, in oak-pine to pine woodlands at 1250–2050 meters, and within the geographic range of *H. mucronata*. Chromosome number, 2*n*=36. It is similar to *H. mucronata* in most features, including its rhizomatous habit, solitary heads, and oblong-spatulate leaves but different in its densely sericeous, white to silvery vestiture of stiff, closely appressed hairs completely obscuring the surfaces. The stems also are sericeous but produce a few stiffly spreading hairs. Leaves are eglandular and proximal margins commonly have long, stiffly spreading cilia. The distinction between *H. gypsophila* and *H. mucronata*, apparent mostly in vestiture, suggests that a reciprocal transplant study might indicate whether differences are more phenotypic than genetic, but its discrete geographic range and its absence in other gypsum areas near Galeana suggest that *H. gypsophila* is a real entity.

35. HETEROTHECA HARMSIANA (Semple) Nesom, **comb. et stat. nov.** *Heterotheca mucronata* var. *harmsiana* Semple, Univ. Waterloo Biol. Ser. 37 (Rev. Heterotheca Phyllotheca), 60. 1996. **TYPE**: **MEXICO**. **Zacatecas**. Road above Concepción del Oro, ca. 8 mi W of jct Rte 54, rocky cactus hillsides, ca 8300 ft, 18 Jun 1976, *D.J. Pinkava et al. P13486* (holotype: ASU as cited in the protologue, not located; isotype: WAT not seen).

Plants caespitose from a woody taproot. Stems erect to ascending-erect, 15–40 cm high, sparsely to moderately and evenly hirsute with slightly deflexed hairs, minutely glandular. Cauline leaves evenly distributed, narrowly oblanceolate to oblanceolate-spatulate, mostly (15–)25–40 mm long and 3–8 mm wide, basally attenuate, often to a narrow petiolar region, surfaces sparsely and loosely strigose to hirsute-villous, eglandular or minutely and inconspicuously sessile-glandular, cilia of leaf and bract margins relatively thin-based (vs. pustulate-based). Heads solitary on sparsely leafy or bracteate peduncles 5–35(–50) mm long, often with subfoliaceous bracts near the heads; involucres

9–15 mm wide, 8–10 mm high, phyllaries eglandular or glandular only at the very apex, otherwise glabrous to sparsely strigose with fine, closely appressed hairs. Ray flowers 12–18. Chromosome number, 2*n*=18 (made by Semple from the type collection of *H. mucronata* var. *harmsiana*).

Flowering Jul–Sep(–Oct). Pine, pine-agave, oak-pine, oak chaparral, chaparral (including agave-cactus); 5000–9200 (–10,000) ft.

Diagnostic features of *Heterotheca harmsiana* are its woody taproot and caespitose growth habit, narrowly oblanceolate to oblanceolate-spatulate leaves with an attenuate, subpetiolate base, and spreading-deflexed stem vestiture. *Heterotheca mucronata* var. *harmsiana* was said by Semple to differ from typical *H. mucronata* by "fewer hairs and more glands" and he mapped both taxa using vestiture as a criterion, identifying them at the same localities in some areas of Nuevo León and Coahuila. Plants of *H. harmsiana*, however, are caespitose and arise from a woody taproot (vs. colonial from rhizomes in *H. mucronata*), stems are erect and have a tendency to be unbranched (vs. decument-ascending and branching distally), leaves are narrowly oblanceolate (vs. broadly obovate to elliptic-obovate in *H. mucronata*). The two are sympatric in central Nuevo León and where their ranges are contiguous or overlapping in southeastern Coahuila (in the Sierra de la Viga and Sierra Zapalinamé) and along the Coahuila-Zacatecas border (Sierra Astillero, e.g., H. harmsiana: *Henrickson 6284*; H. mucronata: *Henrickson 13302c Johnston, Wendt, & Chiang 11571*). Both species occur in the Sierra de la Paila, northwest of Saltillo.

Additional collections examined. MEXICO. Coahuila. Sierra de Parras, ca. 10 km W of Parras de la Fuente, 4 Nov 1972, *Chiang et al. 10070B* (LL); ca. 35 air mi W of Cuatro Cienegas, mid Canyon de la Hacienda of Sierra de la Madera, oak-pine forest, alluvial limestone stream bed, 6000 ft, 6 Aug 1973, *Henrickson 12005* (ASU, MEXU image, RSA, TEX); ca. 22 air mi WNW of Cuatro Cienegas, upper portion of limestone Canyon de la Hacienda, below 1st lumber camp in Sierra de la Madera, oak-pine forest, 5000-6000 ft, 28 Sep 1973, *Henrickson 13633* (ASU, MEXU image, MO, NY, RSA, SRSC image); 29 air mi WNW of Cuatro Cienegas, N slope of the Sierra de la Madera, ca. 7.5 air mi W of Rancho Cerro de la Madera, with lower chaparral-oak scrub at base of Cañon Desiderio, in upper Cañon Posos, 1700-1800 m, 13 Aug 1976, *Henrickson 15341* (MEXU image, NMC, NY, RSA, TEX); Cuatro Cienegas Basin, Sierra Madera, 1968, *Minckley s.n.* (ASU digital image!); Monclova, Gloria Mts, Jul 1939, *Marsh 1892* (TEX); Canon de San Lorenzo, 5 km SW de Saltillo, carr. Saltillo-Concepción del Oro, 1900 m, 5 Jun 1989, *Martinez 1861* (TEX); Sierra Guadalupe, S of La Cuchilla, ledges of limestone rocks, 2400-2500 m, 15 Jul 1934, *Pennell 17380* (PH); Cerro de la Viga, ca. 4 mi E of Jame, logging road, pines, 10,000 ft, 15 May 1981, *Poole 2274* (MEXU image, TEX-2 sheets); S of Saltillo, mountain sides, K884, 29 Jul 1929, *Runyon 1324* (TEX); Mpio. Ramos Arizpe, Sierra de la Paila, Ejido el Cedral por el canon El Carmen, bosque esparcido de *Quercus glaucoides*, *Q. gravesii*, *Pinus arizonica*, y *Juniperus flaccida*, suelo calcareo, 1300-1600 m, 26 Aug 1992, *Valdés et al 2221* (MEXU image); Las Vigas, Sierra Arteaga, Canon de la Carbonera, 2100-2600 m, [1991], *Villarreal & Carranza 3791* (TEX). **Nuevo León**. Mpio. Galeana, El Carrizo, trailside, pine woods, 1740 m, 27 Jun 1983, *Hinton 18471* (GBH - mixed collection, with *H. gypsophila*); Mpio. Montemorelos, El Butano, bosque coniferas-encino, 2000 m, 3 Jul 2004, *Estrada et al. 16317* (BRIT). **Zacatecas**. 3.1 road mi above Concepción del Oro, ridge W of city, S-facing granite slopes, agave-cactus, 8000 ft, 30 Aug 1971, *Henrickson 6284* (ARIZ, MEXU image, NY, RSA, TEX); ca. 15 air mi E of Concepción del Oro, 2.5 mi NE of Guadalupe Garceron in small ravine NW of summit of igneous Sierra del Astillero, 6500 ft, 22 Sep 1973, *Henrickson 13302c* (ARIZ, RSA, TEX); 1 km E of Aranzazu and 6 km W of Concepción del Oro, 29 Mar 1973, *Johnston, Wendt, & Chiang 10476* (TEX); Sierra del Astillero (approached from SE, from Tanque El Alto), extensive chaparral and oaks, lower slope with *Yucca carnerosana*, *Dasylirion*, upper slope with *Pinus ponderosa*, *Agave macroculmis*, 2 Jul 1973, *Johnston, Wendt, & Chiang 11571* (MEXU digital image).

Figure 176. *Heterotheca mucronata*, showing colonial habit. Mpio. Arteaga, Coahuila. Photo by David Mercado-Morales, Naturalista.

Figure 177. *Heterotheca mucronata*. Mpio. San Pedro Garza García, Nuevo León. Photo by E. Tadeo Hernández A., Naturalista.

Figure 178. *Heterotheca mucronata*. Santiago, Nuevo Leon. Photo by Carlos G. Velazco-Macias, Naturalista.

Figure 179. Representative plants of *Heterotheca mucronata*, from Nuevo León and Tamaulipas.

Figure 180. Representative plants of *Heterotheca harmsiana*, all from Coahuila.

36. HETEROTHECA MEXICANA Harms ex Turner, Phytologia 55: 204. 1984. **TYPE**: **MEXICO**. **Durango**. Fields along Rte 40, ca 31 mi SW of Durango, 16 Aug 1960, *R.M. King 3748* (holotype: TEX! image!).

Heterotheca mexicana is endemic to the area around the city of Durango, where it grows at 1900–2600 meters in rocky meadows, grassslands, roadsides, and openings in oak or pine forests. It is similar to *H. mucronata* in habit, vestiture, leaf morphology, tendency for solitary heads on merely bracteate peduncles but is distinctive in its thick woody taproot, longer peduncles, and weakly developed outer pappus of lanceolate scales or bristles. Chromosome number, 2*n*=18. Not sympatric with any other species.

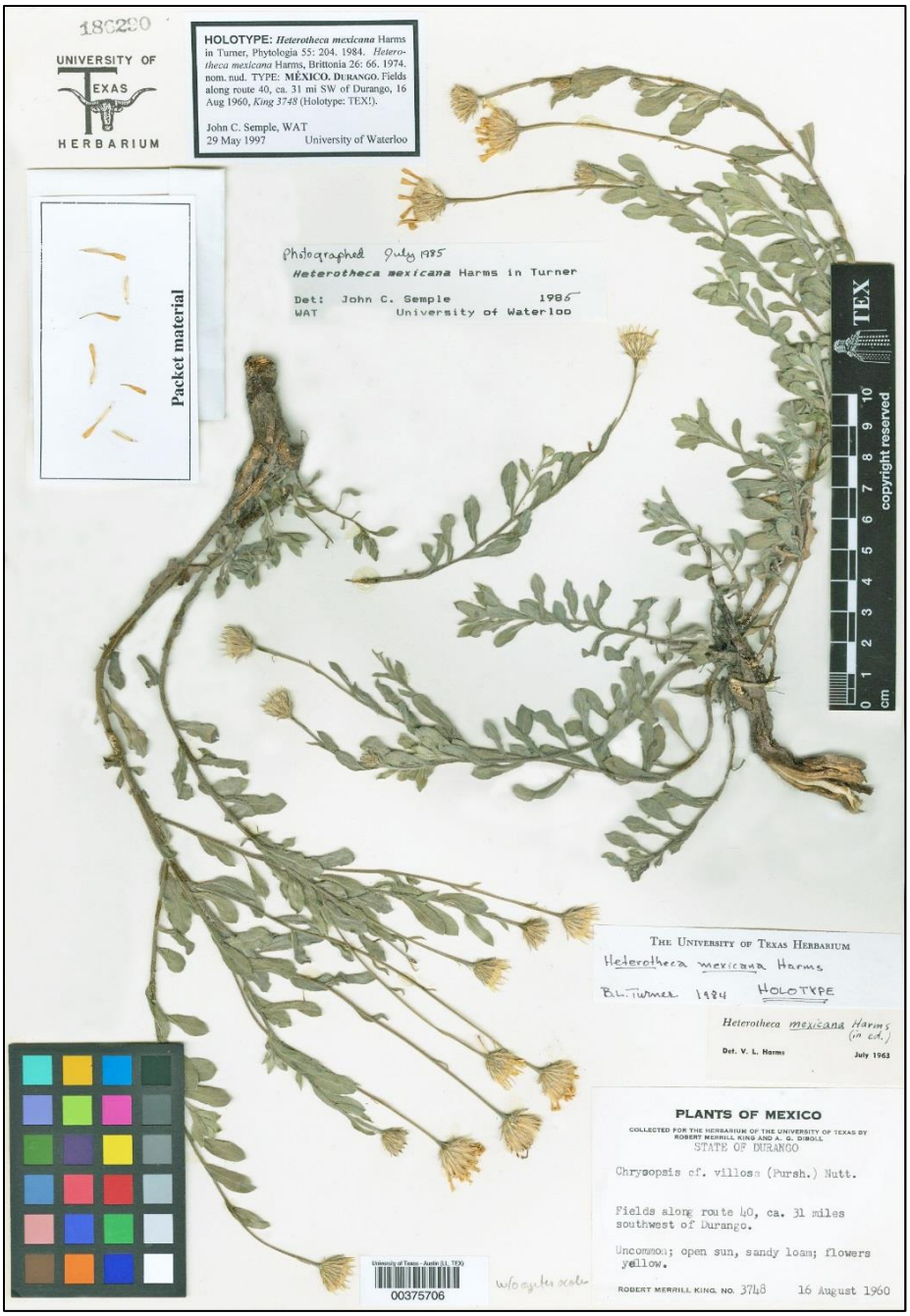

Figure 181. *Heterotheca mexicana*. Holotype (TEX).

37. HETEROTHECA VISCIDA (A. Gray) Harms, Rhodora 70: 302. 1968. *Chrysopsis villosa* (Pursh) Nutt. var. *viscida* A. Gray, Synopt. Fl. N. Amer. 1(2): 123. 1884. *Chrysopsis viscida* (A. Gray) Greene, Erythea 2: 96. 1894. **LECTOTYPE** (Harms 1968): **Arizona**. Santa Cruz Co.: Santa Rita Mts., clefts of dry ledges, 7500 ft, 28 May 1881, *C.G. Pringle s.n.* (GH!; isolectotypes: NY-3 sheets images!, PH!).

Heterotheca viscida usually is unambiguously identified, characterized by its decumbent to decumbent-ascending habit, sessile-glandular to glandular-viscid (stems, leaves, involucre) and sparsely hirsute (or nearly glabrate except for marginal cilia and hairs along veins) vestiture. Leaves broadly elliptic-oblanceolate to obovate or obovate-spatulate, dark green (partly because of low density of non-glandular hairs), proximal with subpetiolate bases but distal often becoming sessile and subclasping. Heads mostly solitary (a second head occasionally produced on a short branch), without capitular bracts. Chromosome number, 2*n*=18.

Semple (1996) observed that *Heterotheca visicida* in Texas sometimes has oblanceolate leaves and smaller heads and may resemble *H. arizonica* and *H. fulcrata* in these aspects — both of the latter, however, consistently have prominent capitular bracts. The apparently disjunct populations of *H. viscida* in Texas (Jeff Davis and Presidio counties) are in the morphological range of those further west.

Representative collections examined. **Arizona**. Cochise Co.: **Chiricahua Mts**: Rustler's Park, rock crevices, 9000 ft, 18-19 Jun 1930, *Goodman & Hitchcock 1187* (UC); Chiricahua Wilderness Area, Rucker Canyon, 7650-7700 ft, 17 Sep 1976, *Leithliter 753* (ASU); Chiricahua Natl Monument, Sugarloaf Mt near trail to lookout tower, crevice of rhyolite tuff, Quercus and shrubs, 7100 ft, 10 Aug 1974, *Reeves R982* (ASU); Ida's Peak along Telephone Trail from "Locust Camp," Pinery Canyon, 8000 ft, 5 Jul 1919, *Stone 301* (PH). **Dos Cabezas Mts**: Around "heads," 8000 ft, 13 Jul 1977, *Bingham 2658* (ASU). **Dragoon Mts**: Stronghold Canyon East, 5600 ft, 2nd major waterfall/bedrock area in major drainage, 23 Oct 1992 (ASU, DES). **Huachuca Mts**: Black Bear Mine, along trail in Lutz Canyon, cliff face with *Cercocarpus, Arbutus, Agave parryi*, ca. 7800 ft, 9 May 1992, *Bowers 3645* (ASU); top of Montezuma Peak, oak and pinyon, 7000-7600 ft, 16 Jul 1990, *Parfitt 4392* (ARIZ); dry cliffs, 3 Jul 1884, *Pringle s.n.* (PH). Santa Cruz Co.: **Santa Rita Mts**: trail to Mt Wrightson, 2700 m, 4 Jul 1991, *Fishbein s.n.* (ARIZ); trail from Madera Canyon to Mt Wrightson, 9400 ft, 12 Aug 1945, *Parker 5855* (UC); clefts of dry ledges,700 ft, 28 May 1881, *Pringle s.n.* (PH-2). **New Mexico**. Doña Ana Co.: **Organ Mts**: On and in vicinity of Organ Needle, E side of Organ Needle, among rocks, 8850 ft, 20 Oct 1979, *Spellenberg & Dunford 5432* (NMC). Luna Co.: **Florida Mts**: N side of Baldy Peak, limestone ledge just below top, 6600 ft, 1 Sep 1997, *Worthington 27037* (UNM); 1.6 air mi WNW of top of Gym Peak, 5800 ft, 12 Jul 1991, *Worthington 19594* (UTEP). Socorro Co.: **Mockingbird Mts.**: White Sands Missile Range, ca. 55 air mi E of San Antonio, between San Andres and Oscura Mts, just S of major saddle, NNE granitic cliffs, shaded, especially in clefts, with *Quercus gambelii, Fraxinus velutina, Solidago wrightii*, in tufts from cracks in deep shade, 2090 m, 3 Sep 1990, *Spellenberg et al. 10597* (ID, NMC). **Texas**. El Paso Co.: **Franklin Mts**: Canutillo, rocky ravines, 12 Jul 1911, *Barlow s.n.* (UC); 0.5 air mi NE from the top of North Franklin Mtn, ca. 6400 ft, 27 Aug 1988, *Worthington 17084* (OBI). Jeff Davis Co.: **Davis Mts**: ca. 0.7 air mi SW of Blue Tank, 4.1 air mi E of summit of Robbers Roost Mt, on Caldwell Ranch, between Madera Canyon and Bicycle Canyon, crevices of rhyolite on vertical palisade rimrock walls at top of slope on NW side of ridge (divide) ca. 6250-6280 ft, 13 Aug 2000, *Carr 19141* (TEX); N slope and summit of Mt. Livermore, rock crevices on cliffs, 29 Jul 1946, *Correll 13540* (NY, SMU); Buffalo Trail Scout Camp, Aguja Canyon, ledges 7 Aug 1966, *Correll 33350* (LL, NY, SMU); summit of Livermore Peak, 9-12 Jul 1921, *Ferris & Duncan 2595* (NY); N cliffs, Mt. Livermore, 7800 ft, 5 Aug 1925, *Hinckley 70* (NY); cliffs on N side of Timber Mtn, near Madera Springs, 6000 ft, 24 Jul 1949, *Hinckley 196* (SMU); Little Aguja Canyon, crevices in cliffs, 1495 m, 12 Jun 1931, *Moore & Steyermark 3071* (NY, PH, UC); upper canyon Limpia Creek, dry rocky ground, 10 Jun 1926, *Palmer 30660* (NY); W side of Sawtooth Mountain, rocky slopes and ledges, 4 Aug 1926, *Palmer 31955* (TEX); porphyritic cliffs of Mt. Livermore, clefts of rock, 2300 m, 6 Jun 1928, *Palmer 34363* (PH); above Madera Spring, N slopes of Timber Mtn, frequent in igneous soil, 6000 ft, 20 Jul 1947, *Warnock 6495* (SMU); Davis Mts, 13 Sep 1918, *Young s.n.* (UC). Presidio Co.: **Chinati Mts**: S side of Chinati Peak, crevices of igneous rock ledges, ca. 6900 ft, 7 Jun 1977, *Butterwick & Lott 3788* (TEX); Horse Creek Canyon on NE slope of Chinati Peak,

rock ledges at upper elevations, ca. 7000 ft, 22 Jul 1942, *Hinckley 2563* (NY, SMU); Chinati Peak, N-facing bluffs under summit, 2280 m, 21 Jul 1945, *McVaugh 7463* (LL, SMU); Chinati Peak and canyons N and E of the peak, canyon wall, rock crevices, 7 Jun 1977, *Powell 3099* (LL).

Figure 182. *Heterotheca viscida*, Cochise Co., Arizona. *Bingham 2658* (ASU).

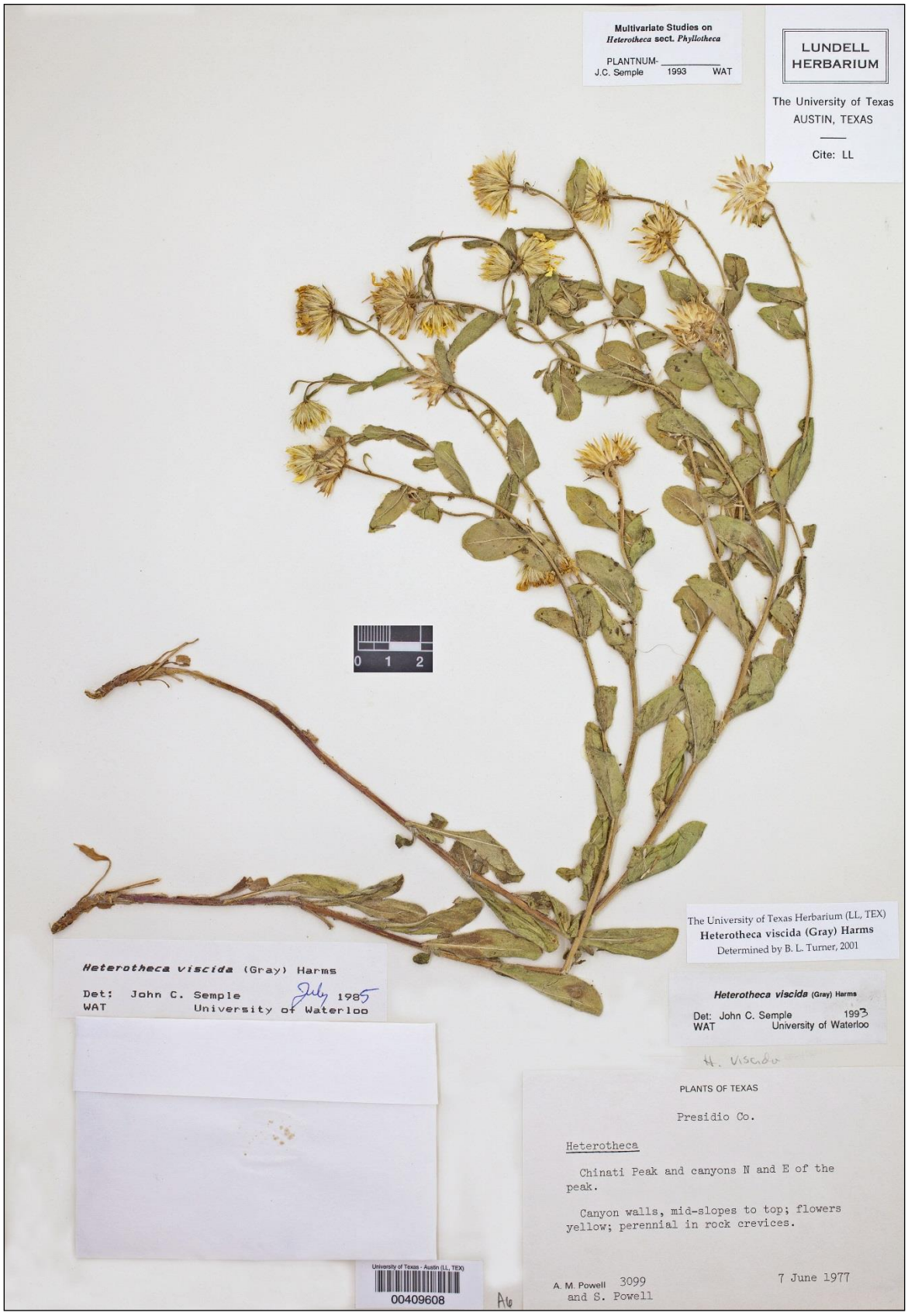

Figure 183. *Heterotheca viscida*, Presidio Co., Texas. *Powell 3099* (LL).

Figure 184. *Heterotheca viscida*, Jeff Davis Co., Texas. *Correll 33760* (LL).

Figure 185. *Heterotheca* aff. *viscida*, Socorro Co., New Mexico. *Spellenberg 10597* (ID). Variant with unusually small heads and slightly out of expected geographic range. The label says Otero Co. but the Mockingbird Mts. are in the SE corner of Socorro County.

38. HETEROTHECA KOMAREKIAE Nesom, **sp. nov. TYPE**: **Colorado**. Archuleta Co.: Quartz Creek Trail, narrow canyon of loose, highly erodable volcanic tuff, 9600 ft, large clumps, very green & leafy, gummy, 13 Aug 1994, *S. Komarek 437* (holotype: FLD, Fig. 187).

Distinctive in its rhizome-like caudex branches, nearly strictly erect stems, primarily stipitate-glandular vestiture, otherwise sparsely hispid-hirsute with a few non-glandular hairs (the whole plant with a dark green aspect), oblong-oblanceolate to elliptic or elliptic-oblong, epetiolate midcauline leaves, solitary heads on short, bracteate peduncles from upper leaf axils, and narrow ray ligules.

Herbaceous perennial, apparently somewhat colonial from rhizomes or rhizome-like caudex branches; stems and leaves dark green, stipitate-glandular and otherwise sparsely hispid-hirsute with a few non-glandular hairs. **Stems** erect, 12–30 cm tall, unbranched up to the inflorescence. **Leaves** all cauline, proximal (on rhizome branches) scale-like, largest at midstem and above, 1.5–3.5 cm long, oblong-oblanceolate to elliptic or elliptic-oblong, epetiolate with base rounded to truncate, sometimes slightly subclasping, proximal with more attenuate base and becoming petiolate, apex apiculate, surfaces stipitate-glandular, midvein sparsely hispid to hispid-hirsute. **Heads** solitary or 2–5 on bracteate peduncles from distal leaf axils; peduncles (axillary branches) 1.5–3.5 cm long. **Involucres** broadly campanulate, 9–14 mm wide (pressed); phyllaries in 3–4 graduate series, linear to linear-triangular, longest 8–10 mm, stramineous, narrowly keeled (raised midvein), glandular. **Ray flowers** ca. 12–20, ligules narrow.

The species is named for Sue Komarek, botanist and author of "Flora of the San Juans: A Field Guide to the Mountain Plants of Southwestern Colorado (1994). Two of the three known collections of the species were made by Sue.

Flowering Jul–Sep. Canyon in volcanic tuff at 9600 ft, probably waifs at lower elevation (7700–8200 ft) along rocky banks and gravel and sand bars of the East Fork San Juan River.

The three collections are from a small geographic area close to the border of Mineral and Archuleta counties (Map 16, Figs. 186, 210). *Heterotheca komarekiae* is distinctive in habit, leaf morphology, inflorescence, and vestiture and would not be confused with any other species from southern Colorado. In its green-glandular-viscid aspect, it is similar to *H. resinolens* (Front Range and central Colorado) and *H. cryptocephala* of south-central New Mexico but different from both in lack of capitular bracts and to *H. viscida* (southern Arizona to trans-Pecos Texas) but different in habit and leaf morphology.

In early September 2020, botanist Rich Haswell from South Fork, Colorado, surveyed along the East Fork San Juan River, including the site of *Komarek 510*, but did not encounter *Heterotheca komarekiae* — he found (pers. comm.) abundant *H. pedunculata* on the "first terrace of the river, which is flat and composed of grassy meadows and mixed conifer groves … among sandy dirt, gravel, and larger stones, sometimes alongside the road, sometimes between road and river, sometimes on the rocky slopes above the road." This suggests that plants of *H. komarekiae* from along the East Fork are ephemeral and have been established there from seeds washed down from higher elevation.

Additional collections. Colorado. Archuleta Co.: Along East Fork San Juan River, off Forest Rd 667, UTM 13, 334972, 4138707 (Wolf Creek Pass Quad: T36N R1E S5), near water's edge along N bank of river, rocky soil, 7715 ft, 26 Jul 2001, *Denslow 668* (RSA, Fig. 189). Mineral Co.: 16 mi NE of Pagosa Springs, E Fork San Juan River, 1.4 mi from Upper Quartz Ridge trailhead, T37N R2E Sec32, gravel and sand bar of riverbank, 8200 ft, 27 Sep 1995, *Komarek 510* (COLO, Fig. 188).

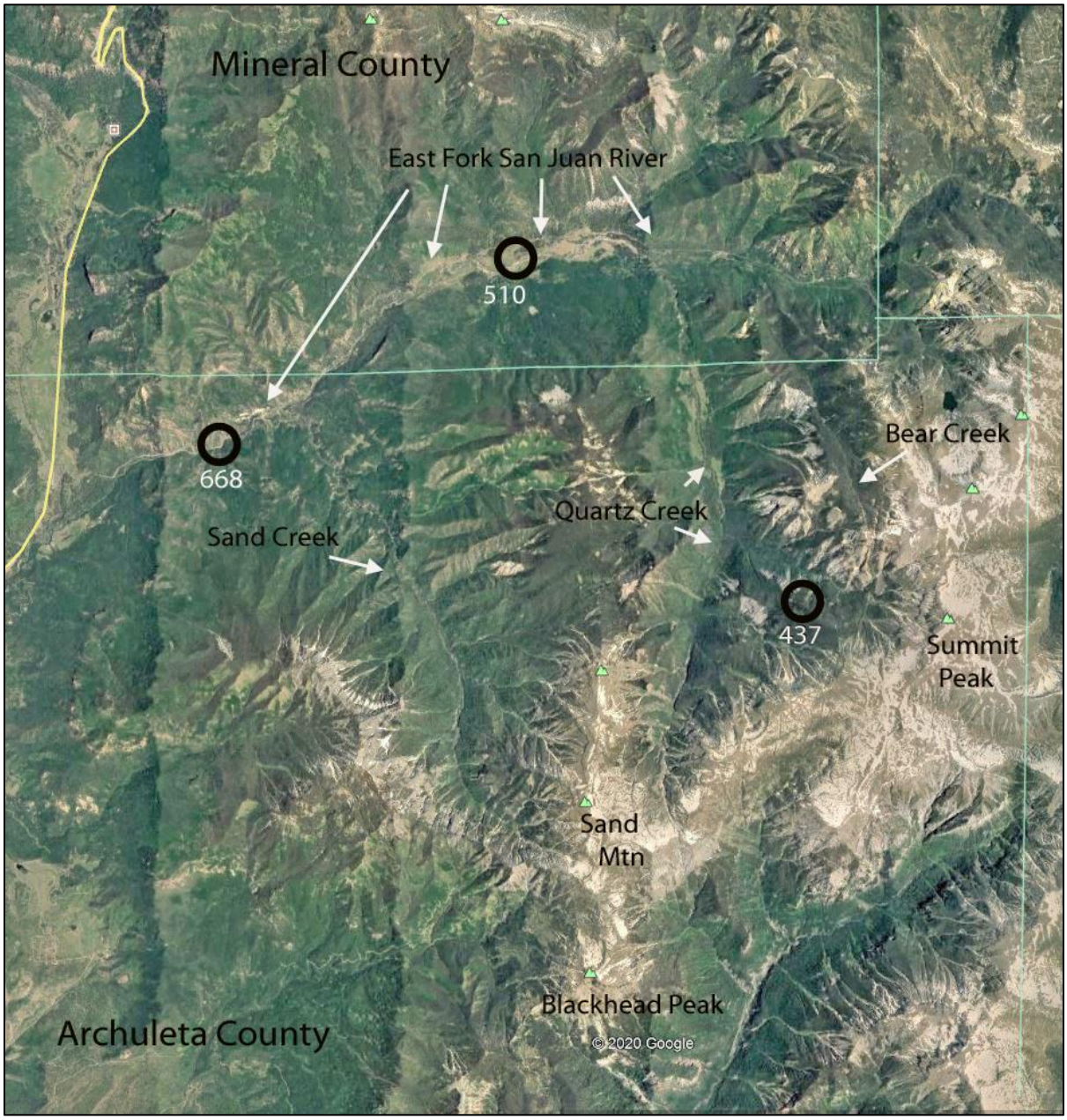

Figure 186. Distribution of *Heterotheca komarekiae*, Archuleta and Mineral cos, Colorado. The type is *Komarek 437* from along the Quartz Creek Trail at 9600 feet elevation. Localities along the rocky edges of East Fork San Juan River ('510' and '668') probably are of plants established from seeds washed down from higher elevation (comments in text).

Figure 187. *Heterotheca komarekiae*. Quartz Creek Trail, Archuleta Co. Holotype (FLD).

Figure 188. *Heterotheca komarekiae*. East Fork San Juan River, Mineral Co. *Komarek 510* (COLO).

Figure 189. *Heterotheca komarekiae*. East Fork San Juan River, Archuleta Co. *Denslow 668* (RSA). Many thanks to the RSA staff for the photo.

39. HETEROTHECA RESINOLENS (A. Nels.) Nesom, **comb. nov.** *Chrysopsis resinolens* A. Nels., Bull. Torrey Bot. Club 28: 232. 1901. **TYPE**: **Wyoming**. Albany Co.: Laramie Peak, moist mountain valleys, 13 Jul 1900, *A. Nelson 7583* (holotype: RM!; isotypes: C, COLO, CM, GH, ILL, MIN, MO!, NEB, NY, OSC, RENO, RM!, US). Images of all types! Protologue: "Open slopes in the foothills of Laramie Peak."

Chrysopsis amplifolia Rydb., Bull. Torrey Bot. Club 31: 648. 1904. *Chrysopsis foliosa* var. *amplifolia* (Rydb.) A. Nels. in Coult. & Nels., Man. Bot. Rocky Mts., 493. 1909. *Heterotheca fulcrata* var. *amplifolia* (Rydb.) Semple, Univ. Waterloo Biol. Ser. 37: 74. 1996. **TYPE**: **Colorado**. [Boulder Co.]: Plains and foothills near Boulder, Longmont, Jul 1902, *E. Tweedy 4898* (holotype: NY image!; isotypes: RM! image!).

Chrysopsis caudata Rydb., Bull. Torrey Bot. Club 31: 648. 1904. **TYPE**: **Colorado**. [El Paso Co.: Pike's Peak,] Ruxton Dell, 2950 m, 2 Aug 1901, *E.E. & E.S. Clements 143* (holotype: NY image!; isotypes: DS image!, GH image!, MIN image!, MO! image!, NEB image!, RM! image!, US image!).

Heterotheca resinolens in typical form, over its whole range, is distinctive in its erect habit, green aspect (surfaces are sessile-glandular with little other vestiture), relatively large, sessile, oblong to oblong-obovate cauline leaves, and large capitular bracts.

Semple recognized the distinctiveness of this entity, as he mapped these plants in Colorado as *Heterotheca fulcrata* var. *fulcrata* and *H. fulcrata* var. *amplifolia*, showing the two almost exactly congruent in range in Colorado and Wyoming (symbols in Wyoming outside of Albany Co. in Semple's Fig. 28 perhaps represent *Chrysopsis resinolens* var. *ciliata*, which is treated here as *H. hirsuta*, a separate species). He placed *Chrysopsis resinolens* as a synonym of var. *fulcrata*, *Chrysopsis caudata* as a synonym of var. *amplifolia*. From from his annotations and published comments, his identifications between the two varieties was based on their density of vestiture. "Variety *amplifolia* is similar in most ways to var. *fulcrata* but the leaf indument is densely short-strigose (50-200 hairs/mm2) with very few or no glands rather than sparsely to moderately hispid-strigose and glandular. It shows the same range in leaf shape that occurs in var. *fulcrata*" (1996, p. 75).

Vestiture variation in some populations of *Heterotheca resinolens* may be within the nature of the species or may indicate genetic influence from some other species, particularly *H. pumila*.

* Plants of the *Chrysopsis amplifolia* type (*Tweedy 4898*) have typical habit and leaf shape for *H. resinolens*; leaf and bract vestiture is sparsely strigose and sparsely glandular.

* The 7 or perhaps 8 plants of the type gathering of *Chrysopsis caudata* (*Clements 143*) all are erect and with large, oblong leaves and bracts, but the vestiture is variable. The US plants are glandular with little other vestiture (like the type of *C. resinolens*); those of GH, MIN, and NY are moderately strigose and apparently eglandular; those of CAS, MO, and NEB/RM (this apparently 1 plant divided at the base) are sparsely strigose and apparently eglandular or sparsely and minutely glandular (like the type of *C. amplifolia*).

Heterotheca resinolens and *H. pumila* can be similar in aspect, and hybridization and introgression may occur where their elevational ranges come into contact. Apparent hybrids occur in Boulder, El Paso, Gilpin, Grand, and Larimer counties. The geographic range of *H. pumila* is considerably wider that that of *H. resinolens*, and outside of the range of typical *H. resinolens*, no *H. pumila* variants have been encountered that suggest influence from *H. resinolens*.

Figure 190. *Heterotheca resinolens*. Holotype (RM).

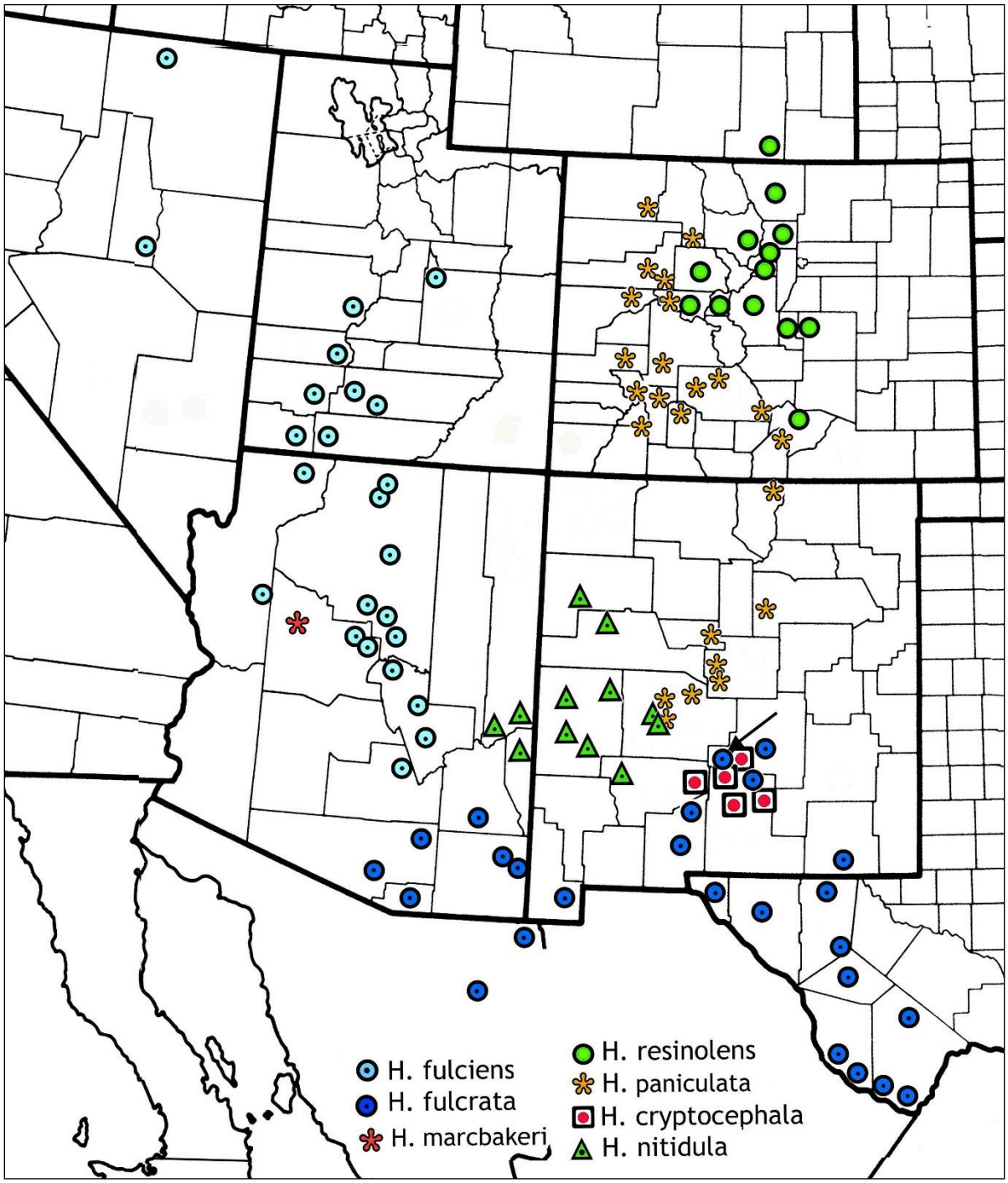

Figure 191. Distribution of *Heterotheca* species. Arrow points to type locality of *H. fulcrata* (Lincoln Co., New Mexico). See Fig. 235 for distribution of *H. fulcrata* in Mexico (Coahuila).

40. HETEROTHECA PANICULATA Nesom, **nom. nov.** *Chrysopsis floribunda* Greene, Pittonia 3: 101. 1896 [not *Heterotheca floribunda* Benth. 1844 = *Heterotheca grandiflora*]. **LECTOTYPE** (designated here): **Colorado.** Montrose Co.: Gunnison Canyon, 27 Aug 1896, *E.L. Greene s.n.* (NDG 53915 image; isolectotype: NDG 53916, Fig. 192).

The type collection of *Chrysopsis floribunda* Greene is representative of the species but the name is a later homonym and illegitimate. *Heterotheca paniculata* is a replacement name.

Heterotheca paniculata often produces lateral branches originating from proximal and midstem nodes upward, with heads arranged in a loose panicle (from the lateral branches). Branches ascending-erect or often decumbent and sprawling or declining from rock faces. Leaves relatively small (mostly 1–2.5 cm long) with minutely glandular and otherwise sparsely hirsute surfaces and coarsely short-ciliate margins. Heads small and few-flowered, often on short peduncles, prominently subtended by capitular bracts usually no longer than the involucre.

Plants perennial from a woody taproot and caudex, with many stems arising from the caudex, often thin and wiry. **Stems** ascending-erect to decumbent or declining from the base and sprawling downward in cliffside habitat, numerous from the base, 20–50 cm, often producing many lateral branches from nodes midstem upward (from as many as 15 nodes), axillary buds (as tufts of small leaves) evident on younger plants, hirsute to spreading-ascending or loosely strigose (see comments below). **Leaves** mostly cauline (basal withered by flowering in larger plants), mostly oblanceolate-obovate to narrowly oblanceolate, narrowly oblong-lanceolate, or elliptic-lanceolate, 8–26 x 2–6 mm, entire, spreading to ascending, proximal petiolate, becoming epetiolate distally, surfaces hispid-hirsute to short-hirsute with erect to ascending hairs, prominently sessile-glandular adaxially (northern system) or on both surfaces (southern system), proximal margins and/or petioles sparsely ciliate to eciliate. **Heads** clustered distally or in a loose panicle; peduncles 2–35 mm; capitular bracts (rarely 0 in a population, 1–)3–5, linear to linear-lanceolate or narrowly oblanceolate, shorter to slightly longer than the involucre. **Involucres** 5–8 mm wide (pressed), inner phyllaries 5–7 mm long, slightly keeled, sparsely hirsute to strigose, essentially eglandular or sessile-glandular distally. **Ray flowers** 7–18, laminae 1.4–1.8 mm wide. **Chromosome numbers**, 2*n*=18 (*Mosquin 5078*-Gunnison Co.), 2*n*=36 (*Mosquin 4869*-Gunnison Co.; *Mosquin 5069*-Ouray Co.; *Semple & Heard 7799*-Mesa Co.).

Flowering (May–)Jun–Aug(–Sep). Sagebrush, oak-cherry, sagebrush-juniper with ponderosa pine, Gambel oak-Douglas fir, ponderosa pine-juniper-Douglas fir, ponderosa pine/spruce-fir, aspen-spruce, spruce-fir, dry rocky slopes, gravelly soil, granite outcrops, cliff crevices and ledges, ravines and canyon bottoms; (6000–)7000–10,000(–10,700) ft.

Through most of this study, I annotated collections of this species as "*Heterotheca asprella*," but the type collections of *Chrysopsis asprella* (*Baker 379*) as well as the similar *Chrysopsis compacta* (*Baker 608*), both from southern Gunnison Co., are closest in morphology to *H. hirsutissima*, perhaps genetically influenced by *H. paniculata*, and include plants of typical *H. hirsutissima*. The holotypes of *Chrysopsis asprella* and *Chrysopsis compacta* are plants of *H. hirsutissima* and both names are treated here as synonyms of *H. hirsutissima*. Some heads in the *Baker 379* distribution (*Chrysopsis asprella*) show a capitular bract, but others do not (CORD, MIN, UC, and VT, images!) and are identified here as typical *H. hirsutissima*. And even on branches where capitular bracts are formed, their presence is inconsistent (some heads with, some without). Stems of *C. asprella* and *C. compacta* are consistently erect to erect-ascending (as in *H. hirsutissima*).

Branching of *Heterotheca paniculata* is not evident on young plants but axillary buds usually are evident and the small heads with prominent capitular bracts are a clue to the identity of the species. The species has previously been identified as *H. pumila* and *H. fulcrata* because of the capitular bracts.

Figure 192. *Heterotheca paniculata*. Isolectotype of *Chrysopsis floribunda* Greene (NDG). This plant, with long, thin stems, was sprawling-declining in its characteristic habitat (see Fig. 201).

Figure 193. *Heterotheca paniculata*, Garfield Co., Colorado. *Vanderhorst 1913* (KANU).

Figure 194. *Heterotheca paniculata*, Gunnison Co., Colorado. *Bryant 150* (KHD).

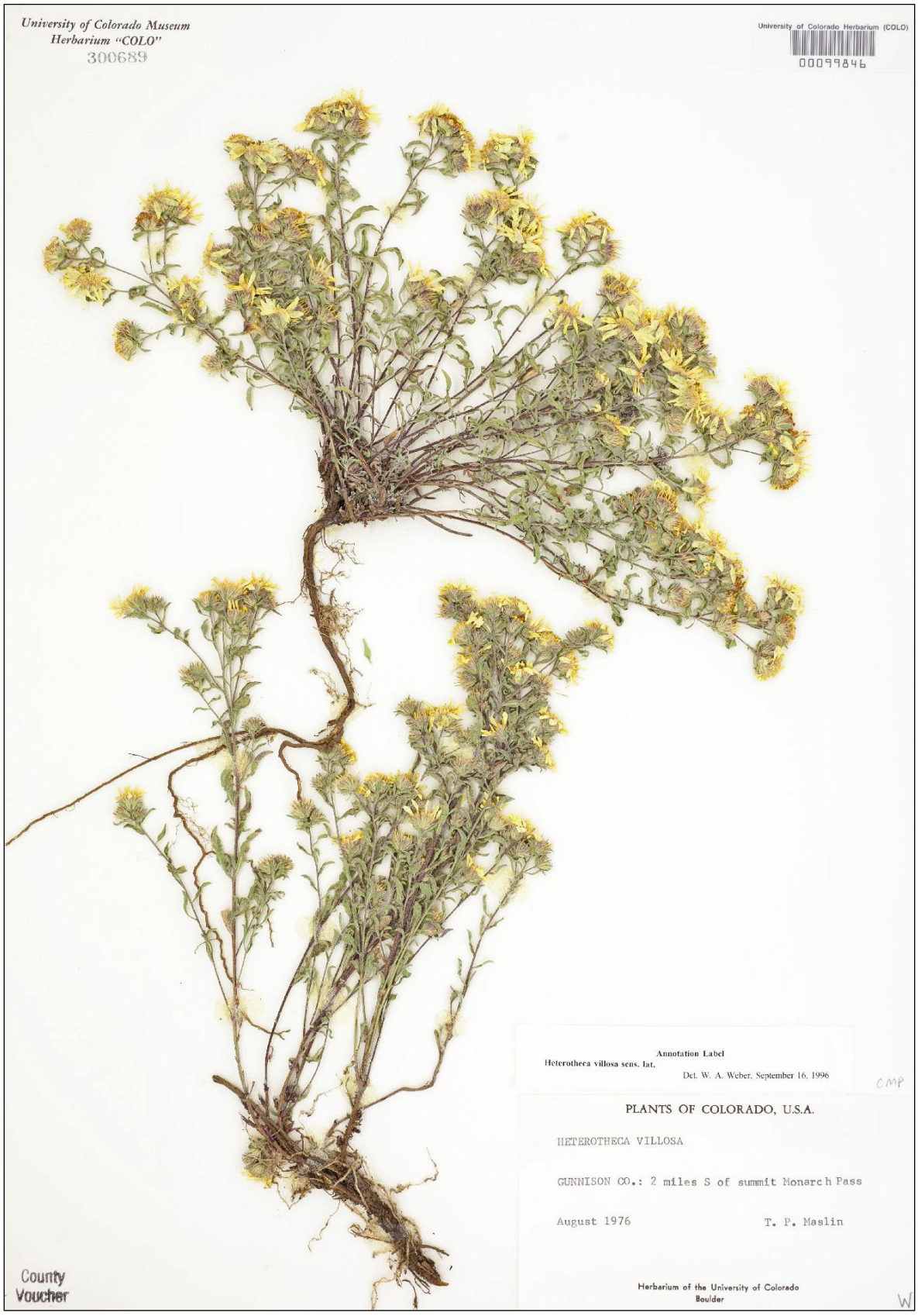

Figure 195. *Heterotheca paniculata*, Gunnison Co., Colorado. *Maslin s.n.* (COLO).

Figure 196. *Heterotheca paniculata*, Gunnison Co., Colorado. *Mosquin 4869* (COLO).

Figure 197. *Heterotheca paniculata*, Gunnison Co., Colorado. *Clark & Lederer 2242* (COLO).

Figure 198. *Heterotheca paniculata*, Gunnison Co., Colorado. *Davidson & Selkin 102* (COLO).

Figure 199. *Heterotheca paniculata*, Gunnison Co., Colorado. *Grey 664* (COLO).

Figure 200. *Heterotheca paniculata*, Gunnison Co., Colorado. *Crosswhite 1189* (RMBL).

Figure 201. *Heterotheca paniculata*. Gunnison Co., Colorado. Site of *Nesom het17-10*. Photos by Nesom, 16 Aug 2017.

Figure 202. *Heterotheca paniculata*. Hinsdale Co., Colorado, *Martin 288* (WSC).

Figure 203. *Heterotheca paniculata*. Mineral Co., Colorado. *Zeger Z-34* (FLD).

Figure 204. *Heterotheca paniculata*. Costilla Co., Colorado, *Anderson 87-104* (COLO).

Figure 205. *Heterotheca paniculata*. Socorro Co., New Mexico, *Maddux 495* (UNM).

Figure 206. *Heterotheca paniculata*. Bernalillo Co., New Mexico, *Megard s.n.* (UNM).

Figure 207. *Heterotheca paniculata*. Taos Co., New Mexico, *Holmgren 7189* (WTU).

Figure 208. *Heterotheca paniculata*. Taos Co., New Mexico. Locality of *Holmgren 7189* (Fig. 207) and *Heil 36026*. Photo by Ken Heil, July 2017.

Figure 209. *Heterotheca paniculata*. Taos Co., New Mexico, site of *Heil 36026*. Photo by Ken Heil, July 2017. Vestiture and axillary branching.

Gene flow apparently occurs where *Heterotheca paniculata* and *H. hirsutissima* are sympatric in southern Gunnison County. I studied and collected *H. hirsutissima*, apparently with influence of *H. paniculata*, on roadsides very near the type locality of *Chrysopsis compacta* (*Nesom het17-15*, 1.5 mi NE of Almont on Co. Road 742); typical *H. paniculata* (*Nesom het17-16*) occurs on cliff faces about 0.3 mile from *het17-15* and at the same elevation. I also studied and collected populations of typical *H. hirsutissima* (*Nesom het17-11*) and closely adjacent populations apparently influenced by *H. paniculata* east-northeast of Parlin (east of Gunnison) along Co. Road 76 (*het17-12*, *het17-13*). The somewhat atypical populations identified here as *H. hirsutissima* show a range of variation similar to the type collections of *H. asprella* and *H. compacta*. Obvious intermediates have not been observed where *H. paniculata* and *H. hirsutissima* are sympatric elsewhere (e.g., New Mexico).

Northern populations of *Heterotheca paniculata* (e.g., Garfield, Moffat, and Routt cos.) mostly have stems evenly and stiffly short-hirsute with deflexed hairs in a single story. Vestiture of southern Colorado populations (e.g., Gunnison, Hinsdale, Montrose, Ouray, and Saguache cos.) is more variable and some plants have loosely strigose to strongly ascending to spreading-ascending with fine hairs, some hirsute proximally but loosely strigose distally. Leaf surfaces tend to be sessile-glandular only adaxially in the north but glandular on both surfaces elsewhere.

Additional collections examined. **Colorado**. Costilla Co.: Sangre de Cristo Mts, along Hwy 160 and Sangre de Cristo Creek, 0.5 mi below turnoff of Old La Veta Pass, montane grassland on N-facing hillside, 2750 m, 22 Jul 1987, *Anderson 87-104* (COLO, Fig. 204). Garfield Co.: Glenwood Springs, 21 Aug 1918, *Osterhout 5830* (POM, RM), *5837* (RM); White River Natl Forest, Hubbards Cave, gravel soil, 8500 ft, 18 Sep 1929, *Thomson RT-77* (RM); Flat Tops/White River Plateau, East Canyon Creek, ca. 6 air mi NW of Glenwood Springs, NW-facing slope above creek, Gambel oak and scattered Douglas fir, 7200-

7600 ft, 25 Jul 1990, *Vanderhorst 1327* (RM); Flat Tops/White River Plateau, Grizzly Creek, ca. 4 air mi E of Glenwood Springs, canyon bottom with cottonwood, Doug fir, spruce, and dogwood, 6000-6200 ft, 24 Aug 1990, *Vanderhorst 1913* (KANU-Fig. 193, RM). Gunnison Co.: ca. 5 air mi SSW of Gunnison, E side of Co. Rd 32B, ca. 3.5 air mi N of Saguache County, sagebrush, 8100-8340 ft, 26 Jul 1999, *Arnett 4616* (RM); Co. Rd 25 at Willow Creek, ca. 1 air mi NW of Blue Mesa Airport, ca. 6 air mi NW of Gateview, riparian and adjacent sagebrush, 8600-8680 ft, 6 Jul 1999, *Arnett 4863* (RM); W side of Wolf Creek, ca. 2 air mi NW of summit of Nine Mile Hill, ca. 4.2 air mi SSW of Blaine Peak, ca. 11.5 air mi SE of Sapinero, sagebrush, 8440-8680 ft, 13 Jul 1999, *Arnett 5095* (RM); along Forest Rd (Uncompahgre) 861 by the Middle Fork Cimarron River, 2-3.2 air mi N of Hinsdale County, 2.8-3.6 air mi NE of Owl Creek Pass, spruce, 9200-9400 ft, 14 Aug 1999, *Arnett 7010* (RM); Uncompahgre Natl Forest, Trail 232 along Big Blue Creek, 1.6-2.1 air mi ENE of Fall Creek Falls, aspen-spruce, 9800-10,015 ft, 23 Aug 1999, *Arnett 7304* (RM); above Erikson Springs on the Kebler Pass Road, slope with *Quercus breweri* and *Prunus*, 7200 ft, 20 Jun 1971, *Breedlove 19535* (CAS); Gunnison Natl Forest, Sec 10, T15S, R87W, uncommon in subalpine park, 9200 ft, 5 Aug 1967, *Bryant 150* (KHD, Fig. 194); Curecanti Natl Rec Area, Cimarron Visitor Center exit off Hwy 50, Mesa Creek Trail along Gunnison River just below Morrow Dam, steep, S-facing slope, dry shrubland, 6835 ft, 17 Jul 2004, *Clark & Lederer 2242* (COLO, Fig. 197); near the Old Maid on Gothic Mtn, directly above Gothic Townsite, rocky soil, ca. 10,700 ft, 28 Jul 1960, *Crosswhite 1189* (RMBL, Fig. 200); R85W, T51N, high, dry, cold prairie, 8009 ft, 9 Sep 1986, *Davidson & Selkin 102* (COLO, Fig. 198); E slope of Meridian Lake, just S of drainage lock, 9200 ft, 12 Jul 1980, *Grey 295* (NY); ca. 2 mi S of Hwy 50, adjacent to Co. Road 25, cliffs S of road, 19 Aug 1980, *Grey 664* (COLO, Fig. 199); along Forest Rd 742, overlooking Taylor Park Reservoir from the south, 17 Jul 2003, *King & Garvey 12586* (NY); S. Iola, 7500 ft, 5 Jul 1961, *Hall 274* (BRY); close to Almont, 22 Jul 1968, *Harmon 1120* (BRY, DS); 2 mi W of Monarch Pass summit, Aug 1976, *Maslin s.n.* (COLO, Fig. 195); Taylor Park Dam, hard gravel overlooking water exits, 6 Aug 1962, *Mosquin 4869* (COLO-Fig. 196, DS); 7.2 mi W of Gunnison, rocky, S-facing, sage-covered slope, 16 Jun 1963, *Mosquin 5078* (DS); 32 mi E of Montrose at Blue Creek, dry slopes, 7000 ft, 17 Aug 1934, *Munz 13102* (DS, POM, TEX, UC); 2.5 mi SW of the Gunnison airport, gravelly semi-barrens, sagebrush, 8150 ft, 15 Jul 1984, *Neese 15893* (BRY, RSA); 5 mi W of Sapinero area (Blue Mesa Point) on Hwy 50, area of pinyon pine-juniper-limber pine-aspen, 8300 ft, abundant on walls and base of steep, rocky road cut, in full flower, 16 August 2017, *Nesom het17-10* (15 dups); 1.8 mi NE of Almont (jct with Hwy 135) on Co. Road 742 along Taylor River toward Taylor Park Reservoir, area of doug fir-aspen, general area of sagebrush slopes with scattered ponderosa pine, 8150 ft, scattered but common (here and on rock faces on up the canyon) on ledges and in crevices of steep rock outcrop/road cut, E side of road, 18 Aug 2017, *Nesom het17-16* (2 dups); 15.6 mi W of Gunnison, Hwy 50, red sandy soil, 30 Jun 1951, *Preece & Turner 2809* (SMU); 8 mi N of Crested Butte, base of cliffs on E face of Gothic Mtn, open cliff crevices, 10,700 ft, 28 Jul 1960, *Russell 28.6* (UC); West Elk Creek, dry rocky soil, 7460 ft, 11 Jul 1961, *Stock 423* (BRY, MO, RSA, UC); Fossil Ridge Wilderness, ca. 10.5 air mi ENE of Almont, spruce-fir, 9000-9800 ft, 3 Jul 1998, *Taylor 7917* (RM); ca. 9.5 air mi ENE of Parlin, sagebrush hills, 8850-9200 ft, 24 Jul 1988, *Taylor 9272* (RM); ca. 4.5 air mi ESE of Parlin, granite outcrops, sagebrush, 8200 ft, 25 Jul 1998, *Taylor 9455* (RM); vicinity of Mount Carbon, 3000 m, 11 Jul 1910, *Tidestrom 3742* (LL); Sapinero, crevices of cañons, 1 Jun 1898, *Wheeler 508* (RM, UC); Gothic, margins of woods and along roadside, rocky slopes, 5 Aug 1937, *Wherry C3702* (PH). Hinsdale Co.: Southern Gunnison Basin, San Juan Mts, ca. 0.2 road mi E of Cebolla Campground, ca. 2.9 air mi W of Dry Lake, ca. 11.8 air mi E of Lake City along Forest Rd 788, steep S-facing slopes and gullies of narrow canyon to an open aspen/mixed conifer forest to a rocky S-facing slope, 9320-10,000 ft, 14 Jul 1998, *Arnett 1524* (RM); near top of Slumgullion Pass, 9 Aug 1979, *Heil NCC-S 1022* (SJNM); Middle Fork Piedra River, FS Road 636, Trail 589 N of trailhead, limestone, 9000 ft, 16 Aug 1997, *Heil 11,369* (SJNM); Gunnison Natl Forest, William Creek Campground [S of Williams Creek Reservoir], campsite #7, dry grassy community, sandy & gravelly soil, 2926 m, 10 Jul 1971, *Martin 288* (WSC, Fig. 202); Cathedral, 1 mi S jct Pinos-Cebolla Rd, where road crosses Cebolla Creek and enters canyon, around cabin and 160 acres of Bob and Scottie Willey, T44N R2W sec12 NE 1/4, dry slopes and lower cliff faces along S-facing metamorphic cliff band above Cebolla Creek, dry scrub vegetation dominated by rabbitbrush, sage, and gooseberry and unique species in cracks in cliff face, 8995 ft, just beginning to bloom, 6 Jul 2010, *Williams 2010-0144* (RMBL). La Plata Co.: San Juan Natl Forest, ca 18 mi. SE of Silverton, S side of Turret, Animas River drainage fir, gravel scree slopes, 12,200 ft, 8 Aug 1961,

Michener 22 (COLO). Mesa Co.: 7.1 km E of Mesa (State St.) on Colo Hwy 65, 8000 ft, dry roadside ditch, 8 Sep 1985, *Semple & Heard 7799* - 2*n*=36 (MO). Mineral Co.: Rio Grande Natl Forest, ca. 1.5 mi N of Creede of Rd 503, igneous rock, montane community, 9450 ft, 29 Jul 1989, *Heil 5529* (SJNM); ca. 6 mi S of Wagon Wheel Gap, Rio Grande Natl Forest, private property (Humphreys Ranch) surrounding Lake Humphreys and Hay Press Lake, spruce-aspen forest below earthen dam separating lakes, along a narrow, wet channel coming from Hay Press Lake and emptying into Lake Humphreys, 9128 ft, 19 Aug 2013, *Regensberg 1437* (KHD); San Juan Natl Forest, San Juan (Rainbow) Hot Springs along the W Fork San Juan River, weedy place, 9100 ft, 27 Jun 2002, *Rink 2127* (SJNM); Wasson Ranch, near Creede, valley, 8840 ft, 29 Jul 1938, *Stewart 1136* (COLO); Wasson (near Creede), North Creek Canyon, ca. 9000 ft, 18 Aug 1939, *Stewart 1515* (COLO); San Juan Natl Forest, last park up Middle Fork [Piedra River] before entering canyon, no slope, deep sand soil, river bank with *Aster* and *Erigeron*, fairly abundant in fairly dry sites, 8500 ft, 15 Aug 1935, *Zeger Z-34* (CS, FLD-Fig. 203). Moffat Co.: Williams Fork River [tributary of Yampa River], 24 Jul 1939, *Zobel s.n.* (CAS). Montrose Co.: Montrose, 4 Jun 1901, *Baker 15* (POM); Black Cañon, 7000 ft, 1 Aug 1901, *Baker 684* (DS, MO, NY, POM, RM-3 sheets, UC-2 sheets); Black Cañon of the Gunnison, 7000 ft, 22 Aug 1896, *Crandall s.n.* (RM); felsige abhinge, Black Cañon, 7300 ft, Sep 1893, *Purpus 710* (UC). Ouray Co.: N-facing hillside, just S of and overlooking Ouray, 16 Jun 1963, *Mosquin 5069*, voucher for 2n=18II (COLO). Pitkin Co.: 2 mi W of Aspen dry meadow, 8000 ft, 19 Jul 1952, *Green 422* (PH). Routt Co.: Park Range, ca. 16.5 air mi SE of Yampa, ca. 4 air mi NNE of McCoy, in canyon along Rock Creek, sagebrush slope, 7300 ft, 8 Aug 1989, *Nelson 17885* (RM). Saguache Co.: ca. 0.1 road mi W of Colo Hwy 114 on BLM Road 3074, ca. 3.6 air mi ESE of Cooper Mtn, sagebrush ravine, 8390-8410 ft, 28 Jul 1999, *Arnett 5759* (RM); Great Sand Dunes Natl Monument, Castle Creek, 8400 ft, 19 Jul 1951, *Bean 51-82* (COLO); Medano Canyon, ca. 2 mi E of Great Sand Dunes NM, along road in canyon bottom, aspen, 9000 ft, 23 Sep 1973, *Dixon 2242* (ALAM); Wet Mts, Wet Mtn Valley, Cochetopa Hills, Soda Spring Gulch, Co. Rd LL56, ca. 7 air mi WSW of Villa Grove, igneous outcrops and adjacent grassland, 8600-9400 ft, 31 Jul 1999, *Hartman 65518* (RSA); ca. 5 mi S of Poncha Spgs on US Hwy 24 to Marshall Pass Rd, ca. 1 mi E of Marshall Pass at base of Mt Ouray, ca. 2 mi SW of summit, 11,500 ft, 4 Sep 1993, *Heil 8097* (SJNM); Hwy 114, 10.2 mi S of jct with Hwy 50, S of Parlin, E of Gunnison, sagebrush hills with scattered doug fir-ponderosa pine-doug fir-juniper, 8200 ft, abundant on ledges and in crevices of steep rock wall, E side of hwy, 17 Aug 2017, *Nesom het17-14* (10 dups); Gray's (E of Marshall Pass), 26 Aug 1910, *Tidestrom 4080* (MO); 4.5 mi up SE slopes of road leading to Marshall Pass, roadside, ponderosa pine/spruce-fir ecotone, 17 Jul 1991, *Turner 15999* (TEX). **New Mexico**. Bernalillo Co. [Sandia Mts]: Sandia Crest, open rocky ground, 10,400 ft, 15 Aug 1966, *Bennett 8787* (BRY); Sandia Crest, open meadow near Kiwanis cabin, 10,500 ft, 30 Sep 1956, *Megard s.n.* (UNM-2 sheets digital images!, Fig. 206). San Miguel Co.: Las Vegas, Upper Gallinas Creek, 2200-2700 m, 9 Jun 1926, *Arsene 17559* (LL). Socorro Co.: Along Cañon del Alamito, N side of Ladrons [Ladrón Peak], 6200 ft, *Baca 190*; 6500 ft, *Baca 236* and *269*; 7400 ft, *Baca 267* (all UNM digital images!); Sevilleta Wildlife Refuge, Los Pinos [Mts], W face behind Nunn/Burris windmill, 5700-6800 ft, 25 Jun 1991, *Maddox 495* (UNM, Fig. 205); Royal Canyon [in low mtns between San Antonio and Magdalena Mts], 5 mi W of San Antonio, cliffs and cliff base, 23 Jun 1982, 5200 ft, *Wahl 77* (UNM digital image!). Taos Co.: Ca. 7 mi E of Amalia, County Road 1950 just N of Costillo Creek, talus slope, S-facing slope just E of gauging station and cattle guard, 8495 ft, Jul 2017, *Heil 36026* (SJNM and 7 dups); Sangre de Cristo Mts, Costilla Creek, 7.8 mi (6 airline mi) SE of Amalia [Hwy 196], common in open rocky areas, 8500 ft, 15 Aug 1973, *Holmgren 7189* (BRY!, NMC!, WTU-Fig. 207); Carson Natl Forest, Forest Service Rd 1950, 0.7 mi E of forest boundary, Costilla Creek, mixed coniferous forest, 8900 ft, 17 Jul 2017, *O'Kane 9962* (SJNM). Torrance Co.: Manzano Mts: New Canyon Campground, ca 5 mi E of Manzano, mixed conifer forest with *Abies*, *Pinus ponderosa*, and *Quercus*, 7500 ft, 21 Aug 1995, *Allred 6281* (BRY, NMCR-not seen, NY); Capilla Peak, meadow, 9300 ft, 23 Jun 1963, *Bedker 1063* (UNM digital image!); Manzano Peak vicinity, 10,000 ft, 18 Jun 1962, *Bedker 683* (UNM digital image!); crest near Manzano Peak, 9900 ft, 18 Aug 1962, *Bedker 687* (UNM digital image!); Colorado (Red) Canyon, 1.5 mi W of Red Canyon Camp, ponderosa pine-doug fir, 8900 ft, 3 Aug 1963, *Bedker 1298* (UNM digital image!); Trigo Canyon, 1/4 mi E of Kennedy Camp, pinyon-juniper, 6400 ft, 2 Sep 1963, *Bedker 1544* (UNM digital image!).

41. HETEROTHECA PUMILA (Greene) Semple, Brittonia 39: 383. 1987. *Chrysopsis pumila* Greene, Erythea 2: 95. 1894. **TYPE**: **Colorado**. [Clear Creek Co.]: Upper Bear Creek, Jul 1889, *E. Greene s.n.* (holotype: NDG 53930 image!). Protologue: "Middle Colorado, high mountains toward the headwaters of Bear Creek."

Chrysopsis cooperi A. Nels., Bot. Gaz. 40: 63. 1905. **TYPE**: **Colorado**. [Boulder Co.]: Long's Peak, near timberline, 3 Aug 1904, *W.S. Cooper 50* (holotype: RM! image!; isotype: MIN image!).

Chrysopsis alpicola Rydb., Bull. Torrey Bot. Club 31: 649. 1905. **LECTOTYPE** (Semple 1987): **Colorado**. [Jackson Co.]: Clark's Peak, 11,700 ft, 1 Aug 1896, *C.F. Baker s.n.* (NY 163220; isolectotypes: MO!, NDG, NY 163178). The NDG label is marked as Baker #19.

Chrysopsis alpicola var. *glomerata* A. Nels., Bot. Gaz. 40: 64. 1905. **TYPE**: **Colorado**. Larimer Co.: Estes Park, Long's Peak House, 9000 ft, Aug 1904, *W.S. Cooper 174* (holotype: RM!; isotype: MIN image!).

Semple annotated the MIN isotype in 1997 as *H. pumila* but in publication (1996, 2006) placed *C. alpicola* var. *glomerata* as a synonym of *Heterotheca villosa* var. *foliosa*.

Plants taprooted, sometimes with rhizome-like caudex branches. **Stems** mostly 10–30(–35) cm, ascending-erect to decumbent-ascending, hirsute to villous-hirsute, glandular. **Leaves** oblong to oblanceolate, lower leaves subpetiolate, often becoming sessile distally, strigose-hirsute to pilose-strigose or loosely strigose-villous with ascending hairs, glandular, petiole and proximal margins usually spreading-ciliate, mostly even-sized to the heads. **Heads** solitary or less commonly clustered on short distal branches; capitular bracts longer than the involucre, oblong to oblanceolate or narrowly elliptic-lanceolate. **Involucres** 10–15 mm wide (pressed); phyllaries in 3–4 series weakly graduate in length, linear-lanceolate with acute to acuminate apices and thin-scarious margins, hirsute to hirsute-villous and characteristically with long, fine hairs, glandular,. **Chromosome numbers** (Semple 1996, p. 85): "2*n*=18, a few reports; 36, about a dozen reports);" and (p. 86) "the few diploids known are atypical with smaller heads and a more *minor*-like reduction in upper leaf size."

Heterotheca pumila occurs abundantly in subalpine and alpine habitats at (7500–)9000–12,100 feet on rocky slopes, scree slopes, alpine meadows, and roadsides and roadbanks; occurrences at lower elevations usually are with ponderosa pine and douglas fir; records below that perhaps show genetic influence of other species, especially along the Front Range. It is known only from Colorado and closely adjacent Carbon Co., Wyoming, and Taos Co., New Mexico. Plants noted and mapped by Semple (1996) as "aff. *H. pumila*" in the Abajo and La Sal Mountains of Utah are identified in the present study as *H. pedunculata*. Apparently emphasizing the occurrence of prominent capitular bracts, Semple (1996, p. 86) noted that *H. pumila* "appears to be a higher elevation race of the fulcrata complex close to the narrow-leaved *resinolens* morph of *H. fulcrata* var. *fulcrata*."

New Mexico. Taos Co.: Culebra Range, Vermejo Park Ranch, steep E-facing bowl 1.2 air mi S of Big Costilla Peak and 0.1 air mi E of point 12931, steep talus, scree, and rock slopes, low alpine vegetation with *Trifolium attenuatum*, *Penstemon whippleanus*, *Geum rossii*, and *Carex*, 12,542 ft, 21 Jul 2007, *Legler 6359* (RM!; documentation of state distribution record by Legler 2010).

Wyoming. Carbon Co.: Sierra Madre, S slope of Quartzite Peak, ca 0.3 mi NW of Wyo Hwy 79 and 13.5 mi WSW of Encampment, 14 Jul 2001, *Fertig 19710* (RM); Sierra Madre, Bridger Peak, 24 Aug 1903, *Goodding 2010* (RM); Medicine Bow Mts, Kennaday Peak, ca 15 air mi E of Saratoga, 2 Sep 1984, *Hartman 19822* (RM); Battle Mtn, outcrop on Battle Pass on Hwy 70, 9916 ft, 25 Aug 1995, *Semple & Zhang 10412* (MO). Larimer Co.: Summit of North Park Range, rocky ledges, 10 Aug 1903, *Goodding 1826* (PH-2 sheets).

Heterotheca pumila is variable in habit, stem length, vestiture, and development of capitular bracts — even when in high-elevation habitats apparently apart from genetic influence of other goldenaster species. Hybrids apparently occur with *H. resinolens* (see comments below), *H. hispida*, and others. Variants with elongate (bracteate) peduncles and reduced capitular bracts occur in Garfield, Grand, and Larimer counties, at 7800-8200 ft elevation, where it is possible that *H. hirsutissima* may be involved in the genetics. Because of its capitular bracts, *H. paniculata* sometimes has been identified

as *H. pumila*, but *H. paniculata* has smaller heads that tend to be distally clustered (shorter peduncles), shorter capitular bracts, short-hirsute stems and leaves, and it occurs in drier habitats at lower elevations.

The distinction of *Heterotheca schneideri* from typical *H. pumila* was recognized late in the study and my annotations of the southwestern population system (here as *H. schneideri*) have been mostly as *H. pumila*.

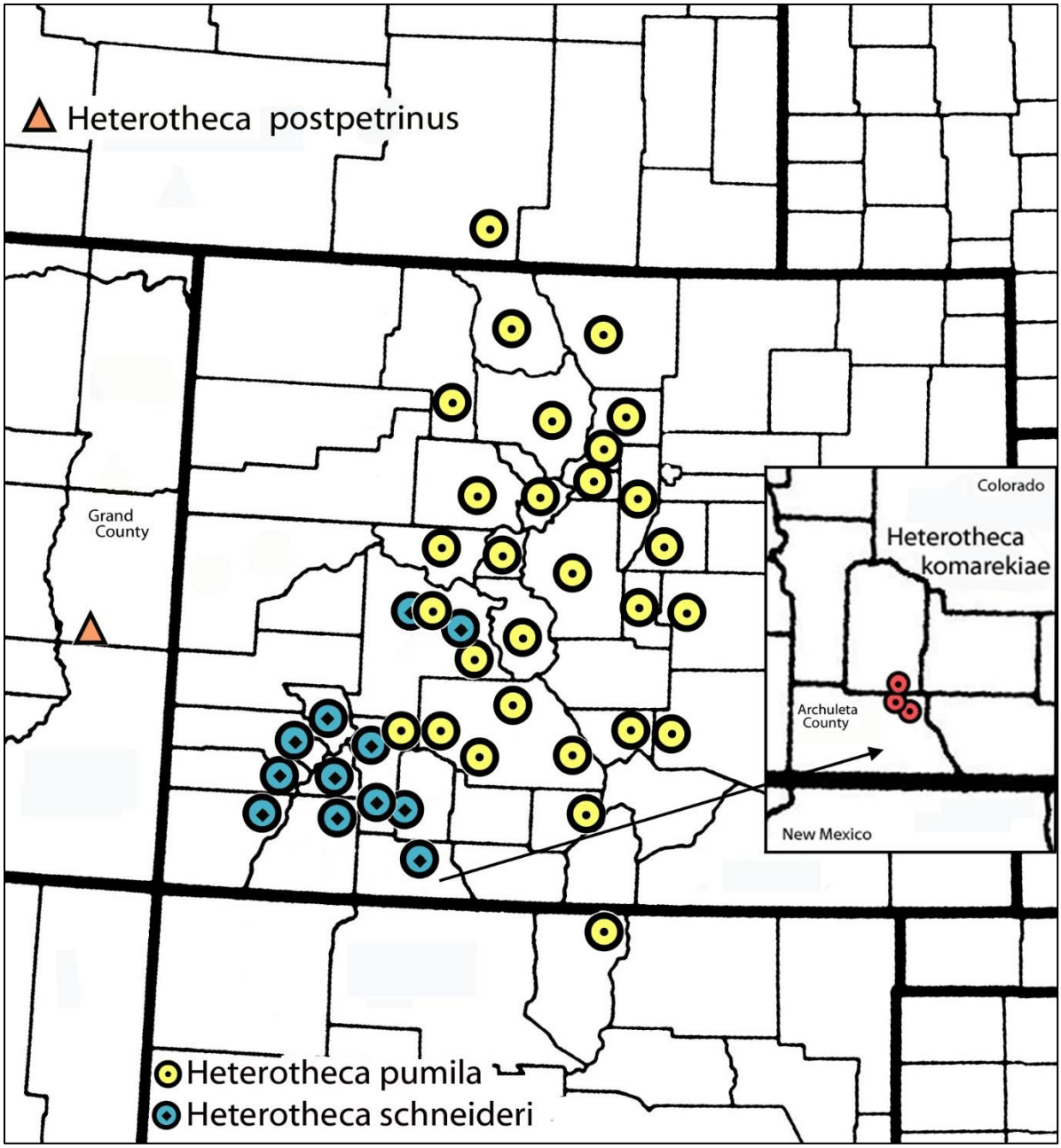

Figure 210. Distribution of *Heterotheca pumila*, *H. schneideri*, *H. postpetrinus*, and *H. komarekiae*. *Heterotheca schneideri* is essentially endemic to the San Juan Mountains (it probably occurs in southwestern Gunnison Co. and two collections document it from the Sawatch Range of central Gunnison Co.). *Heterotheca pumila* reaches the San Juan Mountains at the southwestern corner of its range in Saguache and Hinsdale counties.

Figure 211. *Heterotheca pumila*, Gunnison Co., Colorado, Kebler Pass Road, ca. 2.5 mi W of Crested Butte, locality of *Nesom het17-17* (BRIT). Taprooted, not colonial but spreading habit through rhizome-like proximal stems or caudex branches. Photos by Nesom, 18 August 2017.

Figure 212. *Heterotheca pumila*. Holotype of *Chrysopsis pumila* Greene (NDG).

Figure 213. *Heterotheca pumila*. Details from *Chrysopsis pumila* holotype (NDG).

Figure 214. *Heterotheca pumila*. Top: Details from *Chrysopsis pumila* holotype (NDG). Bottom: Details from *Chrysopsis cooperi* holotype (RM).

Figure 215. *Heterotheca pumila*. Detail from *Chrysopsis alpicola* lectotype (NY).

Figure 216. *Heterotheca pumila*. Variation in involucral morphology; heads from collections from various localities. Compare with heads of *H. schneideri* in Fig. 227.

Figure 217. *Heterotheca pumila*. Clear Creek Co., Colorado. *Smookler 272* (KHD).

Figure 218. *Heterotheca pumila*. Chaffee Co., Colorado. *Neese 15928* (BRY).

Figure 219. *Heterotheca pumila*. Park Co., Colorado. *Hogan 2837* (KHD).

Figure 220. *Heterotheca pumila*. Summit Co., Colorado. Stems and leaves hirsute to villous-hirsute. *Nelson 725* (BRY).

Figure 221. *Heterotheca pumila*. Summit Co., Colorado. *Harms 2089* (KANU). Stems and leaves loosely strigose, and leaf margins mostly without marginal cilia, an uncharacteristic vestiture for the species, more like *H. schneideri*. Compare with Fig. 220 from Summit Co., which has typically villous-hirsute to strigose-villous vestiture.

Figure 222. *Heterotheca pumila*. Saguache Co., Colorado. *Mooers 397* (NY).

42. HETEROTHECA SCHNEIDERI Nesom, **sp. nov. TYPE**: **Colorado**. La Plata Co.: La Plata Mts, road from La Plata to Eagle Pass, 10,600 ft, roadside weed, 1 Aug 1963, *T. Mosquin 5429* with J.M. Gillet, voucher for chromosome count of 2*n*=36, as " Heterotheca pumila" (holotype: COLO-Fig. 231; isotype: DS).

Similar to *Heterotheca pumila* in its high elevation habitats, low, caespitose habit with evenly leafy stems and prominent capitular bracts but different in its closely short-strigose stems and leaves, more prevalent distal branching, and phyllaries more distinctly triangular, more numerous, more strongly graduate, and with thickened (vs. thin-scarious) margins.

Plants taprooted, caespitose, sometimes with rhizome-like caudex branches or basal offsets; aromatic. **Stems** 8–20 cm, erect to ascending-erect or decumbent-ascending, sparsely to moderately, loosely strigose with short hairs, eglandular or minutely glandular immediately below the heads. **Leaves** oblong to elliptic or oblanceolate, lower leaves subpetiolate, often becoming sessile distally, mostly even-sized up to the heads, midcauline 10–32 mm long 3–9 mm wide, sparsely to moderately strigose, minutely glandular adaxially, eglandular abaxially, margins eciliate or sometimes with a few spreading cilia at the petiole base. **Heads** terminal on leafy stems, solitary or loosely clustered from distal branches; capitular bracts as long or longer than the involucre, oblong to oblanceolate or narrowly elliptic-lanceolate. **Involucres** campanulate, 10–15 mm wide; phyllaries in 4–5(–6) series strongly graduate in length, narrowly triangular with acute apices and thickened margins, distinctly keeled, often with purple margins and apex, finely short-strigose to hirsutulous-puberulent, minutely glandular. **Ray flowers** 14–20, ligules 10–14 mm long. **Chromosome number**, 2n = 36 (as "*Heterotheca pumila*"): La Plata Co., *Mosquin & Gillett 5429*; Ouray Co., *Harms 2071*.

Flowering (Jun–)Jul–Sep. Open rocky and gravelly slopes, talus, meadows, aspen, spruce, pine-fir, spruce-fir, and above tree line; (8000–)9000–12,700 ft.

Named for Al Schneider of Cortez, Colorado, webmaster of *Southwest Colorado Wildflowers — Wildflowers, ferns, & trees of Colorado, New Mexico, Arizona, & Utah*, which provides a wealth of information on the regional flora. Al and his wife Betty are ardent and discriminating field botanists and photographers.

The contiguous geography and similarity in habitat of *H. schneideri* and *H. pumila* suggest that they may be most closely related to each other (especially as they have previously been considered conspecific), but *H. schneideri* is similar in vestiture and production of capitular bracts to *H. nitidula*, which also is geographically close. *Heterotheca pedunculata* lacks capitular bracts but has closely strigose vestiture and is geographically close as well. Collections from Ouray Co. (*Beaman & Erbitsh 1167*, COLO; *Underwood & Selby 338*, NY), with long, ebracteate peduncles but occasional capitular bracts, perhaps show gene exchange between *H. pedunculata* and *H. schneideri* — plants of both collections were growing below the normal elevational range of *H. schneideri* but within that of *H. pedunculata*.

1. Stems, leaves, and bracts short-strigose, leaves and bracts eciliate; phyllaries in 4–5(–6) strongly graduate series, finely short-strigose to hirsutulous-puberulent, margins thicker, not scarious ..... 42. **Heterotheca schneideri**

1. Stems, leaves, and bracts strigose-villous to villous-hirsute or hirsute, leaves and bracts spreading-ciliate to weakly ciliate; phyllaries in 3–4 weakly graduate series, hirsute to hirsute-villous and characteristically with long, fine hairs, margins thin-scarious ..... 41. **Heterotheca pumila**

Additional collections. Colorado. Archuleta Co.: San Juan Mts, Quartz Lake Trail below timberline, 6 Sep 1998, *M. Heil 59* (SJNM); San Juan Natl Forest, Nipple Mtn Rd, 2.6 mi from switchbacks sign, large road cut, 10,411 ft, 9 Aug 2002, *Heil 19,919* (SJNM). Dolores Co.: San Juan Natl Forest, East Fork Dolores River, confluence of North and South Forks of Twin Creek, East Fork Trail, ca 6.5 air mi NE

of Rico, SSW-facing slope with Engelmann spruce, scattered aspen, and *Symphoricarpos*, 10,400-10,600 ft, 13 Jul 1994, *Moore 3111* (RM); San Juan Natl Forest, ca 3 air mi N of Rico, beaver pond along Colo Hwy 145, willow thicket surrounding beaver pond and seepage, scattered blue spruce around perimeter of pond, S- to SE-facing, 9000 ft, 16 Aug 1994, *Moore 3950* (RM). Gunnison Co.: Ca. 2 mi NW of Crested Butte, *Artemisia-Salix-Populus*, 9000 ft, sandy soil, 12 Jul 1969, *Higgins 2173* (BRY, Fig. 234); ca. 2.5 air mi W of Pittsburg, subalpine avalanche meadow, 11,200-11,300 ft, 18 Aug 1998, *Taylor 10685* (COLO). Hinsdale Co.: San Juan Natl Forest, Weminuche Wilderness Area, N side of La Osa Creek ca. 1 mi W of San Juan Outfitters Camp, 10,462 ft, 9 Jul 2004, *Heil 24,252* (SJNM); San Juan Natl Forest, Weminuche Wilderness Area, ridge on W side of head of North Fork Los Pinos River, 11,758 ft, 2 Aug 2003, *O'Kane 7459* (SJNM); San Juan Natl Forest, Weminuche Wilderness Area, 1/2 mi SE of Granite Lake along the Weminuche Trail, 10,400 ft, 6 Jul 2003, *Rink 2260* (SJNM). La Plata Co.: San Juan Natl Forest, 28 mi N of Durango on Hwy 550, Purgatory Campsite, along trails under aspen woods with scattered spruce, 8 Aug 1961, *Harms 2058* (KANU, Fig. 230); San Juan Natl Forest, 11.1 mi up Middle Mtn Rd from Vallecito Rd, very large montane meadow, 10,740 ft, *Heil 20,550* (SJNM); San Juan Natl Forest, trailhead to Lime Ridge and Ruby Lake, corkbark fir and Engelmann spruce, 11,543 ft, 2 Sep 2004, *Heil 24,674* (SJNM). Montezuma Co.: Cascade Creek about 4 mi S of Purgatory Ski Resort, gravelly hillside, aspen-spruce, 8000 ft, 13 Aug 1986, *Kass 2543* (BRY, Fig. 232). Ouray Co.: 12 mi S of Ouray, 1 mi N of Red Mtn Pass on Hwy 550, steep mtn slopes, open spruce forest, 9 Aug 1961, *Harms 2071*, voucher for 2*n*=36 (KANU, SASK, WAT) and *Harms 2072* (SASK). San Juan Co.: 6.5 mi S of Silverton on Hwy 550, Molas Divide, rocky hillside and meadow above, 10,900 ft, numerous in clumps, 8 Aug 1961, *Harms 2063* (KANU, Fig. 229); 2.2 mi S of Silverton on Hwy 550, granite outcroppings, open roadside in spruce forest, 8 Aug 1961, *Harms 2064* (KANU); ca. 3/4 mi S of Cascade Creek and 1/10 mi W of US Hwy 550, base of Engineer Mtn, aspen, spruce, douglas fir, white fir, 8909 ft, *Heil 19,785* (SJNM); Weminuche Wilderness, West Needle Mts, N of Crater Lake, open gravelly slope, 11,300 ft, 1 Aug 1997, *Hogan 3266* (COLO, Fig. 228); West Needle Mts, Old Lime Creek Road, near Coal Creek, dry, E-facing hillside, 9700 ft, 3 Aug 1997, *Hogan 3302* (COLO); 7 mi S of Silverton, dry rocky hillside, 10,500 ft, 13 Aug 1936, *Rollins 1544* (NY); 1.6 mi from Stony Pass Jct, talus slopes, pine-fir, 7 Aug 1992, *Thorne 15,052* (BRY, Fig. 233); San Juan Natl Forest, S slope of Coal Bank hill, ca. 9500 ft, 18 Jul 1985, *Trulove 110* (SJNM); Colorado Trail N of Little Molas Lake, North Lime Creek drainage, open area of dry drainage, 17 Aug 2002, *Wingate 7047* (KHD).

The two collections identified here as *Heterotheca schneideri* from Gunnison Co. are from an area where *H. pumila* is abundant and is the only place where the two species appear to be sympatric. Field observations and further collections are needed to clarify the biology.

Figure 223. *Heterotheca schneideri*. Dolores Co., Colorado, Calico National Recreation Trail at ca. 11,800 ft elevation. Photo by Al Schneider, 19 August 2009.

Figure 224. *Heterotheca schneideri*. San Miguel Co., Colorado, Sneffels Highline Trail. Photo by Al Schneider, 4 August 2004.

Figure 225. *Heterotheca schneideri*. Montezuma Co., Colorado, ca. 1 mile SW of the Roaring Forks Road on the shoulder of Forest Service Road 435, ca. 9900 ft elevation. Photo by Al Schneider, 5 August 2020.

Figure 226. *Heterotheca schneideri*. Above: Dolores Co., Colorado, Calico Trail. Below: Montezuma Co., Colorado, ca. 1 mile SW of the Roaring Forks Road. Photos by Al Schneider, 19 August 2009.

Figure 227. *Heterotheca schneideri*. Variation in involucral morphology; heads from various collections and localities.

Figure 228. *Heterotheca schneideri*. San Juan Co., Colorado. *Hogan 3266* (COLO).

Figure 229. *Heterotheca schneideri*. San Juan Co., Colorado. *Harms 2063* (KANU).

Figure 230. *Heterotheca schneideri*. La Plata Co., Colorado. *Harms 2058* (KANU).

Figure 231. *Heterotheca schneideri*. La Plata Co., Colorado. Holotype (COLO).

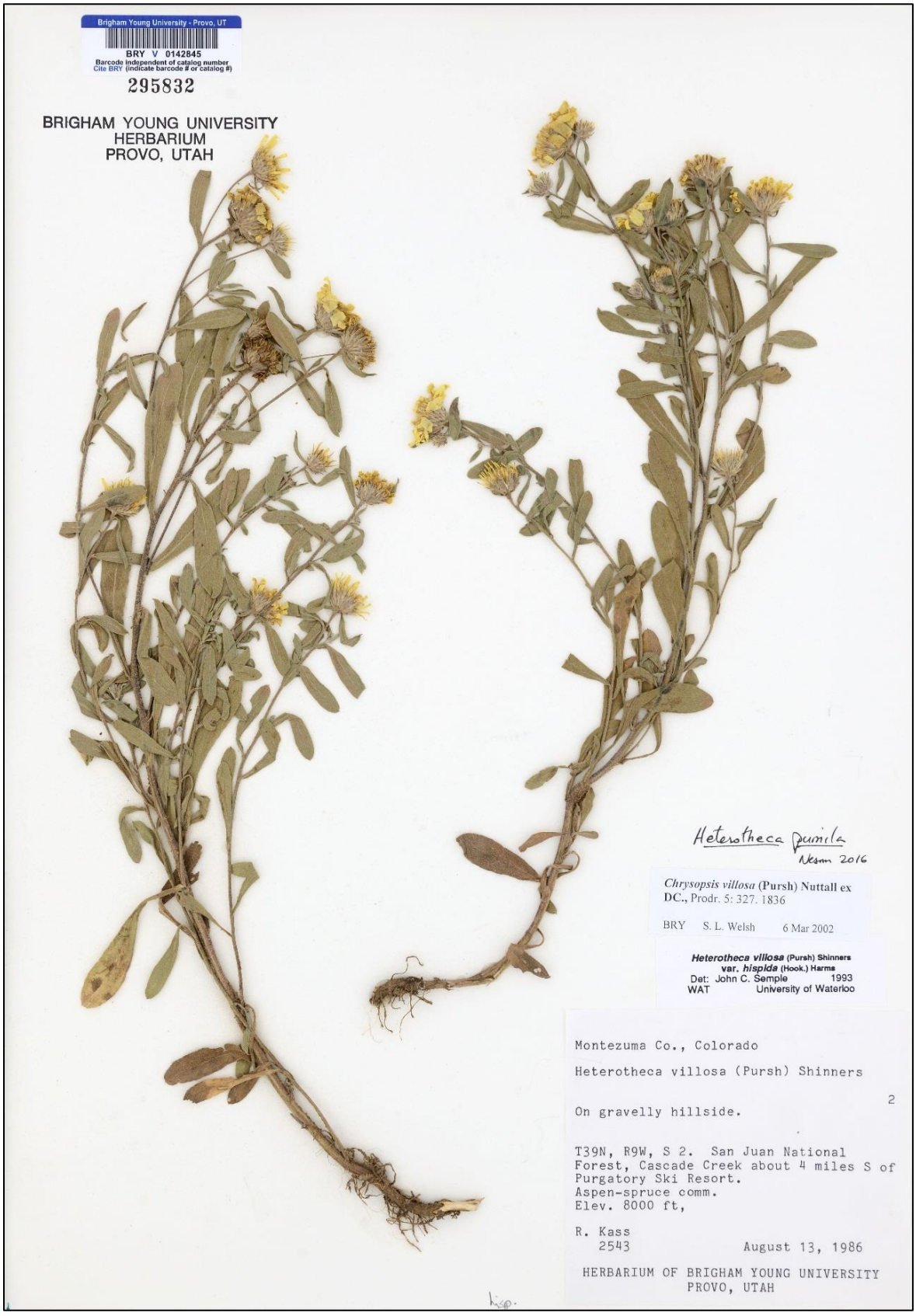

Figure 232. *Heterotheca schneideri*. Montezuma Co., Colorado. *Kass 2543* (BRY).

Figure 233. *Heterotheca schneideri*. San Juan Co., Colorado. *Thorne & Armstrong 15052* (BRY).

Figure 234. *Heterotheca schneideri*. Gunnison Co., Colorado. *Higgins 2173* (BRY).