

**43. HETEROTHECA FULCIENS** Nesom, **sp. nov.** TYPE: **Arizona.** Yavapai Co.: Near Mormon Pocket springs along Verde River, ca. 9.6 mi NW of Clarkdale, floodplain in cobble, gravel, and sand, 1120 m, 30 Sep 2012, *F.S. Coburn 1440* (holotype: ASU!, Fig. 236).

Similar to *Heterotheca fulcrata* sensu stricto in its prominent capitular bracts but rhizomatous, leaves more elongate and more consistently eglandular, heads often more numerous in denser capitulescence (shorter peduncles), and capitular bracts less densely ciliate with shorter hairs.

**Perennial**, producing basal offsets and/or short rhizomes. **Stems** (1–)5–10 from an irregularly branched caudex, 5–20(–25) cm tall, hirsute to villous-hirsute with variable length (not strongly 2-storied), sometimes deflexed hairs, usually minutely glandular. **Leaves** mostly cauline (basal withered by flowering), spreading to ascending, midcauline lanceolate to oblanceolate, lanceolate-oblong, or linear-lanceolate, 12–34 x 3–8(–10) mm, length/width ratio 2.8–7/1, surfaces loosely strigose to strigose-sericeous with short hairs, sometimes very sparsely so, minutely glandular. **Heads** on paucibracteate peduncles 2–4(–5) cm long, 2–10 and compactly to loosely corymboid, rarely solitary. **Involucres** 6–9(–10) mm wide (pressed), phyllaries strongly imbricate in 4(–5) series, inner (longest) 5–8 mm long, sparsely to densely evenly short-strigose to glabrate, eglandular; capitular bracts consistently present, ovate to elliptic-lanceolate, oblong-lanceolate, or narrowly lanceolate, ciliate with hairs 0.5–1.5(–2) mm long. **Ray flowers** 8–16(–20), corollas 9–12 mm. **Disc corollas** 4–6 mm. **Achenes** 2.5–3 mm, strongly flattened, with 3, raised, golden-resinous veins on each face, densely loosely villous-sericeous; outer pappus of narrow scales.

Flowering Jun–Sep(–Oct). Chaparral, pinyon-juniper, ponderosa pine (sometimes with aspen, oak, or ash), spruce-fir-aspen, rocky slopes, cliff bases, canyon walls, cracks and crevices, riparian habitats on cobble and sand or silty loam, roadsides; 3200–8300(–9200, –10,200) feet.

Collections of *Heterotheca fulciens* were annotated by Semple in 1993 as *H. fulcrata* vars. *fulcrata*, *amplifolia*, and *arizonica* and as variably mixed populations of vars. *fulcrata* and *amplifolia*. His maps of *H. fulcrata* (1996, Fig 28 A and B) appear to divide *H. fulciens* between his var. *fulcrata* and var. *amplifolia*, which are shown as sympatric in the range of *H. fulciens*. *Heterotheca fulciens* and typical *H. fulcrata* in the present treatment are allopatric.

- 1. With rhizomes or basal offsets; stems hirsute to villous-hirsute with variable length (not strongly 2-storied) hairs, eglandular or less commonly glandular; peduncles 2–4(–5) cm long; midcauline leaves 12–34 x 3–8(–10) mm, length/width ratio 2.8–7 /1 ..... 43. **Heterotheca fulciens**
- 1. Without rhizomes or basal offsets; stems with hirsute-villous overstory and puberulent, minutely glandular understory; peduncles (1–)3–8 cm long; midcauline leaves 15–55 x 5–17 mm, length/width ratio 2–2.8 /1 ..... 47. **Heterotheca fulcrata**

Nevada plants (Elko and Eureka cos.; e.g., Fig. 240) identified here as *Heterotheca fulciens* have prominent capitular bracts and are interpreted to be disjunct, western outliers of the species. In both counties, typical *H. cinerascens* is the only other goldenaster and is represented by abundant collections. Populational study is needed.

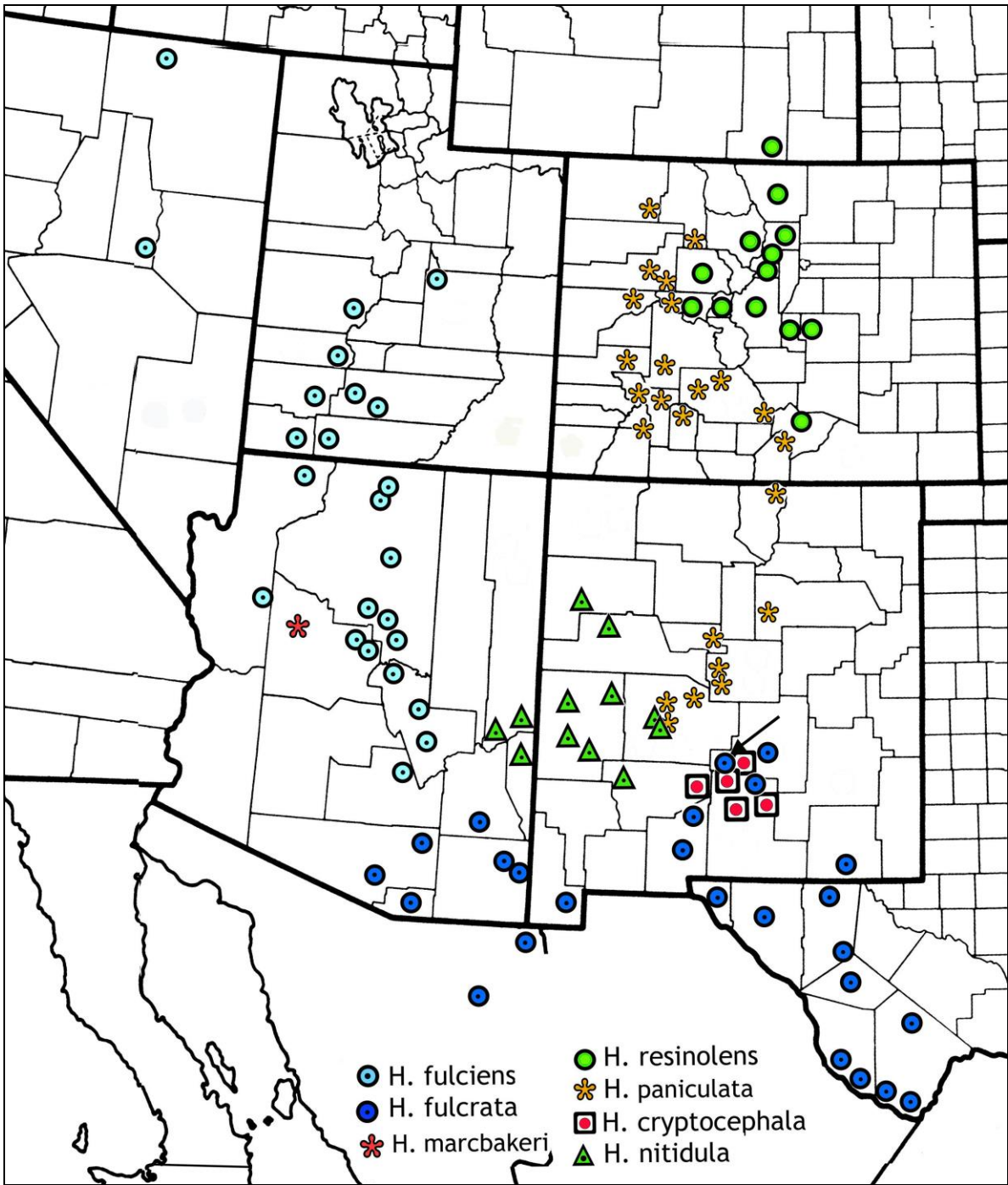


Figure 235. Distribution of *Heterotheca* species.



Figure 236. *Heterotheca fulciens*, holotype. Coburn 1440 (ASU).



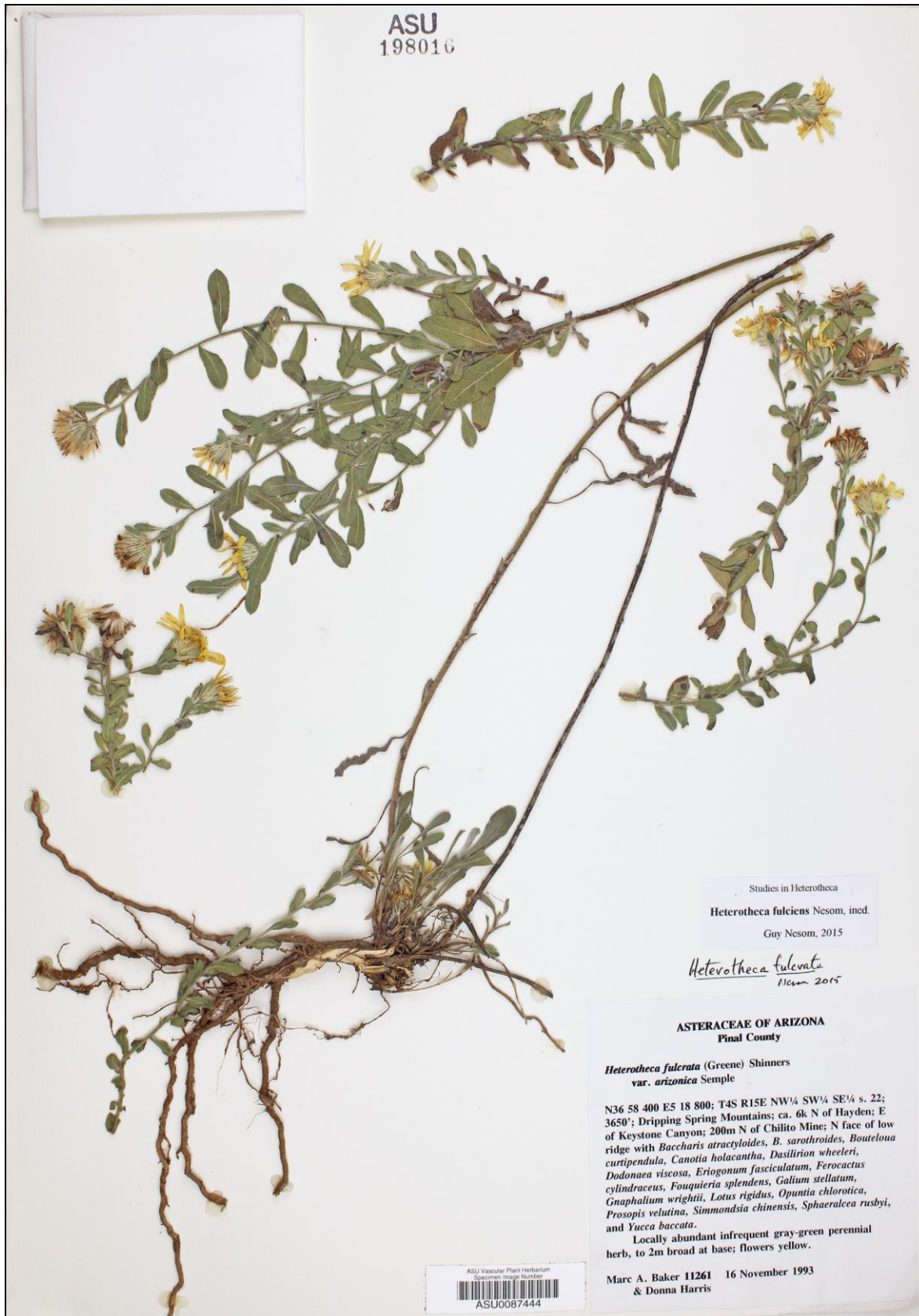


Figure 237. *Heterotheca fulciens*, Pinal Co., Arizona. Baker 11261 (ASU).



Figure 238. *Heterotheca fulciens*, Yavapai Co., Arizona. Licher 1337 (ASC).

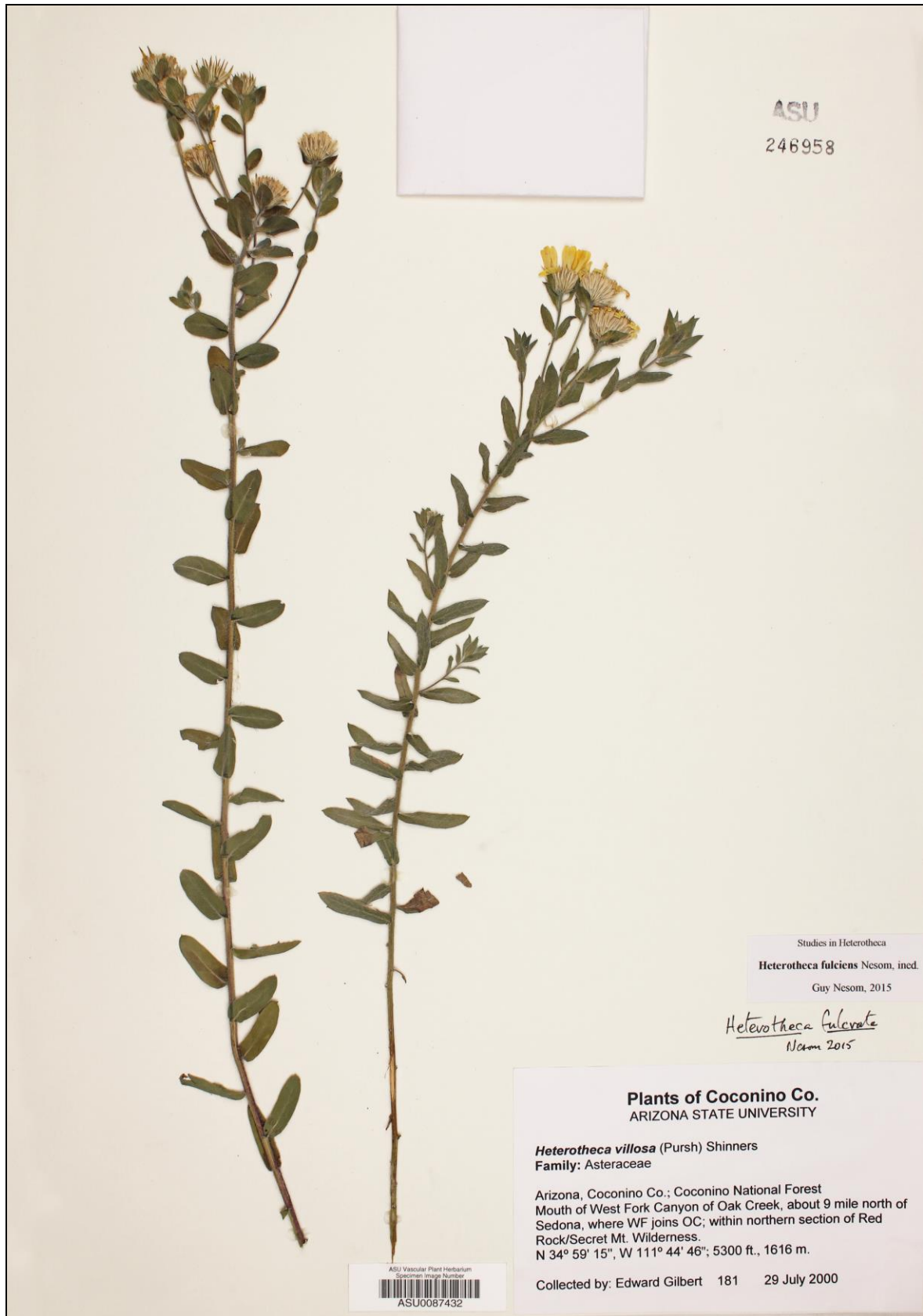


Figure 239. *Heterotheca fulciens*, Coconino Co., Arizona. Gilbert 181 (ASU).





Figure 240. *Heterotheca fulciens*, Eureka Co., Nevada. Tiehm 11844 (RM).

A diploid chromosome number of  $2n=18$  has been determined for *Heterotheca fulciens* from Coconino and Yavapai counties (*Semple 5546, 7890, 8999, 9005, 9007, 9009, 9011, 9013*; as noted on the labels). *Windham 96-267* from Coconino County vouchers a tetraploid chromosome count ( $2n=36$ ) for a plant with unusually broad capitular bracts, perhaps suggesting that collections identified here as *H. fulciens* should be reexamined toward the possibility that two entities exist in sympatry (but ploidal variation exists within other species of *Heterotheca*). Capitular bracts of *Heterotheca fulciens* mostly are oblong-lanceolate to narrowly lanceolate but they vary to distinctly ovate.

**Additional and representative collections examined. Arizona. Coconino Co.:** 3.5 mi E of Jacobs Lake, 7600 ft, 27 Jul 1962, *Anderson 2148* (DS); Sycamore Canyon Wilderness, Cedar Creek, just S of Limestone Pocket, canyon bottom in ponderosa pine forest, 5840 ft, 5 Sep 1992, *Baker 10139* (OBI, RSA); Coconino National Forest, Clear Creek Wilderness Area, Forest Service Rd 81-E, USFS Trail #37 (Maxwell Trail), rim to stream bed with intermittent gravel beds, 6500 ft, 7 Jul 2003, *Bond 374a* and *Bond 398* (ASU); 2 mi N of Flagstaff, 7100 ft, 9 Sep 1961, *Breedlove 1202* (CAS); Grand Canyon, South Rim, Hull Cabin, Kaibab National Forest, 7100 ft, 9 Jul 1997, *Casey s.n.* (ASU); side of FS Road 610, ca 4 road mi NE Kaibab Lodge, spruce-fir-aspen, 9000 ft, 8 Sep 1993, *Christy 1936* (ASU); N Rim Grand Canyon, Swamp Lake Point, dry open hillside, 7522 ft, 14 Jul 1947, *Cooper 1901* (RSA); N Rim Grand Canyon, Powell Plateau, open woodland, 7555 ft, 14 Jul 1947, *Cooper 1913* (RSA); 7 mi S of Flagstaff, roadsides, 7000 ft, 24 Jun 1943, *Dearing 5489* (ASU); Pine Flat Hunting Camp, 6800 ft, 30 Aug 1945, *Darrow 2962* (CAS); near Jacobs Lake, 9 Sep 1938, *Eastwood & Howell 6411* (CAS); near Sunset Crater, 20 Sep 1938, *Eastwood & Howell 6964* (CAS); N rim of Grand Canyon, 21 Sep 1938, *Eastwood & Howell 7008* (CAS); 6 mi E of Jacobs Lake on Hwy 89, 27 Jul 1940, *Ferris 10242* (DS); 6 mi E of Jacobs Lake on US Hwy 89, ponderosa pine, N slope, 27 Jul 1940, *Ferris 10242* (RSA); W of FS Road 257, ridge E of Orderville Canyon, ca. 3 air mi NE of Jacob Lake turnoff on Hwy 89A, ponderosa pine, 7700 ft, 2 Aug 2003, *Fertig 20716* (BRY); Kaibab Plateau, E of FS Road 225C, ca 0.5 mi S of US Hwy Alt 89, ca 2 mi NE of Jacob Lake, ca 19 mi S of the Utah state line, E-dipping slope in small bowl in limestone bedrock on plateau within open ponderosa pine forest (understory recently burned), thin loam over limestone rubble, 2300 m, 26 Jul 2012, *Fertig 27680* (ASU); Coconino Natl Forest, mouth of West Fork Canyon of Oak Creek, about 9 mi N of Sedona, where WF joins Oak Creek, within northern section of Red Rock/Secret Mountain Wilderness, 1616 m, 29 Jul 2000, *Gilbert 181* (ASU); Grand Canyon, 1.5 mi N of Ranger Station, North Rim, rocky slope with southern exposure, 2500 m, 25 Jul 1964, *Halvorson 123* (ASU); Cape Royal Road, 4 mi N of Cape Royal, ponderosa forest, 2440 m, 8 Aug 1965, *Halvorson 205* (ASU); ca. 1 mi N of Bright Angel Point in seasonal housing area, aspen-ponderosa pine, 2540 m, 22 Aug 1965, *Halvorson 215* (ASU); Flagstaff, yellow pine, 700 ft, 23 Aug 1922, *Hanson 12* (MO); N Rim area of GCNP, 15 Aug 1965, *Harper s.n.* (BRY); San Francisco Peaks, N of Flagstaff, 8000 ft, 20-24 Sep 1945, *Heiser 1567* (MO, UC); ca. 4 mi S of Jacob Lake on Hwy 67, 8000 ft, sandy, ponderosa pine-aspen, 2 Aug 2001, *Higgins 28402* (BRY); 15 mi E of Jacobs Lake, yellow pine, 7000 ft, 8 Jul 1938, *Hitchcock et al. 4527* (CAS, WTU); near Shulz Pass Rd by golf course, ca. 7300 ft, 4 Sep 1976, *Hogue 316* (RSA); 3.5 mi from Flagstaff on Schultz Pass road, 7300 ft, 11 Sep 1968, *Howell & True 45068* (CAS); S of Grand Canyon, 6000 ft, 27 Aug 1923, *Jaeger 25* (POM); Flagstaff, 13 Aug 1884, *Jones s.n.* (POM); 28 mi past middle of Camp Verde on I-17N, ponderosa pine-gambel oak, ca. 6700 ft, 6 Sep 1990, *Keil 21420* (OBI); 1.5 mi SW of Jacob Lake, ponderosa forest, 6 Aug 1966, *Lehto 7011* (ASU); Walnut Canyon 7000 ft, 28 Jul 1898, *MacDougal 358* (NY-2 sheets, RM); Kaibab Forest, 5 Oct 1945, *Milner 8974a* (UC); Elden Mtn, 1 mi S 30° W of Little Elden Spring on E slope, 7550 ft, 27 Jul 1985, *Morefield & Roberts 2935* (RSA); off Old Munds Highway, near disc golf course in Pumphouse Wash, ponderosa pine forest, 2100 m, 7 Sep 2011, *Murray AZ932-90* (ASU); 22 mi N of Grand Canyon, 16 Aug 1974, *Nash N-264* (ASU), *Nash N-265* (TEX); road at Stoneman Lake, ponderosa pine zone, 2050 m, 16 Sep 1983, *Pinkava 14071* (ASU); Oak Creek, rocks, Oct 1903, *Purpus 8245* (UC); head of Oak Creek Canyon, 14 mi S of Flagstaff, beside hwy, 29 Sep 1959, *Russell, Smith, & Walters 10843* (ASU); Navajo Ordnance Depot, open places, 7200 ft, 13 Aug 1943, *Schallert s.n.* (CAS, MO, PH); 1 mi N of Parks, 7 Aug 1981, *Semple 5546* (ASU, BRIT, MO); US-89, 1.8 km E of Jacob Lake, open ponderosa pine woods, 7400 ft, 12 Sep 1985, *Semple 7890* (ASU, BRIT, MO); Schultz Pass Rd, off of US-180, N of Flagstaff, grassy ponderosa pine forest, locally



abundant, 2 Oct 1987, *Semple 9005* (BRIT, MO, ny, UC); 4 mi S of Flagstaff, US Hwy 89 along I-17, ponderosa pine, roadside of crushed lava, 3 Oct 1987, *Semple 9007* (MO); US Hwy 89, just S of Oak Canyon Viewpoint, steep rocky roadside embankment, 3 Oct 1987, *Semple 9009* (ASU, BRIT, MO); US-89, just S of Pine Flat Campground, Oak Creek Canyon area, oak, ash, and ponderosa pine, along roadside, 5500 ft, 3 Oct 1987, *Semple 9011* (ASU, BRIT, MO); US-89, S end of Coconino Natl Forest Recreation Area, Oak Creek Canyon, roadside, base of red sandstone cliffs, 4400 ft, 3 Oct 1987, *Semple 9013* (ASU, BRIT, UC); E of Flagstaff, Old Walnut Canyon Rd, ponderosa pine, 6800 ft, 28 Sep 1997, *White 5732* (RSA); W of Walnut Canyon Natl Mon., W Canyon Trail between trailhead and canyon escarpment, open ponderosa pine forest, 6750-6950 ft, 29 Sep 1997, *White 5760* (RSA); San Francisco Mts, Lockett Meadow, mesic grassy meadow, 8450-8550 ft, 10 Oct 1997, *White 5865* (RSA); San Francisco Mts, N side of mts, near "Lost Tank," dirt road ca. 1 air mi W of Hwy 89, open ponderosa pine forest, roadside, 1 Oct 1997, *White 5867* (RSA); NE of Sedona along Oak Creek near Grasshopper Point, ca 3.8 km SE of the summit of Wilson Mtn, sandy soil among alluvial boulders on N-facing slope, 4375 ft, 12 Sep 1996, *Windham 96-267*, **n = 18** (BRY, MO, NY). Gila Co.: Strawberry Hill, Mogollon Rim, N of Pine, ponderosa pine, 1800 m, 10 Sep 1970, *Collom 418* (ASU); Sierra Ancha Mts, Parker Creek drainage, Natural Drainage Expmntl Area, dry exposed ledges, 4700 ft, 25 Aug 1946, *Gould 3729* (SMU); Salt River Canyon, waterfalls area near Salt River Canyon Bridge, riparian, 27 Sep 1968, *Lehto 14243* (ASU); Sierra Ancha Mountains, Parker Creek Canyon, rocky canyon in chaparral area, 4000-4600 ft, 22 Jul 1968, *Pase & Keil 3399* (ASU). Mohave Co.: Mohon Mountains, upper Francis Creek near N boundary of Aquarius Planning Unit, along rock walls of canyon, chaparral-broadleaf riparian, 3900 ft, 14 Jun 1979, *Butterwick 5098a* (ASU). Pinal Co.: Dripping Spring Mountains; ca 6 km N of Hayden, E of Keystone Canyon, 200 m N of Chilito Mine, N face of low ridge, 3650 ft, 16 Nov 1993, *Baker 11261* (ASU). Yavapai Co.: NE of Prescott at Granite Creek, 0.6 mi E of jct Hwys 89/89A, granite outcrop, pinyon-oak, 5200 ft, 5 Sep 1991, *Atwood 17024* (BRY, RM, WS-possibly x *H. arizonica*); Sycamore Canyon Wilderness Area, Railroad Draw, 2 km N of Verde River, wash bottom, 4115 ft, 7 Oct 1992, *Baker 10324* (OBI); NW of Jerome, S of Little Black Mesa, 1.1 km SSW of Red Point Tank, Wildcat Draw, shallow limestone canyon, 1390 m, 25 Sep 1995, *Baker 11965* (ASU); R&S Ranch, West Clear Creek flood plain, N side of channel 1/2 mi E of confluence of West Clear Creek and Verde River, 975 m, 6 Oct 2006, *Bond 463* (ASU); 1.9 km S of Sycamore Canyon where it enters the Verde River, ca. 9 km N of Clarkdale, dry floodplain in cobble and sand, 1080 m, 10 Sep 2011, *Coburn 400* (ASU); Verde River at Perkinsville, ca. 200 m downstream from the bridge, shady, mesic riparian woodland, 1st terrace/ floodplain in silty-loam, 1170 m, 2 Oct 2012, *Coburn 1486* (ASU); Sycamore Creek; vicinity of Summers Spring, canyon bottom, 26 Jun 1992, *Govedich 62692-3* (ASU); Red Rock State Park, sandy flat above floodway, *Juniperus-Sapindus* woodland, 3880 ft, 23 Sep 2006, *Licher 1659* (BRY); Ariz Rte 179, SE of Sedona and ca 7 mi S of Coconino Co. line, pinyon-juniper zone, edge of Upper Sonoran Desert, 1136 m, 17 Sep 1983, *Pinkava 14083* (ASU); US Hwy 89 N of Prescott, crevices of large, locally abundant rock outcrops, 2 Oct 1987, *Semple 8999* (BRIT, MO). Nevada. Elko Co.: Bull Run Mts, slope due W of Bull Run Reservoir, limestone rock outcrops, 6000 ft, 16 Jul 1984, *Tiehm 9050* (BRY, CAS, ID! image!, NY, RSA, TEX). Eureka Co.: Fish Creek Range, Prospect Peak area SSW of Eureka, 1 road mi S of the peak, 8800 ft, with *Artemisia* on open gravel slopes, forming large clumps, 20 Jul 1988, *Tiehm 11844* (BRY, CAS, DES image!, ID! image, KANU image!, MO!, NY!, RM-Fig. 240, RSA, SRP image!, TEX!, UNLV, WTU). Utah. Beaver Co.: Tushar Mts, Beaver Canyon, oak-pinyon-juniper, rocky S-facing slope, 6400 ft, 29 Jun 1984, *Taye 2442* (UT). Emery Co.: NW of Huntington, Manti-La Sal Natl Forest, along State Rte 31, Bull Pasture Trail, narrow canyon with Huntington Creek on S side of hwy, N side an open slope with scattered Douglas fir, spruce, juniper, *Cercocarpus*, ca. 6000 ft, 21 Jul 2004, *Estes et al. 6616* (APSC). Garfield Co.: Escalante, sagebrush, 6700 ft, 8 Jun 1936, *Beck & Tanner s.n.* (BRY); Bryce Canyon Natl Park, Swamp Canyon bottom, sandy soil, 7340 ft, 17 Jul 1986, *Gottschalk s.n.* (UTC); between Torrey and Boulder near Hwy 12 summit, spruce-fir, 9200 ft, 20 Jun 1992, *Higgins 18885* (BRY); Hog Spring Ranch area, Dixie NF, ponderosa pine, igneous, bouldery soil, 8300 ft, 17 Jul 2006, *Madsen 3068* (BRY); Cons Hole at head of S Fork Oak Creek, Navajo sandstone, ponderosa pine-manzanita, 7700 ft, 12 Jun 2012, *Madsen 6007* (BRY); Paunsaugunt Plateau, Dixie Natl Forest, Johnson Ranch, ca. 7800 ft, 14 Jul 2014, *Madsen 6964* (OBI). Iron Co.: N side of Pine Valley Mts, vic. of Grant Ranch along Little Pinto Creek, 16 Jul 1973, *Atwood 5432* (BRY); Cedar Mtn, Ashdown Gorge Wilderness Area, ca 12.5 mi E of Cedar City,

terrace along perennial stream, spruce-fir, 7900 ft, 18 Aug 2009, *Fertig 25106* (BRY); Kolob Rd, 5 mi S of Cedar Canyon, open meadow with aspen, 8500 ft, 18 Aug 1977, *Foster 5335* (BRY). Kane Co.: Mt. Carmel, 14 Aug 1930, *Fuller s.n.* (MO); SC Vermilion, 4 mi N of Glendale, chippy shale, wet meadow community, 6600 ft, 17 Aug 1977, *Higgins 10922* (ASU, BRY, NY); top of the Pink Cliffs, ENE of the Straight Canyon trailhead, limber pine-ponderosa pine, 8700 ft, 23 Aug 2005, *Madsen 2650* (BRY, NY); 15 mi W of Orderville, left fork of Virgin River headwaters, yellow pine, 6600 ft, *Maguire 18858* (NY, WTU); Checkerboard Mesa, Navajo sandstone, 5 Jun 1984, *Neese et al. 15719* (BRY); E Fork Sevier River, spruce-fir, 8600 ft, 5 Aug 1976, *Welsh et al. 14317* (BRY). Millard Co.: Along Horseflat Canyon Creek, 5.8 mi SE of Kanosh and 1.8 mi S of Corn Creek Campground, just S of Second Creek, gravelly soil, open sagebrush slope and oakbrush community, 2000 m, 24 Jul 1991, *Atwood 15934* (ID-2 sheets); Canyon Mts, Eightmile Creek, 11.5 mi from Scipio, canyon bottom, 6800 ft, 13 Aug 1980, *Goodrich 14941* (BRY); Canyon Mts, Oak Creek near Oak Creek Campground and Guard Station, 4.2 mi SE of Oak City, quartzite outcrop with Gambel oak, 6300 ft, 7 Aug 1981, *Goodrich 16084* (ID-2 sheets, UT); Pavant Mts, Mine Camp Peak, aspens, 10,200 ft, 20 Sep 1980, *Greenwood s.n.* (BRY). Washington Co.: Zion Natl Park, West Rim between Potato Hollow and ranger cabin, telephone line trail, ca 7200 ft, 13 Jul 1949, *Bailey 3639* (UC); Zion Natl Park, Hidden Canyon Trail, 5 Jun 1940, *Braem 898* (DS); Zion Natl Park, E side of Spendlove Knoll, 25 Jun 1937, *Cockett 109* (UC); Pine Valley Mts, *Cercocarpus*-ponderosa pine, 8560 ft, 2 Aug 1968, *Gentry 2239* (WTU); Pine Valley Campground, sagebrush, 29 Aug 1937, *Gierisch 570* (WTU); Forest Camp, 3 mi E of Pine Valley, 7000 ft, *Artemisia tridentata* assoc. on dry slopes, 28 Jul 1942, *Gould 1950* (CAS, DS, NY, PH, UC) and 30 Aug 1942, *Gould 2066* (DS, NY, UC); Pine Creek, just N of Enterprise Reservoir, sagebrush-willow-rabbitbrush, 2000 m, 15 Aug 1985, *Higgins 16040* (BRY); Pine Valley Mts, Left Fork Santa Clara River, dry, rocky slope, 7200 ft, 13 Jul 1941, *Munz 16941* (POM, WS, WTU); Zion Natl. Park, Zion Canyon, 1-3 Aug 1925, *Pilbry s.n.* (PH); hillside above Kolob Canyon overlook, pine-juniper, 6500 ft, 16 Jun 1987, *Thorne 5348* (BRY, RSA); Zion Natl. Park, W Rim Trail, slickrock area above Refrigerator Canyon, sandy sites, 6000 ft, 7 Aug 1987, *Thorne & Chandler 5568* (BRY, NY, RM); ZNP, Church Mesa, 2.0 air mi E of Zion Lodge, S of Phantom Valley, near head of Coal Pits Wash, ponderosa pine, manzanita, 7250-7395 ft, 18 Jul 1988, *Thorne 6413* (BRY, RM); Pine Valley Mts, Pine Valley Recreation Area, riparian, 6800 ft, 22 Jul 1986, *Warrick 2601* (BRY, RM).

Variant (*Heterotheca fulciens* x *polothrix*?): **Arizona.** Coconino Co.: San Francisco Mts, 3 Nov 1880, *Greene s.n.* (POM). Stems and leaves hirsutulous and densely glandular; capitular bracts narrow; habit and aspect like *H. cinerascens*. Similar plants also are encountered in Washington Co., Utah.

**44. HETEROTHECA MARCBAKERI** Nesom, **sp. nov.** **TYPE:** **Arizona.** Yavapai Co.: [Apache Creek Wilderness Area], Apache Creek, 4.5 km W of Bald Mountain [Round Hill], N38 61 050 E3 26 250; T17N R6W NE1/4 NW1/4 section 9, granite boulders along creek, 5490 ft, with *Juniperus deppeana*, *Agave parryi*, *Juglans major*, *Rhamnus crocea*, *Arctostaphylos pungens*, *Cercocarpus montanus*, *Echinocereus coccineus*, *Opuntia engelmannii*, *Vitis arizonica*, *Artemisia ludoviciana*, *Eriogonum wrightii*, *Glandularia gooddingii*, *Hedeoma oblongifolia*, *Rosa woodsii*, and *Schoenocrambe linearifolia*; perennial herb with several dark green shoots rooted in cracks of boulders, 27 Aug 1992, *M.A. Baker 10080* (holotype: ASU; isotypes: OBI-2 sheets).

Distinctive in its woody taproot and short, scale-leaved basal offsets, congested and relatively even-sized, elliptic-oblong, sessile cauline leaves, lack of capitular bracts, minutely glandular stems and leaves, and evenly strigose, eglandular phyllaries. Different from *H. fulciens* in its apparently lack of elongate rhizomes, lack of capitular bracts, and eciliate phyllaries. Not similar to any other Arizona species. Known only from the type collection.



Figure 241. *Heterotheca marchbakeri*. Holotype (ASU).



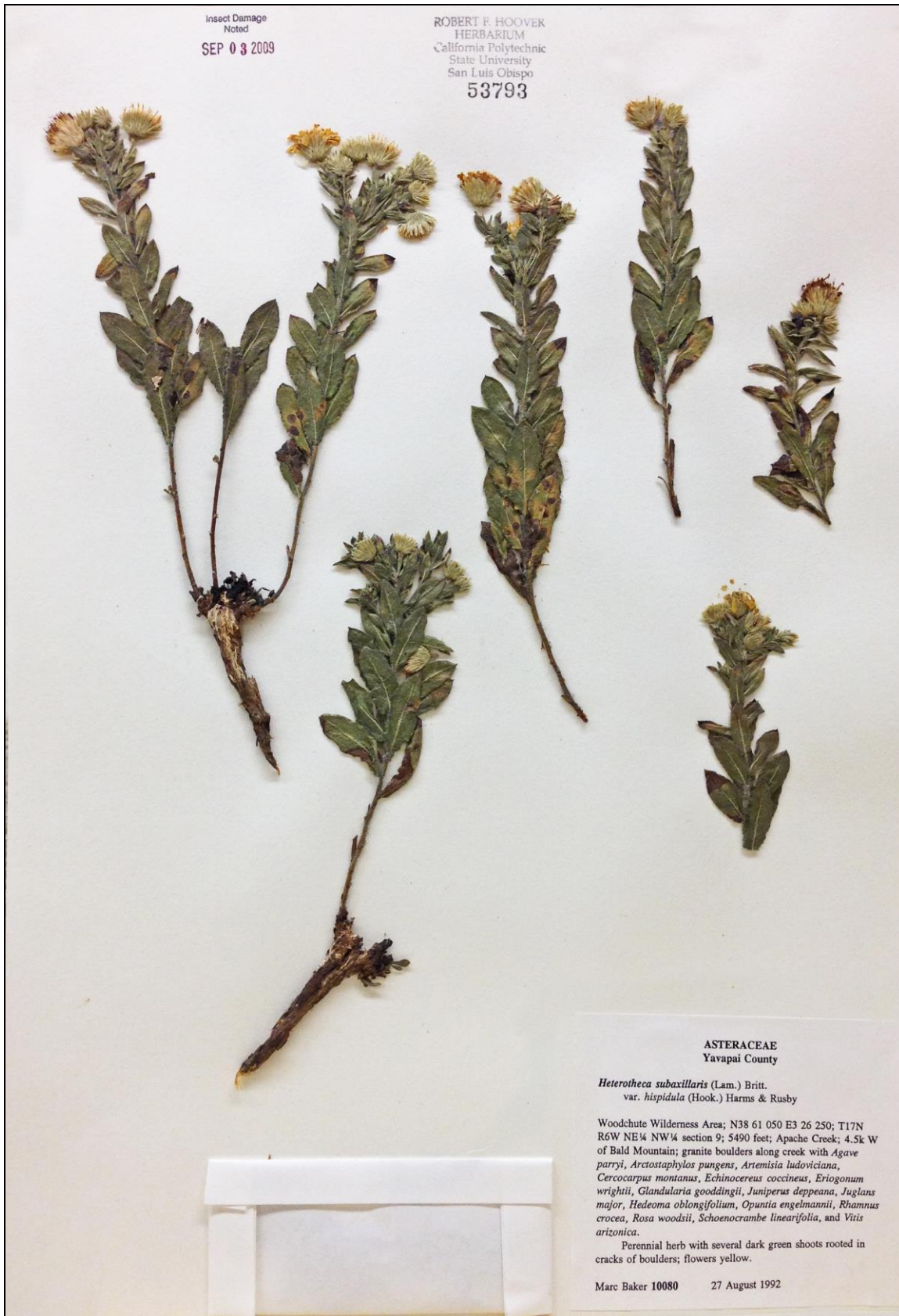


Figure 242. *Heterotheca marcakeri*. Isotype (OBI 53793).



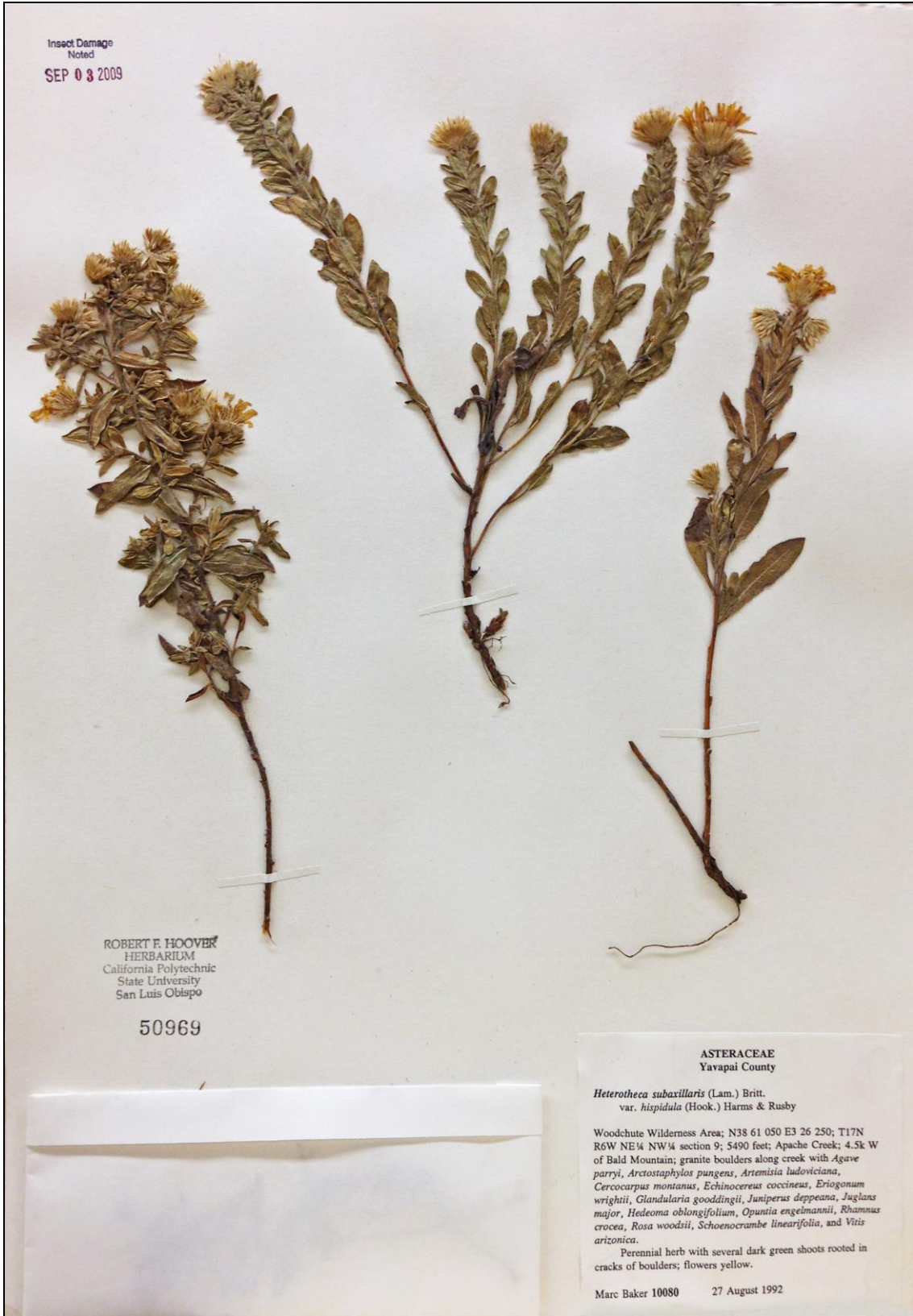


Figure 243. *Heterotheca marcakeri*. Isotype (OBI 50969).



Figure 244. *Heterotheca marcbakeri*. Left, isotype (OBI 53793). Right, holotype (ASU).



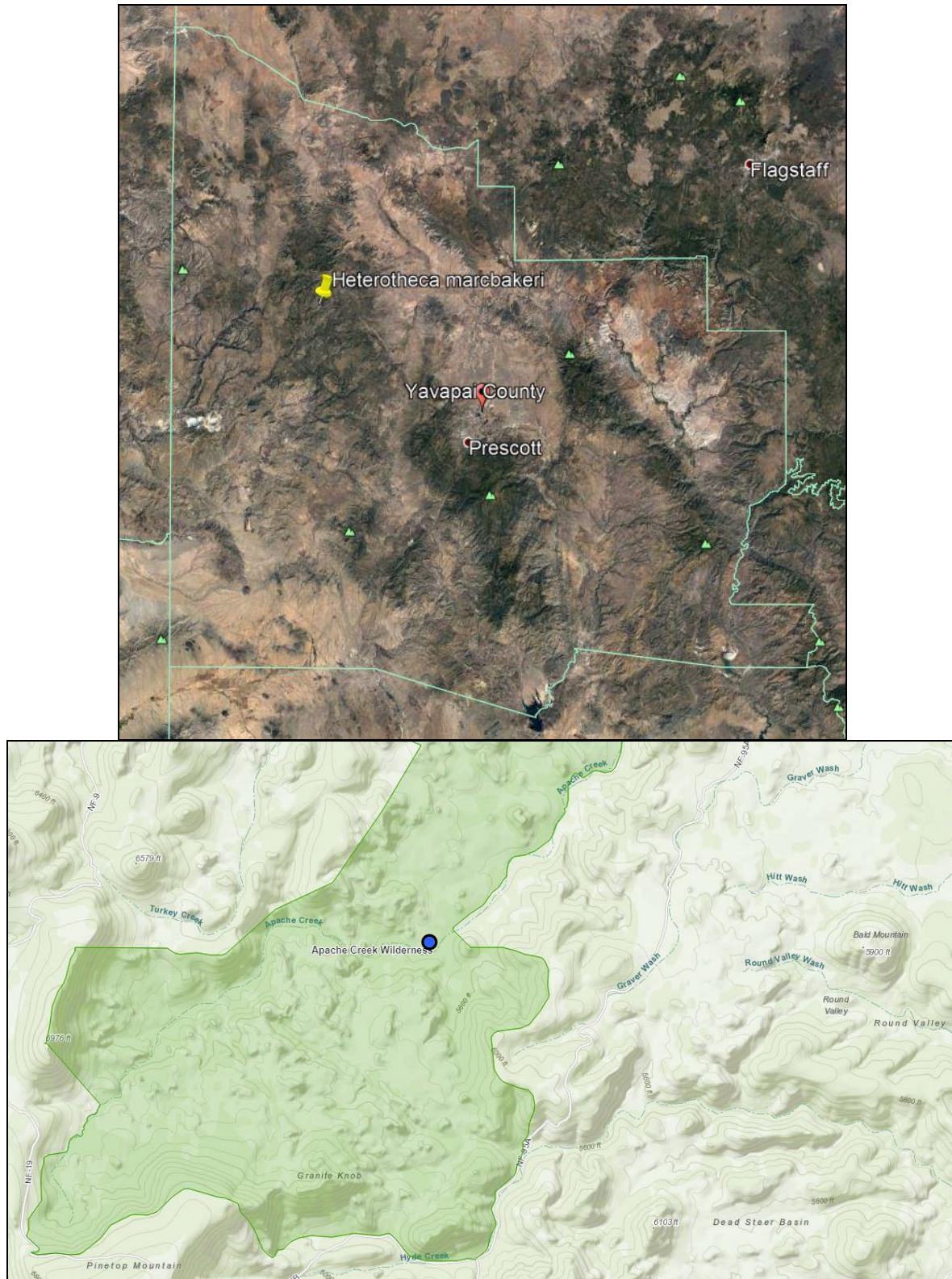


Figure 245. Distribution of *Heterotheca marcbakeri*. Above, location within Yavapai County, in the Santa Maria Mountains. Below, location along Apache Creek in the Apache Creek Wilderness, within Prescott National Forest. Bald Mountain, referred to in the label data, is at right-center. Google Earth and Google Maps.

Plants perennial from a woody taproot and short, scale-leaved basal offsets. **Stems** erect, 20–35 cm tall, unbranched or branched, hirsute, minutely glandular. **Leaves** elliptic to elliptic-oblong, elliptic-lanceolate, elliptic-oblong, mostly 10–35(–40) mm long, sessile, base rounded to attenuate, cauline spreading to ascending, relatively even-sized or slightly decreasing distally, basal deciduous by flowering, surfaces hirsute to hirsute-strigose, minutely sessile-glandular. **Heads** mostly in short-pedunculate clusters, without immediately subtending capitular bracts; involucre 11–15 mm wide; phyllaries eciliate, with broad scarious margins, surfaces strigose, eglandular. Rays 18–24.

The new species probably is most closely related to *Heterotheca fulciens*, based on similarities in geography and morphology. Both produce rhizomes and/or basal offsets (offsets of *H. marcbakeri* are very short), leaves of similar shape and distribution, and relatively compact clusters of heads. Lack of capitular bracts is diagnostic of *H. marcbakeri*, and its heads are larger with more rays (involucre 11–15 mm wide, rays 18–24 vs. 6–9(–10) mm wide, 8–16 (–20)).

During study at ASU in 2015, I left the holotype sheet of *Heterotheca marcbakeri* unidentified because of its unusual morphology — the more recently encountered OBI duplicates indicate that the morphology is constant within the population and that the plants represent a distinct evolutionary entity.

The label for the type collection says "Woodchute Wilderness Area" but the other locality data, including geographic coordinates and township data, place it in the Apache Creek Wilderness (see Fig. 245) in the Santa Maria Mountains of northwestern Yavapai County. The only vascular plant collections from the Santa Maria Mountains (fide Seinet) apparently have been made by Marc Baker (in 1992 and 1998), and no other collections of *Heterotheca* have been made from there. The Apache Creek locality is at the edge of the range of *H. fulciens* — the collection of *H. fulciens* from the Mohon Mountains of southern Mohave County (*Butterwick 5098a*, ASU) is of typical morphology. Field work is necessary to see if the putative differences are consistent in a larger sample.

**45. HETEROTHECA MARGINATA** Semple, Rev. *Heterotheca Phyllothea*, 83. 1996. **TYPE: Arizona.** Maricopa Co.: Superstition Mts., Apache Trail (AZ-88), 1.8 mi E of Tortilla Flats, 16 Oct 1993, *J.C. Semple 10384* (holotype: WAT; isotypes: ASU!, MO! image!, NY image!, UC!, US image!). Semple (1996) cited isotypes also at ARIZ, RM, and TEX.

*Heterotheca marginata* is morphologically distinctive and endemic to Gila, Maricopa, Pinal, and Yavapai counties and known from numerous collections. The species is characterized by relatively tall stems mostly erect from the base with hirsute, variably glandular vestiture, stiff, oblong-lanceolate leaves with densely hirsute surfaces, and long-ciliate margins of distal leaves and peduncular bracts (whence the epithet). Heads are on short, leafy-bracteate peduncles, compactly clustered distally and sometimes produced singly below on short, axillary, leafy-bracteate peduncles. Heads usually are subtended by short, linear to linear-lanceolate capitular bracts. Semple (1996) noted that both diploids and tetraploids occur within *H. marginata*.

Identifications and range delimitation here of *Heterotheca marginata* essentially agree with those of Semple. A collection from Gila County (S of Globe, *Semple 9029*, ASU) is identified by Semple as "aff. *marginata*" but I have identified it as *H. arizonica*. *Solomon 360* from Pinal County has unusually glandular leaf surfaces but it has coarsely ciliate margins and the aspect of *H. marginata*. Collections cited here from ARIZ were seen as images; all of those have been identified by Semple as *H. marginata*.



**Additional collections examined. Arizona.** Gila Co.: Along trail from 288 ca. 1 mi, 33.76, -110.97, 20 Oct 2007, *Farrugia 1561* (OBI); Pinal Mts, S of Globe, W side of Signal Peak off FS Rd 651, riparian, cutting through oak-pine, 6600 ft, 29 Jun 1980, *Forbes 1353* (NY); Sierra Ancha Mts, Parker Creek drainage, Natural Drainages Experimental Area, dry exposed ledges, 4700 ft, 25 Aug 1946, *Gould 3729* (LL, TEX, UC); Parker Creek Cañon, mtn mahogany, chaparral, 5400 ft, 17 Oct 1934, *Johnson J-30* (RM); Pinal Mts, 3.3 mi N of Pioneer Pass Rec. Area, chaparral-ponderosa pine transition, 24 Aug 1968, *Keil 3609* (OBI); Sierra Ancha, chaparral, 4500 ft, 8 Oct 1958, *Pase 1042* (RM); 21.4 km S of US 70, S of Globe, exposed road embankment, loose sandstone, 4 Oct 1987, *Semple & Chmielewski 9029* (MO). Maricopa Co.: Along road at Congress Junction, 24 Sep 1935, *Cutek & Christ 157* (MO); Fish Creek, Apache Trail, 29 Oct 1928, *Eastwood 15924* (CAS, LL, NY); 6 mi E of Tortilla Flat on Hwy 88, sandy soil, 2500 ft, 1 Oct 1986, *Landrum 5299* (ASU, NY); Tonto National Forest, ca. 3.3 mi W of Tortilla Flat near milepost 210 on Hwy 88 (Apache Trail), Canyon Lake, base of steep rocky N-facing slope, 1700 ft, 6 Oct 1997, *Landrum 9123* (ASU, NY); near Horse Mesa Dam, 2000 ft, 19 May 1935, *Peebles 11670* (ARIZ, LL); 3.2 mi on AZ-88, SW of bridge, E of Aracia, picnic site, 7.4 mi W of Tortilla Flats, 16 Oct 1993, *Semple 10383* (ASU, MO); Apache Trail (AZ-88), 1.8 mi E of Tortilla Flats, Superstition Mountains, 16 Oct 1993, *Semple 10384* (ASU); Apache Trail (Ariz Hwy 88) 2.8 mi E of Tortilla Flats, roadside, 16 Oct 1993, *Semple 10385* (UC); Apache Trail (AZ-88), 2.7 km E of Tortilla Flats, octotillo, desert 30 Sep 1995, *Semple 10499* (ASU). Pinal Co.: Devil's Canyon, 26 Sep 1926, *Fulton & Harrison 3102* (ARIZ); Apache Gap, Apache Trail, 2800 ft, 11 Oct 1931, *Gillespie 8540* (DS, UC); Superior-Miami hwy, upper tributaries of Queen Creek, 4500 ft, 23 Oct 1931, *Gillespie 8635.5* (DS, UC); above Superior, 12 Jun 1926, *Harrison 2093* (LL); Devil's Canyon near Superior, 12 Oct 1929, *Harrison & Kearney 6309* (NY) and *6315* (ARIZ, LL); Martinez Canyon, NE of North Butte, north of Gila River, 23 Jun 1982, *Mittleman 14* (ARIZ); Devil's Canyon near Superior, 10 Oct 1926, *Peebles, Harrison, & Kearney 3192* (LL); Devil's Canyon, 4 Oct 1927, *Peebles & Harrison 4904* (ARIZ, LL); Tonto Natl Forest, Superstition Wilderness Area, Heiroglyphic Spring, 2 mi N of Hwy 60 at Gold Canyon Ranch turnoff, 2400 ft, 12 Oct 1991, *Rice 856* (OBI); Tonto National Forest, Superstition Wilderness Area, Miles Ranch trailhead, Forest Rd. 287, ca 12 mi from Hwy 60 to Red Rock Spring trailhead, oak-chaparral upland along perennial stream, 4400 ft, 20 Oct 1991, *Rice 890* (ASU); 3 mi E of jct US Hwy 80 and old Mesa Road, ca. 670 m, 17 Dec 1972, *Solomon 360* (MO). Yavapai Co.: along road from Prescott to Ash Fork, 18 Nov 1928, *Eastwood 16765a* (LL).



Figure 246. *Heterotheca marginata*, Maricopa Co., Arizona. Isotype (ASU).



Figure 247. *Heterotheca marginata*, Maricopa Co., Arizona. Landrum 5299 (ASU). Leaf and bract margins not as densely ciliate as in the isotype.

**46. HETEROTHECA ARIZONICA** (Semple) Nesom, J. Bot. Res. Inst. Texas 1: 27. 2007. *Heterotheca fulcrata* var. *arizonica* Semple, Brittonia 39: 380. 1987. **TYPE: Arizona.** Gila Co.: 0.3 km NW of East Verde River, Ariz. Hwy 87, NW of Payson, 13 Sep 1985, J.C. Semple & S. Heard 7923 (holotype: NY digital image!; isotypes: ASU!, MO! digital image!, US, WAT).

Recognized by its consistently produced capitular bracts, small, basally attenuate, closely spaced leaves, the leaves and bracts with surfaces densely sessile-glandular and margins evenly ciliate with short, thickened hairs. Stems, leaves, and bracts usually are distinctly green because of the reduced nonglandular vestiture.

Caespitose from a woody taproot; stems and leaves densely and prominently sessile-glandular to short stipitate-glandular, essentially green-colored because of the sparse, hirsutulous vestiture of nonglandular hairs. **Stems** ascending, (10–)15–40 cm high. **Leaves:** cauline elliptic to elliptic-ob lanceolate or elliptic-lanceolate with an attenuate base, mostly 5–20 mm long and 1–5 mm wide, usually relatively even-sized, spreading or ascending, often with only the midvein visible and distinctly thickened and raised on abaxial surface, often with a thick-indurate, sharp-pointed, often recurving terminal mucro, margins evenly ciliate with short, thickened hairs. **Heads** solitary or on peduncles as short as 5 mm and distinctly clustered, usually immediately subtended by small, linear to narrowly oblanceolate capitular bracts, bract margins coarsely ciliate with thick-based hairs. **Involucres** 6–10 mm wide, 6–8 mm high; phyllaries glabrous to sparsely strigose, sometimes minutely sessile-glandular distally. **Ray flowers** 8–16(–20). **Chromosome numbers**,  $2n=18$  (Semple 10498, Semple & Chmielewski 9028, Semple & Heard 8003, Semple & Heard 8004),  $2n=36$  (Semple & Chmielewski 9016).

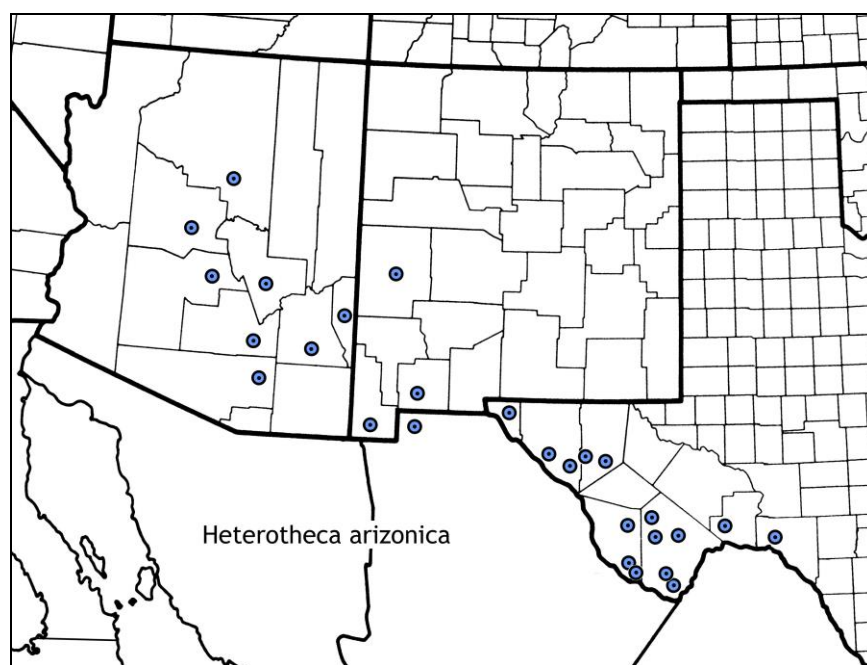


Figure 248. Distribution of *Heterotheca arizonica*.

In Arizona *Heterotheca arizonica* is sympatric with *H. fulciens* and with *H. marginata*. In the Chisos Mountains of Brewster Co., Texas, it apparently is uncommon — several collections show it growing there sympatrically with *H. chisosensis*: Young in 1915 collected both species at "Nail place," and Warnock 1139 from the "wall of Casa Grande" has 3 branches of *H. chisosensis* and 3 of *H. arizonica* mounted on the same sheet. Other Chisos Mountains collections of *H. arizonica* were made by Mueller in 1931 and Warnock in 1941. It seems likely that *H. arizonica* grows in Mexico along the USA border.



Across the geographic range of *Heterotheca arizonica*, non-glandular stem vestiture is consistently spreading (slightly deflexed or up-flexed) to nearly absent, but in Culberson, Presidio, Terrell, Val Verde, and Brewster cos., Texas (e.g., in Brewster Co., *Cory* 44980, *Shinners* 8693, *Sundberg* 1226, and *Tharp s.n.* in 1931), it sometimes is antrorsely appressed. This perhaps reflects genetic influence of local variants of *H. fulcrata*, but (as noted above) typical *H. arizonica* and *H. fulcrata* growing sympatrically have been collected in the Chisos Mountains.

**Representative collections examined. MEXICO. Chihuahua.** Sierra de Moscos, *Chiang et al.* 8711A (TEX). **USA. Arizona. Coconino Co.:** Walnut Canyon, 16 Oct 1937, *Ramsey* 2844 (POM). **Gila Co.:** Miami, granite rock mesa, 3 Sep 1937, *Gentry* 3168 (CAS, RSA); Pinal Mountains, ca. 10.2 mi S of entrance to Tonto National Forest from Claypool on FR 55, then FR 651, ca. 2.6 mi N of Trail head 193, 2.3 mi W of trailhead 198, 6874 ft, 2 Nov 2003, *Gutierrez* 439 (ASU); Sierra Ancha Wilderness Area, Tonto National Forest; on top of Aztec Peak E of lookout tower, *Pinus ponderosa*, *Quercus gambelii*, *Pseudotsuga menziesii*, 7700 ft, 6 Sep 1991, *Imdorf* 132 (ASU); Tonto National Forest, ca 3 mi S of Pleasant Valley, 1/2 mi S of junction of FR 915 and FR 637, above Fourmile Canyon, open woodland, young granitic hills, 5621 ft, 1 Sep 2004, *Makings* 1773 (ASU); Winkelman, desert with *Opuntia*, 27 May 1977, *Pinkava P-13817* (ASU); 7.0 km E of Superior on US Hwy 60, roadside and rocks, 30 Sep 1995, *Semple* 10498 (MO); 4.1 km SW of Seneca on Hwy 60, red sandstone outcrop, 3 Oct 1987, *Semple & Chmielewski* 9028, 2n=18 (ASU, MO); Ariz Hwy 77, 21.4 km S of US-70, S of Globe, exposed road embankment, loose sandstone, 4 Oct 1987, *Semple* 9029, 2n=9II (ASU); US Hwy 60, rocks above Salt River, E of bridge, rocks and sandy soil just above river, 29 Sep 1995, *Semple* 10497, 2n=9II (ASU). **Graham Co.:** Pinaleno Mountains, Van Gausig Mountain, 1.5 mi W of AZ Hwy 6661, desert grassland on decomposed granite, 4700 ft, Jun 1976, *Bingham* 2256 (ASU); Santa Teresa Mountains, BLM Wilderness, Jackson Mountain, E fork of Beauchamp Canyon, desert grassland, riparian, among rocks in narrow canyon, 4100 ft, decumbent perennial, 14 Aug 1998, *Buegge* 487 (ASU); eastern foothills of Galiuro Mountains, ca 3.5 mi from end of High Springs Rd and on foot into hills, oak-pinyon pine-juniper woodland with grassy areas and patches of manzanita-dominated chaparral, on rocky slopes in full sun, 30 Sep 1989, *Keil* 21263 (ASU). **Greenlee Co.:** Clifton, 1 Nov 1899, *Davidson s.n.* (RSA, UC); Clifton, 24 Oct 1940, *Goodding* 85-40 (ASU); 2 mi N of Clifton, *Prosopis-Acacia-Senecio*, 6 Jun 1935, *Maguire* 11821 (BRY, NY); Eagle Creek above confluence with Gila River, upstream from pump station, Vertical conglomerate canyon walls, 6 Sep 1998, *McGill* 7007 (ASU); N of Clifton on US Hwy 666, S of Morenci, roadcut through alluvial deposits, 18 Sep 1985, *Semple & Heard* 8003, 2n=9II (ASU, MO); N of Clifton on US Hwy 666, 1 mi N of Morenci Rd, rock cuts and mine tailings, 18 Sep 1985, *Semple & Heard* 8004, 2n=9II (ASU, BRIT, MO, UC); S of Coronado Mountain, NW of Morenci, W of Coronado Gulch, ridgeline, 6830 ft, locally abundant perennial with dark green leaves, 13 Oct 1994, *Wright* 1308 (ASU). **Maricopa Co.:** Apache Lake, rocky hills, 5 Oct 1938, *Gentry* 3982 (RSA); Tonto National Forest, ca. 6.0 mi NE of Lost Dutchman State Park on Apache Trail at Canyon Lake Overlook, 1875 ft, 18 Jan 2004, *Gutierrez* 504 (ASU); Four Peaks Wilderness, Cane Spring Canyon between Hidden Water Spring and Cottonwood Creek, permanent water, 1800 ft, 5 Apr 1989, *Jones* 838 (ASU). **Navajo Co.:** grassland hike on roadside bluff, [W of Ariz Hwy 288 SW of Aztec Peak], 20 Oct 2007, *Farruggia* 1601 (ASU). **Pima Co.:** Santa Catalina Mts, Redington Pass, 2 Oct 1939, *Benson* 9753 (POM); Tortolita Mountains, Rail X Ranch Rd access, semi-desert grassland, 4018 ft, sprawling perennial, 11 Sep 2013, *Lindley* 271 (ASU). **Pinal Co.:** Superstition Mts, S slopes, 18 Oct 1931, 4000 ft, *Gillespie* 8614 (DS); Santa Catalina Mountains, Redington Pass, upper edge of the Lower Southern Desert, 4400 ft, 5 Oct 1938, *Glendenning* 85 (ASU); Sierra Ancha, Aztec Peak, pine clearing, gravel, 7700 ft, 24 Aug 1958, *Johnson s.n.* (ASU); Tonto National Forest, Arnett Creek, turnoff about 4 mi S of Superior, riparian, seasonally dry, cottonwood-willow dominants, common in riparian-uplands transition among rocks, 2957 ft, 4 Oct 2005, *Makings* 2235 (ASU); Oak Flats Recreation Area, near Globe, 3500 ft, 23 Oct 1952, *McCleary s.n.* (ASU); Superstition Wilderness Area, Tonto National Forest, Boulder Canyon trailhead, across from the Canyon Lake, *Juniperus deppeana*, *Pinus edulis*, *Platanus wrightii*, *Quercus emoryi*, common upland perennial, 5000 ft, 14 Sep 1991, *Rice* 727 (ASU); US Hwy 60, 7.0 km E of Superior, roadsides and rocks, 30 Sep 1995, *Semple* 10498, 2n=9II (ASU); Pinal Mts near Craig Ranch, dry slope, 5200 ft, 14 Sep 1935, *Shreve* 7464 (WTU). **Yavapai Co.:** 0.6 mi E of jct 89/89A, NE of Prescott at Granite Creek, granite outcrop, pine-

oak, 5200 ft, 5 Sep 1991, *Atwood 17024* (NY); road from Prescott to Ash Fork, 8 Nov 1928, *Eastwood 16765a* (CAS); Mescal Mts, 24 May 1890, *Jones s.n.* (POM); US Hwy 89, NE of Prescott, MP-317, crevices of large, locally abundant rock outcrops, 2 Oct 1987, *Semple 8999*, 2n=18 (ASU, NY). **New Mexico.** Catron Co.: SE edge of Plains of San Augustin, 14 mi SW of Horse Springs, vic. of Bat Cave, 16 Jul 1948, *Smith 87* (PH). Hidalgo Co.: E of Hachita, roadside, 14 Jun 1948, *Dittmer s.n.* (UNM digital image!); Little Hatchet Pass, 24 Aug 1970, *Turner & Powell 6092* (TEX, UC); Little Hatchet Mts, small limestone hills just W of Granite Pass, W end has igneous outcrops and cliffs, 4600–4800 ft, 18 Oct 1997, *Worthington 27328* (TEX, UNM digital image!). Luna Co.: Florida Mts, stream bed, 22 Jun 1957, *Jackson 2466-2* (UNM digital image!); Florida Mts, steep canyon on NW side of range, igneous, ca. 6000 ft, 12 May 1984, *Worthington 11932* (NMC, NY, TEX). **Texas.** Brewster Co.: Pena Blanca Mts [ca. 9 mi SE of Marathon], ca. 6 mi E of Hwy 385, in and around rock dikes in low mtns, 30 Sep 1962, *Correll 26104* (LL, SMU); S end of Del Norte Mts, limestone ridges, 6 Sep 1947, *Hinckley 4106* (NY); top of Elephant Mesa on Nevill Ranch, ca. 35 mi S of Alpine, dark volcanic rock, ca. 6100 ft, 20 Jun 1961, *Johnston 6424* (LL); 18 mi S of Alpine, hill near roadside park, 24 Aug 1976, *Kolle 1380* (TEX); Turtle Mtn., just W of the Corazones Peaks [70 mi S of Alpine, slightly NW of Big Bend NP], N of the Christmas Mts, 13 Aug 2017, *Ohl 122* (SRSC image!); 5 mi SW of Marathon, limestone slopes, 2 Aug 1946, *Shinners 8693* (SMU); 1 mi S of Terlingua, rock crevices, 21 Jul [no year], *Solbrig 3193*, 2n = 18 (NY); ca. 20 mi S of Marathon along Hwy 385, novaculite hillside, 17 Sep 2002, *Turner 22-239* (TEX); 3.3 mi S of Marathon along Hwy 385 from the Southern Pacific RR tracks, roadside cut in rocky chert (Caballo novaculite), 17 Jun 2003, *Turner 23-144* (TEX); wall of Casa Grande, 7000 ft, 15 Jun 1937, *Warnock 1139* (TEX–3 branches of *H. chisosensis* and 3 branches of *H. arizonica*); along Hwy 18 mi S of Alpine, frequent in igneous hills, 4300 ft, 26 Jul 1947, *Warnock 6616* (LL, SMU); [Chisos Mts, Big Bend Natl Park], Goat Mountain, 5 Aug 1941, *Warnock 20985* (BRIT); Chisos Mts, Nail place, dry slopes, 7 Aug 1915, *Young s.n.* (TEX). El Paso Co.: Hueco Tanks, rock crevices, 4000 ft, 17 Sep 1948, *Hinckley 4588* (NY); Hueco Tanks State Park, 15 Sep 1987, *Peterson 1147* (TEX); Hueco Tanks State Park, S end of boulders, 12 Jul 1976, *Powell 2996* (LL); Hueco Tanks State Park, 1 Nov 1973, *Riskind 1615* (BRIT, LL); Franklin Mts, McKelligan Canyon, 4 Nov 1942, *Shiner 40920* (TEX); vicinity of El Paso, 1941, *Stearns 154* (NY); SE side of North Mountain, 20 Aug 1977, *Van Devender s.n.* (TEX); near Hueco Tanks, cracks in granite cliffs, 20 Aug 1946, *Waterfall 6640* (NY) and *6640a* (NY); Franklin Mts, 0.5 mi SE of the top North Franklin Mountain, Ash Canyon Spring, 5700 ft, 20 Aug 1978, *Worthington 3194* — with large leaves, numerous heads, densely glandular stems and leaves, perhaps x *H. fulcrata* (TEX); Hueco Mts, Hueco Tanks State Park, N side of North Mtn, 4550 ft, 11 Aug 1979, *Worthington 4922* (BRIT). Presidio Co.: S side of Chinati Peak, crevices of igneous rock ledges, ca. 6900 ft, 7 Jun 1977, *Butterwick & Lott 3786* (TEX); Marfa, San Esteban Lake [10 mi S of Marfa], Jul 1936, *Hinckley s.n.* (TEX–2 sheets); just below San Esteban Lake, 12 mi S of Marfa, frequent on rocks, ca. 1300 m, Jul 1936, *Hinckley 698* (NY–2 sheets); Tierra Vieja Mts, near Vieja, clumps at edge of rimrock, 1950 m, 14 Aug 1941, *Hinckley 2085* (NY); upper Pinto Canyon on Watts ranch, 40 mi SW of Marfa, hanging from cliff crevices, ca. 5200 ft, 8 Jul 1942, *Hinckley 2538* (NY–2 sheets); head of canyon above Watts ranch house, on big boulders, 27 Aug 1943, *Hinckley 2846* (NY); Capito [Capote] Peak, 30 Aug 1944, *Hinckley 3245* (NY); branch of Cibolo Canyon (Chinati Mts), ca. 5 mi E of Russell Menzies ranch house, canyon walls, 4300 ft, 10 Aug 1947, *Hinckley 3971* (SMU); Big Bend Ranch State Park, Lower Monilla Canyon, 2690 ft, 13 Oct 2015, *Morey 297* (SRSC image!); top of Chinati Peak, common on bluffs, 21 Jul 1945, *Muller 8333* (LL, SMU). Terrell Co.: Route 41, 30 Aug 1946, *Albers 46172* (TEX); ca. 3 mi S of Sanderson, N-facing limestone bluffs, 13 Jun 1969, *Sikes 418* (TEX). Val Verde Co.: NW side of Pecos River, cliffs, 31 Oct 1966, *Correll 34054* (LL); Seminole Canyon State Historical Park, canyon rim overlooking confluence of Seminole and Presa Canyons, rock ledges and cliffs, 22 Nov 1987, *Labus 36* (TEX); ca. 7 mi ESE of Langtry, around edge of old RR tunnel near ruins of Vinagaroon, 7 Oct 1978, *Poole 1574* (LL, NY, VDB); Amistad Natl Rec. Area, Pecos River picnic area and boat launch, disturbed, gravelly (limestone) clay soils at base of massive, W-facing limestone roadcut, 24 May 2002, *Poole 4581* (TEX); Seminole Canyon State Park, limestone ledges and boulders above canyon, 8 Aug 1975, *Snyder 383* (SMU); Pecos River, 14 Jun 1931, *Tharp 8868* (TEX); Scenic Park overlook on Hwy 90, E bank of Pecos River, bare limestone bluffs, 14 Sep 1991, *M. Turner 2* (TEX); mouth of Pecos River, limestone soil in canyon tops, 1000 ft, 10 Aug 1967, *Warnock 22717* (TEX).



Figure 249. *Heterotheca arizonica*, Greenlee Co., Arizona. Maguire 11821 (BRY).





Figure 250. *Heterotheca arizonica*, Brewster Co., Texas. Warnock 6616 (LL).





Figure 251. *Heterotheca arizonica*, Gila Co., Arizona. Jones 659 (ASU).

**47. HETEROTHECA FULCRATA** (Greene) Shinnery, Field & Lab. 19: 71. 1951. *Chrysopsis fulcrata* Greene, Bull. Torrey Bot. Club 25: 19. 1898. **LECTOTYPE** (Shinnery 1951): **New Mexico**. Lincoln Co.: White Mts., near Cherokee Bill's Spring, 6300 ft, 21 Aug 1897, *E.O. Wooton 511* (NDG 53811-Fig. 252; isolectotypes: AC, E, NY-2, P, US).

From among ND-G syntypes *Wooton 510*, *511*, and *512*, Shinnery (1951) selected 511 as the lectotype. Harms (1968a, p. 17) entered a caveat: "This choice causes some confusion since Wooton and Standley (1913, 1915) obviously considered the first cited specimen, *Wooton 510* (NDG 53814-Fig. 253) from the Organ Mountains, as the true type of *C. fulcrata*, and their subsequent descriptions of *C. cryptocephala* and *C. senilis* seem based upon this understanding." *Wooton 512* was cited as a paratype in the protologue of *C. cryptocephala*, but there was never an explicit or formal statement by Wooton and Standley regarding lectotypification of *C. fulcrata*. Semple (1987) stated that "I consider all three Wooton syntype collections to be members of [*Heterotheca fulcrata*] var. *fulcrata* and accept Shinnery's lectotype designation, *Wooton 511* (ND-G)." Semple's 1987 position is affirmed here and Shinnery's choice appears to remain valid, notwithstanding Semple's later citation (1996, pp. 68, 70) and 1995 and 1997 annotations (e.g., NY, US) of 510 as lectotype.

*Chrysopsis senilis* Woot. & Standl., Contr. U.S. Natl. Herb. 16: 179. 1913. *Heterotheca fulcrata* (Greene) Shinnery var. *senilis* (Woot. & Standl.) Semple, Brittonia 39: 380. 1987. **TYPE**: **USA. New Mexico**. Doña Ana Co.: Organ Mts., 4800 ft, 1 Sep 1897, *E.O. Wooton 509* (holotype: US image!; isotypes: MIN, MO!, NDG, NY image!).

**Plants** perennial, taprooted and caespitose from a thick, woody caudex. Stem vestiture 1- or 2-storied, hirsutulous to hirsute or hirsute-villous, less commonly loosely antrorsely strigose, eglandular. Leaves cauline (basal not persistent), oblong or obovate to oblanceolate or nearly spatulate, bases sessile (in blades with attenuate base) to truncate and subauriculate and sometimes subclasping, surfaces hirsute-villous to hirsute or hirsute-strigose, sparsely to densely sessile-glandular at least adaxially. **Heads** solitary or often on short branches in loose clusters of 2–5, peduncles mostly (1–)3–8 cm long, bracteate or ebracteate; capitular bracts 1–3(–4), oblanceolate to elliptic-oblanceolate or linear-oblanceolate, equaling or longer than the involucre. **Involucres** 8–10(–12) mm wide; phyllaries sparsely strigose at least distally to glabrate, sometimes densely strigose, eglandular. **Ray flowers** 12–18. **Chromosome number**  $2n=18$  (Culberson Co., Texas — *Semple & Heard 8170*, *Semple & Heard 8177*).

Flowering Jun–Sep. Open meadows and rocky ground, steep slopes, cliffs and cliff bases, talus, ledges and crevices, desert scrub, pinyon-juniper, pine-oak, ponderosa pine, pine-fir; 4200–8000 ft.

*Heterotheca fulcrata* in the strict sense is characterized by heads on leafy-bracteate peduncles, consistently with leaves and prominent capitular bracts densely long-ciliate (ciliate pustulate-based) at least along on the proximal margins. Semple's concept of the species included a broad morphological and geographical range of plants with capitular bracts. Segregates (presumably) from Semple's concept recognized here at specific rank include (at least in part) *H. arizonica*, *H. hirsuta*, *H. cryptocephala*, *H. fulciens*, *H. nitidula*, *H. paniculata*, and *H. resinolens* — the range of *H. cryptocephala* is at the northern margin of *H. fulcrata* sensu stricto in south-central New Mexico and mostly at higher elevations, while each of the others is allopatric with typical *H. fulcrata*.

Plants of *Heterotheca fulcrata* in the trans-Pecos Texas area, especially in the Chisos Mountains, tend to have antrorsely oriented, loosely strigose stem vestiture and oblanceolate leaves with sessile-attenuate bases, but the variation seems to be continuous with more typical morphology. In northern Coahuila, capitular bracts sometimes are reduced in size or formed slightly below the involucres and marginal cilia are relatively short.



Figure 252. *Heterotheca fulcrata*, Lincoln Co., New Mexico. Lectotype (Wooton 511, NDG).





Figure 253. *Heterotheca fulcrata*, Doña Ana Co., New Mexico. Paratype (Wooton 510, NDG).



Figure 254. *Heterotheca fulcrata*, northern Coahuila, Mexico, Wynd & Mueller 593 (MO).

**Additional (representative) collections examined. MEXICO. Chihuahua.** Sierra de los Hechiceros, Cañón Encampanado, below (E of) Rancho Encampanado and above (W of) jct with Cañón de Indio Felipe, canyon bottom woods with perennial stream, on rock cliffs, 1300-1400 m, 27 Jul 1974, *Wendt & Adamcewicz 425* (LL, MEXU image). **Coahuila.** Mpio. Acuña-Ocampo, Sierra del Carmen, Rancho el Secadero, Cañón Poblano, 2100-2800 m, bosque de *Pinus cembroides*, *Quercus grisea*, *Crataegus greggiana*, *Juniperus flaccida*, *Ungnadia speciosa*, *Fraxinus berlandieri*, 20 Aug 1994, *Carranza 2082* (MO); Mpio. Ocampo, Sierra del Pino, Ejido Acebuches, Cañón La Vaca, bosque disperso de *Pinus arizonica* y *Juniperus flaccida* con *Arbutus xalapensis*, *Quercus intricata*, *Quercus gravesii*, *Quercus glaucooides*, 1850 m, 30 Sep 2005, *Carranza 3974* (MEXU image!); Sierra Jardin, ca. 8500 ft and above, 1 Sep 1966, *Flyr 1158* (SMU); SE of Big Bend Natl Park, S end of Sierra del Carmen, Canyon de Centinella, S side of Pico de Centinella, [date], *Henrickson 11659* (TEX); ca. 54 air mi SE of Big Bend Natl Park, S end of Sierra Maderas del Carmen, Cañón de la Fronteriza, 2 mi NE of Rancho San Isidro at end of Cañón del Alamo, rhyolite area, 1700-2000 m, 6 Aug 1976, *Henrickson 15033* (MEXU image, NY, RSA, TEX, UC); Sierra del Carmen, Canyon Hundido on N side of Pico de Centinela, E of Rancho El Jardin by winding road, steep canyon through igneous sierra, *Quercus* spp., *Pinus* spp., *Acer*, *Tilia*, *Garrya*, *Ceanothus*, *Fendlera*, *Pseudotsuga*, 1500-2250 m, 27 Jul 1973, *Johnston et al. 11818* (MEXU image, TEX); ca. 140 km NW of Muzquiz, Cuesta del Ploma area, ca. 3 road km S along road originating just SE of crest of Hwy 2A, high knob and long, sharply dipping ridge of soft 'rhyolite' atop limestone, juniper-oak-yucca on limestone, ca. 1640 m, uncommon, 4 Jun 1992, *Nesom & Mayfield 7432* (MEXU, TEX); Mpio. Ocampo, Maderas del Carmen Mts, [date], *Riskind et al. 1705* (TEX); Mpio. Villa Acuña, Serranias del Burro, Rancho El Bonito, Cañón El Toro, 18 Sep 1977, *Riskind 2158b* (TEX); Mpio. Ocampo, Sierra del Carmen, Cañón de la Fronteriza, 1520 m, 12 Aug 2004, *Riskind et al. 23880* (TEX); N slope of Pico de Centinela, Sierra del Carmen, Canyon Hundido, 1900 m, 27 Jul 1973, *Riskind 11818* (NY not seen); Sierra del Carmen, 0.25 mi N of Campo Dos along trail to Campo Tres, along stream in moist canyon, mesic forest of *Pinus strobiformis*, *Pseudotsuga*, *Abies coahuilensis*, rhyolitic, 2325 m, common throughout the area, 7 Aug 1974, *Wendt & Adamcewicz 526* (LL, MEXU image); Mpio. Villa Acuña, Sierra del Carmen, Canyon de Sentenela on Hacienda Piedra Blanca, moist stream side, 8 Jul 1936, *Wynd & Mueller 593* (MO, TEX). **Sonora.** Base of San Luis Mts up to 6000 ft, 5 Sep 1893, *Mearns 2080* (CAS); Rio Bavispe region, Cañón Internacional, pine-oak, 23 Aug 1940, *White 3493* (ARIZ image!). **USA. Arizona. Cochise Co.:** Dos Cabezas Mts, Cooper Peak, upper oak woodland, 2130 m, 21 Aug 1976, *Bingham 2534* (ASU photo); Dos Cabezas Mts, Government Peak, NW-slope, granite, with mixed grasses, 11 July 1976, *Bingham 2654* (ASU photo); Bowie, 19 Sep 1884, *Jones 4296* (POM); Chiricahua Mts, Coronado Natl Forest, along Forest Rd 74, ca. 3 mi SE of Rucker Forest Camp, ca. 5800 ft, oak-juniper woodland, locally common on roadside, [small heads], 8 Aug 1992, *Keil 23762* (ASU, OBI); Bisbee, 28-30 Aug 1910, *Pilsbry s.n.* (PH). **Graham Co.:** Eastern foothills of the Galliuero Mts, ca. 3.5 mi from end of High Springs Rd and on foot into hills, oak-pine-juniper, [small heads], 30 Sep 1989, *Keil 21263* (OBI); 0.9 mi below Arcadia campground, oak hillside, 1460 m, 5 Nov 1967, *Lehto 10092* (ASU, OBI, UC); Pinaleno Mts, 0.8 mi above Arcadia campground, pine forest, 5 Nov 1967, *Lehto 10210* (ASU); Graham Mts, below Sawmill, 7-13 Sep 1914, *Thorner & Shreve 7784* (CAS). **Maricopa Co.:** Horse-dam Mesa [Superstition Mountains], 21 May 1929, *Eastwood 17379* (CAS). **Pima Co.:** Coyote Mts, Mendoza Canyon, along canyon bottom 1280 m, 17 Sep 1982, *Mittleman 461* (ASU); E slope of Rincon Mts, at highest point on Happy Valley road, under oaks, 4600 ft, 4 Sep 1946, *Pultz 1923* (CAS). **Santa Cruz Co.:** Santa Rita Mts, Baldy Trail, 7000 ft, 6 Nov 1924, *Bartram s.n.* (PH); Santa Rita Mts, Upper Josephine Canyon, stony slope, 7 Sep 1944, *Clark 12416* (RM); White House [Madera] Canyon, ca. 5100 ft, 2 Sep 1932, *Clausen 580* (DS); Santa Rita Mts, 4500 ft, 24 Aug 1903, *Jones s.n.* (POM); Santa Rita Mts, 7 Oct 1934, *Kearney & Peebles 10570* (DS); southern portion of Santa Rita Mts, 14.8 mi E from Amado along road to Mt. Hopkins (Whipple Observatory), woodland with riparian zone, roadside at canyon bank, pinyon-juniper-oak, 1930 m, 9 Sep 1985, *Keil 19025* (ASU, OBI); Santa Rita Mts, 10-20 Sep 1910, *Pilsbry s.n.* (PH); Madera Canyon, oak-pine woods, 1600 m, 21 Aug 1974, *Reeves R-1037* (ASU); Madera Canyon Trail, 1600 m, 13 Oct 1974, *Reeves R-1806* (ASU). **New Mexico. Doña Ana Co.:** San Andres Mts, Lower Goat Springs, 15 Aug 1950, *Fleetwood s.n.* (UNM digital image!). **Eddy Co.:** Carlsbad Caverns Natl Park, side canyon of West Slaughter Canyon, ca. 1.1 km S, 3.2 km W of jct of West and North Slaughter Canyons, limestone ledges, 22 Jul 1977, *Burgess 4639* (BRIT, TEX). **Hidalgo Co.:** Big



Hatchet Mtn Wilderness, Thompson Canyon, end of access road W into shady side canyon, desert scrub and rock-wall communities, 5870 ft, 13 Sep 2010, *Heil 32972* (SJNM). Lincoln Co.: Capitan Mts, along Forest Service Rd 56, doug fir-ponderosa pine-white fir, ca. 2300 m, 1 Aug 1976, *Wagner & Sabo 2176* (UNM). Otero Co.: SW of Ruidoso on US Hwy 70, 3.9 km N of Reservation Rd 4, SE-facing rocky road embankment and ditch, 21 Sep 1985, *Semple & Heard 8149* (BRIT). **Texas.** Brewster Co.: Rock crevices near summit of Mt. Emory, 7 Aug 1946, *Correll 13687* (SMU); Big Bend National Park, below Emory Peak, crevices of ledges, 17 Jun 1964, *Correll 29749* (LL); Window Trail, 7 Jul 1944, *Cory 44772* (TEX); North Wall, 10 Jul 1944, *Cory 44872* (LL); Iron Mountain [7 mi NW of Marathon, Gilliland Peak area], 13 Jul 1944, *Cory 44980* (TEX); Chisos Mts, Juniper Canyon, cliffs, 7400 ft, 15-18 Jul 1921, *Ferris & Duncan 2790* (NY); Chisos Mts., upper slopes of Green Gulch, 27 Aug 1944, *Lundell 13266* (LL, SMU); Chisos Mts, slopes of Emory Peak, crevices of rimrock, 2300 m, 22 Jun 1931, *Moore & Steyermark 3212* (NY, PH); Chisos Mts, 18 Jun 1931, *Mueller 8199* (NY); Boot Spring, 8 Jul 1932, *Muller s.n.* (SMU, TEX); Chisos Mts, 9 Jul 1932, *Mueller s.n.* (NY); Glass Mts, Old Blue, from base to summit on rocky limestone slopes, 18 Jun 1941, *Rose-Innes & Moon 1222* (TEX); Big Bend Natl Park, granitic cliff side near The Window, ca. 4500 ft, 4 Aug 1946, *Shinners 8743* (SMU); Big Bend Natl Park, The Basin, talus slope, ca. 5600 ft, 7 Aug 1946, *Shinners 8803* (SMU-2 sheets); 5 mi W of Alpine along Hwy 90, roadside, 16 Aug 1981, *Sundberg 1226* (TEX); Marathon, 15 Jun 1931, *Tharp s.n.* (TEX); 5 air mi W of Alpine, bluff along upper canyon, 28 Jun 1997, *Turner 97-229* (TEX); frequent on top of Pulliam Bluff, 2 Jun 1937, *Warnock 767* (TEX); wall of Casa Grande, 7000 ft, 15 Jun 1937, *Warnock 1139* (TEX–3 branches of *H. chisosensis* and 3 branches of *H. arizonica*); Glass Mts, Maple Canyon, infrequent in limestone crevices, 2 Aug 1940, *Warnock W275* (MO, TEX); W limestone slopes of Gilliland Peak, 5500 ft, 29 Aug 1947, *Warnock 6955* (SMU). N slope of Mt. Emory, igneous soil, 7500 ft, 10 Sep 1950, *Warnock 9706* (SMU); Glass Mts, W slopes of Old Blue Mountain on the Victor Pierce Ranch, limestone soil, 4700 ft, 27 Jun 1957, *Warnock & McBryde 15696* (LL). Culberson Co.: Guadalupe Mts, Pine Springs Canyon, 7 Sep 1961, *Correll & Johnston 24249* (LL); Hurd's Draw [or Herds Pass Draw, Jeff Davis into se Culberson Co.], buff silt (alluvial cover), hilly topography, 9 Jun 1949, *Janszen 40* (TEX); Guadalupe Mts, above Frijole, canyon near spring, 9 Aug 1945, *Lundell 14390* (LL, SMU); Guadalupe Mts, McKittrick Canyon, dry creek bed, 1890 m, 21 Jul 1931, *Moore & Steyermark 3529* (NY, PH); Guadalupe Mts, Smith Canyon (=Bear Canyon), 1.5-2 mi N of Pine Spring Canyon, rocky stream bed, 27 Nov 1963, *Oatman & Rowlett s.n.* (TEX); Van Horn, sands, 10 Jun 1905, *Reverchon s.n.* (SMU); Guadalupe Natl Park, along Bear Canyon Trail, along creek, ca. 6400 ft, 23 Sep 1985, *Semple & Heard 8170* (BRIT); Guadalupe Natl Park, along Bear Canyon Trail, 7000 ft, 23 Sep 1985, *Semple & Heard 8174* (TEX); Guadalupe Natl Park, along Bear Canyon Trail at jct with Bowl Trails, ca. 8000 ft, 23 Sep 1985, *Semple & Heard 8177* (BRIT); Guadalupe Natl Park, along the Bowl Trail, very moist area at bottom of bowl, ca. 7700 ft, 23 Sep 1985, *Semple & Heard 8184* (BRIT); Guadalupe Mts, Smith Canyon, limestone crevices, 6200 ft, 10 Jul 1949, *Turner 1253* (SMU); Guadalupe Mountains, Smith Canyon, limestone soil, 5500 ft, 15 Sep 1948, *Warnock 121* (TEX); Guadalupe Mts, S of McKittrick Canyon, limestone soil, 5000 ft, 20 Jul 1954, *Warnock 11925* (LL); Guadalupe Mts, McKittrick Canyon, JC Hunter Ranch, limestone soil, 5 Sep 1954, *Warnock 12064* (LL, SMU); Guadalupe Mountains Natl Park, mid South McKittrick Canyon, 6500 ft, 25 Sep 1971, *Warnock 23365* (LL); Guadalupe Mts, Pine Spring Canyon, gravel bars above Pine Spring Camp, 23 Sep 1946, *Whitehouse 17090* (SMU); Chisos Mts, Nail place, the falls, 7 Aug 1915, *Young s.n.* (TEX). El Paso Co.: Southern Hueco Mts, along first drainage N of Four Mile Draw, ca. 30 mi E of El Paso, 25 Apr 1976, *Butterwick & Osborn 2593a* (BRIT); Franklin Mts State Park, Upper Fusselman Canyon, S of Loop 375, N of S Franklin Mountain, common on gravelly igneous and sedimentary slopes, 31 Oct 1989, *Carr 10225* (TEX); vicinity of Cottonwood Spring, W side of Franklin Mts, above Conutilla, crevices of rocks, 15 Oct 1952, *Correll 15054* (LL); Hueco Tanks, 32 air mi ENE of El Paso, granitic slopes, 12 Aug 1946, *Shinners 8933* (SMU); Franklin Mts, McKelligon Canyon, end of road, limestone gravel, 13 Aug 1946, *Shinners 8997* (SMU); Franklin Mts, mid McKelligon Canyon, limestone soil, 4200 ft, 31 Aug 1948, *Warnock 8241* (LL, SMU); Franklin Mountains, ca. 8 mi from El Paso toward the White Sands, limestone soil, E lower slope along the arroyos, 4600 ft, 28 Sep 1956, *Warnock 14230* (LL); El Paso, 24 Oct 1931, *Whitehouse s.n.* (TEX). Hudspeth Co.: NE end of Quitman Mts near Sierra Blanco, 4 Jul 1921, *Ferris & Duncan 2507* - densely glandular like *H. arizonica* (MO). Jeff Davis Co.: Cherry Canyon Ranch in N part of Davis Mts, E-W stretch of Eagle Waterhole Canyon, ca. 0.1-0.5 mi E of its mouth at Cherry Canyon,

Friend Mtn Quadrangle, local on unshaded rhyolite outcrops in open portions of pinyon-oak-juniper woodland on relatively mesic lowest portion of steep N-facing slope, 4760–4800 ft, *Carr et al.* 23482 (TEX); Davis Mts, Madera Canyon, cliff crevices, 20 Aug 1946, *Correll* 13997 (NY, SMU); Davis Mts, Fern Canyon, 15 Aug 1934, *Cory* 9644 (LL); Davis Mts, Little Aguja Canyon, clefts of porphyritic cliffs, 12 Jun 1928, *Palmer* 34530 (LL); Davis Mts, in the canyon of San Carlos Tunnel, among rocks on bluffs, rocky igneous soil, 22 Jul 1967, *Powell* 1533 (TEX). **Presidio Co.:** Panther Canyon (Big Bend Ranch State Park), N of Hwy 170 and Rio Grande river, vicinity of Colorado Canyon, rocky streambed, 25 Jun 1975, *Butterwick B-1009* (TEX); W side of Chinati Mts, Scheele's Goat Ranch, crevices of syenite, 10 Sep 1961, *Correll & Johnston* 24401 (LL, NY); Tierra Vieja Mts, below turn of ZH or Holland Canyon, walls and ledges of canyon, 1510 m, 20 Jun 1941, *Hinckley* 1764 (NY); Cottonwood Canyon, ledges and cliffs just above first fall, 1510 m, 16 Jul 1941, *Hinckley* 1966 (NY); Espy Miller ranch, ZH Canyon, rock crevices along creek, 11 Jun 1943, *Hinckley* 2718 (NY); Sierra Vieja, Capote Canyon, ca. 1 mi below Capote Falls, 24 Jun 1973, *Sikes & Smith* 658 (TEX).

A series of collections made by F.R. Fosberg in 1930 from Doña Ana Co., New Mexico, includes some that appear to be intermediate between *Heterotheca fulcrata* and *H. zionensis*, both of which occur in the immediate area in typical morphology. The putative intermediates are similar in aspect to the Fosberg collections of typical *H. fulcrata* but marginal cilia are reduced in length and capitular bracts are absent; cauline leaves are silvery gray on crowded internodes, spreading in orientation, and with contorted margins; stems are hirsute-villous.

**Typical *H. zionensis*:** Doña Ana Co.: 2 mi NW of San Miguel, sand wash, 1200 m, 18 Aug, *Fosberg* S3850 (POM, RSA).

**Typical *H. fulcrata*:** Doña Ana Co.: Canyon in S end of Organ Mts, base of cliff, 1580 m, 9 Oct, *Fosberg* S3684 (RSA); mouth of canyon at S end of Organ Mts, porphyritic rocks, 1580 m, 9 Oct, *Fosberg* S3713 (LL, RSA); Piño Blanca, S end Organ Mts, N slope, 1500 m, 11 Oct, *Fosberg* S3950 (RSA).

**Putative intermediates:** Doña Ana Co.: Pyramid Peak, W slope, limestone ledges, 1380 m, 22 Jul, *Fosberg* S3229 (RSA); 2 mi E of Vado, hills of andesitic porphyry, 1250 m, 4 Aug, *Fosberg* S3347 (RSA); Pyramid Peak, W slope, limestone ledges, 1400 m, 12 Aug, *Fosberg* S3736 (LL, RSA).

**48. HETEROTHECA CRYPTOCEPHALA** (Woot. & Standl.) Nesom, **comb. nov.** *Chrysopsis cryptocephala* Woot. & Standl., Contr. U.S. Natl. Herb. 16: 179. 1913. **TYPE: New Mexico.** [Lincoln Co.]: White Mts., V Pasture, Sect. 23, 23 Jul 1905, *E.O. Wootton s.n.* (holotype: US image!).

These plants are similar to *Heterotheca fulcrata* sensu stricto, but they occur only in a small region of south-central New Mexico. They produce prominent capitular bracts and oblong to elliptic, sessile, clasping to subclasping leaves, but leaves, stems, bracts, and phyllaries are sessile-glandular and only sparsely short-villous to hirsute-villous — because of much-reduced non-glandular vestiture, the whole plant has a distinctly green aspect. Capitular bracts 3–4(–5) per head, foliaceous and longer than the involucre, margins ciliate but usually not long-ciliate as in typical *H. fulcrata*. Involucres 9–12 mm wide. Ray flowers 10–18, corollas ca 15 mm long. The restricted geography is evidence that these plants are an coherent entity.

Flowering Jul–Sep. Grassy areas, cliff faces, roadsides and ditches, ponderosa pine, ponderosa pine-oak oak-ash; 6800–9000 ft.

**Additional collections examined. New Mexico. Lincoln Co.:** White Mts, N edge of Ruidoso, road to Montgomery Field Station, S-facing roadcut, doug fir, ponderosa pine, and Gambels oak, 6900 ft, *Ward & Spellenberg* 81-449 (NY). **Otero Co.:** Sacramento Mts, La Luz Canyon Road, ca. 1/2 mi W of Apache Canyon, ponderosa pine-oak, 7320 ft, 26 Jul 2001, *Allred* 8121 (BRY); western slopes of the Sacramento Mts, Lincoln Natl Forest, La Luz Canyon, Apache Canyon (small side canyon), grassy open area in mixed conifer forest with ponderosa pine, sw white pine, 7720 ft, 23 Aug 2002, *Allred* 8341



Figure 255. *Heterotheca cryptocephala*, Otero Co., New Mexico. Baker 14698 (ASU).





Figure 256. *Heterotheca cryptocephala*, Otero Co., New Mexico. Baker 14698 (ASU), same collection as in Fig. 255, showing consistency of morphology within the population.

(NMCR); Sacramento Mts, 7 km SW of Sacramento, above Hoosier Canyon, limestone cliff and associated talus within burned and mostly killed *Pseudotsuga menziesii*-*Pinus ponderosa*-*Abies concolor* forest, 2530 m, 17 Aug 2002, *Baker 14698* (ASU-2 sheets, BRIT); SW of Ruidoso on US-70, 3.9 km N of Reservation Rd #4, rocky road embankment and ditch, 21 Sep 1985, *Semple & Heard 8149* (MO, NMC, UC); White Mts, 6200 ft, 19 Aug 1897, *Wootton s.n.* (RM). **Sierra Co.:** White Sands Missile Range, Salinas Peak, alongside building (S side) on top, 8965 ft, 10 Aug 1996, *Anderson 6859* (TEX).

**49. HETEROTHECA NITIDULA** (Woot. & Standl.) Nesom, J. Bot. Res. Inst. Texas 1: 24. 2007. *Chrysopsis nitidula* Woot. & Standl., Contr. U.S. Natl. Herb. 16: 179. 1913. **TYPE: New Mexico.** [Catron Co.]: Mogollon Mts., on or near the West Fork of the Gila River, 7500 ft, 20 Aug 1903, *O.B. Metcalfe 552* (holotype: US, Fig. 257; isotypes: AC image!, GH image!, MIN image!, MO!, NMC!, RM! image!).

The description and labels say "Socorro Co." but redefined county boundaries now place the type locality in Catron County.

*Heterotheca nitidula* is endemic to west-central New Mexico and the White Mountains of adjacent Apache and Greenlee counties, Arizona. It is similar to *H. fulcrata* in its prominent capitular bracts but distinctive in its relatively narrow and more elongate leaves (mostly narrowly oblanceolate, 3–5.5 cm long, 3–8 mm wide, attenuate to the base), relatively long rays (10–12 mm long), and particularly in its strigillose vestiture. *Heterotheca nitidula* (like *H. fulciens*) produces basal offsets and short rhizomes and is distinctive in habit from typical *H. fulcrata*. Heads solitary or usually in clusters of 2–6 and usually (sometimes variable on a single plant), immediately subtended by lanceolate capitular bracts. Stems, leaves, bracts, and phyllaries minutely glandular and sparsely to moderately strigillose with a nonglandular vestiture of extremely thin, slightly flexuous, closely appressed hairs 0.5–1.5 mm long, without enlarged basal cells (use 10x lens to see clearly).

Plants of *Heterotheca nitidula* in the Zuni Mountains area of Cibola and McKinley counties appear to be set apart geographically and have a reduced amount of nonglandular vestiture and often a slightly glaucous aspect (e.g., Fig. 260).

Flowering Aug–Sep(–Oct). Open rocky slopes and flats, ridges, ledges dry grassland roadsides, meadows, pinyon-juniper, limber pine, ponderosa pine, ponderosa pine-mixed conifer, spruce-fir, spruce, (7000–)7400–10,400 feet.  $2n=18$  (*Semple & Heard 8021*; *Turner 5700*).

**Additional collections examined: Arizona.** **Apache Co.:** Apache Natl Forest, Mount Baldy area, W Fork Little Colorado River, parking area off State Rd 273, locally abundant in dry grassland, 2787 m, 21 Sep 1998, *Brant & Stone 4128* (MO, TEX); Greer, Riverside Ranger Station, 2700 m, 24 Aug 1920, *Eggleston 17157* (NY); White Mts, Black River, Thompson's Ranch, 14 Jul 1910, *Goodding 602* (RSA); White Mts, Thompson's Ranch, steep W slopes, 14 Jul 1910, *Goodding 602* (NY); Alpine, open flats, 31 Jul 1912, *Goodding 1259* (CAS, NY, WTU); White Mts, 6–15 Aug 1903, *Griffiths 5329* (MO); along Forest Rd 275 in Stone Creek drainage, above stream in gravelly soil, 8000 ft, 11 Aug 1998, *Hammond 11478* (TEX); White Mts, dry road shoulders, 8500 ft, 15 Aug 1973, *Moldenke 27846* (LL); Apache Natl Forest, along Nutrioso Creek and US Hwy 180/191-Coronado Trail, ca. 5.5 air mi NNW of Alpine, meadow above the creek, 8080–8120 ft, 21 Sep 2005, *Nelson 67212* (RM); Apache Natl Forest, White Mts, along Benny Creek, ca 1 air mi W of S end of Greer, meadow, 9050–9140 ft, 3 Sep 2006, *Nelson 70834* (RM); Apache Natl Forest, Greens Peak, ca 16.5 air mi W of Springerville, electronic site on rocky, open mtn top, 10,000–10,133 ft, 4 Sep 2006, *Nelson 70967* (RM); 8 mi E of Nutrioso, ridge above Milk Canyon Escudilla Mtn, 8500 ft, yellow pine assoc., 24 Aug 1951, *Parker & McClintock 7545* (CAS); near Greer, 8300 ft, 19 Aug 1935, *Peebles 12555* (LL); Sheep Crossing Campground [Hwy 273 near Greer], spruce-fir, 9200 ft, *Pinkava, Brown, and McLeod 503*, 20 Aug 1971 (ASU); E edge of Alpine on US 180, road embankment, red shale, limber pine, 8030 ft, 19 Sep 1985, *Semple & Heard 8021*, **2n=18** (ASU, BRIT, NY); N of Greer, Rte 373 near Rosey Creek Rd, 22 Aug 1973, *Sexton s.n.* (ASU); 12 mi N of Alpine, common in roadside cuts, 13 Aug 1967, *Turner 5700*, **2n=18** (TEX); Sitgreaves Natl. Forest, 5.4

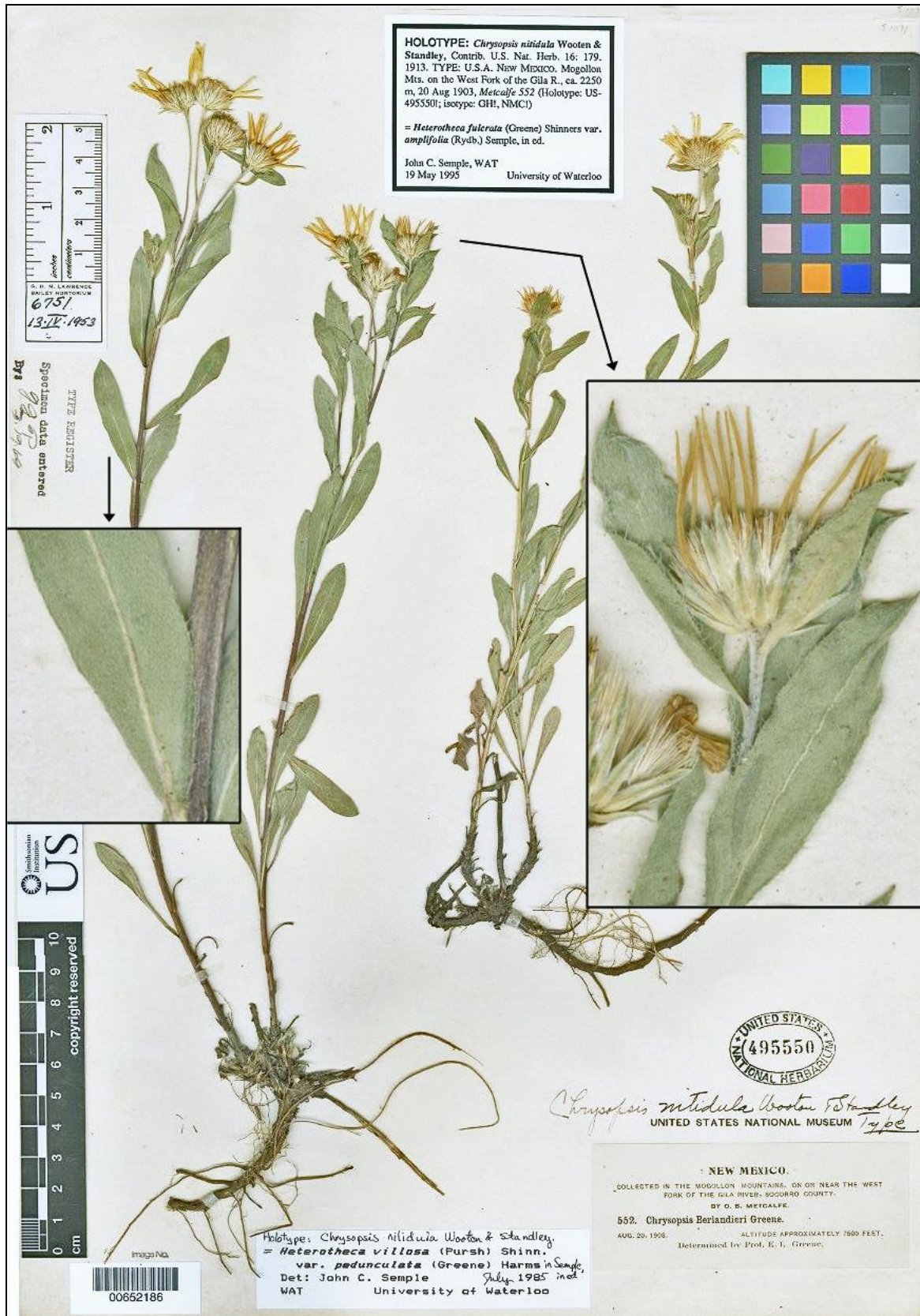


Figure 257. *Heterotheca nitidula*, holotype. Catron Co., New Mexico.





Figure 258. *Heterotheca nitidula*, Cibola Co., New Mexico. Riffle 804 (UNM).



Figure 259. *Heterotheca nitidula*, Socorro Co., New Mexico. Hutchins 4758 (UNM).





Figure 260. *Heterotheca nitidula*, McKinley Co., New Mexico. *McCallum 1378* (UNM).



mi S of jct US 666 and US 180 on 666, E of road in meadow, 15 Aug 1978, *Warnock 1677* (TEX). Greenlee Co.: Apache Natl. Forest, 10 mi E of Big Lake on Forest Rd 249 and 8 mi from Alpine, near turnoff to Sierra Blanca and on hillside above lake in rocky soil, open areas in spruce forest, 8900 ft, 16 Aug 1972, *Hess 2937* (SMU). **New Mexico.** Catron Co.: ca. 10 mi E of Beaverhead in open yellow pine forest, ca. 8000 ft, 28 Sep 1951, *Dunn 7716* (RSA); Datil Forest, Sec 33 T10S R14W, 10 Sep 1926, *Ewing 6* (RM); Mogollon Mts, Gila Natl. Forest, Indian Creek drainage and Bear Wallow Mtn, common perennial on E-facing slope and drier areas, 9200 ft, 4 Sep 1968, *Hess 2394* (NMC, SMU); Gallo Mts Jewett Gap, milepost 18, 8160 ft, 27 Aug 1997, *Hubbard s.n.* (UNM image!); Mogollon Mts, 1.4 road mi N of Gilita Campground, ponderosa pine, ca. 8100 ft, 7 Sep 1978, *Moir & Fitzhugh s.n.* (NMC); Mogollon Mts, 7 Sep 1881, *Rusby 167* (UC); Mogollon Mts, high rocky summits, 7 Sep 1881, *Rusby 168* (MO, NY-3 sheets; PH); 3.3 km W of Luna on US 180, 5.5 mi E of NM state line, open ponderosa pine, 19 Sep 1985, *Semple & Heard 8027* (UC); Mogollon Mts, Forest Rd 141 just N of Negrito Work Center, open parkland, ponderosa pine, 12 Aug 2008, *Sivinski & Lowrey 6930* (UNM image!); Gila Natl Forest, 13 mi straightline NNE of Beaverhead Ranger Station, near NM 163 and FS 150, montane grassland and pinon-juniper woodland, SW-facing slope, sandy, rocky ash flow, 7500 ft, 3 Oct 1995, *Williams 2600* (NMC). Cibola Co.: Zuni Mts, jct of Forest Service Rd 3178.1 and 3180, ponderosa pine area, 7800 ft, 17 Aug 1968, *Riffle 783* (UNM image!); Zuni Mts, SE slope of Mt Sedgwick, rock ledges close to the summit, 9200 ft, 17 Aug 1968, *Riffle 804* (UNM, Fig. 258); Zuni Mts, road jct at base of Mt Sedgwick, 8900 ft, 21 Sep 1968, *Riffle 1068* (UNM image!). Grant Co.: Mogollon Mts, on or near the West Fork of the Gila River, ca. 7500 ft, 20 Aug 1903, *Metcalf 552* (NY, UC). McKinley Co.: Zuni Mts, McGaffey Camp off NM Hwy 400, open fields, 2800 m, 30 Jul 1964, *Baad 1075* (WTU); Cibola Natl Forest, [Zuni Mts], Cottonwood Canyon, abundant on open slope, 28 Aug 1981, *McCallum 1378* (UNM-2 sheets, Fig. 260). Sierra Co.: Black Range, Stiver Spring area [Taylor Peak area], gravel and sandy loam of ponderosa pine-mixed conifer area, 7900 ft, 13 Aug 1982, *Hutchins 10374* (UNM image!); Black Range, Diamond Creek, S-facing slope, 12 Aug 1982, *Knight 2282* (UNM image!); Taylor Creek, ca. 14 air mi E of Beaverhead, rocky S-facing slope with ponderosa pine, 7400 ft, 14 Aug 1982, *Spellenberg et al. 6598* (NMC). Socorro Co.: Socorro [Magdalena Mts], rocky fertile open wooded hillside, 8000 ft, 18 Aug 1968, *Demaree 59017* (COLO image!, RSA, UNM image!); San Mateo Mts, Cibola Natl Forest, FS Rd 138, ca. 6.0 mi N of FS Rd 330, 9735 ft, 15 Aug 2009, *Heil 31540* (SJNM); Magdalena Mts, South Baldy, SE slope, gravel loam, ca. 10,400 ft, 26 Aug 1973, *Hutchins 4758* (UNM, Fig. 259); Magdalena Mts, vicinity of Water Canyon, gravel loam, 9800 ft, 30 Sep 1973, *Hutchins 4889* (UNM image!); Magdalena Mts, vicinity of Water Canyon, gravel loam, 10,300 ft, 13 Jul 1974, *Hutchins 5053* (UNM image!); Magdalena Mts, N side of Timber Peak, head of Water Canyon, 8300 ft, 11 Sep 1959, *Martin 3684* (UNM image!); Middle Fork of Gila, 7500 ft, 5 Aug 1900, *Wooton s.n.* (NMC).