

Another look at *Hymenoxys* subgenus *Plummera* (Asteraceae: Heliantheae: Gaillardiiinae) from Arizona and New Mexico

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Wagner, W. L. (Department of Botany, MRC 166, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560, U.S.A.), R. A. Fletcher (U.S. Forest Service, 517 Gold Ave., SW, Albuquerque, NM 87102, U.S.A.) & R. K. Shannon (Department of Botany, MRC-166, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560, U.S.A.). Another look at *Hymenoxys* subgenus *Plummera* (Asteraceae: Heliantheae: Gaillardiiinae) from Arizona and New Mexico. *Brittonia* 51: 79–86. 1999.—The recent merger of *Plummera* into *Hymenoxys* is followed here. The two previously recognized species of *Plummera* are here treated as a single polymorphic species of *Hymenoxys*, *H. ambigens*, consisting of three varieties: var. *ambigens* from the Mescal, Santa Teresa, and Pinaleno Mountains of southeastern Arizona; var. *floribunda* from the Chiricahua, Dos Cabezas, Dragoon, Little Dragoon, and Mule Mountains of southeastern Arizona; and var. *neomexicana* described here from the Animas and Peloncillo Mountains of southwestern New Mexico.

Key words: Asteraceae, Compositae, Heliantheae, Gaillardiiinae, *Hymenoxys*, *Plummera*, Arizona, New Mexico

Recently, Bierner (1994) and Bierner and Jansen (1998), on the basis of DNA restriction site analysis, submerged the genus *Plummera* into *Hymenoxys*, a classification first suggested by Turner et al. (1973) and again by Wagner (1979), but *Plummera* was maintained as distinct by Bremer (1994). The close affinity of *Plummera* with *Hymenoxys* has been noted since Gray's (1882) description of the new genus *Plummera* and its first species, *P. floribunda*. Blake (1929) also recognized the similarity between the two genera, commenting with his description of *P. ambigens* that the characters that separated the two species of *Plummera* also tended to break down the gap between the two genera. In fact, as more specimens have been examined, it became evident that the few characters used to separate *Plummera* from *Hymenoxys* were variable. The only exception is that the taxa of *Plummera* are monoecious with

functionally staminate disk florets whereas all *Hymenoxys* are gynomonoeious with hermaphroditic disk florets. Despite this difference, Bierner's submersion of *Plummera* into *Hymenoxys* was an appropriate step and is followed here. In this paper we argue for making an additional change in the classification, reducing the two species formerly included in *Plummera* to one.

In his classification, Bierner (1994) continued to recognize two species as originally included in *Plummera* [*Hymenoxys ambigens* (S. F. Blake) Bierner and *H. microcephala* Bierner], although Turner et al. (1973) and Wagner (1979) had both recommended that these taxa not be retained at the rank of species. Although he recognized that morphological differences between the two species are slight, Bierner retained them on the basis of only two things beyond morphology: evidence from glandular trichome chemistry (Spring et al.,

1994) and disjunct geographical ranges in the oak-juniper-pine woodlands of southeastern Arizona. Bierner did not mention the New Mexico populations reported by Wagner (1979).

The glandular trichome chemistry data presented by Spring et al. (1994), while useful for showing that *Hymenoxys*, *Dugaldia*, *Plummera*, and *Macdougalia* are all closely related, is neither sufficient nor appropriate for distinguishing species. Indeed, the authors themselves stated that "the use of minor compounds for taxonomic evaluation is questionable and the significance of their presence or absence should not be over-estimated." Their sample size was too small to determine whether the presence of the compounds for which they screened was variable for any of the taxa.

Because Bierner's paper (1994) reducing *Plummera* to subgeneric rank within *Hymenoxys* had primarily a nomenclatural emphasis, he recognized the two previously described species as distinct and commented that there was no zone of intergradation. He was apparently unaware, however, of several collections expanding the ranges previously reported for both species, especially those from the Peloncillo and Animas ranges in southwestern New Mexico reported by Wagner (1979). In addition, both species have been collected in more of the isolated ranges in southeastern Arizona during the past two decades. The ranges of the taxa still do not overlap, but the disjunctions are smaller than previously thought. Examination of collections from throughout the range shows that there is geographical variation that can be recognized as three taxa corresponding with the two described species and the New Mexico populations. Perhaps most interesting are Wagner's collections identified as *Hymenoxys ambigens* from the Animas Mountains of southwestern New Mexico, but described as intermediate between *H. ambigens* and *H. microcephala* in some characters (Wagner, 1979).

Earlier treatments, beginning with Blake (1929) and including Kearney and Peebles (1960), segregated the two species of *Plummera* mainly on the basis of the number of squamellae on the achenes, 0–2 in

P. floribunda vs. 4–6 in *P. ambigens* (or the disk florets epappose). Not only is the character variable within each species, but the presence of achenes with 2–4 squamellae from plants of the Animas Mountains indicates that this character is not tenable for the segregation of two species. The only other character used in earlier treatments as a basis for separating these taxa was flexuous vs. straight hairs on the achenes. Alone this feature becomes a relatively minor character distinguishing the two taxa, insufficient for species-level recognition, especially since the New Mexico populations are intermediate, with weakly flexuous hairs. In our study of 62 collections from throughout the known range of these plants, we found several other characters that vary including outer involucre bract size and number, and apex of inner involucre bracts. Most of these features correlate to some degree with variation of pappus number and ovary (achene) pubescence, but there are no large gaps in the overall pattern. It therefore seems best to treat *Hymenoxys ambigens* and *H. microcephala* as one species, recognizing the variation at the infraspecific level. We propose combining the two species, and recognize three geographically discrete entities at the varietal level. The varietal rank is used for these taxa because that is the rank universally used in *Hymenoxys*. All measurements are from dried material. Ligule measurements do not include the tube.

HYMENOXYIS AMBIGENS (S. F. Blake) Bierner, *Sida* 16: 6. 1994. (Figs. 1, 2)

Plummera ambigens S. F. Blake, *J. Wash. Acad. Sci.* 19: 276. 1929. TYPE: UNITED STATES. Arizona: Graham Co., lower slopes of Mt. Graham, ca. 1370 m, 22 Jul 1927, R. H. Peebles, G. J. Harrison & T. H. Kearney 4395 (HOLOTYPE: US-1436073 [photo NMC]; ISOTYPES: GH-n.v., US).

Erect and rather stout biennial or short-lived perennial, monoecious herbs, from a stout taproot; caudex sometimes branched, stems 4–15 dm tall, much branched above, aromatic. Leaves in a prominent basal rosette (except apparently reduced in var. *neomexicana*) and cauline, alternate, quickly reduced above, pinnatisect, the lobes fili-



FIG. 1. *Hymenoxys ambigens* var. *neomexicana*. A. Habit. B. Branch of capitulescence. C. Capitula. D. Inner involucre bract. E. Ray floret (pistillate). F. Disk floret (staminate). G. Disk floret showing style and stamens. H. Stamen. (A, C–H from Wagner 1170, holotype; B from Todsén s.n. on 15 Sep 1980.)

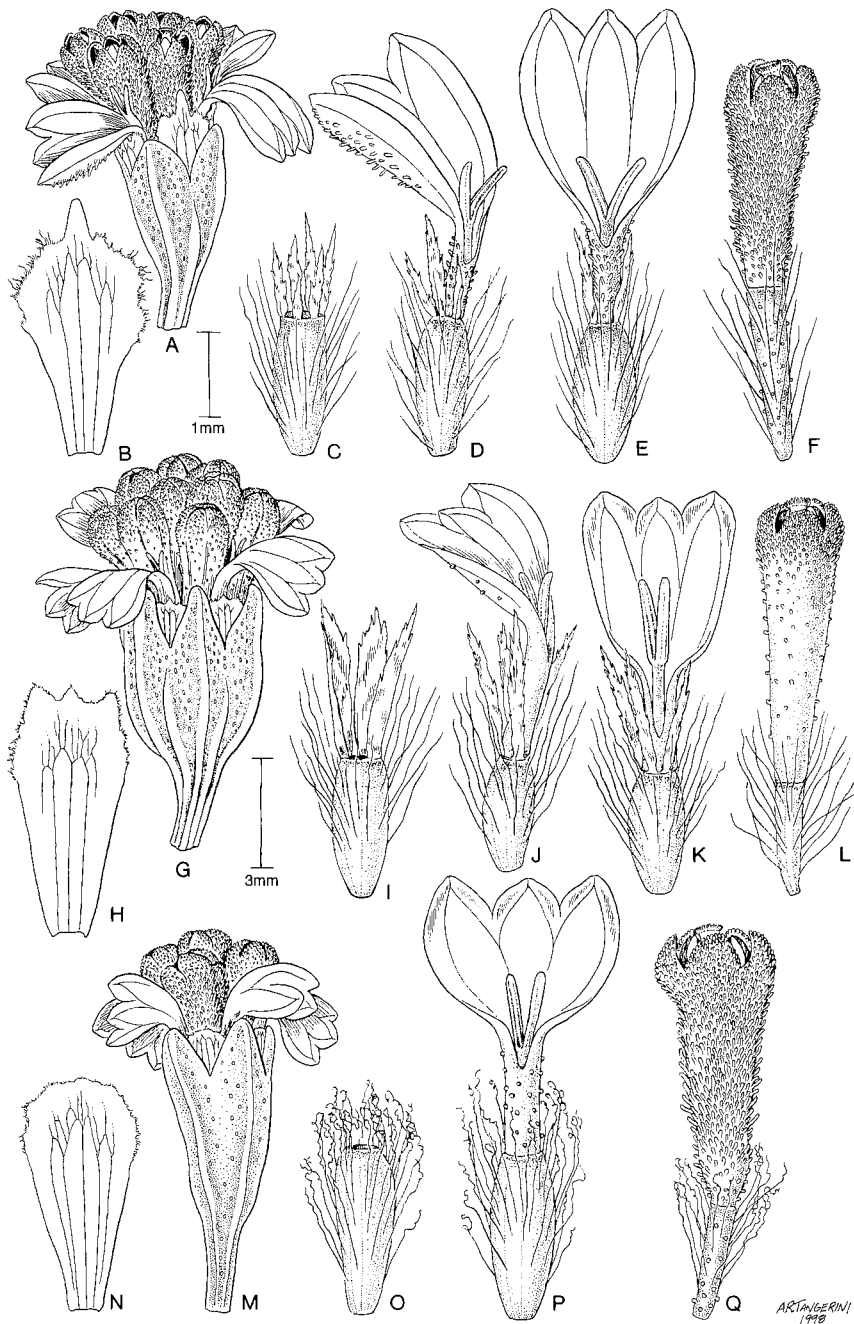


FIG. 2. *Hymenoxys ambigens*. A-F. *Hymenoxys ambigens* var. *ambigens* (from Guhl & Reeves R3875A). A. Capitula. B. Inner involucre bract. C. Ray achene. D, E. Ray florets (pistillate). F. Disk floret (staminate). G-L. *Hymenoxys ambigens* var. *neomexicana* (from Wagner 1170, holotype). G. Capitula. H. Inner involucre bract. I. Ray achene. J, K. Ray florets (pistillate). L. Disk floret (staminate). M-Q. *Hymenoxys ambigens* var. *floribunda* (from Reeves 3958B). M. Capitula. N. Inner involucre bract. O. Ray achene. P. Ray florets (pistillate). Q. Disk floret (staminate). Scale bars: A, G, M, 3 mm; all others, 1 mm.

form. Capitula in paniculiform cymes, small, radiate, yellow; involucre obpyramidal, in 2 rows, the outer row composed of 3–5 ovate-oblong, obtuse, carinate bracts, 3.5–6 mm long, connate $\frac{1}{2}$ – $\frac{3}{4}$ their length into a coriaceous or cartilaginous cupule, the inner row of as many cuneate, oblanceolate or rhombic, alternating bracts, their apex cuspidate, mucronate or truncate to rounded, weakly scarious to broadly erose-scarious; ray florets 3–4, pistillate, corollas glabrous, or the tube and the abaxial surface of the ligule sparsely puberulent, the hairs short, thick, ligule 2.6–5.2 mm long, minutely 3-lobed; disk florets 7–13, functionally staminate, corollas tubular-funnelform, 2.5–3.5 mm long, 5-toothed, densely to sparsely puberulent with short, thick hairs; receptacle flat, naked; ray achenes obovoid, plump, ca. 15-ribbed, villous with straight or flexuous hairs; pappus none, or of 2–6 unequal, oblong or lanceolate, obtuse to acuminate, lacerate, ribless, hyaline squamellae 1–2 mm long; disk ovaries sterile, usually trigonous, with evident but aborted ovule, pubescence as in ray achenes; pappus as in ray florets or absent. Chromosome number, $n = 15_{II}$ (in vars. *ambigens* and *floribunda*, Bierner, 1994).

Phenology.—Usually flowering from July through October, occasionally as early as June or as late as November.

Distribution (Fig. 3) and *ecology*.—Occurring in small populations at 1400–2100(–2320) m, in rocky to sandy granitic soils, open canyon floors or slopes, primarily in the Madrean encinal (oak woodland) or with Apache pine (*Pinus engelmannii*), or along intermittent stream sides with Arizona cypress (*Cupressus arizonica*), Arizona walnut (*Juglans major*), and Arizona sycamore (*Platanus wrightii*), and occasionally along roadsides. Known from several mountain ranges in southeastern Arizona and adjacent southwestern New Mexico, roughly in three north-south groupings: Little Dragoon, Dragoon, and Mule Mountains; Mescal, Santa Teresa, Pinaleno, Dos Cabezas, Chiricahua, and reported by Kearney and Peebles (1960) from the adjacent Swisshelm Mountains; and Peloncillo Mountains and Animas Mountains.

Key to the varieties of *Hymenoxys ambigens*

1. Inner involucre bracts rhombic, apex with a cusp 0.6–1 mm long, margin scarious, entire or nearly so; pappus scales 3–6 or sometimes absent on disk florets; hairs on ovary (achene) dense, straight. ... var. *ambigens*
1. Inner involucre bracts cuneate to oblanceolate, apex without a cusp, truncate to rounded or with a mucro 0.1–0.2 mm long, margin scarious, erose; pappus scales 2–4 or absent; hairs on ovary (achene) sparse to moderate, weakly to conspicuously flexuous.
 2. Outer involucre bracts 5; pappus scales 2–4 or sometimes absent on disk florets; apex of inner set usually mucronate; ovary (achene) hairs weakly flexuous. var. *neomexicana*
 2. Outer involucre bracts 3–4; pappus scales 0–4; apex of inner set truncate to rounded or sometimes mucronate; hairs on ovary (achene) flexuous. var. *floribunda*

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var. *AMBIGENS* (Fig. 2)

Outer involucre bracts 4, (3.5–)4–5 mm long, connate $\frac{1}{2}$ – $\frac{3}{4}$ of their length, the inner set rhombic, 3.5–5 mm long, the cusp 0.6–1 mm long, scarious margins flanking cusp narrow, entire or nearly so; ray florets 4, the ligule 3.5–5.2 mm long, sometimes the tube and the abaxial face of ligule sparsely puberulent; disk florets 7–11, the corollas 2.7–3.5 mm long, moderately to densely puberulent; pappus scales 3–6 or sometimes absent on disk florets, the scales 1–1.8 mm long; achene hairs dense, straight, 1.5–2.5 mm long, opaque, white.

Distribution.—Mescal, Santa Teresa, and Pinaleno Mountains of southcentral–southeastern Arizona, at 1400–2100 m.

Representative specimens examined: UNITED STATES. **Arizona**: GILA CO.: Mescal Mtns., S slope below El Capatan, W of Yellowjack Spring, *Bingham* 2614 (ASU). GRAHAM CO.: Santa Teresa Mts., Upper Beauchamp Canyon, between Cottonwood and Jackson Mtns., 5100 ft, *Bingham* 2539 (ASU); Pinaleno Mtns., Coronado National Forest, Noon Creek, 5100 ft, *Kearney & Peebles* 14105 (US); Mt. Graham, ca. 6000 ft, *Kearney & Peebles* 9777 (US); Pinaleno Mtns., Jacobson Canyon near Angle Orchard, *Bingham* 1866 (ASU); Pinaleno Mtns. along Marjilda & Gibson Canyons, 5000 ft, *Bingham* 1654 (ASU); Pinaleno Mtns., Wet Canyon campsite, *Keil et al.* 10198 (ASU); Swift Trail, 4850 ft, *Peebles* 14523 (US); Swift Trail (Hwy. 366), 6.4 mi SW of jct. Rte. 666 & 366, Sec.

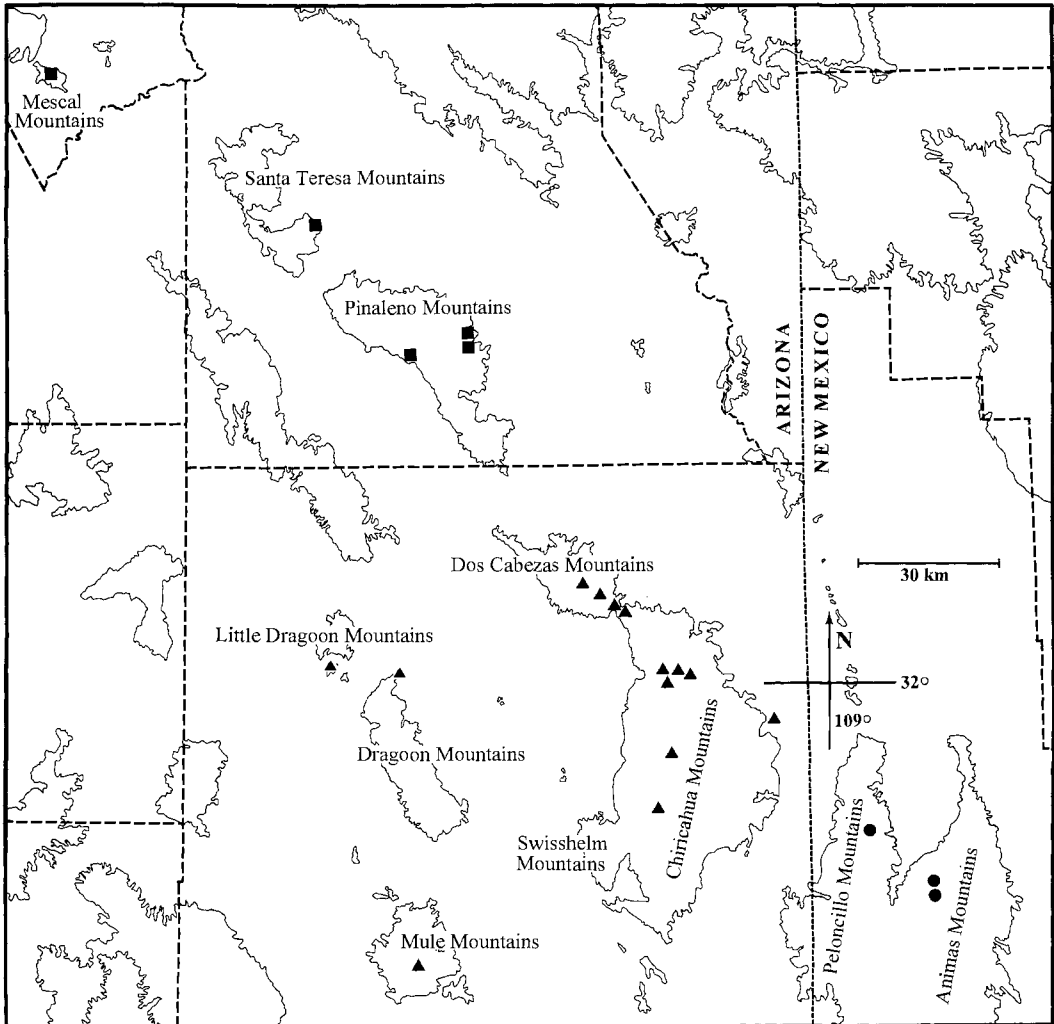


FIG. 3. Distribution of *Hymenoxys ambigens* var. *ambigens* (squares), *Hymenoxys ambigens* var. *floribunda* (triangles), and *Hymenoxys ambigens* var. *neomexicana* (dots). Contour lines are drawn at 1524 m to show outline of isolated ranges.

3, T9S, R25E, 4700 ft, McGill & Lehto L20590 (ASU, US); Swift Trail, Hwy. 366, 8.6 mi W of jct. Rte. 666 & Hwy. 366, 5800 ft, Guhl & Reeves R3875A, R3875B, R3875C (ASU); Pinaleno Mtns., Grant Creek, 5200 ft, Johnson 11102 (ASU).

Hymenoxys ambigens (S. F. Blake) Bierner var. *floribunda* (A. Gray) W. L. Wagner, comb. et stat. nov. *Plummera floribunda* A. Gray, Proc. Amer. Acad. Arts 17: 215. 1882, non *Hymenoxys floribunda* (A. Gray) Cockerell, Bull. Torrey Bot. Club 31: 485. 1904. *Hymenoxys micro-*

cephala Bierner, Sida 16: 6. 1994. TYPE: UNITED STATES. Arizona: Cochise Co., Apache Pass, Chiricahua Mtns., Sep 1881, J. G. Lemmon & S. Lenmon 352 (HOLOTYPE: GH-n.v.; ISOTYPES: BM-n.v., GH-n.v., K-n.v. [photos F, US], NDG-n.v., PH-n.v. [2 sheets], US [2 sheets]). Although only the name "J. G. Lemmon" appears on the specimen label of the sheet in the US type collection, Gray (1884) noted that the genus is named after the discoverer, Sara Plummer, now

Mrs. J. G. Lemmon, and commented: "Wherever the name of *Lemmon* is cited for Arizonian plants, it in fact refers to this pair of most enthusiastic botanists." (Fig. 2)

Outer involucre bracts 3–4, 4–6 mm long, connate $\frac{2}{3}$ – $\frac{3}{4}$ of their length, the inner set cuneate and truncate to rounded or oblanceolate with a short mucro 0.1–0.2 mm long, 3–3.3 mm long, scarious margins at apex broad and often irregular, erose; ray florets 3–4, the ligule 3–5 mm long, the tube sometimes sparsely puberulent; disk florets 10–13, the corollas 2.5–3.5 mm long, sparsely to moderately puberulent; pappus absent or scales 2–4, the scales 1–2 mm long; achene hairs sparse, flexuous, 1.5–2.1 mm long, opaque, tan to white.

Distribution.—Chiricahua, Dos Cabezas, Dragoon, Little Dragoon, and Mule Mountains, 1400–2320 m, and reported from the Swisshelm Mountains by Kearney and Peebles (1960), southeastern Arizona.

Additional specimens examined: UNITED STATES. **Arizona:** COCHISE Co.: Dos Cabezas Mtns., N slope of Howell Canyon, 5500 ft, *Bingham 2647* (ASU); Dos Cabezas Mtns., NE slope of Cutoff Canyon, Apache Pass, 4700 ft, *Bingham 2436* (ASU); Chiricahua Mtns., Tompkins Canyon, 6500 ft, *Blumer 2159* (US); Chiricahua Mtns., Turkey Creek Rd., 9.7 mi E of Hwy. 181, *Bierner 92-31* (ARIZ); Chiricahua Mtns., entrance to Rucker Canyon recreational area, 5700 ft, *Gould & Haskell 4620* (ARIZ); Chiricahua Mtns., N end, Bowie Mtn., NE slope, 5000 ft, *Bingham 2428* (ARIZ); Chiricahua Mtns., 6 mi E of Portal, 4900 ft, 2 Sep 1966, *Cazier s.n.* (ASU); Chiricahua Natl. Monument, Bonita Park, W of Persely's Mine Rd., 6100 ft, *Reeves 3133A, 3133G* (ASU); Chiricahua Natl. Monument, $\frac{1}{2}$ mi from Massai Pt., 6750 ft, *Reeves 3663A, 3663B* (ASU); Chiricahua Natl. Monument, lower Pickett Canyon, 5300 ft, *Jandrey & Reeves R4014* (ASU); Chiricahua Natl. Monument, N side of Sugarloaf Mt., 6950 ft, *Reeves 3958A, 3958B* (ASU); Dragoon Mtns., N end, Billy Four Canyon along canyon bottom, *Goodding 246-58* (ARIZ); Little Dragoon Mtns., $\frac{1}{4}$ mi N of Adams Peak on N slope, 5400 ft, *Bingham 2628* (ASU); Mule Mts. near Bisbee, *Harrison et al. 6240* (ARIZ, US); Bisbee, *Goodding 38* (ARIZ); Sulphur Springs Valley, 24 Aug 1933, *Taylor s.n.* (ARIZ).

A single collection of a plant similar to *Hymenoxys ambigens* var. *floribunda* from Dragoon Mountains, Upper East Stronghold Canyon along trail to West Stronghold Canyon [*Reichenbacher 1545* (ARIZ)] differed from all other collections of *H. am-*

bigens var. *floribunda* (or either of the other varieties). It has considerably larger heads with cuneate inner involucre bracts that greatly exceed the outer series of 5 bracts, 18–20 disk florets, and extremely wide pappus scales. This collection may represent an undescribed species, but field studies are necessary to determine its status.

Hymenoxys ambigens (S. F. Blake) Bierner var. **neomexicana** W. L. Wagner, var. nov. TYPE: UNITED STATES. New Mexico: Hidalgo Co., Animas Mtns., Lower Indian Creek Canyon, Sec. 16, T31S, R19W, 5800 ft, canyon bottom, 22 Jul 1975, *W. L. Wagner 1170* (HOLOTYPE: UNM-57697). (Figs. 1, 2)

A *Hymenoxys ambigens* var. *ambigens* bracteis involucrelibus externis 5 et squamis pappi 2–4 differt.

Outer involucre bracts 5, 5–5.8 mm long, connate $\frac{2}{3}$ – $\frac{3}{4}$ of their length, the inner set cuneate, 3.5–3.8 mm long, truncate, usually mucronate, the mucro 0.1–0.3 mm long, scarious margins flanking mucro narrow, erose; ray florets 4, the ligule 2.6–4 mm long, sometimes sparsely puberulent on the abaxial face; disk florets 8–10, the corollas 2.6–3.5 mm long, moderately to sparsely puberulent; pappus scales 2–4, sometimes absent on disk florets, the scales 1–2 mm long; achene hairs sparse, weakly flexuous, 1.8–2.8 mm long, translucent, white.

Distribution.—Peloncillo and Animas Mountains of southwestern New Mexico, at 1640–2200 m.

Additional specimens examined: UNITED STATES. **New Mexico:** HIDALGO Co.: Animas Mtns., W fork of Indian Creek Canyon, N slopes at base of Animas Peak, Sec. 28, T31S, R19W, N-facing slope, pine forest, 7250 ft, *W. L. Wagner 1792* (UNM); Indian Creek Canyon, 6000 ft, 14 Jul 1968, *Todsen s.n.* (NMC); Peloncillo Mtns., Bioresearch Ranch, Maverick Spring Canyon near Lee's Corral, canyon bottom, Sec. 11, T30S, R21W, 5500 ft, 15 Sep 1980, *Todsen s.n.* (NMC-50426); Peloncillo Mtns., Bioresearch Ranch, Maverick Spring Canyon, canyon bottom, near third dam above Shorty Miller's, Sec. 12, T30S, R21W, 5400 ft, 15 Sep 1980, *Todsen s.n.* (NMC-50423).

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