

# TAXONOMY OF SARTWELLIA (COMPOSITAE HELENIEAE)<sup>1</sup>

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*Sartwellia* is a genus of three species confined to gypsiferous soils of southern New Mexico, western-most Texas and north-central Mexico (Fig. 4). It was first proposed by Gray (having been named in honor of Dr. H. P. Sartwell, a botanical correspondent and "zealous student and collector of the plants of Western New York . . .") in 1852 from a collection of Charles Wright made in trans-Pecos Texas.

Previous to the present, the only definitive study has been that of Rydberg (1915) who also recognized three species. Johnston (1941) subsequently added an additional species name, *S. humilis*, but this has been reduced to synonymy under *S. mexicana* in the treatment that follows.

Meiotic chromosome counts of  $n=18$  have been reported for all three of the species (Table 1). At diakinesis and metaphase I the bivalents are of moderate size showing mostly 2 chiasmata.

In describing *Sartwellia*, Gray stated that it ". . . is chiefly remarkable from its invalidating the distinctions of the subtribe Flaverieae [heretofore containing but one genus, *Flaveria*] to which, on account of its whole habit and general characters, I am obliged to refer it, notwithstanding the pappus and the pedicellate (not glomerate nor strictly fascicled, though crowded) capitula." Rydberg, in his treatment of the tribe Helenieae for The North American Flora, followed Gray in retaining the two genera as sole members of the subtribe Flaverinae.

Turner and Johnston (1961) have suggested that these two genera are closely related to *Haplöesthes*, a genus which most authors (including Gray, 1884; Bentham, 1876; and Hoffmann, 1894) have placed in the tribe Senecioneae. Ornduff *et al.* (1963), noting the suggestion as to tribal position made by Turner and Johnston, have commented, that if *Flaveria* ( $n=18$ ), *Haplöesthes* ( $n=18$ ) and *Sartwellia* ( $n=18$ ) are placed in the Senecioneae that "Their morphology and chromosome number give them an isolated position in that tribe, whereas removal to Heliantheae or Helenieae would be less taxing to tribal homogeneity."

Assuming that the Helenieae is an artificial assemblage as has been suggested by several authors (Turner, 1956), inclusion of these genera as a subtribe within the Senecioneae (as presently circumscribed) would be as defensible as including them within the Heliantheae. In fact, as indicated by Skvarla and Turner (1966) the former tribe is palynologically more

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TABLE 1. CHROMOSOME NUMBERS OF SARTWELLIA POPULATIONS

SPECIES	LOCALITY AND VOUCHER	NUMBER
<i>S. flaveriae</i> Gray	NEW MEXICO. Socorro Co.: 17 mi E of San Antonio. <i>Turner &amp; Powell 6126 (TEX)</i> .	18
<i>S. flaveriae</i> Gray	TEXAS. Culberson Co.: 6.2 mi W of Salt Flat. <i>Turner &amp; Powell 6140 (TEX)</i> .	18
<i>S. mexicana</i> Gray	MEXICO. Coahuila: 45 mi SW of Cuatro Cienagas. <i>Turner 6004 (TEX)</i> .	18
<i>S. mexicana</i> Gray	MEXICO. Coahuila: 1 mi S of Estacion Hermanas. <i>Turner 6009 (TEX)</i> .	18
<i>S. mexicana</i> Gray	MEXICO. Nuevo Leon: 12 mi S of Coahuila line on Matehuala highway. <i>Graham &amp; Johnston 4199 (TEX)</i> .	18**
<i>S. mexicana</i> Gray	MEXICO. San Luis Potosi: 30 mi S of Matehuala. <i>Ellison 59 (TEX)</i> .	18*
<i>S. mexicana</i> Gray	MEXICO. San Luis Potosi: 11 mi N of Huisache. <i>Birdsong &amp; Turner 178.1 (TEX)</i> .	18
<i>S. puberula</i> Rydb.	MEXICO. Durango: 2 mi NW of Bermejillo. <i>Stuessy 937 (TEX)</i> .	18

\* Powell & Turner (1963).

\*\* Turner & Johnston (1961).

heterogenous than is the Heliantheae, and if we are to accept the subtribe Labineae and some of the genera such as *Arnica* and *Bartlettia*, recognized as belonging to the Senecioneae by Rydberg (1927), it is as morphologically diverse as the Heliantheae. Certainly the three genera appear to be senecioid in habit (opposite, mostly clasping, leaves); involucre mostly in 1 or 2 series; pappus (when present) of bristles (at least in part); style branches truncate; and achenes columnar, usually ribbed (Figs. 1-3). While the genera appear to have no close relatives in either tribe, I believe they are reasonably close to *Arnica* ( $x=19$ ) and might well be positioned within or near that taxon, as indeed, as has been suggested by Hoffmann's treatment of the tribe (*i.e.*, he positions *Haplöesthes* next to *Arnica*). As to the  $x=18$  chromosome base, this number is as rare in the Heliantheae as it is in the Senecioneae; in any case it is not too difficult to imagine its origin at some ancestral time through chromosomal loss from *Arnica* ( $x=19$ ), if one does not wish to assume an ancestral base of  $x=9$  for the genus itself.

SARTWELLIA A. Gray, Pl. Wright. 1:122. 1852. Type species: *S. flaveriae*.

Annual or short-lived perennial herbs 6-30 inches tall, the stem branching from the base. Leaves narrowly linear, opposite. Heads radiate, 10-45

flowered, in corymbiform cymes. Involucre turbinate to broadly campanulate; bracts typically 5, in two series, broadly oval or oblong to elliptic, yellowish. Receptacle small, convex, glabrous. Ray florets 3-5, fertile; ligules very small, yellow, narrowly to broadly oval or rarely linear, truncate or variously 2-3 toothed. Disk florets 5-parted, 10-40, fertile; corolla tube about as long as the throat; style branches short, truncate, penicillate at the apex. Achenes black at maturity, cylindric or nearly so, 10-ribbed; pappus of the disk florets of 5 erose squamellae, alternating with 5 bristles, these wholly united into a cup-like crown (in *S. flaveriae*) or else variously united at the base of the corolla tube and deciduous with the latter; pappus of the ray florets usually reduced but similar to those of the disk, rarely completely absent.

Base chromosome number,  $x=18$ .

#### KEY TO SPECIES

1. Florets 20-40 per head; involucre campanulate, the outer 3 involucreal bracts broadly oval, 2-3 mm long, 1.5-2.0 mm wide, *not* conspicuously thickened and keeled at the base; plants usually 4-15(40) cm tall  
 . . . . . 1. *S. mexicana*
1. Florets 8-15 per head; involucre turbinate to narrowly campanulate, the outer 3 involucreal bracts broadly linear to oval (rarely elliptic), 1.5-2 mm long, ca 1 mm wide, conspicuously thickened and somewhat keeled at the base.
  2. Pappus of disk achenes fused, forming a lacinate crown or cup ca 0.5 mm long (rarely the pappus of 5 distinct squamellae alternating with 5 bristles, as in *S. mexicana*, below); plants of the United States (Texas and adjacent New Mexico) . . . . . 2. *S. flaveriae*
  2. Pappus of disk achenes with 5 squamellae, 0.5-1.0 mm long, alternating with 5 somewhat longer bristles, not united into a distinct crown or cup; plants of northern Mexico . . . . . 3. *S. puberula*

1. SARTWELLIA MEXICANA A. Gray (S. Wats. Proc. Am. Acad. 18:107, *hyponym*. 1882), Proc. Am. Acad. 19:34. 1884. Holotype GH!: MEXICO. Coahuila: Monclova. Aug 23-31, 1880. *E. Palmer* 683. (Mounted on same sheet with *E. Palmer* 683 is a glabrate specimen of *S. puberula*). Isotype US!.

*Sartwellia humilis* I. M. Johnston, Jour. Arn. Arb. 22:167. 1941. Holotype GH!: MEXICO. San Luis Potosi: 4 mi S of Cedral, gypsum plain, 1938, *I. M. Johnston* 7567. Isotype US!.

Herbs 6-15(40) cm high, glabrous; leaves narrowly linear, 2-6 mm long, ca 1 mm wide or less; heads 25-45 flowered; involucre 2.2-3.0 mm high, the 3 outer bracts broadly oval to obovate, yellow and membranous, with faint orange ribs, usually rounded at the apex, glabrous; ray flowers 5, ligules 0.5-1.0 mm long, ca 0.75 mm wide; disk corollas 1.5-2.0 mm long; achenes

1 mm long or less, sparsely hispidulous; pappus of 5 squamellae, 0.5-1.0 mm long, alternating with 5 somewhat longer bristles. Chromosome number,  $n=18$ .

Distribution: Gypseous soils of eastern Coahuila, western Nuevo Leon south to Zacatecas and San Luis Potosi, reportedly common in "alkaline plains" and flats. Aug-Oct.

Both Rydberg (1915) and, surprisingly, I. M. Johnston (1941) failed to recognize the more distinguishing features which characterize what I treat here as *S. mexicana* and *S. puberula*. While Rydberg recognized two species for northern Mexico, *S. puberula* and *S. mexicana*, he did not recognize the biological integrity of the numerous-flowered, campanulate-headed taxon which I treat as *S. mexicana*; rather he applied the latter name to the fewer-flowered, turbinate-headed populations of more western Coahuila and adjacent Chihuahua. Rydberg inadvertently gave the name *S. puberula* to the latter populations in describing, as a new species, puberulent forms of what he accepted as *S. mexicana*. Johnston (1941) largely recognized the inadequacy of Rydberg's treatment, himself believing *S. puberula* to be ". . . no more than a puberulent variety of *S. mexicana* Gray." While Johnston, in his recognition of *S. humilis*, clarified to some considerable degree the biological status of the several taxa, he unfortunately failed to examine the holotype of *S. mexicana* closely, for the specimen is clearly a robust form of his *S. humilis*. Johnston's carelessness is perhaps understandable in that he thought of his *S. humilis* as a uniformly small, compact plant; also he apparently did not appreciate fully the floral distinctions which characterized *S. humilis*, remarking only, in a comment following his description of the species, that *S. humilis* differs from *S. mexicana* ". . . in having numerous very short spreading stems and slightly larger heads." Finally, it is possible that Johnston was misled by the holotype of *S. mexicana* for it is mounted, with overlapping heads, on the same sheet with a glabrate specimen of *S. puberula* from San Lorenzo, southwestern Coahuila (*E. Palmer 683*). That Johnston should fail to find the definitive characters that marked his *S. humilis* (or *S. mexicana* of this treatment) is surprising, for it is more distant from *S. puberula* than the latter is from *S. flaveriae*, a species recognized almost solely on characters of the pappus (which occasionally break down) and distribution.

In habit *S. mexicana* is characteristically low and compact but spindly specimens up to 40 cm high have been collected well to the south of Saltillo (*Waterfall 15736*) and, as mentioned above, the holotype itself is very similar in habit to *S. puberula*.

Specimens examined: MEXICO. Coahuila: 1 mi S of Hermanas, 22-24 Aug 1938, *I. M. Johnston 7058* (GH, US); 6 mi N of La Ventura, 12-13 Sep 1938, *I. M. Johnston 7634* (FM, UC); on Vanegas-Saltillo rd, Jul-Aug 1934, *C. L. Lundell 5719* (ARIZ, DS, US); Las Hermanas, 26 mi N of Monclova, 24 Aug 1938, *F. Shreve 8425* (ARIZ, US); 6 mi N of La Ventana, 13 Sep 1938, *F. Shreve 8723* (ARIZ, US); N of La Ventura (14 mi N of Salvador), 20

Aug 1940, *E. R. Tinkham* 9609 (ARIZ, GH); 1 mi S of Hermanas, 23 Aug 1959, *U. T. Waterfall* 15795 (F, SMU). Nuevo Leon: 46 mi S of Saltillo, 8 Oct 1959, *M. C. Johnston & J. Graham* 4199 (TEX); 74 mi N of Matehuala, 24 Aug 1951, *U. T. Waterfall* 16595 (SMU, UC). San Luis Potosi: 30 mi S of Matehuala, 25 Aug 1960, *W.L. Ellison* 59 (TEX); Matehuala, 13 Aug 1959 *J. Rzedowski* 11489 (TEX); 40 mi S of Matehuala, 20 Aug 1959, *U.T. Waterfall* 15736 (F, SMU). Zacatecas: Cedros, Oct 1907, *F.E. Lloyd* 14 (UC, US); Cedros, Oct 1907, *F. E. Lloyd & J. E. Kirkwood* 145 (GH); Hacienda de Sierra Hermosa, 4-5 Sep 1938, *I. M. Johnston* 7405 (FM, GH, UC); 14 mi S of Zacatecas-Coahuila state line on Highway 54, 2 Aug 1965, *J. Strother* 464 (TEX).

2. *SARTWELLIA FLAVERIAE* A. Gray, Pl. Wright. 1:122. 1852. Holotype GH!. TEXAS: "prairies of the Rio Seco." Oct 1849, *C. Wright* 386 Iso-type US!.

Erect, tap-rooted, annual herb, 10-40 cm high, glabrous; leaves narrowly linear, 2-5 cm long, ca 1 mm wide (lower-most leaves rarely up to 2.5 mm wide); heads 9-15 flowered; involucre turbinate, 2.0-2.3 mm high; bracts 5 in two series, the 3 outer ones ca twice as long as wide, fleshy-membranous above but thickened below forming a distinct fleshy keel along the lower midrib; ray florets 3-5; yellow; ligules oval to linear, ca 2 mm long, 1 mm wide; disk corollas ca 2 mm long; achenes 1.5-1.8 mm long, hispidulous; pappus of disk florets wholly united into an erose crown, ca 0.5 mm long or rarely of 5 erose squamellae alternating with 5 bristles, these variously united at the base; pappus of ray florets similar to but smaller than that of the disk, rarely completely absent. Chromosome number,  $n=18$ .

Distribution: Gypseous soils of western-most Texas and adjacent New Mexico. (May) Aug-Sept.

The pappus of this species, while normally united into a crown or cup, may occur as 5 squamellae alternating with 5 bristles, such as occurs in *S. mexicana* and *S. puberula*. This variation is found both within populations and between populations (e.g., *E. Whitehouse* 16998, SMU; 16869, SMU; *Correll & Correll* 26035, LL).

*S. flaveriae*, except for the pappus, is very similar to *S. puberula*. Their ranges do not overlap, however, unless one considers some of the pappus forms mentioned above as belonging to the latter species.

Representative specimens: UNITED STATES. NEW MEXICO. De Baca Co.: 27.5 mi S of Ft Sumner, 23 Sep 1967, *J. B. Secor* 80 (TEX); Eddy Co.: 3.5 mi S of Loving, 17 Sep 1946, *E. Whitehouse* 16869 (ARIZ, SMU, UC); Chaves Co.: 54 mi SE of Vaughan, 12 Aug 1947, *U. T. Waterfall* 7741 (NY); Lincoln Co.: White Mountains, 23 Aug 1897, *E. O. Wooton* 383 (DS, POM, UC, US); Otero Co.: White Sands, 31 Aug 1904, *E. O. Wooton* 2619 (US); Socorro Co.: hills S of rd from Ben Rentfrow's Ranch to "upper crossing of malpais," 13 Sep 1923, *W. W. Eggleston* 19432 (US). TEXAS. Culberson

Co.: 30 mi N of Van Horn, 16 Sep 1948, *B. H. Warnock & B. L. Turner* 203 (LL, SMU); Crane Co.: 11 mi E of Grand Falls, 3 Oct 1935, *V. L. Cory* 27357 (LL); Hudspeth Co.: W side of Salt Lake on hwy 62, 21 Sep 1946, *E. Whitehouse* 16998 (SMU, US); Loving Co.: along & above Salt Creek near hwy 285 N of Orla, 27 Sep 1962, *D. S. Correll & H. B. Correll* 26035 (LL); Pecos Co.: ca 10 mi NE of Grandfalls, 19 Aug 1947, *L. C. Hinckley* 3995 (SMU); Reeves Co.: 1 mi NE of Pecos, 7 Jun 1943, *U. T. Waterfall* 4376 (ARIZ, NY, SMU); Ward Co.: ca 1 mi W of Peyote, 18 Sep 1966, *D. S. Correll* 33654 (LL); Winkler Co.: 10 mi SW of Kermit, 4 Sep 1954, *T. Collins* 685 (SMU).

3. *SARTWELLIA PUBERULA* Rydb., *N. Am. Fl.* 34:141. 1915. Holotype NY: MEXICO. Chihuahua: plains below San Carlos. *C. C. Parry (Mex. Bound. Surv.)* 640. Isotype (fragment) UC!.

Erect, tap-rooted, annual or short-lived perennial herb, 15-45 (100) cm high, glabrous to rarely puberulent; leaves narrowly linear, 2-7 cm long, 1-2.5 mm wide; heads 10-18 flowered; involucre turbinate, 2.0-2.5 mm high; bracts 5 in two series, the 3 outer ones nearly twice as long as wide, fleshy-membranous above, fleshy and thickened below and somewhat keeled; ray florets 5, yellow; ligules oval to linear 1.5 mm long, 1 mm wide or less; disk corollas ca 2 mm long; achenes 1.0-1.5 mm long, hispidulous in lines along the ribs; pappus of disk florets of 5 squamellae, 0.5-1.0 mm long, alternating with 5 somewhat longer bristles (the pappus sometimes partially united, approaching that of *S. flaveriae*); pappus of ray florets usually reduced but similar to that of the disk (rarely completely absent). Chromosome number,  $n = 18$ .

Distribution: Gypseous soils of western Coahuila and eastern Chihuahua, south to northern Durango; common locally on flats and plains; (May) Aug-Sep.

Through misapplication of the type, this species has long gone under the name, *S. mexicana* (see discussion under the latter species). Rydberg (1915) inadvertently gave the name *puberula* to the taxon through his description, as a new species, of puberulent forms of what he took to be *S. mexicana*. Actually, *S. puberula*, as treated here, is nearly always glabrous, puberulent forms having been collected only in the vicinity of Castillon, Coahuila (*Johnston & Muller* 1267; just south of the type locality of the species) and more recently in northern Durango (*Stuessy* 937). Sparsely puberulent forms are also known (*Johnston & Muller* 1438) and it appears that relatively few genes segregate for this character, these occurring sporadically over a broad region.

The species is to be expected in trans-Pecos Texas, (gypseous exposures of the Big Bend area) since collections have been made just south of Presidio, Texas by I. M. Johnston (see cited specimens, below).

Representative specimens: MEXICO. Chihuahua: 5 mi S of Ojinaga, 9-10 Aug 1941, *I. M. Johnston* 8000 (GH); 4 mi S of Chapo, 21-22 Sep 1940,

*I. M. Johnston & C. H. Muller* 1438 (GH); near Jimenez, 20 Sep 1892, *C. G. Pringle* 5264 (GH); Rancho San Jose del Progreso, 21 Sep 1942, *R. M. Stewart* 2323 (GH). Coahuila: 4 mi N of Parras, 15-17 Sep 1938, *I. M. Johnston* 7705 (GH, US); Castillon, gypsum flats by corrals of the hacienda, 13 Aug 1941, *I. M. Johnston* 8187 (GH); near Tanque La Luz on gypsum beds along escarpment, 26 Aug 1941, *I. M. Johnston* 8497 (GH); Puertecito, gypseous bank just E of ranch, 28 Aug 1941, *I. M. Johnston* 8588 (GH); ca 2 mi E of Tanque La Palma, 30 Aug 1941, *I. M. Johnston* 8609 (GH); 5-7 mi SW of Rosario, 3-4 Sep 1941, *I. M. Johnston* 8817 (GH); San Lorenzo de Laguna & vicinity, 22-27 leagues SW of Parras, 1-10 May 1880, *Dr. E. Palmer* 683 (F, GH, US); Cerro de Cypriano, Jul 1910, *C. A. Purpus* 4476 (F, GH, US); rd from San Vicente, 4-5 Oct 1941, *R. M. Stewart & I. M. Johnston* 1957 (GH). Durango: 2 mi NW of Bermejillo on rte 49, 16 Aug 1967, *T. F. Stuessy* 937 (TEX).

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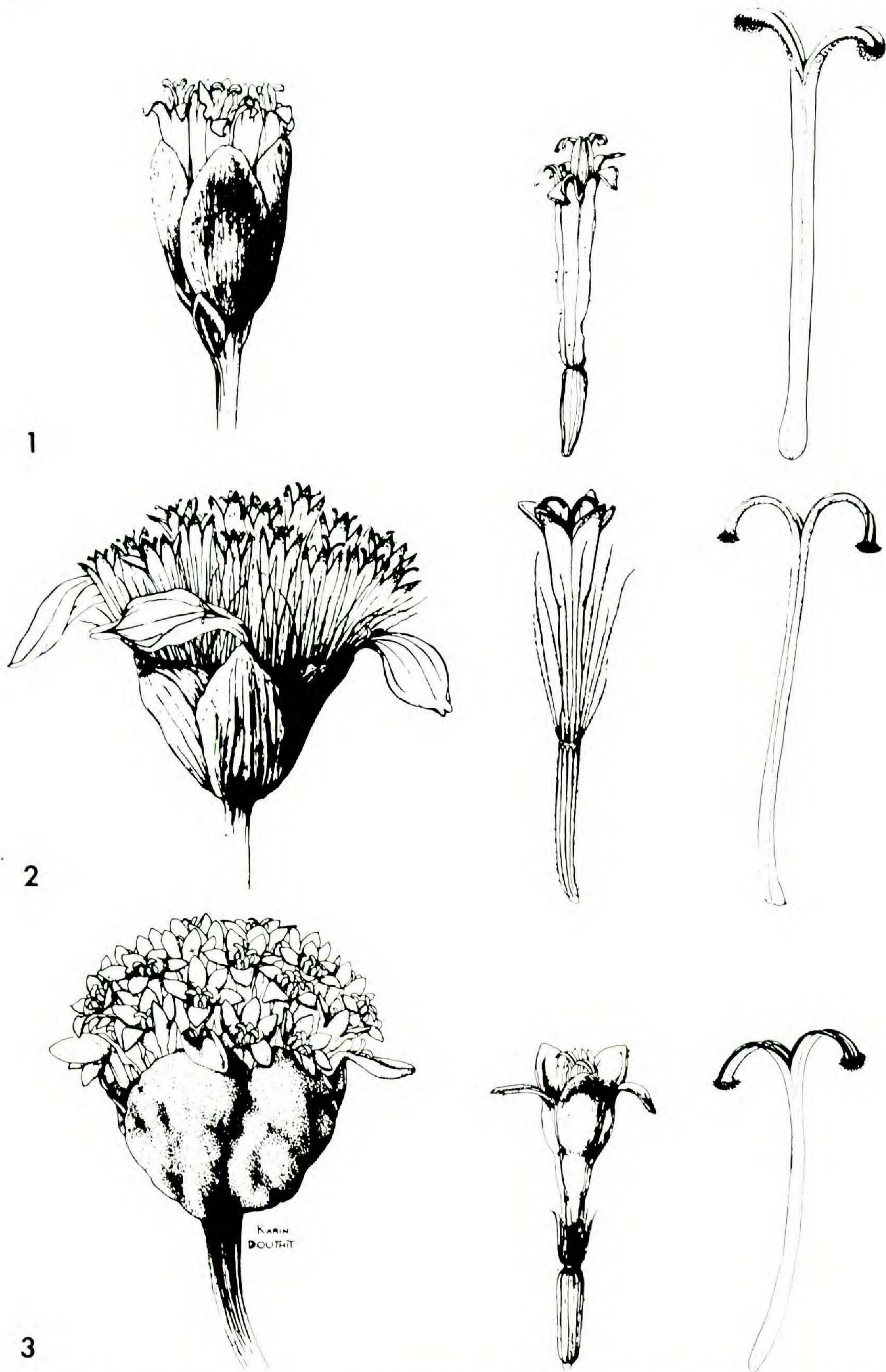


Fig. 1-3. Heads, disc florets and style of (1) *Flaveria pringlei* (King 2533, TEX); (2) *Haplöesthes* (Ellison & Turner 43, TEX); and (3) *Sartwellia mexicana* (Johnston 4199, TEX). Sketches by K. Douthet.



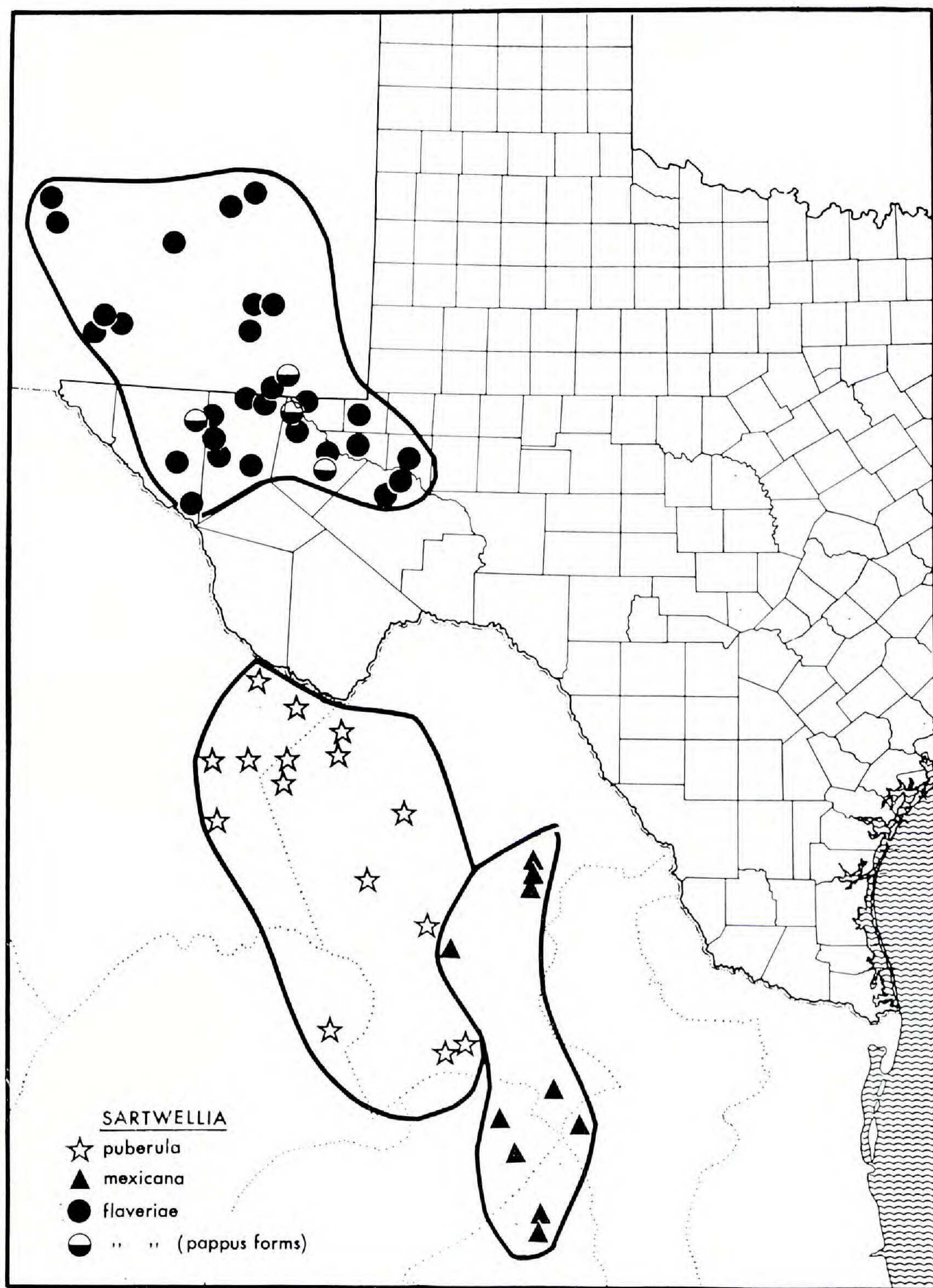


Fig 4. Distribution of three species of *Sartwellia*. Pappus forms of *S. flaveriae* superficially resembling those of *S. puberula* are shown within the range of the former taxon. Additional explanation in text.