

NOTES ON THE GENUS *POLYGALA* IN THE UNITED STATES AND MEXICO

TOM WENDT

A MONOGRAPH of *Polygala* L. section RHINOTROPIS Blake has recently been completed and is being prepared for publication. The purpose of the present article is to validate a number of nomenclatural changes and to note taxonomic reinterpretations in this section before publication of the revised edition of the National List of Scientific Plant Names. In order to present a complete picture of the proposed changes, Mexican taxa that do not occur in the United States are included when relevant to the discussion of United States taxa. In addition, *Polygala watsonii* Chodat of section MONNINOPSIS Gray is reported as new to the United States.

Polygala section RHINOTROPIS Blake, Contr. Gray Herb. 47: 70. 1916.

***Polygala heterorhyncha* (Barneby) Wendt, comb. et stat. nov.**

Polygala subspinos S. Watson var. *heterorhyncha* Barneby, Leaflet W. Bot. 3: 194. 1943. TYPE: United States. Nevada. Southeastern Nye Co., foothills of Spotted Range, toward Frenchman Flat, Ripley & Barneby 3427 (CAS!, holotype; GH!, isotype).

This taxon has been treated as a variety of *Polygala subspinos* S. Watson, and Beatley (1976) states that it is "doubtfully distinct" even at that rank. However, where the range of the widespread *P. subspinos* approaches that of the local *P. heterorhyncha* in southern Nevada, these taxa show no intergradation in the key characters given below and are strongly separated ecologically. In this area, *P. subspinos* is confined to juniper and pinyon-juniper woodlands and sagebrush desert at 1600–2000 meters in the volcanic uplands to the north, while *P. heterorhyncha* is found in Mojave Desert scrub and less frequently in transitional desert vegetation (e.g., *Coleogyne* scrub) at 900–1525 meters in the valleys to the south (see Beatley, 1976, for a review of the vegetation of this area). The two species may be separated by the following key.

- | | |
|---|---------------------------|
| Beak of keel petal entire or slightly erose; body of seed more or less evenly and moderately densely pubescent or infrequently with glabrate patches. | <i>P. subspinos</i> . |
| Beak of keel petal with 1 or 2 prominent invaginations along lower side formed by sinuate excess tissue; body of seed densely pubescent just below umbo of aril, lower half sparsely and unevenly pubescent to glabrate. | <i>P. heterorhyncha</i> . |

***Polygala intermontana* Wendt, stat. et nom. nov.**

Polygala acanthoclada Gray var. *intricata* Eastwood, Proc. Calif. Acad. Sci. II. 6: 283. 1896, non *P. intricata* Blake. TYPE: United States. Utah. San Juan Co., Willow Creek, 14 July 1895, *Eastwood 10* (in part) (CAS!, holotype; GH!, UC!, isotypes). Paratype: United States. Utah. San Juan Co., Barton's Range, 13 July 1895, *Eastwood 10* (in part) (MO!, US!).

This Great Basin species is distinguished from the more southern *Polygala acanthoclada* Gray by the characters given in the key below. Both species are diploid, $n = 9$ (Wendt, unpubl.); the few morphological intermediates found in the limited zone of sympatry in southeastern Utah and northern Arizona are tetraploid, $n = 18$. These facts argue strongly for recognition of the two taxa as separate species, which can be separated by the key that follows.

- Leaves and branchlets densely pubescent with spreading hairs; pedicels pubescent, usually shorter than flowers, 1.5–4.0(–5.8) mm. long; outer sepals pubescent with spreading hairs. *P. acanthoclada*.
 Leaves densely pubescent with incurved hairs; branchlets with densely matted or shaggy tomentum of appressed, incurved, or occasionally irregularly inclined or divergent hairs; pedicels glabrous, usually longer than flowers, (2.5–)3.0–7.0(–9.0) mm. long; outer sepals glabrous or merely ciliate, occasionally with a few incurved hairs near apex. *P. intermontana*.

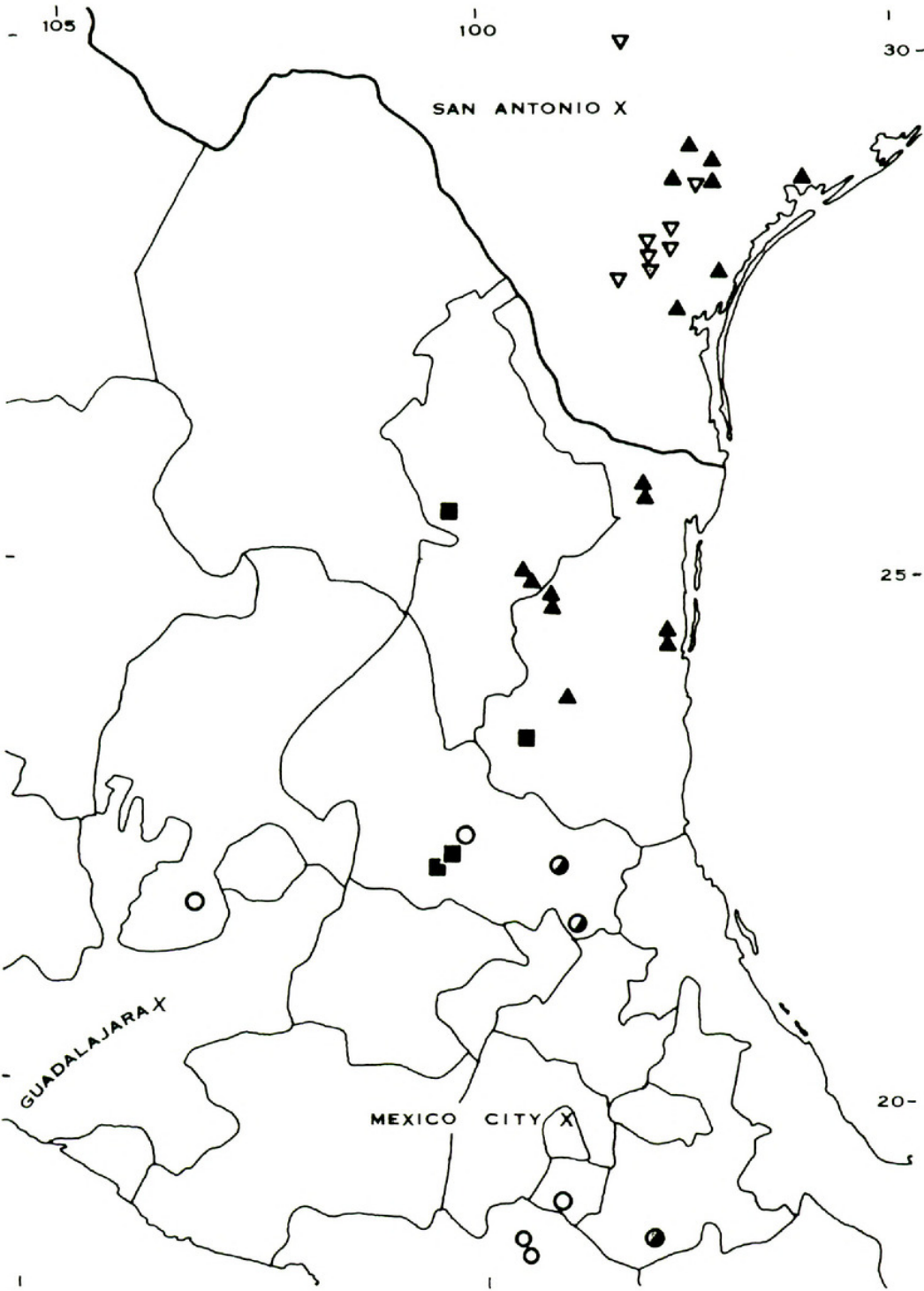
The taxa related to *Polygala lindheimeri* Gray have long been a perplexing problem. This complex is distinguished by the following suite of characters: upper sepal alone persistent in fruit, keel prominently beaked and/or saccate portion of keel glabrous, wings rose-pink, racemes typically leaf-opposed. Blake, the last monographer of the North American members of the genus, varied in the number of species that he recognized within this complex from nine (1916) to four (1924). Barneby (1970) noted that it is "a critical group. . . . Specific lines are hard to draw, for the available differential criteria are seldom absolute."

In the present treatment I recognize two species, each with a number of varieties (MAPS 1, 2). Justification for this decision and full synonymy will be given in the monograph to follow. The two species may be distinguished by the following key.

- Rootstock with prominent, bright orange-red cortex loosely exfoliating in thin layers; stamens 8 or 7; [chromosome number $n = 18$ or 27]. . . . *P. nitida*.
 Rootstock with firm, brown, gray, or dull red-brown cortex not exfoliating in thin layers; stamens 7; [chromosome number $n = 9$ or 18 ($n = 9$ in U. S. taxa)]. *P. lindheimeri*.

***Polygala nitida* T. S. Brandege, Univ. Calif. Publ. Bot. 4: 272. 1912.**
 TYPE: Mexico. San Luis Potosí. Minas de San Rafael, Bagre, *Purpus 5168* (UC!, holotype; BM (*fide* Blake, 1916), F!, GH!, NY!, US!, isotypes).

Polygala nitida, previously treated as confined to Mexico, is here considered to be composed of four varieties, two of which occur in the United States (MAP 1). Jones (1975) apparently referred South Texas populations of both of the United States taxa to *P. tweedyi* Britton ex Wheelock



MAP 1. Distribution of *Polygala nitida* var. *nitida* (squares), var. *lithophila* (circles), var. *tamaulipana* (closed triangles), var. *goliadensis* (open triangles); intermediates between var. *lithophila* and other varieties (half-circles).

(= *P. lindheimeri* var. *parvifolia* Wheelock), although he cited no collections. The varieties of *Polygala nitida* may be separated by the following key.

- A. Flowers 3.4–5.0(–5.3) mm. long; beak 0.2–0.6 mm. long, deltoid or oblong, less (usually much less) than twice as long as thick, or occasionally absent; stamens 7; [chromosome number $n = 18$]. var. *lithophila*.
- A. Flowers (4.1–)4.5–7.5 mm. long; beak (0.6–)0.8–1.7 mm. long, oblong to linear, two or more times as long as thick, or rarely absent; stamens 7 or 8; [chromosome number $n = 18$ or 27].
 - B. Flowers (4.1–)4.5–6.1 mm. long; leaves mostly suborbicular, obovate or elliptic, the apex rounded or obtuse, abruptly mucronate, infrequently acute in distal leaves; distal leaves similar to lower or, when distinctly narrower, usually narrowly obovate; beak white or yellow, with or without rose on tip; stem pubescent with closely incurved hairs 0.07–0.15 mm. long; stamens 8; [chromosome number $n = 18$]. var. *nitida*.
 - B. Flowers (4.4–)5.0–7.5 mm. long; leaves linear, ovate, or elliptic, apex acute to acuminate, extended gradually into mucronate tip, less frequently rounded and abruptly mucronate; distal leaves, when distinctly narrower than basal, lance-ovate to linear; beak white to yellow, usually rose along lower side throughout; stem pubescence as in var. *nitida*, or hairs loosely incurved and longer; stamens 7 or 8; [chromosome number $n = 18$ or 27].
 - C. Leaves, including basal ones, narrowly elliptic (at least 5 times as long as wide), lanceolate, or linear (or, when leaves in lower third of stem broader, then the distal leaves lance-elliptic, much narrower than basal, and stem pubescence of closely incurved-appressed hairs mostly 0.07–0.15(–0.2) mm. long, these lying very close to stem surface with free tip touching stem); [chromosome number $n = 18$]. var. *tamaulipana*.
 - C. Leaves in lower third of stem elliptic to ovate, 1.5–3 times as long as wide, distal leaves similar or somewhat narrower but never lanceolate or linear; stem pubescence mostly of loosely incurved hairs 0.15–0.3 mm. long, the hair tips not close to stem surface; [chromosome number $n = 27$]. var. *goliadensis*.

***Polygala nitida* T. S. Brandegees var. *lithophila* (Blake) Wendt, comb. et stat. nov.**

Polygala lithophila Blake, Contr. Gray Herb. 47: 74. 1916. TYPE: Mexico. San Luis Potosí. Minas de San Rafael, Guascalá, *Purpus* 5175 (GH!, holotype; NY!, UC!, isotypes).

Polygala erythrorrhiza Barneby, Rhodora 72: 69. 1970. TYPE: Mexico. Guerrero. 11 mi. S. of Iguala, 2600 feet, *Ripley & Barneby* 13737 (NY!, holotype; CAS!, K (fide Barneby), MICH!, US (fide Barneby but not located there by author), isotypes).

This taxon is known from scattered localities in San Luis Potosí, southern Zacatecas, Morelos, and Guerrero; collections from eastern San Luis Potosí are morphologically intermediate between *Polygala nitida* vars. *nitida* and *lithophila*, and a single collection from southern Puebla shows affinities to the quite allopatric *Polygala nitida* var. *tamaulipana*

(MAP 1). It is usually found on soft or crumbly, often highly mineralized soils at 325–1500 meters elevation in tropical deciduous scrub.

***Polygala nitida* T. S. Brandegees var. *nitida*.**

The typical variety is known from a few localities in the Sierra Madre Oriental from San Luis Potosí to Nuevo León (MAP 1). Its usual habitat is deep but rocky, calcareous or shaley soils at 1200–1800 meters, in subtropical oak woodland or occasionally in juniper woodland.

***Polygala nitida* T. S. Brandegees var. *tamaulipana* Wendt, var. nov.**

Polygala lithophila Blake, *pro parte*, but not as to type.

Planta erecta 5–20 cm. alta; caules arcte incurvati-puberuli pilis 0.07–0.1(–0.15) mm. longis. Folia lanceolata vel linearia vel anguste elliptica, interdum folia inferna latiora, 0.5–3.5(–4.0) cm. longa, 0.1–0.3 cm. lata (folia inferna interdum ad 0.8 cm. lata), plerumque firma; apex acutus vel acuminatus sensim mucronatus. Pedicelli 1.5–3.0 mm. longi; flores (4.4–)5.0–7.5 mm. longi; sepala inferna plerumque viridia ad marginem dilute rosea vel alba; rostrum carinae (0.6–)0.8–1.7 mm. longum (raro deficiens) oblongum vel lineare, omnino album vel luteum, vel latus infernum roseum vel tantum apex roseus; stamina 7 vel 8. Capsula sessilis vel perbrevistipitata, basis rotundata vel acuta. Chromosomatum numerus $n = 18$.

TYPE: Mexico. Tamaulipas. 45 mi. N. of San Fernando (29 mi. N. of jct. of Rtes. 100 & 97) along Rte. 97 to Reynosa, ca. 46 mi. S. of Reynosa, 25°26' N., 98°13' W., ca. 75 m. elevation, roadside in nearly flat caliche brushland, 1 August 1977, *Wendt 2095* (holotype, LL; isotypes, ENCB, MEXU). Chromosome number of type population $n = 18$.

The new variety is known from central Tamaulipas and eastern Nuevo León northward near the coast into the eastern part of South Texas, reaching as far north as Lavaca Bay and DeWitt County (MAP 1). It is generally found on dry soils from near sea level to 600 meters elevation, in Tamaulipan thorn scrub, oak savanna, and coastal prairie, or occasionally in montane woodland. Some Mexican populations show intergradation to *Polygala nitida* var. *nitida*.

REPRESENTATIVE SPECIMENS. **Mexico.** NUEVO LEÓN: 11 mi. E. of Linares on road to Guadalupe, *M. C. Johnston & Graham 4254A* (TEX). TAMAULIPAS: 3 mi. W. of Morales, 19 mi. E. of Matamoras–Victoria highway on the road to Loreto, *Johnston & Crutchfield 5350* (MICH, TEX). **United States.** TEXAS: Calhoun Co., Port Alto, 25 July 1937, *Drushell s.n.* (NY); Goliad Co., 1.8 mi. SE of Weesatche, *Wendt 1972* (LL); Kleberg Co., Kingsville, *Tracy 9427* (GH, MO, NY); San Patricio Co., 7½ mi. S. of Taft, *F. Jones 469* (SMU).

***Polygala nitida* T. S. Brandegees var. *goliadensis* Wendt, var. nov.**

Planta effusa vel fere erecta 5–20 cm. alta et usque 20 cm. lata plerumque multo parvior; caules laxae incurvate-puberuli, pilis pro parte maxima

0.15–0.3 mm. longis. Folia elliptica vel ovata, interdum folia distalia angustiora, 0.8–2.2 (–2.5) cm. longa, (0.2–)0.3–0.9 cm. lata, plerumque firma et reticulata; apex acutus et sensim mucronatus vel interdum rotundatus et abrupte mucronatus. Pedicelli (2.0–)2.5–4.0 mm. longi; flores (4.6–)5.0–7.3 mm. longi; sepala inferna plerumque viridia ad marginem dilute rosea vel alba; rostrum carinae (0.6–)0.8–1.7 mm. longum, oblongum vel lineare, album vel luteum, et plerumque roseum in latere inferno; stamina 7 vel 8. Capsula sessilis basi acuto vel rotundato, vel brevistipitata stipite 0.3–0.5 mm. longo. Chromosomatum numerus $n = 27$.

TYPE: United States. Texas. Duval Co., 19.1 mi. ESE. of Freer on Rte. 44, 5.4 mi. ESE. of jct. with Rte. 3196 to Rosita, 27°47'15" N., 98°20'30" W., ca. 450 ft. elevation, low caliche cut along highway, crumbly open slope, 19 July 1977, *Wendt 1978* (holotype, LL; isotypes, MEXU, SMU). Chromosome number of type population $n = 27$.

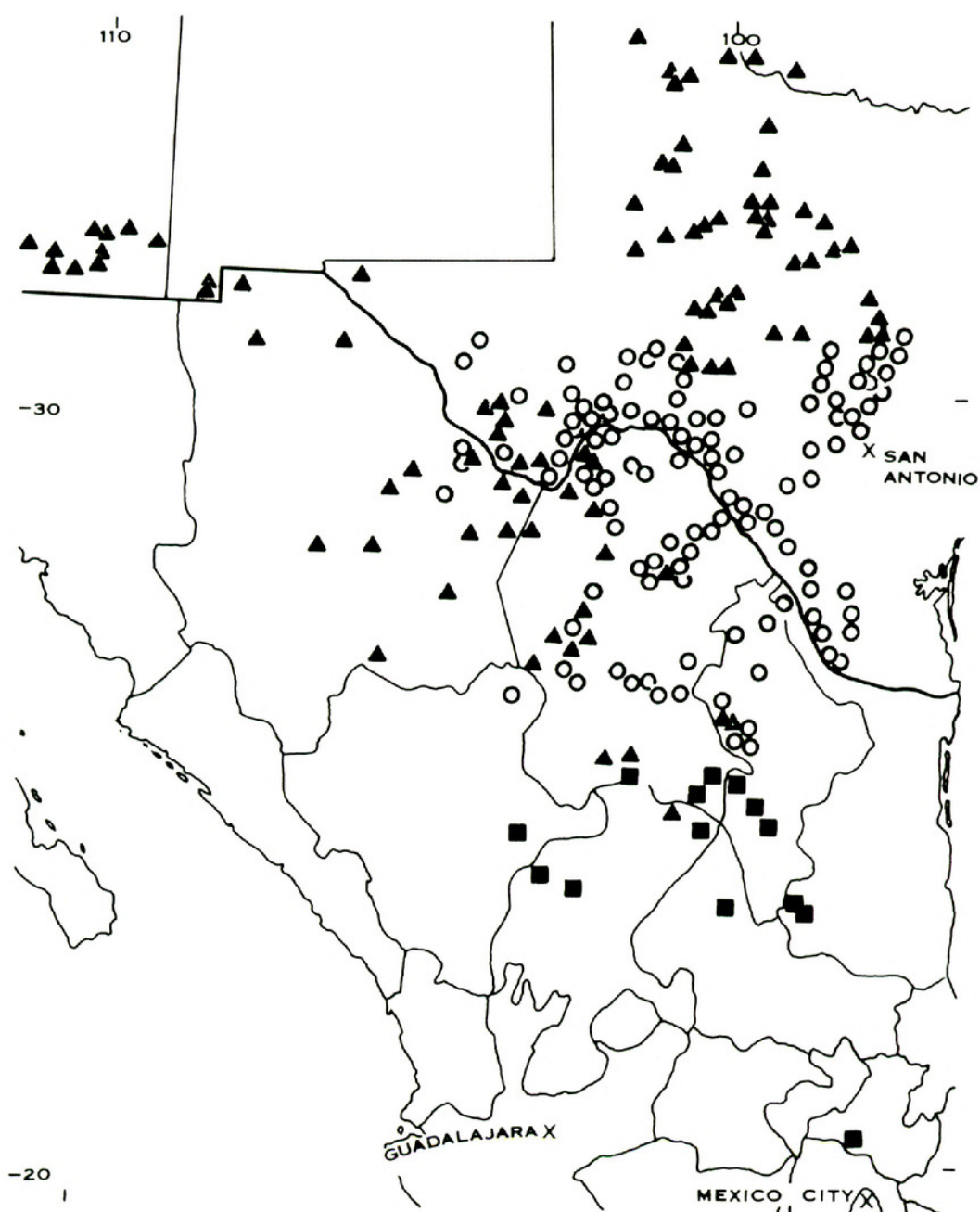
Polygala nitida var. *goliadensis* is known from the central part of South Texas in Duval, Wells, Live Oak, San Patricio, Bee, and Goliad counties, and from an apparently disjunct population in Blanco County in the central part of the state (MAP 1). Through most of its range, it inhabits Tamaulipan thorn scrub at 50–150 meters elevation; the Blanco County population is in an area of Edwards Plateau juniper-oak woodland at ca. 300 meters elevation. The new variety is most common on crumbly, open slopes and roadcuts of the Goliad Formation of South Texas (Jones, 1975), from which it draws its name. Toward the coast from this formation, *P. nitida* var. *goliadensis* is replaced by *P. nitida* var. *tamaulipana*; a narrow zone exists in which apparent intergrades are found.

REPRESENTATIVE SPECIMENS. UNITED STATES. TEXAS: Bee Co., 8.0 mi. W. of center of Beeville on U. S. Rte. 59, *Wendt 2097* (LL); Blanco Co., Blanco, dry open ground, *E. J. Palmer 12155* (MO, NY, POM, UC); Goliad Co., 4.5 mi. W. of Goliad on Rte. 239, *Wendt 2098* (LL); San Patricio Co., 2.1 mi. NW. of Mathis, *W. Lewis & F. Jones 5583* (MO).

Polygala lindheimeri Gray, Boston J. Nat. Hist. 6: 150. 1850. LECTOTYPE (here designated): United States. Texas. "On rocks, Pierdenales 6/47," *Lindheimer exsic. fasc. III no. 333 field no. 498* (GH!). Paratypes: United States. Texas. "Rocky declivities of the Upper Guadalupe, Aug. 1845," *Lindheimer exsic. fasc. III no. 333 field no. 500* (GH (2 sheets)!, MO!); "Rio Grande East to Colorado on rocky hills," *Wright s.n.* (GH!). Blake (1916) cited a specimen of the *Lindheimer III. 333* at BM, but a field number (if present) was not given.

Polygala lindheimeri includes three varieties, two of which occur in the United States (MAP 2). They may be distinguished by the following key.

- A. Plant pubescent with spreading hairs 0.3–0.5 mm. long, rarely glabrous; lower leaves elliptic, ovate, or obovate, usually prominently reticulate, firm; distal leaves often narrower than basal ones but rarely lanceolate; [chromosome number $n = 9$]. var. *lindheimeri*.



MAP 2. Distribution of *Polygala lindheimeri* var. *lindheimeri* (circles), var. *parvifolia* (triangles), var. *eucosma* (squares).

- A. Plant pubescent with incurved hairs 0.07–0.15(–0.2) mm. long, rarely entirely glabrous but leaves frequently so; leaves as in var. *lindheimeri* or much narrower; [chromosome number $n = 9$ or 18].
- B. Saccate portion of keel externally puberulent with incurved hairs in upper part; plant procumbent or decumbent, deeply rooted in rocky or loose soil; leaves broadly to narrowly elliptic, obovate, or ovate, thick textured, costa prominent abaxially but other venation obscured by spongy tissue, glabrous or nearly so, distal leaves usually not markedly narrower than basal ones; upper petals with apex white or greenish white, if light rose then usually not much darker than rest of upper petal; ventrolateral

lobes of aril (0.8–)1.0–2.2 mm. long, $(\frac{1}{3}-)\frac{1}{2}$ as long as seed body to equal in length; [chromosome number $n = 18$]. var. *eucosma*.

- B. Saccate portion of keel glabrous or rarely externally puberulent in upper part; plant upright to procumbent, when the latter then tenaciously rooted in limestone crevices; leaves linear to elliptic or ovate, thin to thick textured, pubescent or glabrous, the distal leaves often markedly narrower than the basal ones; upper petals with apex dark rose; ventrolateral lobes of aril 0.4–1.9 mm. long, $\frac{1}{5}-\frac{3}{4}$ as long as seed body; [chromosome number $n = 9$]. var. *parvifolia*.

***Polygala lindheimeri* Gray var. *eucosma* (Blake) Wendt, comb. et stat. nov.**

Polygala eucosma Blake, Contr. Gray Herb. 47: 72. 1916. TYPE: Mexico. Coahuila. Sierra Madre 40 mi. S. of Saltillo, *Ed. Palmer 2143* (GH!, K (*fide* Blake)).

This Mexican variety is most common in the Sierra Madre Oriental from southern Coahuila south to Tamaulipas and San Luis Potosí; its range also extends westward to western Zacatecas and eastern Durango, and the variety is known from one locality in Hidalgo (MAP 2). It grows on deep soils at (1525–)1800–2375 meters elevation, in woodlands of oak, oak-pinyon, or pinyon, in overgrazed grassland, and in forests of *Pinus arizonica* Engelman.

***Polygala lindheimeri* Gray var. *parvifolia* Wheelock, Mem. Torrey Bot. Club 2: 143. 1891. TYPE: United States. Arizona. Foothills of Santa Rita Mts., 25 June 1884, *C. G. Pringle s.n.* (NY (ex Herb. J. D. Smith)!, holotype; F (3 sheets)!, G!, GH!, K (*fide* Blake, 1916), MICH!, MO!, NY (2 sheets)!, US (2 sheets)!, isotypes).**

Polygala tweedyi Britton ex Wheelock, *ibid.* TYPE: United States. Texas. "Tom Greene Co.," 1879, *Tweedy s.n.* (NY!, holotype; GH!, isotype).

This widespread and variable variety ranges from southeastern Arizona, southwestern New Mexico, and extreme western Texas southeastward through eastern Chihuahua, the Big Bend of Texas, and Coahuila to extreme northern Zacatecas and western Nuevo León, and from the northern Edwards Plateau of Texas northward to the Texas panhandle and southwestern Oklahoma (MAP 2). It grows in dry soils or occasionally in limestone crevices in open juniper-oak or mesquite savanna, desert grassland, and desert scrub at 350–1850 meters elevation. *Polygala lindheimeri* var. *parvifolia* intergrades with *P. lindheimeri* var. *lindheimeri* in the Big Bend region in Texas and Mexico and in northern Coahuila.

***Polygala lindheimeri* Gray var. *lindheimeri*.**

The type variety is found in the United States only in Texas, where it ranges from the southern Edwards Plateau and southern Trans-Pecos to

the western part of South Texas; it extends southward into eastern Chihuahua, northeastern Durango, Coahuila, Nuevo León, and the Tamaulipan panhandle (MAP 2). It grows in limestone crevices and dry soil at 90–1600 meters elevation in dry juniper-oak woodland, juniper savanna, Tamaulipan thorn scrub, and desert scrub.

Polygala nudata T. S. Brandege, Univ. Calif. Publ. Bot. 4: 183. 1911.

TYPE: Mexico. Coahuila. Sierra de la Paila, *Purpus* 4762 (UC!, holotype; BM (*fide* Blake, 1916), F!, GH!, MO!, NY!, US!, isotypes).

Polygala nudata and *P. minutifolia* Rose were described in 1911 by workers on opposite coasts of the United States; the latter species had priority by several months. Blake (1916, 1924) combined these very similar taxa. However, further collections, fieldwork, and examination of the types have shown these to be distinct species; they may be distinguished by the following key.

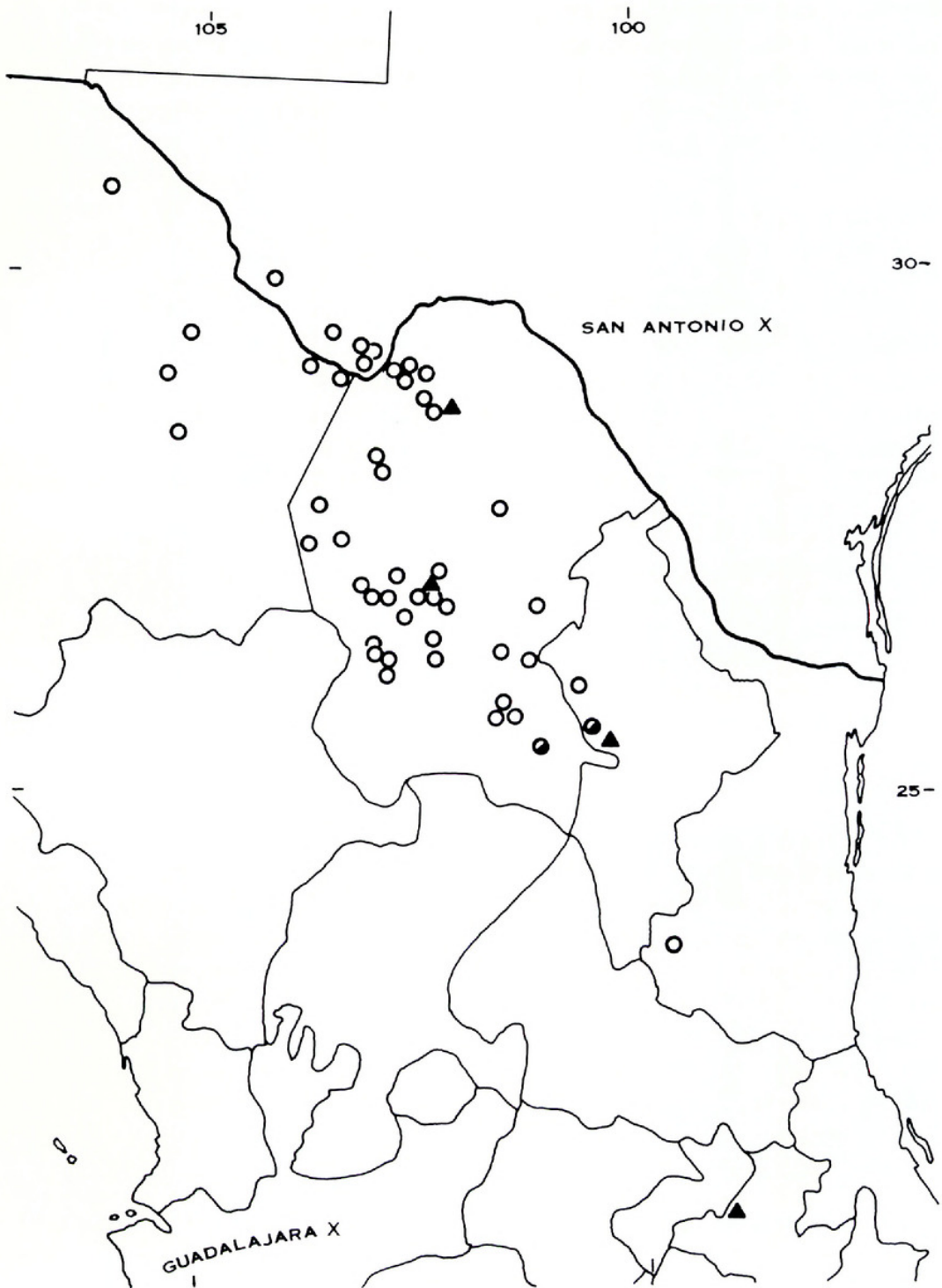
- Plants usually upright and fastigiate, often in crevices or rocky soil but rarely on vertical cliffs and then not mat-forming; stems (0.7–)0.9–1.4(–1.9) mm. in diameter (dry) in green portion; seed hairs short, projecting only 0.1–0.2(–0.4) mm. beyond seed base. *P. nudata*.
 Plants confined to crevices of vertical limestone cliffs, loosely mat-forming; thickest stems 0.5–0.8(–0.9) mm. in diameter (dry) in green portion; seed hairs longer, projecting (0.3–)0.5–0.9 mm. beyond seed base. *P. minutifolia*.

Polygala minutifolia is a rare species known only from the type locality near Monterrey, Mexico (*C. G. Pringle* 13949 (US!, holotype; CAS!, GH!, MICH!, MO!, SMU!, isotypes)), and three other scattered localities in the mountains of eastern Mexico (MAP 3). Although it was reported from Texas by Correll and Johnston (1970), this record was probably based on material of *P. nudata*; I have seen no material of either species annotated by these authors. *Polygala nudata* is a more common species, ranging from the northern Sierra Madre Oriental of Mexico northwestward through the Chihuahuan Desert to the extreme southern portion of the Big Bend area of Texas (MAP 3). It is known in Texas and the United States from only five localities.

REPRESENTATIVE SPECIMENS. **United States.** TEXAS: Brewster Co., Blue Creek, Chisos Mts., *Cory* 6999 (GH); Presidio Co., N. of Chinati Peak between Dead Horse Canyon and Pinto Canyon, 5500 ft., *Butterwick & Lott* 3807B (LL).

Polygala section **MONNINOPSIS** Gray, Pl. Wright. 2: 31. 1853.

During work on a treatment of the Polygalaceae for the Chihuahuan Desert Flora (M. C. Johnston *et al.*, in preparation), the following collection of *Polygala watsonii* Chodat was discovered: United States. Texas. Brewster Co., stony limestone slopes, Old Blue, Glass Mts., 21 March 1941, *Warnock & Innes* 573 (DS, GH).



MAP 3. Distribution of *Polygala minutifolia* (triangles), *P. nudata* (circles), *P. nudata* populations showing some characteristics of *P. minutifolia* (half-circles).

This represents the first known collection of this species in the United States. The above specimens had been identified as *Polygala scoparioides* Chodat, which is the closest United States relative of *P. watsonii*. The



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