

**AJO PEAK TO TINAJAS ALTAS: FLORA OF SOUTHWESTERN ARIZONA  
PART 18. EUDICOTS: POLEMONIACEAE – PHLOX FAMILY**

**RICHARD STEPHEN FELGER**

Herbarium, University of Arizona  
Tucson, Arizona 85721

&

International Sonoran Desert Alliance  
401 W Esperanza Ave  
Ajo, Arizona 85321

\*author for correspondence: rfelger@email.arizona.edu

**SUSAN RUTMAN**

90 West 10th Street  
Ajo, Arizona 85321  
tjt@tabletoptelephone.com

**J. MARK PORTER**

Rancho Santa Ana Botanic Garden  
1500 North College Avenue  
Claremont, California 91711  
j.mark.porter@cgu.edu

**ABSTRACT**

A floristic and natural history account is provided for the phlox family as part of the vascular plant flora of the contiguous protected areas of Organ Pipe Cactus National Monument, Cabeza Prieta National Wildlife Refuge, and the Tinajas Altas Region in southwestern Arizona. The family includes 9 genera, *Aliciella*, *Eriastrum*, *Gilia*, *Ipomopsis*, *Langloisia*, *Leptosiphon*, *Linanthus*, *Loeseliastrum*, and *Phlox*, and 14 species in the flora area, all of which are native, plus unidentified *Gilia* fossils 8130 to 13,500 ybp. This is the eighteenth contribution for this flora published in *Phytoneuron*.

This contribution to our flora in southwestern Arizona is published in a series in *Phytoneuron* and also available open access on the website of the University of Arizona Herbarium (ARIZ): <http://cals.arizona.edu/herbarium>. The flora area covers 5141 km<sup>2</sup> (1985 mi<sup>2</sup>) of contiguous protected areas in the heart of the Sonoran Desert (Figure 1). The first article in this series includes maps and brief descriptions of the physical, biological, ecological, floristic, and deep history of the flora area (Felger et al. 2013a). Explanation of the format for the flora series is provided in part 3 (Felger et al. 2013b). Fossil specimens from packrat middens are indicated with a dagger symbol (†). All specimens cited are at the University of Arizona Herbarium (ARIZ) unless otherwise indicated by the abbreviations for herbaria at Cabeza Prieta National Wildlife Refuge (CAB), Organ Pipe Cactus National Monument (ORPI), and the standardized abbreviations for herbaria (Index Herbariorum, Thiers 2016). All photos and scans are by Sue Rutman unless otherwise stated. Generic descriptions for the Polemoniaceae cover the genus as a whole, while the keys and species description pertain to populations as they occur in and near the flora area.

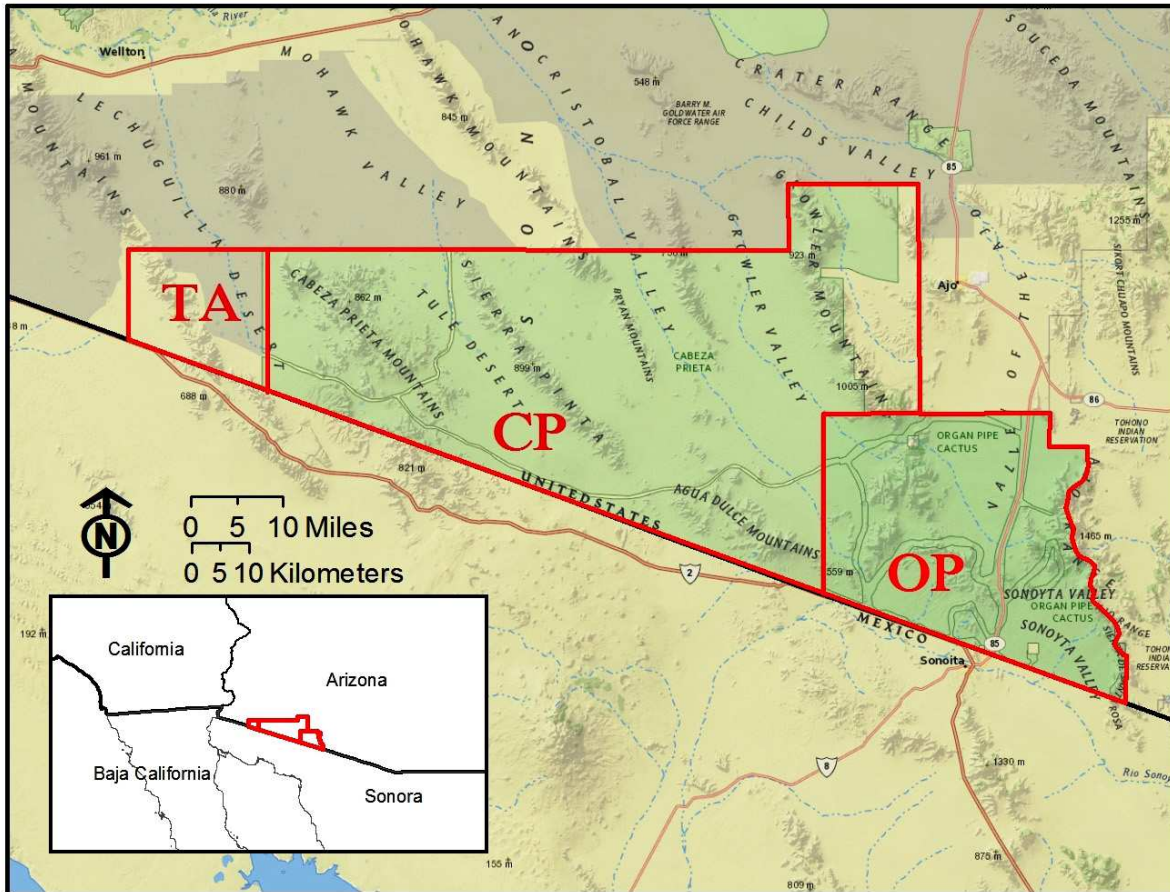


Figure 1. Flora area in southwestern Arizona. OP = Organ Pipe Cactus National Monument; CP = Cabeza Prieta National Wildlife Refuge; TA = Tinajas Altas Region. Green shading indicates approximate boundaries of federally designated wilderness.

### POLEMONIACEAE – Phlox Family

Ephemerals or perennial herbs (rarely shrubs, small trees, or vines elsewhere). Leaves opposite or alternate, in basal rosettes, or opposite below and alternate above, simple and entire to dissected; stipules none. Flowers in modified cymes or solitary, 5-merous, radial (actinomorphic) or bilateral (zygomorphic). Sepals usually fused below into a tube. Corollas sympetalous; filaments attached to the tube. Ovary usually 3-carpellate with 3 chambers. Style 1; stigma lobes 1 per carpel (stigmas 3-lobed among those in the flora area). Fruit usually a capsule; seeds 1–many, often mucilaginous. North temperate regions worldwide, western North America, and western South America; 20 genera, 385 species (Porter & Johnson 2000; Porter & Patterson 2015; Wilken & Porter 2005).

Among the 14 species in the flora area, two are perennials (*Ipomopsis multiflora* and *Phlox tenuifolia*) and the others are cool-season ephemerals. There are no summer or non-seasonal ephemerals and no facultative annual/perennials. The two perennials are restricted to the Ajo Mountains, while most of the ephemerals are widely distributed across the flora area although mostly in Organ Pipe. There are no non-native Polemoniaceae in the flora area. *Gilia* fossil specimens were found in fossil packrat middens. Representatives of Polemoniaceae in the flora area show

biogeographic affinity with regions of winter rainfall to the west and north, especially California and the Great Basin. Their seeds are small, not winged, and except for those in *Aliciella*, *Linanthus demissus*, and *Phlox*, are highly hygroscopic and upon contact with water immediately produce an envelope of slime, or mucilage, which as it dries tenaciously cements the seed to anything it touches. These species tend to have relatively thick, wrinkled seed coats that expand when wet.

Table 1. Local distributions and growth forms of Polemoniaceae. † = Fossil. OP = Organ Pipe Cactus National Monument; CP = Cabeza Prieta National Wildlife Refuge; TA = Tinajas Altas Region. WI = winter-spring/cool-season ephemerals and PR = perennials.

Taxa	Region			Growth Form	
	Organ Pipe	Cabeza Prieta	Tinajas Altas	Winter ephemeral	Perennial
<i>Aliciella latifolia</i>		CP	TA	WI	
<i>Eriastrum diffusum</i>	OP	CP	TA	WI	
<i>Eriastrum eremicum</i>	OP			WI	
<i>Gilia flavocincta</i>	OP			WI	
<i>Gilia stellata</i>	OP	CP	TA	WI	
(† <i>Gilia</i> sp.)	(OP)			(WI)	
<i>Ipomopsis multiflora</i>	OP				PR
<i>Langloisia setosissima</i>	OP	CP	TA	WI	
<i>Leptosiphon chrysanthus</i>	OP			WI	
<i>Linanthus bigelovii</i>	OP	CP		WI	
<i>Linanthus demissus</i>	OP			WI	
<i>Linanthus jonesii</i>	OP	CP	TA	WI	
<i>Linanthus maricopensis</i>		CP		WI	
<i>Loeseliastrum schottii</i>			TA	WI	
<i>Phlox tenuifolia</i>	OP				PR
Totals: 14	11	6	6	12	2

- 1. Leaves opposite (upper leaves sometimes alternate); flowers nocturnal or diurnal.
- 2. Perennials; flowers diurnal and white; Ajo Mountains..... **Phlox**
- 2. Ephemerals; flowers nocturnal or diurnal, white, yellow, or cream and speckled; widespread.
- 3. Flowers bright yellow; opening diurnally, closed at night..... **Leptosiphon**
- 3. Flowers white or cream and speckled; opening at sunset and nocturnal, generally closed during the day or if diurnal then flowers with red, maroon or purplish spots or streaks in the throat.  
..... **Linanthus**
- 1. Leaves alternate; flowers diurnal.
- 4. Perennials from a knotty, woody base; stems leafy throughout..... **Ipomopsis**
- 4. Spring ephemerals; first leaves in a basal rosette, the stem leaves reduced or clustered near stem tips.
- 5. Flowers in woolly heads; corolla lobes blue..... **Eriastrum**
- 5. Flowers not in woolly heads; corolla lobes various colors, sometimes bluish (among *Gilia*).

6. Leaves and calyx lobes bristle-tipped; flowers sessile in leaf axils or in dense, compact and leafy-bracted heads.

7. Leaves broadest near the tip; most leaves with some 2- or 3-forked bristles; corollas radial or nearly so..... **Langloisia**

7. Leaves linear, not expanded above; leaf bristles all single; corollas bilateral, 2-lipped.  
..... **Loeseliastrum**

6. Leaves and calyx lobes not bristle-tipped; flowers mostly pedicelled; inflorescence open, with few and reduced leaves and overtopping the leaves.

8. Leaves more or less ovate, toothed but not dissected, to about 2 times longer than wide; corollas bright reddish pink..... **Aliciella**

8. Leaves pinnately dissected, more than 3 times longer than wide; corolla lobes white to pale lavender-blue or lavender-pink..... **Gilia**

**Aliciella**

Annuals and perennial herbs. Stems erect, ascending or decumbent, glabrous, pubescent, or glandular. Leaves alternate (basal leaves usually in a rosette), simple and entire, lobed, toothed, or 1- or 2-times pinnately lobed, the apices acute, acuminate, or mucronate; cauline (stem) leaves reduced above and ultimately bract-like. Inflorescences open, cymose, flowers 1–3 per cyme. Calyx glandular and with hyaline membranes alternating with the herbaceous costae and lobes. Corollas longer than the calyx, the corolla lobes usually shorter than the tube, ovate, acute, or acuminate. Fruits spheric to ovoid, with 3 locules, the valves dehiscent from the apex. Seeds 3–many, yellow or brown, not mucilaginous when wet (except sometimes in *A. latifolia*). Western North America; 25 species (Porter 1998).

**Aliciella latifolia** (S. Watson) J.M. Porter subsp. **latifolia**

[*Gilia latifolia* S. Watson]

Broad-leaf gilia. Figure 2.

Cool-season ephemerals, glandular pubescent and highly variable in size; (2.5) 5–30 cm tall, often branched, occasionally unbranched when drought stressed. Smaller plants with mostly basal leaves, larger plants with moderately leafy stems. Leaves alternate (lower leaves occasionally subopposite), (0.7) 1.5–7 × 1.2–3.2 cm, lower leaves petioled, the petioles often winged, the upper leaves often sessile; leaf blades broadly ovate, coarsely toothed to lacinate, the teeth 1–2 mm long. Inflorescences of few- to many-flowered panicle-like cymes; flowers pedicelled. Calyx 4–6 mm long, the segments narrow and sharply pointed, and membranous between the green midribs. Corollas bright reddish pink (magenta internally, pale pink externally). Filaments papillose toward the tip. Dried anthers white. Seeds 0.6–0.7 mm long, yellow-tan, glistening, plump, and more or less ovoid, not (or slightly) mucilaginous when wet.

Slopes and adjacent bajadas and washes in Cabeza Prieta, at least in the vicinity of Tule Well and the Growler Mountains, and in the Tinajas Altas Mountains.

Western Arizona, southeastern California, southern Nevada, southwestern Utah, northeastern Baja California, and northwestern Sonora. A second subspecies occurs in Utah.

**CP:** Tule Well, *Goodding 6 March 1940* (ASU). Tule Mts, 26 mi W of Papago Well, 15 Apr 1940, *Benson 10795*. 1 km N of Tule Well, 11 Apr 1993, *Felger 93-441A*. 1.3 km NNW of Charlie Bell Pass, 3.5 km W of Daniels Arroyo, E slope of Growler Peak, 22 Apr 1993, *Walter 269* (ASU).

**TA:** In a pass N of Tinajas Altas Pass, 1200 ft, *Halse 31 Mar 1973*.

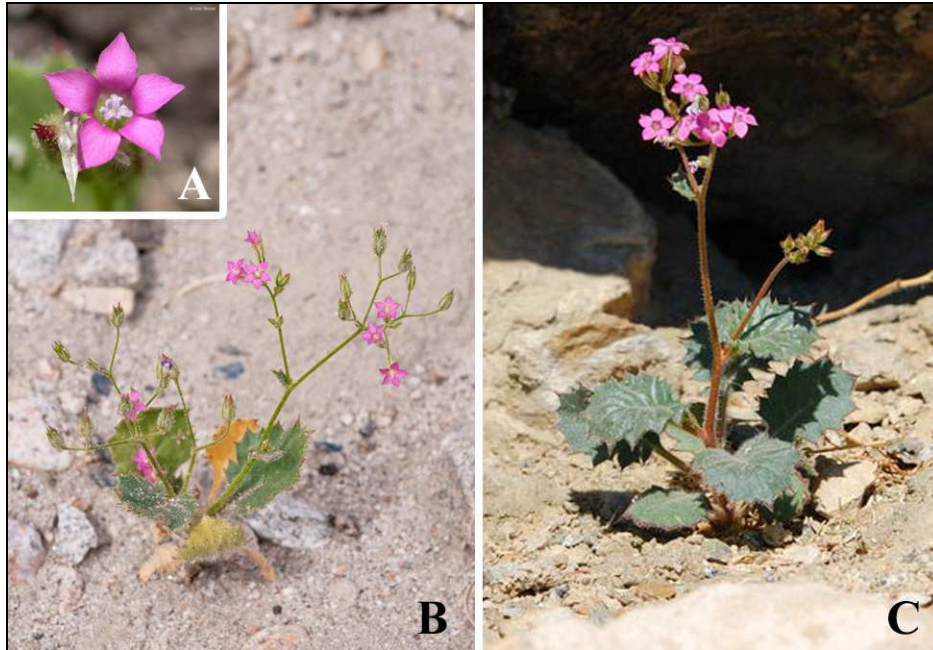


Figure 2. *Aliciella latifolia* subsp. *latifolia*. (A) Kelbaker Lavabeds, Mojave National Preserve, San Bernardino Co., California, 14 Apr 2005, photo by Keir Morse (CalPhotos). (B) Box Canyon, E of Mecca, Riverside Co., California, 6 Apr 2011, photo by Richard Spellenberg. (C) Saline Valley, Inyo Co., California, 17 Apr 2009, photo by Gary A. Monroe (CalPhotos).

**Eriastrum**

Cool-season ephemerals in southwestern Arizona, also warm-season ephemerals or perennials elsewhere. Stems erect to spreading, glabrous or floccose, occasionally also glandular. Leaves alternate, simple or more often pinnate-lobed, the lobes spinulose-tipped. Inflorescences usually composed of bracteate, woolly, head-like units, the flowers often sessile; bracts leaf-like. Calyx with hyaline membranes alternating with the herbaceous costae and lobes, the lobes unequal in length, sparsely floccose to canescent, apex spinose. Corollas actinomorphic or zygomorphic, funnelform to salverform; stamens equal or unequal, anthers sagittate; style included or exerted. Fruits ovoid, with 3 locules, the valves dehiscent from the apex. Seeds 1–several per locule, mucilaginous when wet. Western North America; 16 species.

- 1. Corollas 7–8 mm long, the lobes shorter than the tube; stamens attached midway in corolla throat; anthers 0.5–0.8 mm long..... **Eriastrum diffusum**
- 1. Corollas 10–16 mm long, the lobes as long as to longer than the tube; stamens attached at base of the throat; anthers 1.2–2.2 mm long..... **Eriastrum eremicum**

**Eriastrum diffusum** (A. Gray) H. Mason

Woolly-star. Figure 3.

Ephemerals; stems erect or spreading, 3–20 cm long, wiry and diffusely branched above (unbranched when drought-stressed), the main axis short, sparingly white-woolly, glabrate in age. Leaves narrowly linear or pinnatifid with 3 or 5 narrowly linear segments, the segments spinulose-tipped; lower leaves largest, 1–4 cm long, usually deciduous at or soon after flowering. Flowers in compact, white-woolly heads, these subtended by leafy bracts 8–17 mm long and similar in form to the leaves. Calyx lobes spinulose. Corollas funnelform, mostly radially symmetric, 6–9 (10) mm long, the tube white or yellowish, the lobes blue, 3–3.5 mm long; corollas falling with daytime heat. Stamens 2–3 mm long, the filaments attached in upper throat, unequal in length and exerted; the

anthers 0.5–0.6 (0.8) mm long. Seeds mucilaginous when wet. The small flowers and small anthers suggest a selfing (autogamous) breeding system. Flowers open during the middle of the day, March and April.

Widespread in many habitats across the flora area including washes, valley bottoms and plains, hills, and mountains.

Southeastern California to western Texas and Utah, Colorado, Baja California, and northern Sonora.

**OP:** Bates Mts, 8 mi S of Growler Well, *Nichol 17 Apr 1939*. Sinita Basin, 23 Mar 1969, *Lehto 15396* (ASU). Aguajita, wash, 6 Apr 1988, *Felger 88-293*. Armenta Ranch, *Wirt 10 Mar 1991* (ORPI).

**CP:** Papago Well, 22 Mar 1935, *Kearney 10870*. Las Playas, 15 Apr 1964, *Niles 354*. Childs Mt, 2240 ft, 9 Apr 1993, *Felger 93-281*. Charlie Bell Road near E boundary of Refuge, 9 Apr 1993, *Felger 93-311*. Growler Wash, 10 Apr 1993, *Felger 93-368*.

**TA:** NE end of Tinajas Altas Pass, *Van Devender 6 Mar 1983*. Coyote Water, 18 Mar 1998, *Felger* (observation).

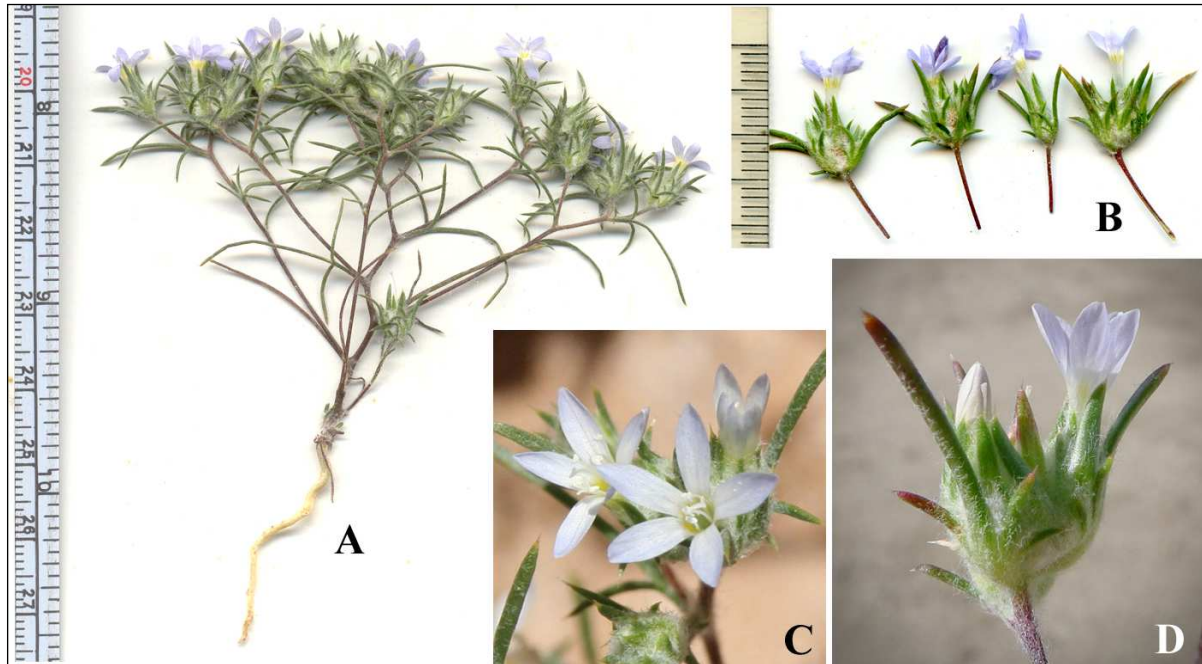


Figure 3. *Eriastrum diffusum*. (A) Kuakatch Wash near Hwy 85, 21 Mar 2008. (B) Midway Wash at Hwy 85, 8 Mar 2015. (C) Bates Well Road, 29 Feb 2008. (D) Anza Borrego State Park, San Diego Co., California, 5 Apr 2013, Keir Morse (CalPhotos).

***Eriastrum eremicum* (Jepson) H. Mason subsp. *yageri* (M.E. Jones) H. Mason**  
Desert woolly-star. Figure 4.

Ephemerals; stems openly branched and erect but spreading, 3.5–28 (34) cm long, wiry and diffusely branched above (unbranched when drought-stressed), the main axis short; stems sparsely glandular, floccose or sparingly white-woolly, glabrate in age. Leaves narrowly linear or pinnatifid with 3 to 5 narrowly linear segments, the segments aristate; lower leaves largest, 0.8–3.5 cm long, usually dark reddish brown or tan at or soon after flowering. Inflorescences terminal, capitate, of slightly to densely white-woolly heads, these subtended by leafy bracts 7–22 mm long and similar in form to the leaves. Calyx lobes glandular and spinulose. Corollas funnelform, zygomorphic to nearly

actinomorphic (sometimes shape  $\pm$  actinomorphic but color pattern zygomorphic), 10–23 mm long; the tube white but mid-tube blue with reddish marks proximally, the throat yellow, white, or pale blue and with yellow patches; the lobes blue to pale blue to white, often with some darker purple or blue streaks or spots near the base, 3–7 mm long. Stamens 3–8 mm long, the filaments attached in the lower throat, unequal in length and long exserted; the anthers 1.2–1.7 (2.2) mm long. Seeds mucilaginous when wet.

In the flora area known from a few specimens from the Ajo and Growler mountains.

This species occurs in western Arizona, mostly above the deserts and at upper elevations within the deserts, to southwestern Utah, southern Nevada, southeastern California, and northeastern Baja California. Subsp. *yageri* occurs in Arizona and Nevada.

**CP:** Lower slopes of Growler Mts NE of Charlie Bell Pass, tributaries to Daniel's Arroyo, 20 Mar 1992, *Crawford 7a* (ASC, det. H.D. Hammond).

**OP:** Alamo Canyon, *Tinkham Apr 1942*. Growler Canyon (E of Bates Well), 19 Mar 1975, *Lehto 1823* (ASU).



Figure 4. *Eriastrum eremicum* subsp. *yageri*. (A) Kofa Queen Canyon, Kofa Mountains, Kofa National Wildlife Refuge, Yuma Co., 5 Apr 2014. (B) Near Bull Basin, Upper Verde River, Yavapai Co., 6 May 2013, photo by Frankie Coburn (SEINet). (C) Near Rio Verde Ranch, Yavapai Co., 6 May 2013, photo by Frankie Coburn (SEINet).

## Gilia

Annuals (cool-season ephemerals in the flora area) with taproots or herbaceous perennials; glabrous, capitate-glandular, pilose, or floccose (cobwebby). Stems erect, ascending or decumbent (unbranched and highly reduced when drought-stressed). Leaves alternate, basal leaves usually forming a rosette, simple, entire, dentate, pinnately- or bipinnately-lobed; cauline leaves reduced in size. Inflorescences cymose, bracteate panicles. Flowers funnelform, 5-merous, but 3–10-merous flowers are observed. Calyx with hyaline membranes alternating with the herbaceous costae and lobes, glabrous, floccose or glandular. Corollas funnelform, more or less actinomorphic; lobes ovate to lanceolate, obtuse, acute or acuminate. Stamens epipetalous, equally inserted on the corolla at the

sinuses of the lobes or lower, the filaments equal or unequal, included or exerted. Fruits globose, ovoid or obovoid, with 3 locules, dehiscent from the apex one-third of the length of the valve or the valves completely separating. Seeds 3–many, small, ovoid to angular, yellowish to brown, mucilaginous when wet.

Western North America and South America; about 40 species. Only two species have been collected in the flora area; however, another, *Gilia mexicana* A.D. Grant & V.E. Grant, is expected in mesic areas of mountains. It differs in having small flowers (the tube and throat subequal or shorter than the calyx), purplish spots at the base of the corolla lobes, and leaf lobes that are narrowly linear.

- 1. Lower part of plant with at least some cobweb-like hairs; calyx (2.6) 3–5.5 mm long.  
..... ***Gilia flavocincta***
- 1. Hairs bent or crinkled and some are branched (not cobweb-like); calyx 3.5–7 mm long.  
..... ***Gilia stellata***

***Gilia flavocincta*** A. Nelson subsp. ***australis*** (A.D. & V.E. Grant) A.G. Day & V.E. Grant  
[*G. ophthalmoides* Brand subsp. *australis* (A. Nelson) A.D. & V.E. Grant]  
Lesser yellow-throat gilia. Figure 5.

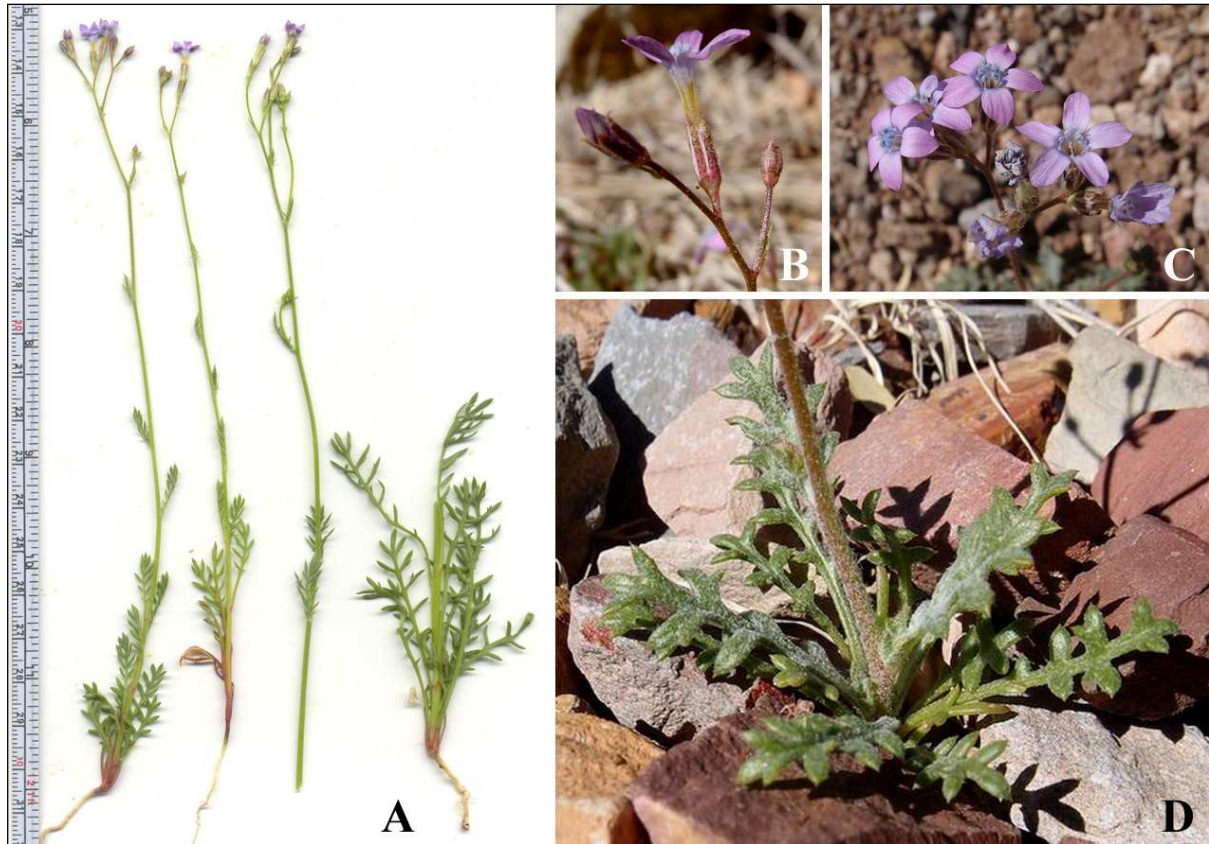


Figure 5. *Gilia flavocincta* subsp. *australis*. (A) Estes Canyon, 2 Mar 2008. (B & D) Salero Ranch, Santa Cruz Co., 28 Feb 2014. (C) State Trust land N of Salero Ranch, 17 Mar 2012. Photos B–D by Sue Carnahan.

Ephemerals; stems 10–30 (45) cm long, spreading, branched throughout, sparsely floccose to woolly below, glabrous and glaucous distally and usually sparsely glandular in inflorescences. Leaves 1.5–8 cm long, forming a loose basal rosette, sparsely cobwebby, pinnatifid or bipinnately-



lobed, the lobes narrow; leaves conspicuously suffused with reddish purple when drought stressed. Inflorescences congested in flower but loose in fruit; generally in 1–2-flowered cymes, the cymes often paired; pedicels unequal, 1.5–14 mm long, usually glandular. Calyx 3–5.5 mm long, glabrous or sparsely floccose; the intercostal membrane and lobes flecked with bright purple or purple-spotted, the lobes acuminate to attenuate. Corollas 7–18 mm long, funnellform, the tube included within and equal to the calyx, the throat exserted, the throat yellow, the lobes 2–6.5 mm long, narrowly to broadly obovate, acute, pink to yellow with violet flecks. Stamens subequal in length, inserted just below the sinuses of the lobes, and slightly exserted. Stigmas adjacent to the anthers. Capsules 5–8.5 mm long, broadly ovoid, widest at base, slightly exceeding or subequal to the calyx; dehiscent  $\frac{1}{3}$ – $\frac{1}{2}$  the length of the valve. Seeds 10–35 per capsule, ovoid, angular or reniform, 0.9–1.7 mm long, 0.5–0.9 mm wide, and golden-brown.

Widespread in many habitats across most of Organ Pipe including higher elevations in the Ajo Mountains, but not in the southwestern and the western margins of the monument.

Southern Arizona and Utah to western Texas, Baja California, and northern Sonora. Subspecies *flavocincta*, with larger flowers, occurs in central Arizona.

**OP:** Valley back of Montezuma's Head, 28 Mar 1941, *McDougall 44*. Sonoyta road 1 mi S of N entrance, 10 Apr 1941, *McDougall 80*. N of Headquarters, 26 Mar 1965, *Ranzoni 298* (ORPI). Mouth of Pitahaya Canyon, 17 Feb 1979, *Bowers 1569* (ORPI). Trail from The Cones to Mount Ajo, 4025 ft, 10 Apr 2005, *Felger 05-275*.

### ***Gilia stellata* A. Heller**

Star gilia. Figure 6.

Ephemerals; often densely white-villous with geniculate trichomes below. Stems usually several from base, (6) 10–40 cm long, with stipitate-glandular trichomes distally, these usually bearing darkly pigmented terminal glands. Leaves forming a basal rosette, (1) 1.5–8.5 cm long, grayish, pinnatifid or bipinnatifid; the rachis narrow and linear, with toothed lobes, the teeth acute and mucronate; upper cauline leaves greatly reduced, bract-like, entire or 2-toothed. Inflorescences of loose panicles; flowers in 2-flowered cymes, pedicels spreading, unequal in length, glabrous or glandular. Calyx 2.5–5.5 (7) mm long, villous or capitate-glandular; the lobes triangular-attenuate. Corollas 5–8.2 (9) mm long, funnel-shaped, the tube included or slightly exserted, the throat yellow with purple or reddish spots, the lobes pink or white. Stamens diverging from the corolla at the sinuses of the corolla lobes, and slightly exserted. Style slightly exserted. Capsules 5–7 mm long, widely ovoid, subequal or shorter than the fruiting calyx. Seeds 9–18 per capsule; 1.2–1.6 mm long, orange, lumpy, and angular like a miniature orange gumdrop that has been in a backpack too long. As with many other *gilia*s, the flowers are protandrous (stamens dehisce before stigma is receptive), suggesting outcrossing. However, Grant & Grant (1964) include this as an autogamous species of *Gilia*.

Common and widespread across the flora region in many habitats including washes, bajadas, hills, and mountains.

Widespread in Arizona, southeastern California, southern Nevada, southwestern Utah, western New Mexico, Baja California, and northwestern Sonora. If some hairs are crinkled (bent) and some are branched, then it is *G. stellata*.

**OP:** Alamo Canyon, *Nichol 26 Mar 1939*. Canyon Diablo, 21 Mar 1935, *Kearney 10811*. Alamo Canyon, floor of canyon, streambed, 2000 ft, flowers with yellow throat, blue flare, 19 Apr 1942, *Cooper 743*. Dripping Springs, *Clark 12 Mar 1944* (ORPI).  $\frac{1}{2}$  mi NE of Quitobaquito, 18 Mar 1945, *Gould 2993*. Flats W

of Bates Well Mts, 31 Mar 1978, *Bowers 1163*. Arch Canyon, 5 Apr 1978, *Bowers 1185*. Base of Scarface Mt, 1650 ft, *Tallarovic 20 Mar 1992* (ASC).

**CP:** S end Sierra Pinta, *Monson 20 Mar 1958*. El Camino Diablo, 7.6 mi E of Papago Well, just S of Sheep Mountains at N end of Agua Dulce Mts, granitic hills, 12 Mar 1983, *Daniel 2658* (ASU). Agua Dulce Mts, ½ mi N of Papago Well, 16 Mar 1992, *Yeatts 3204* (CAB). Charlie Bell Pass, white blossoms, somewhat rank smelling, 3 Apr 1992, *Whipple 3915*. Tule Tank, 14 Apr 1992, *Harlan 287*. Childs Mt, 2240 ft, 9 Apr 1993, *Felger 93-285*.

**TA:** Tinajas Altas Pass, 20 Feb 1979, *McLaughlin 1972*. Vicinity of Tinajas Altas, 1200 ft, flowers light purple, 32°18'40"114°03'08"W, *Van Devender 5 Mar 1983*. Coyote Water, 25 Oct 2004, *Felger* (observation).

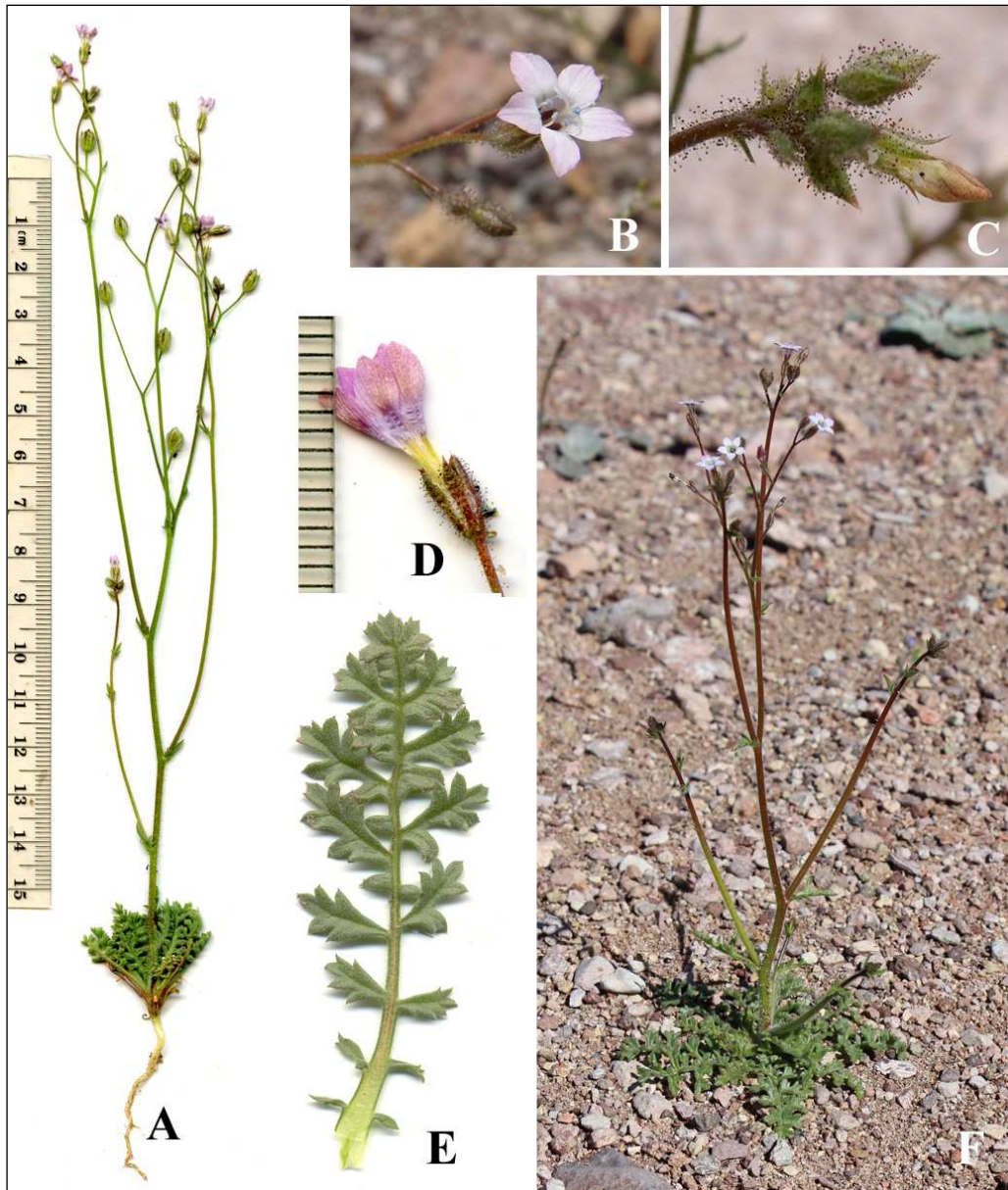


Figure 6. *Gilia stellata*. (A) Senita Basin, 16 Mar 2015. (B) Near Ragged Top, Ironwood Forest National Monument, Pima Co., 25 Mar 2012, photo by Sue Carnahan. (C) Flats E of Tinajas Altas, 2 Mar 2014, photo by Sue Carnahan. (D) Sierra de Águila near Mex Hwy 2, Sonora, 7 Mar 2015. (E) Estes Canyon, 8 Feb 2003. (F) Alamo Wash, 5 Mar 2014.

**Gilia** sp.

**OP:** †Alamo Canyon, capsules, 8130 to 9570 ybp (3 samples). Montezuma's Head, capsules, 13,500 ybp.

**Ipomopsis**

Annuals (cool-season ephemerals), perennial herbs, or subshrubs, simple or branched. Leaves basal or alternate, entire to deeply pinnately lobed, gradually reduced upward, the lobes confluent with the rachis, flat or terete, usually linear. Inflorescences terminal, paniculate, open or congested, the basic unit composed of 2–7 pedicelled flowers subtended by a single bract, these sometimes thyrsoid and arranged along one side of the rachis. Flowers actinomorphic or zygomorphic. Calyx with hyaline membranes alternating with the herbaceous costae and lobes, glabrous, villous or glandular, the tube membranes usually ruptured in fruit. Corolla usually salverform, white to purplish or red; stamens unequally inserted on the corolla tube or throat; filaments equal or unequal in length; anthers included or exserted; style included to exserted. Capsule ovoid; seeds 1–many per locule, becoming mucilaginous when wet. North and South America; 30 species.

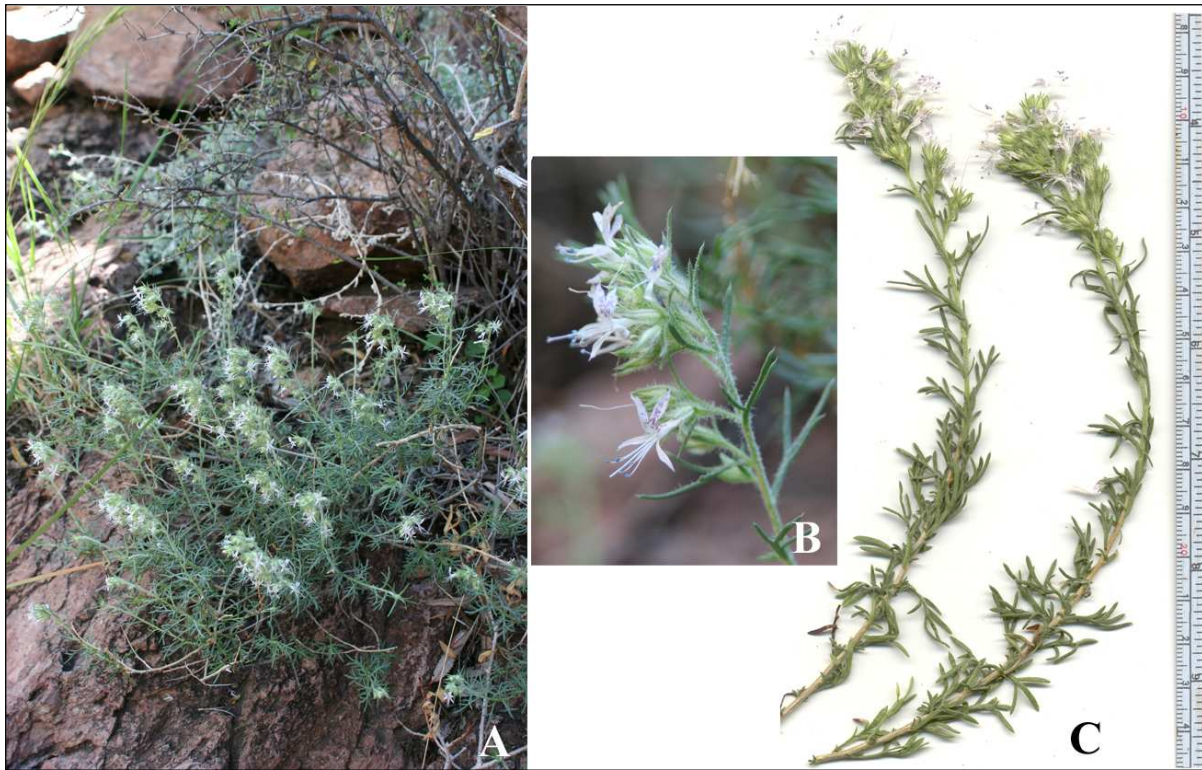


Figure 7. *Ipomopsis multiflora*. (A & B) Arch Canyon, above the arch, 16 Sep 2006. (C) Above Bull Pasture, 21 Sep 2008.

**Ipomopsis multiflora** (Nuttall) V.E. Grant

[*Gilia multiflora* Nuttall]

Many-flowered gilia. Figure 7.

Short-lived perennials with a somewhat woody base (subshrub). Stems 15–45 (50) cm long, simple or branched at base, with white, glandular and non-glandular hairs. Leaves 0.6–3.5 cm long, pinnately lobed with 3–7 (9) linear lobes, 2–10.3 mm long; the upper cauline leaves usually simple; glabrous or sparsely short pilose or glandular. Inflorescences terminal, one-sided panicles, with

flowers subsessile and crowded on short, lateral branches. Flowers showy, zygomorphic. Calyx 3.5–8 mm long, glandular pubescent, often also with non-glandular trichomes; the lobes short-aristate. Corollas pale violet to purplish or bright lavender with white and darker purple markings forming a nectar guide; the tube 5–15 mm long (usually 10 mm or more); the lobes narrowly ovate, (3) 4–6 mm long. Filaments and style bright lavender, the stamens inserted on the upper tube or throat, long exerted but unequal in length, the anthers blue. Capsules 4.5–7 mm long, (3) 5–24-seeded.

Higher elevations in the Ajo Mountains; often rooted in rock crevices on bedrock and pockets of shallow soil.

Mainly in Arizona and New Mexico but not in the desert, and also northeastern Sonora (*Walker 25 Aug 1966*, UCR) and expected in northern Chihuahua.

**OP:** Arch Canyon, 3200 ft, 12 Oct 1988, *Baker 7641* (ASU). Boulder Canyon, 3200 ft, 13 Oct 1988, *Baker 7645* (ORPI). Route to saddle between Boulder and Arch Canyons, *Rutman 27 Sept 1998* (ORPI). Above Bull Pasture on trail to Mt Ajo, *Rutman 10 Apr 2005*.

### **Langloisia**

Annuals, compact and much branched, the branches rigidly spreading to ascending. Leaves alternate, subsessile, lanceolate or oblanceolate, coarsely toothed or pinnately lobed, the teeth and lobes with 1–3 bristles. Inflorescences terminal, sub-capitate, and bracteate, the bracts leaf-like but reduced in size. Flowers actinomorphic, subsessile. Calyx with hyaline membranes alternating with the herbaceous costae and lobes; the membranes rupturing in fruit; the lobes bristle-tipped. Corolla funnellform. Stamens equally inserted on the upper tube; filaments equal in length and straight; anthers mostly exerted. Stigmas exerted. Capsule ellipsoid, triangular in cross-section, dehiscent, the 3 valves separating completely with age. Seeds 6–30, becoming mucilaginous when wet. A genus of one species closely allied to *Loeseliastrum*.

### **Langloisia setosissima** (Torrey & A. Gray) Greene subsp. **setosissima**

Great Basin langloisia. Figure 8.

Cool-season ephemerals, compact and bristly, (2) 3–10 cm tall, often much-branched, the main axis very short or lacking, stems leafy throughout, pubescent with branched trichomes. Leaves alternate, narrowly obovate or oblanceolate, the larger ones 1–2.5 cm long, toothed or pinnately lobed, the segments triangular and prominently bristle-tipped; bristles white, (3) 5–9 mm long, 2- or 3-forked on lower lobes of all except the first leaves. Calyx segments bristle-tipped. Corollas 10–16 mm long, radial or nearly so, lavender-pink and showy. Anthers and pollen white to blue. Capsules 5–7 mm long, the valves separating at maturity. Seeds 3–9 per locule, 1.1–2 mm long, ellipsoid to short and squat depending on position in capsule, pale orange-yellow, mucilaginous when wet. Often flowering in March, plants dying by mid-April.

Occasional in the western part of Organ Pipe and widespread in Cabeza Prieta and Tinajas Altas; sandy to rocky habitats, washes, plains and bajadas, hills, and mountains, generally on granitic, limestone and other calcium-rich substrates.

Also in the Pinacate volcanic region of northwestern Sonora, western Arizona, southeastern California, southern Nevada, and southwestern Utah. Subspecies *setosissima* is replaced by subsp. *punctata* (Coville) Timbrook to the north and northwest in southern California, Nevada, Idaho, and eastern Oregon.

**OP:** 4 mi N of Bonito Well, 9 Apr 1941, *McDougall 60*. 10 mi N of Bates Well Road & Puerto Blanco Drive, 30 Mar 1978, *Bowers 1119*.

**CP:** Tule Well, *Goodding* 6 Mar 1940 (ASU). Buckhorn Tank (Simmons 1966). Cabeza Prieta Tank, canyon, 6 Apr 1979, *Lehto* 23541 (ASU). Charlie Bell Pass, 3 Apr 1992, *Whipple* 3941. 1 km N of Tule Well, 11 Apr 1993, *Felger* 93-443. Chico Shuni Wash, 2 Feb 2003, *Rutman* 2003-34.

**TA:** E side Tinajas Altas Pass, 18 Mar 1998, *Felger* 98-102.

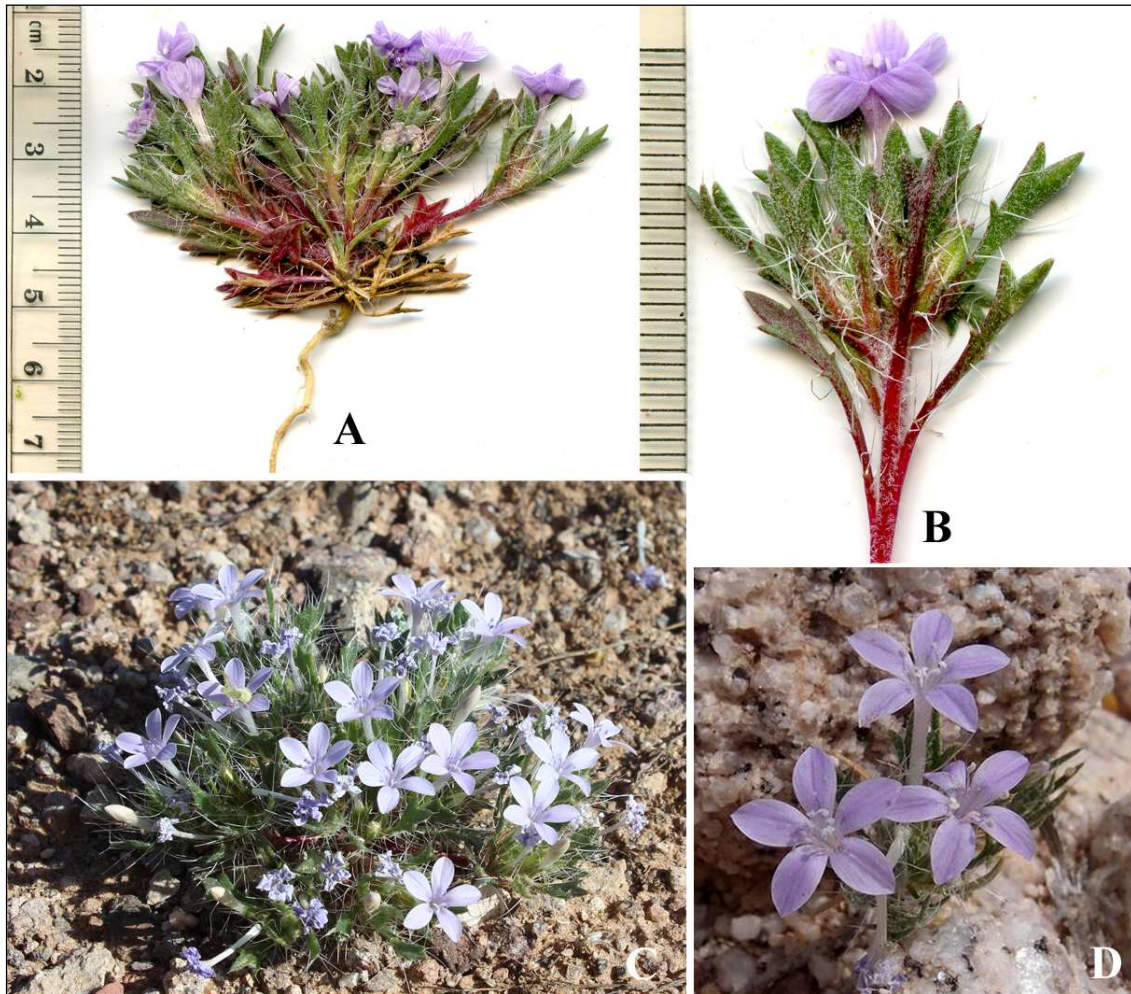


Figure 8. *Langloisia setosissima* subsp. *setosissima*. (A & B) Sierra de Águila near Mex Hwy 2, Sonora, 7 Mar 2015. (C) Lookout Mountain, N of Ajo, Maricopa Co., 12 Mar 2014. (D) Flats E of Tinajas Altas, 2 Mar 2014, by Sue Carnahan.

### Leptosiphon

Annuals or perennial herbs; stems erect to decumbent, usually branched from base, occasionally simple, and leafy. Leaves opposite, rarely alternate above, entire or with 3–9 palmately arranged lobes, the lobes confluent with the rachis, linear, flat to terete, acute to weakly spinulose. Inflorescences terminal and head-like or axillary few-flowered cymes, or solitary; glabrous, pubescent or glandular. Flowers pedicelled, actinomorphic. Calyx with hyaline membranes alternating with the herbaceous costae and lobes, sometimes the membranes quite narrow and usually ruptured or distended in fruit, the lobes equal, linear to attenuate, and often mucronate. Corollas funnellform, salverform or campanulate, with a hairy ring inside the tube or the ring absent. Stamens equally inserted on the corolla throat or tube; anthers slightly exserted or included; filaments equal in length. Style included to exserted. Capsules ovoid to oblong; seeds 1-several per locule. Western North America and Chile; 30 species.

“*Linanthus* in the traditional sense (e.g., Grant 1959; Patterson 1993) is not monophyletic. In their revised classification of Polemoniaceae, Porter and Johnson (2000) divided *Linanthus* into two genera, resurrecting and expanding *Leptosiphon* Benth., in addition to *Linanthus*” (Porter & Patterson 2015: 57). Due to convoluted complications of nomenclature, the transfer of *Linanthus aureus* into *Leptosiphon* necessitated a new name for that species (Porter & Patterson 2015).

***Leptosiphon chrysanthus* J.M. Porter & R. Patterson subsp. *chrysanthus***

[*Gilia aurea* Nuttall. *Linanthus aureus* (Nuttall) Greene. *Leptosiphon aureus* (Nuttall) J.M. Porter & L.A. Johnson subsp. *aureus*]

Golden desert-trumpets. Figure 9.

Winter-spring ephemerals. Stems 3–15 cm long, wire-like, the plants usually taller than broad, ascending, glabrous, pilose, or glandular. Leaves opposite, 3–8 mm long, linear or with 3–5 linear lobes, glabrous or glandular. Inflorescences open, the flowers in 1–3-flowered cymes, mostly terminal (the cymes terminate the branches). Flowers on thread-like pedicels, 4–13 mm long, showy and often obscuring the rest of the plant; opening diurnally, closed at night. Calyx glandular, 3–8 mm long, the lobes equaling the tube, the hyaline membranes as wide as the herbaceous costae. Corollas actinomorphic, 6–15 mm long, bright, golden yellow, the tube 6–10 mm long, with 5 broad lobes each 5–7 mm long, and a brighter yellow or maroon center (throat) with a ring of hairs between the tube and throat. Stamens inserted on the throat, pollen orange. Styles slightly exserted. Capsules 2.5–5 mm long. Seeds 1 to many per locule, becoming mucilaginous when wet.



Figure 9. *Leptosiphon chrysanthus* subsp. *chrysanthus*. (A) Tent Rocks, SE of Camp Verde, Yavapai Co., 4 Apr 2007, photo by Max Licher. (B & C) Salero Headquarters, Salero Ranch, Santa Cruz Co., 26 Mar 2014, photo by Sue Carnahan.

Known from Organ Pipe by two records in 1941 from the northern part of the Monument. It is common much farther eastward and northward in Arizona.

Southeastern California to southwestern New Mexico, southwestern Utah, southern Nevada, Baja California, and northern Sonora. A white-flowered form in California deserts is named subsp. *decorus* (A. Gray) J.M. Porter & R. Patterson.

**OP:** Road to Walls Well, 26 Mar 1941, *McDougall 39*. Flats, N border of Monument, 10 Apr 1941, *McDougall 81* (ORPI).

**Linanthus**

Annuals or perennials; stems simple or branched from the base, erect to decumbent, and leafy. Leaves mostly opposite, sometimes alternate above, simple, pinnatifid, or deeply palmately lobed, the lobes confluent with the rachis, linear, flat or terete, and acute to mucronate. Inflorescence terminal and open, solitary, in cymes, or densely compact, and glabrous or glandular; subtending bracts identical to the leaves. Flowers sessile or short pedicelled, and actinomorphic. Calyx with hyaline membranes alternating with the herbaceous costae and lobes, usually ruptured or distended in fruit, the lobes equal or unequal, linear to attenuate, and often mucronate. Corollas funnelform, salverform, or campanulate, white, yellow, lavender, or sometimes bluish. Stamens equally inserted on the corolla throat or tube; anthers exerted or included; filaments equal in length. Style included to exerted. Capsules ovoid to oblong; seeds 1–several per locule, mucilaginous or unchanged when wet.

Western North America; 24 species.

1. Leaves with 3 linear lobes; flowers diurnal, in compact clusters, the corollas cream colored and speckled with reddish markings in the throat..... **Linanthus demissus**

1. Leaves mostly linear, simple, or simple below and 3-lobed at the first flowering node; flowers nocturnal, not in compact clusters, the corollas white with dark purple inside the tube.

2. Corollas 8–16 mm long; leaves associated with the terminal flower of the main axis mostly trifid. .... **Linanthus bigelovii**

2. Corollas (8.5) 12–20 (25) mm long; leaves associated with the terminal flower of the main axis, simple and linear.

3. Flowers small, corollas 8.5–16.5 mm long, the lobes 3.5–7.5 mm long, 2.4–4.8 mm wide; calyx and pedicels with coarse stipitate glands, the stalks multiseriate at base and the terminal gland disc-like and multicellular..... **Linanthus jonesii**

3. Flowers large, corollas 14–30 mm long, the lobes 7.9–20.6 mm long, 5.4–10.2 mm wide; calyx and pedicels with delicate stipitate glands, a few stalks multiseriate at base, others uniseriate and the terminal gland disc-like and multicellular, or the terminal gland globose and bi-cellular.

..... **Linanthus maricopensis**

**Linanthus bigelovii** (A. Gray) Greene subsp. **bigelovii**

Bigelow desert-trumpets. Figure 10.

Cool-season ephemerals, erect, simple or more often freely and dichotomously branched, (5) 10–25 cm tall. Stems sparsely stipitate-glandular, particularly at the nodes and in the inflorescence (glandular trichomes delicate, with uniseriate stalks and few-celled terminal glands). Leaves 1.5–4.3 cm long, opposite, simple and linear or linear-filiform, commonly the more distal leaves 3-cleft essentially to the base into linear-filiform segments. Inflorescence cymose, diffuse and branching, the terminal flower subsessile or pedicellate, the pedicel 0.2–4 mm long, usually stipitate glandular, commonly closely subtended by a pair of leafy bracts. Flowers vespertine (nocturnal), closed during the day, opening in the late afternoon or evening and remaining open through the night; powerfully fragrant. Calyx 8–14 mm long, the lobes unequal, sparsely to moderately villous, sometimes also

glandular. Corollas actinomorphic, 8–16.3 (20) mm long, the lobes (2) 4–7.5 (14.1) mm long, 1.5–5.9 mm wide, white and generally flecked with purple, maroon, or brown-red on the abaxial lobe margins, and with a band of purple in the upper tube or throat. Stamens inserted in the mid-tube, filaments slender and glabrous; pollen yellow. Capsules cylindroid, 5–10 mm long. Seeds 12–21 per locule, 0.6–1.3 mm long, ellipsoid, angular and reniform; mucilaginous when wet.

Widespread across the flora area including sand flats, dunes, washes, plains, hills, and mountains.

Southeastern California to southwestern Utah and western Texas, Baja California, and northern Sonora. Subspecies *johnsonii* J.M. Porter and R. Patterson, a glabrous and glaucous race, occurs in Arizona, California, and Nevada to the north and west of subsp. *bigelovii*. See discussion for *L. jonesii*.

**OP:** 0.5 mi N of Quitobaquito, 18 Mar 1945, *Gould 2994*. Bajada, N of Headquarters, *Ranzoni 26 Mar 1965* (ORPI). Ajo Mts, 1 mi NE of picnic area at base of Tillotson Peak, 10 Mar 1973, *Shervanck 702* (RSA). Bull Pasture Trail, 11 Apr 1978, *Bowers 1228*.

**CP:** 8 mi E of Papago Well, 14 Apr 1941, *Benson 10762A* (RSA). Pinta Sands, 1 Feb 1992, *Felger 92-39*. 0.5 mi N of Papago Well, 16 Mar 1992, *Yeatts 3207* (CAB). Charlie Bell Pass, 3 Apr 1992, *Whipple 3925*. Childs Mt, 9 Apr 1993, *Felger 93-297*. Chico Shunie Wash, ½ mi W of Chico Shunie Well, sand-gravel bed, 1780 ft, 2 Feb 2003, *Rutman 2003-33*.

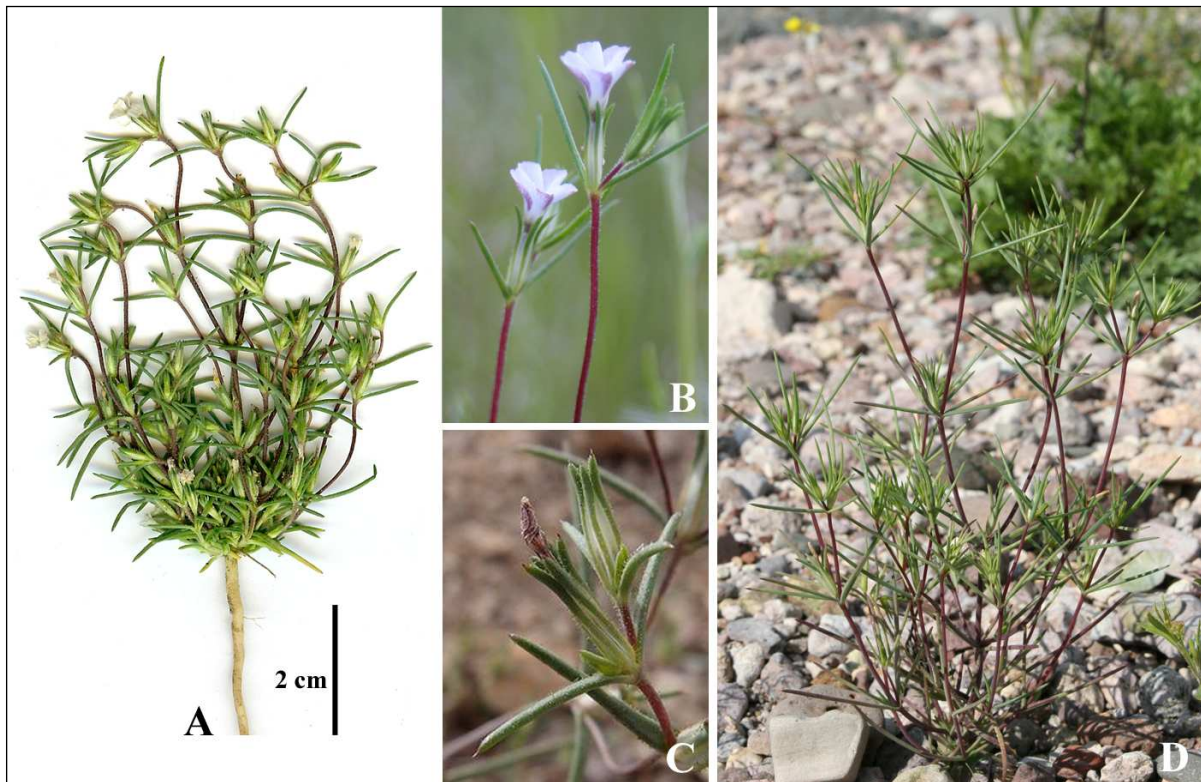


Figure 10. *Linanthus bigelovii* subsp. *bigelovii*. (A) Sierra Los Tanques near Mex Hwy 8, Sonora, 27 Mar 2010. (B) Ajo, 3 Mar 2005. (C) Near Ragged Top, Ironwood Forest National Monument, Pima Co., 25 Mar 2012, photo by Sue Carnahan. (D) Coffeepot Mountain, Sikort Chuapo Mts, Maricopa Co., 27 Feb 2005.



***Linanthus demissus*** (A. Gray) Greene

Desert snow. Figure 11.

Diminutive, cool-season ephemerals, 2–10 cm tall, highly branched throughout; stems ascending or decumbent, glandular and short pilose. Leaves 5–11 mm long, opposite, palmatifid, (leaves rarely simple and linear), the lobes 3 (5), linear, mucronate, glabrous or short-pubescent. Inflorescences solitary in the axils of bracts or in compact, terminal, bracteate clusters. Flowers subsessile, diurnal (open during the day)—the showy flowers may blot out the view of the rest of the plant. Calyx 4–7 mm long, glandular, campanulate, the lobes free to near the base and unequal. Corollas 5–8 mm long, campanulate, white to cream, the lobes white with red or purple flecks or streaks at the base. Stamens inserted near the base of the tube, the filaments glabrous. Style exerted slightly beyond the stamens. Capsules 2.2–3.1 mm long, ellipsoid, dehiscent the full length of the valves. Seeds (4) 5–10 per locule, 0.6–0.8 mm long, not becoming mucilaginous when wet.

Mostly in Arizona Upland regions of Organ Pipe including the Ajo, Bates, Diablo, and Growler mountains, and often localized.

Western Arizona, southeastern California, southern Nevada, and southern Utah.

**OP:** Wash near Sonoyta Rd, 10 Apr 1941, *McDougal* 68. Rocky slopes S of Bates Well, 18 Mar 1944, *Clark 11407* (ORPI). Low hill, 0.5 mi N of Canyon Diablo on Ajo Mt Drive, 5 Apr 1978, *Bowers 1189* (ORPI). Also see Figure 11A & D.

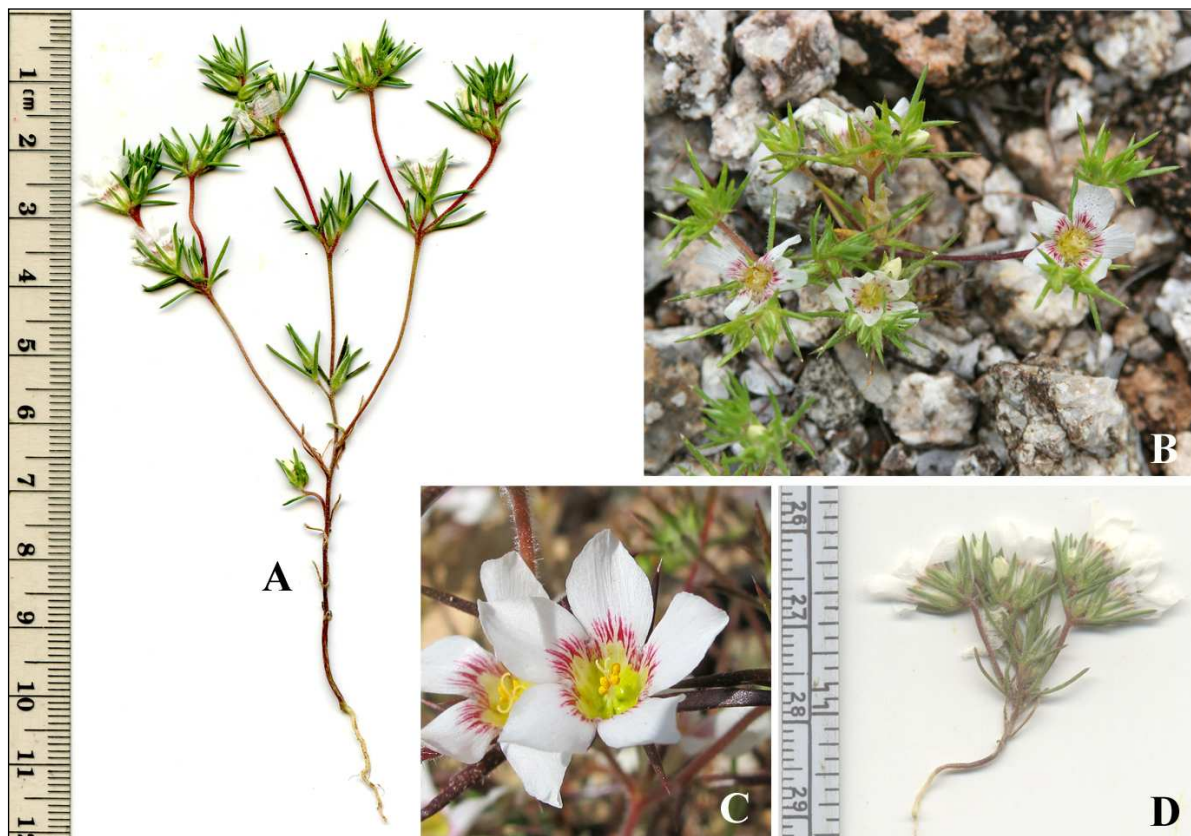


Figure 11. *Linanthus demissus*. (A) Middle elevation hills near N end of Ajo Mountain Drive, Diablo Mts, 22 Mar 2015. (B) On grus, Sand Tank Mountains, W of Javelina Mountain, Maricopa Co., 5 Mar 2005. (C) North Mountain Preserve, Phoenix, Maricopa Co., 23 Mar 2013, photo by Frankie Coburn (SEINet). (D) On grus, near Bluebird Mine, 9 Mar 2014.

***Linanthus jonesii*** (A. Gray) Greene[*L. bigelovii* var. *jonesii* (A. Gray) Jepson & H. Mason]

Jones's desert-trumpets. Figure 12.

Cool-season ephemerals, erect, simple or more often freely, dichotomously branched, (2.8–) 5–26 cm tall; stems sparsely but coarsely stipitate-glandular throughout, more densely stipitate-glandular at and just below the nodes and in the inflorescence (some of the glandular trichomes robust, with multiseriate stalks and multicellular, disc-like, terminal glands). Leaves 2.1–3 cm long, opposite, simple and linear or linear-filiform, coarsely stipitate-glandular on the upper surface near the nodes. Inflorescence cymose, diffuse and branching, more or less regularly dichotomous, the terminal flower subsessile or pedicellate, the pedicel 0.5–8.2 mm long, coarsely stipitate-glandular; flowers closely subtended by a pair of leafy bracts. Flowers vespertine (nocturnal), closed during the day, opening in the late afternoon or evening and remaining open through the night. Calyx 8–11 mm long, lobes unequal and glandular. Corolla actinomorphic, 8.5–16.5 mm long, the lobes 3.5–7.5 mm long, 2.4–4.8 mm wide, cream to white, generally flecked with purple, maroon or brown-red on the abaxial lobe margin, with a band of purple in the upper tube or throat. Stamen inserted in the mid-tube, filaments slender, glabrous; pollen yellow. Capsules cylindroid, 4–6.3 mm long. Seeds 12–21 per locule, 0.6–0.9 mm long, angular reniform, mucilaginous when wet.

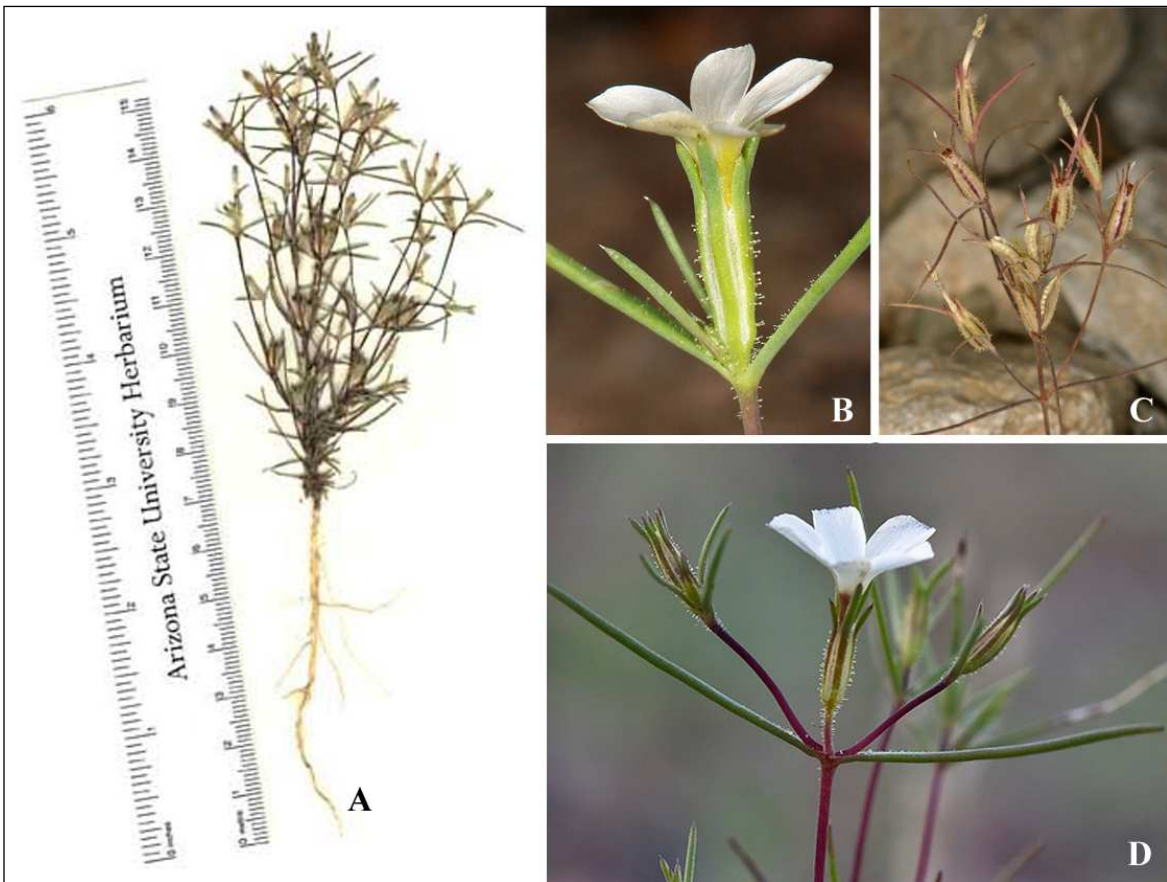


Figure 12. *Linanthus jonesii*. (A) 4.1 mi to Alamo Crossing from junction of Route 60 at Wenden, Yuma Co., 10 Mar 1973, *D.J. Pinkava 10311C* (ASU 49948). (B) Eastern Mojave Desert, Turtle Mts, San Bernardino Co., California, 19 Mar 2010, photo © by Steve Matson (CalPhotos). (C) Owens Valley, W edge of Big Pine near School Street and Big Pine Creek, Inyo Co., California, 26 Apr 2009, photo © by Steve Matson (CalPhotos). (D) Turtle Mts, San Bernardino Co., California, 19 Mar 2010, photo by John Game (SEINet).

Widespread in the Lower Colorado Valley region of the flora area: southwestern Organ Pipe, Cabeza Prieta, and Tinajas Altas.

SE California to southern Nevada, Arizona, Baja California Peninsula, and western Sonora.

*Linanthus jonesii* can be difficult to distinguish from *L. bigelovii* in southwestern Arizona, suggesting either introgression or a strong genetic link between the two. Distinguishing *L. jonesii* and *L. maricopensis* also can be difficult. This group certainly needs more study. *Linanthus jonesii*, with its coarsely glandular pedicels and calyx, is easily distinguished from *L. bigelovii* in California, but the distinction is less clear in Arizona, where *L. bigelovii* tends to also have glandular trichomes. The glandular trichomes of *L. bigelovii* are relatively delicate and uniseriate (cells in one row) with globular terminal glands. In contrast, *L. jonesii* has coarse, multiseriate (cells in 2 or more rows) glandular trichomes with flattened, tack-like, comparatively large and multicellular terminal glands. (Porter & Patterson 2015).

**OP:** 0.5 mi N of Quitobaquito, 18 Mar 1945, *Gould 2994*.

**CP:** 8 mi E of Papago Well, 14 Apr 1941, *Benson 10762A* (RSA). Lower slopes of Growler Mts NE of Charlie Bell Pass, tributaries to Daniel's Arroyo, 1200 ft, 20 Mar 1992, *Crawford 7b* (ASC, det. Felger, Feb. 2012).

**TA:** Tinajas Altas Mts, *Van Devender 26 March 1983* (det. J.M. Porter, 2012; cited in Felger et al. 2012).

**Linanthus maricopensis** J.M. Porter & R. Patterson  
Maricopa desert-trumpets. Figure 13.

Cool-season ephemerals, 6–25 cm tall, erect, simple (unbranched) or more often freely and dichotomously branched. Stems sparsely but coarsely stipitate-glandular throughout, and more densely stipitate-glandular at and just below the nodes and in the inflorescence (some of the glandular trichomes are robust, with multiseriate stalks and multicellular, disc-like, terminal glands). Leaves 0.8–3.3 cm long, opposite, simple and linear or linear-filiform (rarely 3-lobed with the central lobe longest), coarsely stipitate-glandular on the upper surfaces near the nodes. Inflorescence cymose, diffuse and branching, the terminal flower subsessile or pedicellate, the pedicel 1.5–13.5 mm long, and coarsely stipitate-glandular; flowers closely subtended by a pair of leafy bracts. Flowers vespertine (nocturnal), closed during the day, opening in the late afternoon or evening and remaining open through the night, and very fragrant. Calyx 8–13 mm long, the lobes unequal and glandular. Corollas actinomorphic, 14–30 mm long, the lobes 7.9–20.6 mm long, 5.4–10.2 mm wide, cream to white, generally flecked with purple, maroon or brown-red on the abaxial lobe margins, and with a band of purple in the upper tube or throat. Stamen inserted in the middle of the tube, the filaments slender and glabrous; pollen yellow. Capsules cylindroid, 4.5–9.1 mm long. Seeds 18–32 per locule, 0.6–1.1 mm long, angular and reniform; mucilaginous when wet.

Documented in the flora area from Cabeza Prieta on sandy soils including dunes of the Pinta Sands and nearby areas of blowing sands, and expected elsewhere. In nearby regions also on granitic soils including rocky substrates.

Endemic to Arizona in Maricopa and Pima counties.

This large-flowered species has consistently been identified as *L. dichotomous*. However, it lacks the inflated, villous filament bases and white, pithy seed coats characteristic of *L. dichotomous*. Rather, *L. maricopensis* possesses a number of traits similar to *L. jonesii* (see discussion for *L. jonesii*). Clearly, more research is needed to understand the relationships among these species.

**CP:** Sand dunes (Pinta Sands) S of El Camino Diablo, 14.4 mi E of Tule Well, 800 ft, with *Oenothera*, *Larrea*, *Hesperocallis*, *Triteleiopsis*, & *Geraea*, 13 Mar 1983, *Daniel 269* (ASU, ver. by Walter Fertig and Felger, 28 Mar 2015). 3½ mi W of Papago Well along Camino del Diablo, sandy soil, with *Oenothera deltoidea* var. *arizonica*, uncommon, 13 Mar 1983, *Mason & Eiber 3601*. E side of Pinta Sands, low dunes encroaching lava field, 32°05'56"N, 113°18'45"W, 240 m, collected and pressed at dusk, flowers sweet-fragrant, corollas white (7 a.m. next morning the flowers were closed), 11 Apr 1993, *Felger 93-427*.

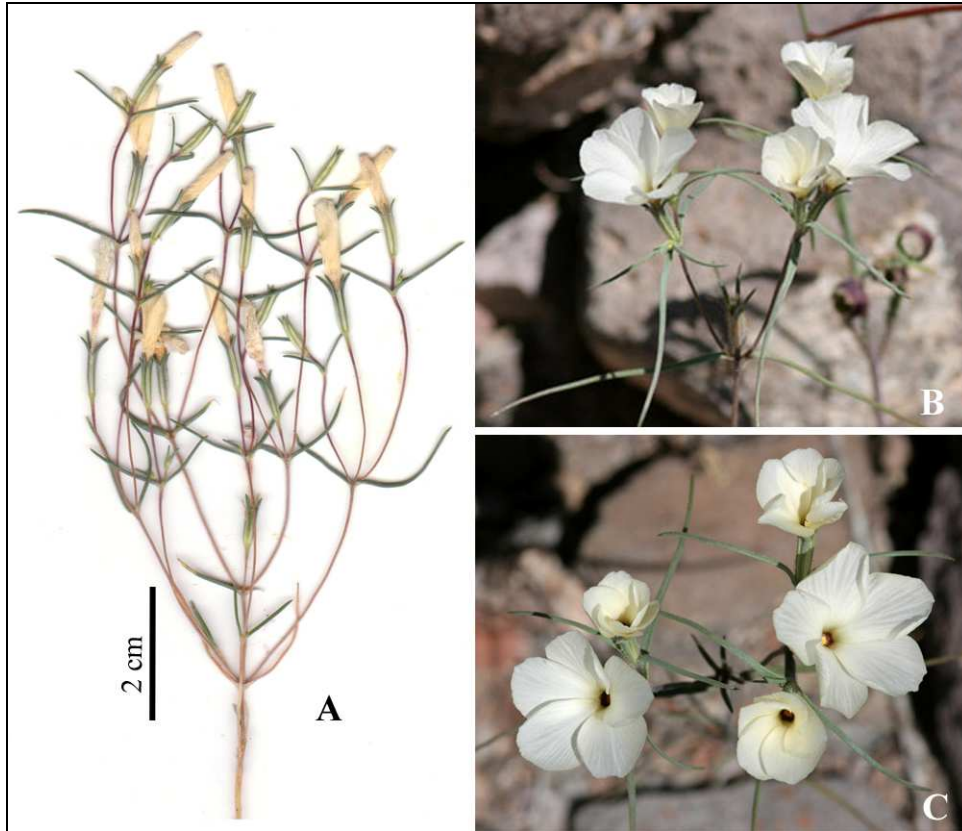


Figure 13. *Linanthus maricopensis*. (A) Sierra Los Tanques near Mex Hwy 8, Sonora, 27 Feb 2010. (B & C) Sand Tank Mts, Maricopa Co., 8 Mar 2008, photos by Patrick Alexander (SEINet).

### **Loeseliastrum**

Annuals, compact and highly branched, the branches rigidly spreading or ascending. Leaves alternate, sessile, linear to oblanceolate, coarsely toothed or pinnately lobed, the teeth and lobes with 1 terminal bristle. Inflorescences terminal, head-like or sub-capitate, bracteate, the bracts leaf-like but reduced in size. Flowers weakly to moderately zygomorphic, and sessile. Calyx with hyaline membranes alternating with the herbaceous costae and lobes, the membranes rupturing in fruit, the lobes bristle-tipped. Corollas bilabiate. Stamens subequally inserted on the upper tube; filaments unequal in length, up-curved; anthers mostly exserted. Style exserted. Capsule ovoid, with 3 rounded lobes in cross-section, dehiscent, the 3 valves separating completely with age. Seeds 2–10 per locule, mucilaginous when wet. Western USA and northern Mexico; 3 species.

#### **Loeseliastrum schottii** (Torrey) Timbrook

[*Langloisia schottii* (Torrey) Greene]

Schott's calico. Figure 14.

Cool-season ephemerals. Stems 3–12 cm long, leafy distally, sparsely so below; the main axis short, giving the plant a compact but spreading habit; villous-hirsute or villous-puberulent with

crisped, multicellular trichomes. Leaves alternate, 1–3 cm long, broadly linear or narrowly oblong, toothed or shallowly lobed, the teeth and lobes with a bristle 1.5–3.5 mm long, proximal margins of the leaf often densely bristly-ciliate. Flowers white to pink and showy in dense leafy-bracted clusters. Calyx 4–6 mm long, the lobes pilose, glandular, and bristle-tipped. Corollas 8–15 mm long, bilabiate, the tube 4–10 mm long, the upper lip with 3 (4) lobes, 3–7 mm long, the lower lip with (1) 2 lobes, the lobes white to pink, with maroon streaks at the base of the upper lobes. Stamens unequal in length, curving upward, and shorter than the corolla lobes; anthers included to exerted, pollen yellow. Capsules 2–5 mm long, the valves separating at maturity. Seeds 2–6 per locule, ca. 1 mm long, mucilaginous when wet.

Low dunes on the west side of Tinajas Altas Mountains and perhaps elsewhere in the western part of the flora area; common on the Mohawk Dunes (north of the flora area).

Desert and semi-desert in western Arizona, southern California, southern Nevada, southwestern Utah, Baja California, and northwestern Sonora.

TA: Butler Mountains, *Van Devender 27 Mar 1983*.



Figure 14. *Loeseliastrum schottii*. Anza Borrego State Park, San Diego Co., California, 27 Mar 2011, photos by Keir Morse.

### Phlox

Herbaceous perennials, often caespitose (but not in the flora). Stems erect to decumbent, often much branched. Leaves mostly opposite, often alternate only in the inflorescence, simple, entire, linear to elliptic or lanceolate. Inflorescences terminal, the flowers in 1–3-flowered cymes. Flowers pedicelled or sessile. Calyx with hyaline membranes alternating with the herbaceous costae and lobes, the membranes ruptured in fruit, the lobes equal. Corollas salverform or occasionally narrowly funnellform, white, pink, red, blue, or purple. Stamens unequally inserted on the tube; filaments short, usually equal in length, and glabrous; anthers and style usually included. Capsule ovoid to ellipsoid. Seeds 1 (2 or 3) per locule, usually not mucilaginous when wet. North America and Siberia; 60 species.

### **Phlox tenuifolia** E.E. Nelson

Mountain phlox. Figure 15.

Perennials, herbaceous or suffrutescent. Stems 1–6 and wiry, 27–82 (125) cm tall, the internodes elongate, pilose to short villous. Leaves linear to narrowly lanceolate, flat, 20–50 mm long, 1–3 mm wide, glabrous or sparsely pilose. Inflorescences terminal, with 2 or 3-flowered cymes;

pedicels 7.5–40 mm long, sparsely glandular to short pilose. Calyx 7–12 mm long, the membranes flat, long pilose and with glandular trichomes. Corollas narrowly funnelform, white or rarely lavender, the tube 7–16 mm long, the lobes 6.5–10 mm long, 3–5 mm wide, obtuse to truncate. Stamens unequally inserted on the upper tube; stigmas adjacent to the anthers, and included. Capsules 4.4–6.3 mm long, dehiscent the full length of the valves, or nearly so. Seeds 1 per locule, 3–4 mm long, not mucilaginous when wet. Flowering in spring and with summer-fall rains.

Canyons and rocky slopes generally in the Ajo and Diablo mountains, especially above 3000 feet.

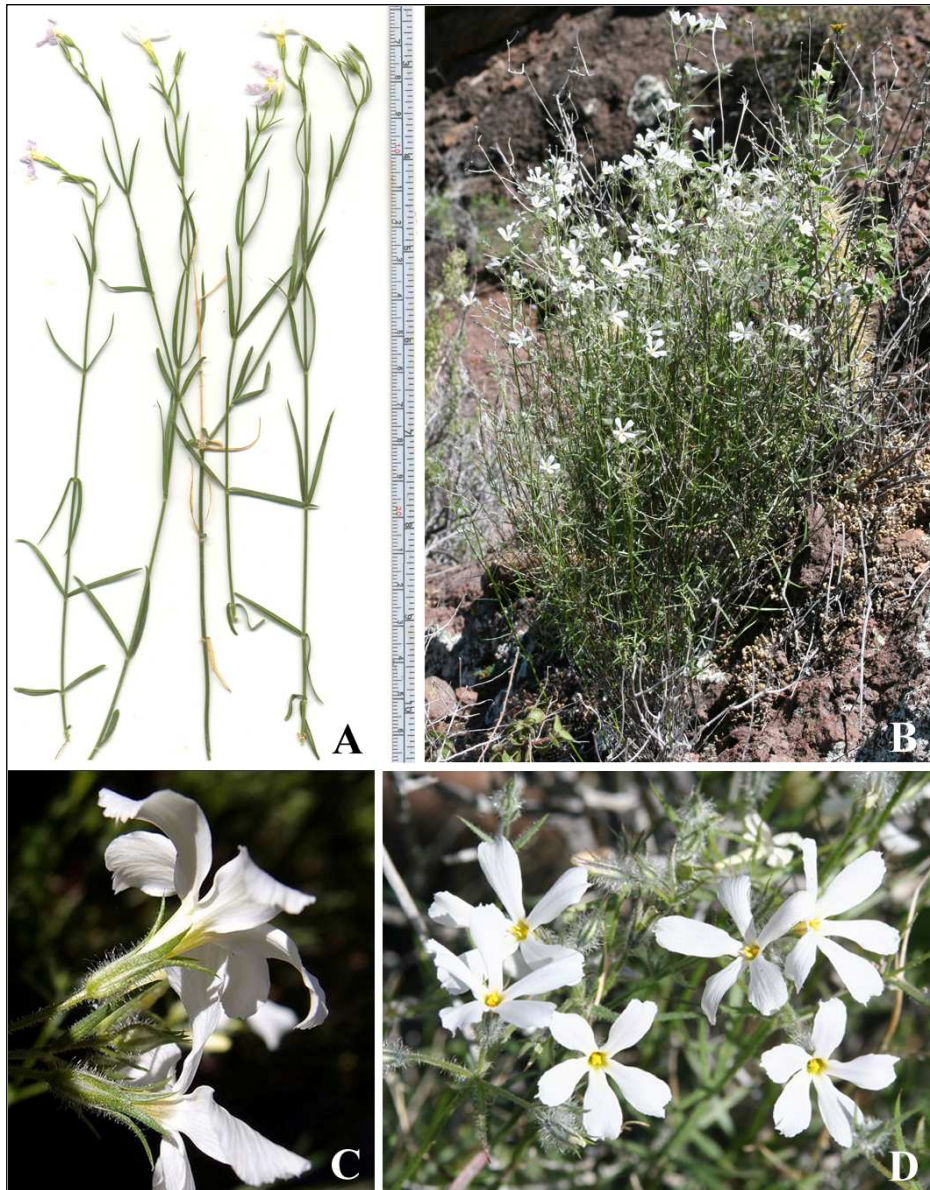


Figure 15. *Phlox tenuifolia*. (A) Trail to Bull Pasture, 21 Sep 2008. (B & D) Estes Canyon, 12 Mar 2005. (C) La Milagrosa Trail, Santa Catalina Mts, Pima Co., 22 Mar 2015, photo by Sue Carnahan.

Eastward and northward in Arizona, mostly above the desert, New Mexico, northern Sonora east of the flora area, and Chihuahua.

**OP:** Ajo Mts, *Gooding 31 Oct 1938*. Alamo Canyon, *Nichol 4 May 1939*. Arch Canyon, 3500 ft, 28 Mar 1965, *Niles 550*. Bull Pasture Trail, 5 Nov 1977, *Bowers 932*. Diablo Canyon, 12 May 1988, *Baker 7606* (ASU). Middle fork of Alamo Canyon near crestline of Ajo Mts, 15 Mar 2003, *Rutman 2003-343* (ORPI). Diablo Mts, 807 m, shaded base of N-facing cliff, 22 Sep 2013, *Rutman 20130922-21*.

### ACKNOWLEDGEMENTS

In addition to the gratitudes provided in part 1 in this flora series, we thank Susan Davis Carnahan for copyediting expertise. George McNeil Ferguson, Walter Frank Fertig, Richard (Rick) Alan Johnson, Andrew M. Salywon, Andrew C. Sanders, Thomas R. Van Devender, James (Jim) Thomas Verrier, and George Yatskievych provided significant information and reviews. For use of photos we thank Patrick Alexander, Sue Carnahan, Frankie Coburn, Gary A Monroe, Keir Morse, and Richard Spellenberg. RSF thanks the Wallace Research Foundation for financial support.

### LITERATURE CITED

- Felger, R.S., S. Rutman, J. Malusa, and T.R. Van Devender. 2013a. Ajo Peak to Tinajas Altas: Flora of southwestern Arizona: An introduction. *Phytoneuron* 2013-5: 1–40.
- Felger, R.S., S. Rutman, J. Malusa, and T.R. Van Devender. 2013b. Ajo Peak to Tinajas Altas: A flora of southwestern Arizona: Part 3: Ferns, lycopods, and gymnosperms. *Phytoneuron* 2013-37: 1–46.
- Felger, R.S., T.R. Van Devender, B. Broyles, & J. Malusa. 2012. Flora of Tinajas Altas, Arizona—A century of botanical forays and forty thousand years of *Neotoma* chronicles. *J. Bot. Res. Inst. Texas* 6: 157–257.
- Grant, V.E. 1959. Natural History of the Phlox Family, vol. 1, Systematic Botany. Martinus Nijhoff, The Hague, Netherlands.
- Grant, V. and K. Grant. 1964. Flower Pollination in the Phlox Family. Columbia Univ. Press. New York.
- Patterson, R. 1993. *Linanthus*. Pp. 840–844, in J.C. Hickman (ed.), The Jepson Manual. Univ. of California Press, Berkeley.
- Porter, J.M. 1998. *Aliciella*, a circumscribed genus of Polemoniaceae. *Aliso* 17: 23–46.
- Porter, J.M. and L.A. Johnson. 2000. A phylogenetic classification of Polemoniaceae. *Aliso* 19: 55–91.
- Porter, J.M. and R. Patterson. 2015. A fistful of Polemoniaceae: New names and combinations. *Aliso* 32: 55–88.
- Simmons, N.M. 1966. Flora of the Cabeza Prieta Game Range. *J. Ariz. Acad. Sci.* 4: 93–104.
- Thiers, B. 2016 [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. <<http://sweetgum.nybg.org/ih/>>
- Wilken, D.H. and J.M. Porter. 2005. Vascular plants of Arizona: Polemoniaceae, Phlox family. *Canotia* 1: 1–37.

### Previously published parts of the Flora of southwestern Arizona

- Part 1. INTRODUCTION. *Phytoneuron* 2013-5: 1–40.
- Part 2. CHECKLIST. *Phytoneuron* 2013-27: 1–30.
- Part 3. FERNS, LYCOPODS, & GYMNOSPERMS. *Phytoneuron* 2013-37: 1–46.
- Part 4. MAGNOLIIDS. *Phytoneuron* 2013-38: 1–9.
- Part 5. MONOCOTS EXCEPT GRASSES. *Phytoneuron* 2013-76: 1–59.
- Part 6. POACEAE – GRASS FAMILY. *Phytoneuron* 2014-35: 1–139.

- Part 7. CACTACEAE – CACTUS FAMILY. Phytoneuron 2014-69: 1–95.
- Part 8. ACANTHACEAE – APOCYNACEAE. Phytoneuron 2014-85: 1–74.
- Part 9. CONVULVULACEAE – MORNING GLORY FAMILY. Phytoneuron 2015-2: 1–22.
- Part 10. BERBERIDACEAE, BIGNONIACEAE, BORAGINACEAE & BURSERACEAE.  
Phytoneuron 2015-1: 1–60.
- Part 11. BRASSICACEAE – MUSTARD FAMILY. Phytoneuron 2015-6: 1–48.
- Part 12. CAMPANULACEAE to CUCURBITACEAE. Phytoneuron 2015-21: 1–39.
- Part 13. EUPHORBIACEAE – SPURGES. Phytoneuron 2015-26: 1–65.
- Part 14. FABACEAE – LEGUMES. Phytoneuron 2015-58: 1–83.
- Part 15. FAGACEAE to LYTHRACEAE. Phytoneuron 2015-59: 1–54.
- Part 16. MALPIGHIACEAE to MORACEAE. Phytoneuron 2015-60: 1–54.
- Part 17. NYCTAGINACEAE to PLUMBAGINACEAE. Phytoneuron 2016-34: 1–77.