

FIRST REPORT OF *LASIOPOGON GLOMERULATUS* (ASTERACEAE: GNAPHALIEAE) FOR ARIZONA, USA, AND NORTHERN AND WESTERN HEMISPHERES

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ABSTRACT

We report *Lasiopogon glomerulatus* (Harv.) Hilliard as naturalized in Arizona, the first occurrence of *Lasiopogon* Cass. in the USA and the northern and western hemispheres. This diminutive, spring-flowering, annual member of Gnaphalieae is native to southern Africa and not previously recorded outside that region. The North American material has most frequently been mistaken for *Gnaphalium palustre* Nutt. but is readily distinguished using the key provided here. It is documented from both urban and rural habitats in Maricopa, Pima, and Pinal counties, Arizona, where it may have been observed as early as 2005. Herbarium collections date from February 2014 and iNaturalist observations from April 2016 onward.

In 2016, the third author began to notice iNaturalist posts of an unusual woolly, annual composite from the Phoenix and Tucson areas. He provisionally identified many of these observations as *Gnaphalium palustre* Nutt. (e.g., <https://www.inaturalist.org/observations/2917672>), but consistent differences between them and actual *G. palustre*, and the community resources of iNaturalist, led him to the genus *Lasiopogon* Cass., a taxon native to Africa and previously unknown in the Western Hemisphere (Morefield 2020). Conversations with regional botanists and a search of the *G. palustre* and other gnaphaliid folders at the Arizona State University Vascular Plant Herbarium (ASU) and the University of Arizona Herbarium (ARIZ) turned up voucher specimens of *Lasiopogon* as far back as 2014 (*Fertig 29152*, ASU). Using a key to subtribe Gnaphaliinae (now the tribe Gnaphalieae) for southern Africa (Hilliard 1983), the authors verified the Arizona collections as *L. glomerulatus* (Harv.) Hilliard.

Lasiopogon glomerulatus [*Gnaphalium glomerulatum* Harv.] is native to southern Africa, documented in Madagascar, Namibia, South Africa, and Zambia (Hilliard 1983; African Plant Database 2022). In its native range, *L. glomerulatus* flowers between May and October (winter–spring in the Southern Hemisphere) and occurs in mainly arid habitats, in stony or gravelly soils or hard-packed sand; it has also been recorded from coastal dunes (Hilliard 1983).

Description - *Lasiopogon glomerulatus*

Prostrate annual, much branched from base, with thin taproot. **Leaves** alternate, woolly, and quickly deciduous near base of stem; leaf blades 2–10 mm long × 0.25–2 mm wide, margins flat. **Flowering heads** in terminal clusters, usually closely subtended by woolly bracts. **Inner phyllaries** or bracts abruptly tan-colored at tip, blunt to notched, cupped inward, distinctly longer than florets; stereome divided (see below, Comments on morphology). **Pistillate florets** white or tinged with purple, 50 or more, surrounding bisexual florets. **Bisexual florets** purple-tipped, fewer than 10, in center of head. **Receptacle** domed, tuberculate. **Achenes** oblong, tan-colored, 0.5 mm long, with

minute myxogenic (mucilage-producing) hairs. **Pappus** of evenly barbellate bristles, falling in partial to complete rings.

Habitat in Arizona

Seasonally moist or irrigated ground in urban areas, such as roadsides, parking lots, residential yards, and a golf course, as well as disturbed natural areas, such as Santa Cruz Flats, the base of the Santa Catalina Mountains near Tucson, and a desert arroyo in southwestern Pima County near the Mexican border. Vegetative communities include Sonoran Desert and semi-desert grassland. Elevation range: 334 m (*Rutman s.n.*, 25 Feb 2015, ARIZ) to 1036 m (*Bertelsen 2015-006*, ARIZ). Flowering in Arizona from December through May.

Vouchers

Maricopa Co.: Tempe, along railroad tracks paralleling the Tempe Sports Complex dog park, weedy clay flats, 366 m, 8 Feb 2015, *Fertig 30228* (ASU); Tempe, parking area north of Alameda Natural History Museum, thin soil in cracks in asphalt pavement, 354 m, 7 Feb 2016, *Fertig 31124* (ASU); South Phoenix, near 40th Street and Carter Dr., in pavement cracks of parking lot, 360 m, 18 Feb 2016, *Makings 4793* (ASU); South Phoenix, 40th Street and St. Catherine, growing from cracks in the sidewalk, 349 m, 20 Feb 2019, *Makings 6092* (ASU); Mesa, Red Mountain Ranch Country Club, in gravelly soil near 10th tee, 470 m, 20 Feb 2021, *Makings 6896* (ASU). Pima Co.: Organ Pipe Cactus National Monument, Aguajita Wash, 25 Feb 2015, *Rutman s.n.* (ARIZ); Santa Catalina Mts, Finger Rock Canyon, desert scrub and riparian scrub, 3400 ft [1036 m], 10 Mar 2015, *Bertelsen 2015-006* (ARIZ; original det. *Gnaphalium palustre*); [Santa Catalina Mts,] Sabino Canyon, bajada near dry creek bed off Esperero trail, desert scrub, 810 m, 14 Mar 2015, *Bird 109* (ARIZ; original det. *Gnaphalium palustre*); Oro Valley, Rancho Feliz Dr. near La Cañada Dr., mesquite bosque, sandy soil, 739 m, 27 Feb 2017, *Mendoza 176* (ARIZ); Saguaro National Park (Rincon District), Javelina Wash East, Cactus Forest Loop Drive area, along desert wash, 886 m, 12 Apr 2019, *Bird & Bachman s.n.* (ARIZ; original det. *Gnaphalium palustre*); Tucson, 0.5 mi SSW intersection of Ironwood Hill Dr. and Greasewood Rd., landscaping and barren ground in yard, 9 Mar 2019, *Ferguson 4504* (ARIZ); South Tucson, E Tucson Marketplace Blvd, drip-irrigated landscaping between sidewalk and paved road, 756 m, 4 Mar 2021, *Carnahan 4669* (ARIZ); South Tucson, E Tucson Marketplace Blvd, drip-irrigated landscaping between sidewalk and paved road, 756 m, 22 Mar 2021, *Carnahan 4682* (ARIZ, RENO); Historic Canoa Ranch, 7 km S of Green Valley, revegetated slope in scrub grassland, 896 m, 25 May 2021, *Carnahan 4723* (ARIZ); Tucson, corner of Van Buren Ave. and Baker St., disturbed bare ground and curbside gravels, 776 m, 9 Mar 2022, *Carnahan 5068* (ARIZ, ASC, DES, TEX, UCR, USON). Pinal Co.: Santa Cruz Flats, 3.5 miles S of Picacho, flats of fine gravel over silty clay in *Larrea tridentata*-*Ambrosia deltoidea* community, 475 m, 21 Feb 2014, *Fertig 29152* (ASU).

Naturalization

Although 2014 is apparently the first year of collection, *Lasiopogon glomerulatus* may have arrived in Arizona much earlier: George Ferguson (pers. comm. to Sue Carnahan, 14 Jun 2021) reported these plants were established in his Tucson yard in 2005 and likely were already present when he purchased the home in 2004; he vouchered them in 2019 (*Ferguson 4504*, ARIZ) after learning they were new to the region.

Given the greater number of herbarium collections and iNaturalist observations in the Tucson area, and the casual report of plants in a residential yard in 2004 or 2005, it seems likely that *Lasiopogon glomerulatus* arrived first in the USA in the Tucson area and spread from there. The fact that most of the collections have been in urban settings—a churchyard, a golf course, backyard, etc.—suggests a human-caused dispersal, but the heads disarticulate into light pappose fruits that easily disperse in the wind. *Lasiopogon glomerulatus* is likely to occur in other Arizona counties and in neighboring states, especially California and Sonora, Mexico. An iNaturalist observation in March

2022 from San Bernardino Co., California, may be the first record of occurrence in the state, pending species identification (Echols 2022).

iNaturalist has become an increasingly visible and valuable resource, contributing millions of geolocated data points and helping to document the occurrence and behavior of organisms in their environment. Data from iNaturalist should be reviewed and used with caution, as the submissions may lack details or views necessary to confirm an identification, and iNaturalist contributors and identifiers have widely varying levels of expertise. In the case of *Lasiopogon glomerulatus*, however, the many iNaturalist observations of this species in the Phoenix and Tucson areas inspired the current effort to identify it and document its presence in North America. We feel confident based on similar appearance and geography that the unvouchered iNaturalist observations mapped herein are the same species.

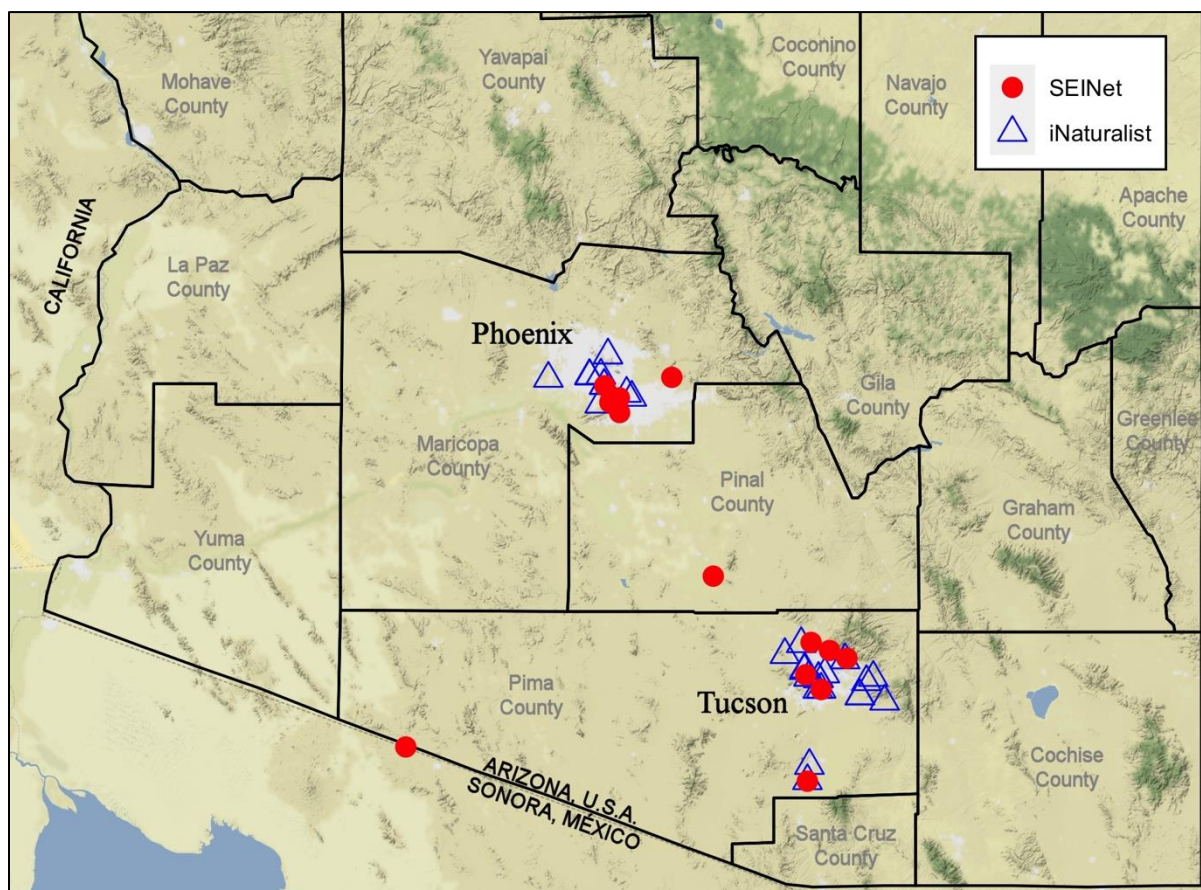


Figure 1. Locations of verified SEINet specimen records (red circles) and iNaturalist observations (blue triangles) of *Lasiopogon glomerulatus* in Arizona. The iNaturalist records shown are those with open geoprivacy, locational uncertainty less than 250 m, compatible Creative Commons licenses, and identity verified by one or more of the authors.

Comments on morphology

A reliable—though difficult to see even with magnification—character of *Lasiopogon* not shared with other Arizona gnaphaliids is the divided (fenestrated) stereome in the inner phyllary or bract (Figure 2C). Hilliard (1983: 1), who worked extensively with the genus in southern Africa, noted this:

The structure of the stereome (the thickened region in the lower part of an involucre bract) has been found of considerable value in the classification of the genera (see Hilliard & Burtt in Bot. J.

Linn. Soc. 82: 181-232, 1981). Ideally, an inner bract is cleared and examined under a compound microscope....When 'fenestrated', there is a thin patch in the thick-walled tissue of the stereome and at least the midvein can be seen running through it; when 'undivided', no such thin patch is visible.

The North American species most likely to be confused with *Lasiopogon glomerulatus* (and to which many of the early collections and observations were assigned) is *Gnaphalium palustre* (Fig. 2F). Specimens of *L. glomerulatus* will key to *G. palustre* in the treatment of Gnaphalieae in Flora of North America North of Mexico (Barkley et al. 2006) as well as The Jepson Manual (Baldwin et al. 2012), although the species descriptions do not match up perfectly. An easily observed feature to distinguish *Lasiopogon* from *Gnaphalium* in the field is the opaque tan tips of the inner phyllaries (Fig. 2B). These tips are blunt or slightly notched, visibly longer than the florets, and incurved over them so that the dark-colored florets appear sunken. In contrast, the inner phyllaries of *G. palustre* are translucent or whitish, rounded to sub-acute at the tip, and rarely much longer than the florets. Also helpful for distinguishing the two species are the smaller, early-deciduous stem leaves of *L. glomerulatus*, compared to the larger, more persistent stem leaves of *G. palustre*.

Gnaphalieae and the genus *Lasiopogon*

The tribe Gnaphalieae includes about 187 genera and 1240 species worldwide (Barkley et al. 2006), concentrated in southern Africa, Australia, and South America but also widespread in the Northern Hemisphere. Nineteen genera and 111 species were reported by Barkley et al. (2006) for the tribe in North America north of Mexico.

The genus *Lasiopogon* comprises seven species, six of which were considered restricted to southern Africa prior to this report (Hilliard 1983; EOL 2021; Tropicos 2021): *L. brachypterus* O. Hoffm. ex Zahlbr., *L. debilis* Hilliard, *L. glomerulatus*, *L. minutus* Hilliard & Burt, *L. ponticulus* Hilliard, and *L. volkii* Hilliard. Only *L. muscoides* (Desf.) DC. had a wider range, occurring in southern Africa and disjunctly in northern Africa and central Spain, and eastward to Pakistan and India. Two species formerly treated in *Lasiopogon* (*L. micropoides* DC. and *L. molluginoides* DC.) were moved to the genus *Ifloga* by Hilliard & Burt (1981).

KEY TO TRIBE GNAPHALIEAE IN ARIZONA

The tribe Gnaphalieae is taxonomically challenging due to the species' general similarity to one another and their small reproductive parts often concealed by woolly hairs and bracts. The following key to gnaphaliid genera pertains to taxa occurring in Arizona (listed following each genus); it is not intended to substitute for the full key to North American Gnaphalieae in Barkley et al. (2006). The couplet distinguishing *Gnaphalium* and *Lasiopogon* should work for all known North American taxa.

1. Plants perennial and dioecious (male and female flowers on separate plants); usually in temperate to montane habitats.
 2. Plants mostly taller than 25 cm; basal leaves often withering before flowering **Anaphalis** (*A. margaritacea*)
 2. Plants mostly shorter than 30 cm; basal leaves usually present at flowering..... **Antennaria** (*A. marginata, media, microphylla, neglecta, parvifolia, rosea, rosulata, umbrinella*)
1. Plants annual, biennial, or perennial, but not dioecious; in various habitats from deserts to mountains.
 3. Plants annual; receptacle with paleae subtending some or all florets.
 4. Outer pistillate florets not enclosed by paleae; pappus none **Diaperia** (*D. verna*)
 4. Outer pistillate florets enclosed by saccate paleae; pappus usually on inner florets.

5. Pappus of 13–28+ bristles, exerted; central florets bisexual **Logfia**
(*L. arizonica, depressa, filaginoides*)
5. Pappus of 0 or 1–10 bristles, hidden within head; central florets staminate **Stylocline**
(*S. gnaphaloides, intertexta, micropoides, sonorensis*)
3. Plants annual, biennial, or perennial; receptacle lacking paleae.
6. Plants annual, biennial, or perennial, often taller than 20 cm; stems erect or ascending; florets yellow to reddish..... **Pseudognaphalium** (*P. arizonicum, canescens, jaliscense, leucocephalum, luteoalbum, macounii, priscum* [Nesom 2021], *stramineum*)
6. Plants annual, usually shorter than 20 cm; stems often spreading to prostrate; florets whitish or purplish, sometimes pale yellow.
7. Inner phyllaries purplish at junction of stereome (thickened, herbaceous, green part of inner phyllary) and lamina (distal portion of inner phyllary); inner phyllary tips purplish to whitish **Gamochoeta** (*G. purpurea, stagnalis*)
7. Inner phyllaries not purplish at junction of stereome and lamina; inner phyllary tips variously colored.
8. Largest leaves longer than 10 mm, or wider than 3 mm, or both; phyllaries usually in 3–5 series, woolly near base; tips of inner phyllaries white to translucent, rounded to acute, spreading at maturity, equal to or slightly longer than florets (cavity above florets none or poorly defined); stereome undivided; receptacle flat, smooth **Gnaphalium** (*G. exilifolium, palustre*)
8. Largest leaves 2–10 × 0.25–2 mm; phyllaries in 2 series, glabrous; tips of inner phyllaries tan, opaque, truncate to notched, erect, incurved, distinctly longer than florets at maturity, collectively forming a well-defined circular cavity above florets; stereome divided; receptacle hemispheric and/or honeycombed **Lasiopogon** (*L. glomerulatus*)

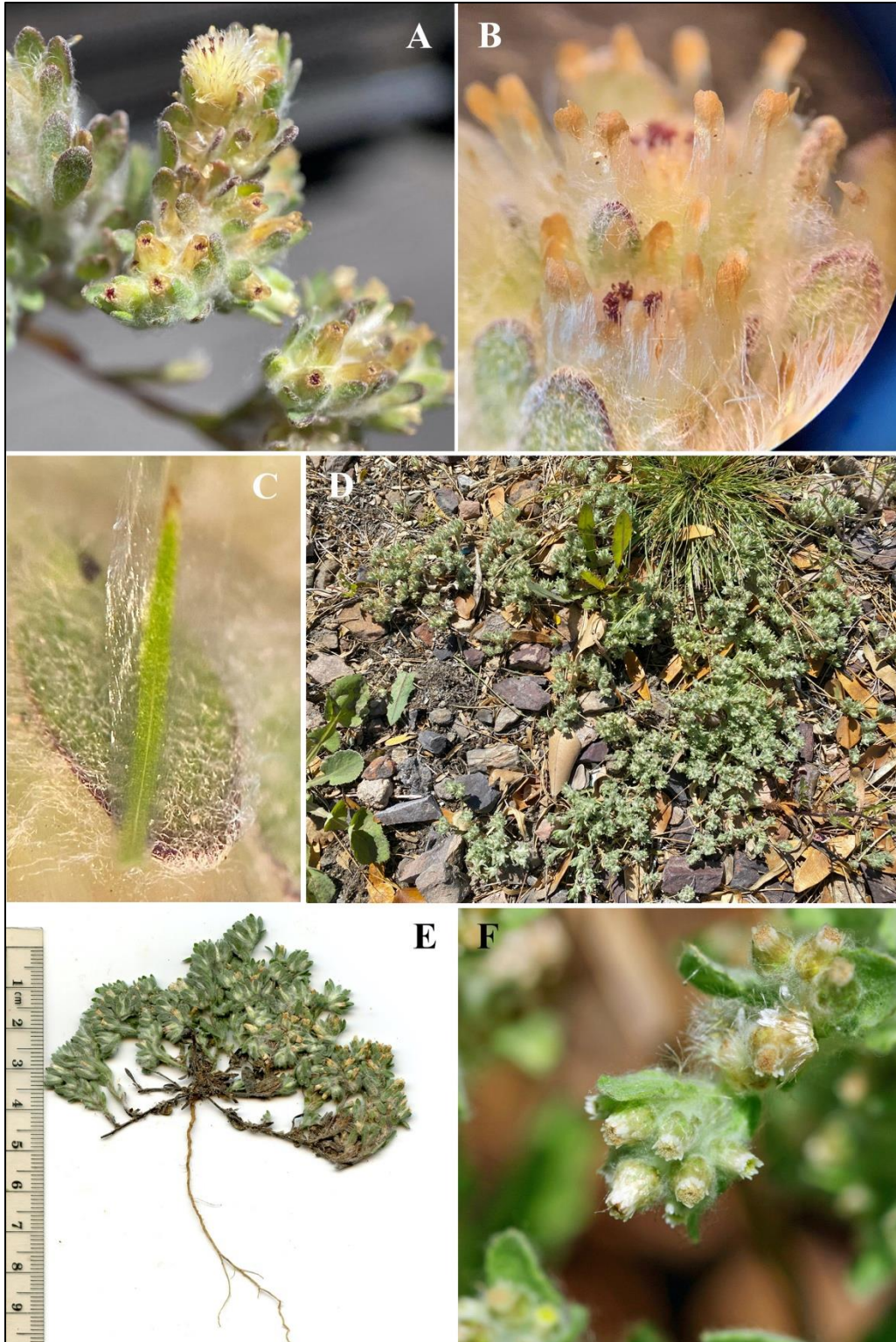


Figure 2. *Lasiopogon glomerulatus*. A. Tucson; 22 Mar 2021. B. Close-up of tan-tipped inner phyllaries. C. Inner phyllary showing divided stereome (midvein visible). D. Growth habit, Tucson; 4 Mar 2021. Photos A–D by Sue Carnahan. E. Kuakatch Village, Organ Pipe Cactus National Monument; 11 Mar 2015. Scan by Sue Rutman. F. *Gnaphalium palustre* for comparison, Tonto National Forest. Photo by Liz Makings.

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