

NEW DISTRIBUTION RECORDS FOR *GAMOCHAETA* (ASTERACEAE: GNAPHALIEAE) IN THE UNITED STATES

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ABSTRACT

Gamochaeta stagnalis is reported for the first time for the United States (Arizona and New Mexico). In Arizona these plants have previously been identified as *Gamochaeta purpurea* and *Gamochaeta falcata*. The species is common in Mexico and apparently is at the northern limit of its distribution in Cochise, Pima, and Santa Cruz cos., Arizona, and Hidalgo Co., New Mexico. *Gamochaeta purpurea* sensu stricto also occurs in Arizona, disjunct from its main range in the eastern U.S.A. Plants of the southeastern U.S.A. previously identified in some treatments as *Gamochaeta falcata* are separated into two species: *Gamochaeta calviceps* and *Gamochaeta antillana*. A lectotype is chosen for *G. antillana*. *Gamochaeta calviceps* is known primarily from the southeastern U.S.A. but is reported from two collections in California. *Gamochaeta coarctata* is first reported for Arkansas and Virginia and further documented for California. *Gamochaeta stachydifolia*, a South American native, is reported from two counties in California. For each of the 12 *Gamochaeta* species recorded for the U.S.A., a hypothesis of nativity is given, with a brief rationale.

RESUMEN

Se cita *Gamochaeta stagnalis* por primera vez para los Estados Unidos (Arizona y Nuevo México). En Arizona estas plantas han sido identificadas previamente como *Gamochaeta purpurea* y *Gamochaeta falcata*. La especie es común en México y aparentemente tiene su límite Norte de distribución en los condados de Cochise, Pima, y Santa Cruz, en Arizona, y condado de Hidalgo, en Nuevo México. *Gamochaeta purpurea* sensu stricto aparece también en Arizona, disyunta de su área principal en el Este de U.S.A. Las plantas del Sureste de U.S.A. a veces identificadas previamente como *Gamochaeta falcata* se separan en dos especies: *Gamochaeta calviceps* y *Gamochaeta antillana*. Se escoge un lectotipo para *G. antillana*. *Gamochaeta calviceps* se conoce primariamente del Sureste de U.S.A. pero se citan dos colecciones en California. *Gamochaeta coarctata* se cita por primera vez de Arkansas y Virginia, y se documentan otras citas para California. *Gamochaeta stachydifolia*, nativa de Sur América, se cita de dos condados de California. Para cada una de las 12 especies de *Gamochaeta* citadas para U.S.A., se ofrece una hipótesis de la posibilidad de ser nativas, con un informe razonado.

In connection with preparation of a taxonomic treatment of the genus *Gamochaeta* Wedd. for the developing Flora of North America volumes, various range extensions and new records have come to light.

***Gamochaeta purpurea* sensu stricto in Arizona**

Plants of *Gamochaeta* in Arizona have been identified as *G. purpurea* (L.) Cabr. (as *Gnaphalium purpureum* L.: Kearney & Peebles 1960; Lehr 1978) and *G. falcata* (Lam.) Cabr. (Nesom 1990). *Gamochaeta purpurea* sensu stricto does

indeed occur in Arizona, but further study shows that the more common plants are instead a species widespread in Mexico but previously unreported for the United States (see below). The native range of *G. purpurea* sensu stricto apparently is the eastern U.S.A., including eastern Texas, but it occurs as an adventive in many parts of the world. In the U.S.A., Arizona is the only other state in which *G. purpurea* is known to occur.

Specimens examined. **ARIZONA. Cochise Co.:** Chiricahua Mts., Rucker Canyon, streambank near upper road crossing, scarce, ca. 6300 ft, 8 Jun 1980, *Toolin 797* (ARIZ). **Pima Co.:** Rincon Mts., Speed Ranch, 7400 ft, 23 Aug 1909, *Blumer 3301* (GH, MO); Spud Rock Spring, wet meadow, 7200 ft, 17 Sep 1982, *Bowers R828* (ARIZ); Rincon Mts., 7500 ft, 1891, *Neally 230* (TEX, US); Santa Catalina Mts., Bear Canyon, near Tucson, 27 Apr 1930, *Corys s.n.* (ARIZ, GH); Mt. Lemmon, control road, 23 Aug 1931, *Harrison and Kearney 8128* (ARIZ, LL); Sabino Canyon, 26 Mar 1926, *Loomis 1410* (ARIZ); 10 mi NE of Tucson in Sabino Canyon, frequent along banks of small stream, 15 May 1965, *Matthews 387* (ARIZ, ASU); Sabino Canyon near Tucson, 26 March 1926, *Peebles et al. 1410* (US); old Sawmill on Apache Camp Trail, 6800 ft, 24 Jul 1914, *Shreve s.n.* (ARIZ); Sabino Canyon, moist alluvial soil, 2800 ft, 2 May 1903, *Thornber 416* (US); Sabino Canyon, moist alluvial soil, 3000 ft, 2 May 1903, *Thornber 468* (ARIZ, MO, NMC, US); Sabino Canyon, 5 May 1903, *Thornber s.n.* (ARIZ); Saw Mill, 24 Jul 1914, *Thornber 7303* (ARIZ).

The plant of *Harrison and Kearney 8128* (ARIZ; the LL specimen has a single stem with drawing of the habit) produced numerous decumbent, rhizome-like or caudex-like branches arising from a central axis and apparently was distinctly perennial. At least one of the plants collected by Shreve (s.n., ARIZ) also appears to have been perennial. It will be interesting to investigate whether the highly unusual modification of *Harrison and Kearney 8128* is phenotypic or whether a distinct genetic race might be present.

Gamochaeta purpurea probably is native to eastern North America (see below), where it is the least weedy of its congeners, but the species apparently occurs widely through the world as a adventive. Plants of *G. purpurea* in southern Arizona (Pima Co.) occur along sandy banks of perennial streams in Sabino Canyon and Bear Canyon at the base of the Santa Catalina Mountains east of Tucson. The first known collections were made in these long-popular recreation areas in 1903, perhaps accidentally established there through heavy visitation, as the same sites are heavily infested by other, more aggressive non-native species. On the other hand, collections of *G. purpurea* also have been made in the Rincon Mts. (Pima Co.) and the Chiricahua Mts. (Cochise Co.), where the species is less likely to have been introduced by human activity. It also seems unlikely that plants of *G. purpurea* sensu stricto in scattered Mexican localities were introduced there by human activity.

A record of *Gamochaeta purpurea* from New Mexico (Allred 2003) was attributed to documentation in McIntosh (1996), which instead reported records for *Pseudognaphalium leucocephalum* (A. Gray) Anderb. The voucher for the *Gamochaeta* record in New Mexico is identified here as *Gamochaeta stagnalis* (see citation below). Documentation for a report of *Gamochaeta purpurea* from

Montana (Dorn 1984, as *Gnaphalium purpureum*) has not been verified. Reports of *Gamochaeta purpurea* from California, Oregon, Washington, and British Columbia are primarily based on *G. ustulata* (Nutt.) Holub (a native and relatively common species), although three other species (non-native, relatively uncommon) of the genus are now known from California: *G. calviceps*, *G. stachydifolia*, and *G. coarctata*.

The status of *Gamochaeta stagnalis*

The present report documents the occurrence of *Gamochaeta stagnalis* in the U.S.A., where it occurs in Arizona and New Mexico. These plants have previously been identified in Arizona mostly as *Gamochaeta purpurea*. In the U.S.A., *G. stagnalis* does not geographically overlap with any other species and its identity should now be easily ascertained. A full description is given here, since one apparently does not exist elsewhere.

Gamochaeta stagnalis (I.M. Johnston.) Anderb., Opera Bot. 104:157. 1991. *Gnaphalium stagnale* I.M. Johnston, Contr. Gray Herb. ser. 2, 68:99. 1923. TYPE: MEXICO. SAN LUIS POTOSÍ: marshes about San Luis Potosí ("in palustris circa urbem"), Aug 1876, J.G. Schaffner 225 (HOLOTYPE: GH!). A specimen at US, Schaffner 666 (with "225" and "212" also written on the label), collected in Sep 1879, is the same species but apparently not a duplicate of the type.

Plants annual from a short, very slender to filiform taproot, less commonly from very shallow fibrous roots. **Stems** single and erect or 2–8 and decumbent-ascending, 2.5–20(–35) cm long, densely and loosely arachnoid-tomentose. **Leaves** mostly cauline, oblanceolate-spatulate to narrowly oblanceolate or nearly linear, 1–4 cm long, 2–6(–10) mm wide, basal usually not persistent, cauline oblanceolate, slightly reduced upward in size, equally loosely tomentose above and beneath or the adaxial surface glabrescent and greener. Capitulescence a capitulate cluster (in smallest plants) of heads or an interrupted series of small glomerules subtended by divergent-ascending bracts similar to the upper cauline leaves, sometimes branching at lower nodes. **Involucre**s campanulate, 2.5–3 mm high, conspicuously imbedded in loose tomentum, the outer bracts basally hairy; inner phyllaries narrowly oblong-lanceolate, with rounded-obtuse, whitish lamina, usually purple above the stereome and along proximal margins of the lamina, outer phyllaries ovate-triangular, translucent; receptacles deeply concave to crateriform. **Florets**: bisexual (2–)3(–4); all corollas purplish-tipped.

Flowering (Mar–)Apr(–May). Sandy, often moist soil, washes and permanent streams, canyon bottoms, flower beds, riparian, desert grassland, juniper-grassland, creosote bush-mesquite-cholla, oak woodland; 900–1750 m; Ariz., N.Mex.; Mexico (Sonora, Chihuahua, Coahuila, Nuevo León, Baja California Sur, Sinaloa, Durango, Zacatecas, San Luis Potosí, and other states to the south).

Specimens examined: **ARIZONA. Cochise Co.**: floodplain of Miller Canyon, 0.8 mi by road W of Hwy 92, under *Quercus emoryi* in open woodland, 14 Apr 1991, Bowers 3426 (ARIZ); Dragoon Mts., Noonan Canyon, SE slope of S-facing saddle, 5080 ft, with *Fouquieria*, 29 Apr 1983, Caffey-Moquin 396 (UNM)

and 399 (UNM); Whetstone Mountains, rocky draw, 27 Apr 1952, *Goodding* 58-52 (ARIZ); Huachuca Mountains, Coronado National Memorial, rocky bench in wash, E end of park, 5000 ft, 20 Apr 1991, *McLaughlin* 6233 (ARIZ); San Bernardino Ranch, 18 mi E of Douglas, moist area around Middle Well, 3800 ft, 25 May 1981, *Marrs-Smith* 561 (ASU); SW corner of Chiricahua National Monument, grassland, juniper, 5400 ft, 19 Apr 1975, *Reeves* R2595 (ASU). **Pima Co.:** Rincon Mountains, along the Manning Camp trail, moist draws in desert grassland, 4500 ft, 27 Apr 1983, *Bowers* R1124 (ARIZ); Rincon Mts., unnamed canyon at W base of Tanque Verde Ridge, 3200 ft, moist soil in streambed, 29 Apr 1984, *Bowers* R1433 (ARIZ, LL); Altar Valley, 8 airline mi SSW of Robles Junction (Three Points), creosote bush-mesquite-cholla woodland, infrequent in disturbed areas, 2900 ft, 6 Apr 1973, *Holmgren* 6668 (NY); Baboquivari Canyon, 11 Mar 1926, *Leding and Thackery* 1123 (ARIZ); Forestry Cabin at W base of Baboquivari Peak, Papago Indian Reservation, permanent stream in oak-Sonoran desert zone, grazed, 6-7 Apr 1973, *Lehto et al.* 10660 (NY, US); Pagago Indian Reservation, 0.3 mi E of Topawa, mesquite-cactus, bur-sage desert, roadside washes, 6 Apr 1973, *Lehto et al.* 10749 (ARIZ); 22.0 mi S of Robles Jct. at Las Delicias Ranch Road along Hwy 286, desert grassland with mesquite, burweed, *Opuntia* spp., 3200 ft, 14 May 1988, *McLaughlin* 4568 (ARIZ); Buenos Aires National Wildlife Refuge, along Brown wash, with hackberry and mesquite, 3600 ft, 25 Apr 1991, *McLaughlin* 6253 (ARIZ); Lower Bear Canyon, moist sand along stream, 3200 ft, 13 Apr 1961, *Mason* 1908 (ARIZ); along Santa Cruz River at Cortaro Road, NW of Tucson, 5 Apr 1976, *Mason* 3171a (ARIZ); Little Tucson, Ascencio flood-water field section last plowed summer 1978, 17 Apr 1979, *Nabham* 540 (ARIZ); Pima Co.: Coyote Mts., Mendoza Canyon, 3200 ft, abundant on canyon floor, 22 April 1945, *Parker* 5797a (ARIZ, BRIT, LL, NY); wet banks of the Rillita, 14 Apr 1881, *Pringle* 13744 (GH, MO); Santa Catalina Mountains, Ventana Canyon, 1908, *Shreve* s.n. (ARIZ); Fort Lowell, Rillito, 23 Apr 1903, *Thorner* s.n. (ARIZ); Tucson, First Avenue at Roger Road, irrigated flower bed around parking lot, 14 Aug 1994, *Van Devender* 94-444 (TEX). **Santa Cruz Co.:** Nogales-Lochiel Road, 6 mi from Ariz. Hwy 82, 9 airline mi E of downtown Nogales, sandy soil around oak tree, 4200 ft, 18 Apr 1973, *Holmgren* 6866 (ARIZ, NY); Agua Caliente Canyon, along stream near road crossing, riparian vegetation with *Celtis*, *Baccharis*, *Fraxinus*, 3800 ft, 2 Apr 1978, *Reeves* 6640 (ASU); Santa Rita Mountains, Gardner Canyon, 5700-5800 ft, 8 May 1975, *Van Devender* s.n. (ARIZ). **NEW MEXICO. Hidalgo Co.:** Peloncillo Mts., Granite Gap, occasional on W-facing granitic slope with *Ericameria laricifolia*, *Fouquieria splendens*, *Agave palmeri*, *Opuntia phaeacantha* var. *discata*, 21 Apr 1993, *McIntosh* 2665 (NMC).

Localities for *Gamochaeta stagnalis* in Arizona and New Mexico are at the north-western extremity of its overall range, where flowering is restricted to the end of the cool season. The species is common and widespread in Mexico, from Baja California Sur, Sonora, and Chihuahua southward and eastward to Jalisco and Colima, Nuevo León, San Luis Potosí, and Veracruz, where it occurs at elevations of 200-1800(-2600) meters in rocky or gravelly soil, including stream beds and other periodically wet sites, in areas of thorn-scrub, tropical deciduous, or oak woodland, usually in open or disturbed sites. In Mexico it flowers December through May but sometimes continues longer in wet seasons.

Plants of *Gamochaeta stagnalis* are recognized by their annual duration, usually from a filiform taproot, oblanceolate leaves equally tomentose on the lower and upper surfaces, interrupted capitulescence, small, basally tomentose heads, and phyllaries conspicuously purplish at the stereome/lamina junction and along the proximal margins of the lamina. It is similar to and probably closely related to *G. antillana* (below).

The status of *Gamochaeta antillana*

Gamochaeta antillana (Urb.) Anderb., a common species in the southeastern U.S.A., was combined in concept with *Gamochaeta calviceps* (Fern.) Cabr. and identified as *Gamochaeta falcata* (Lam.) Cabr. by Nesom (1990). Godfrey (1958) separated *G. calviceps* and identified the other species as *G. falcata*. It is now clear that two taxa occur in this region, and they are now known to be widely sympatric, countering Godfrey's notion that they might be treated as geographic varieties.

Gamochaeta antillana (Urb.) Anderb., Opera Bot. 104:157. 1991. *Gnaphalium antillanum* Urban, Repert. Spec. Nov. Regni Veg. 13:482. 1915. TYPE: CUBA. "In insula Saba ad Great Hill et Gumbeygut, m. April, fruct. delapsis, *Suringar*" (holotype: B, apparently destroyed). Two paratype collections cited by Urban (*Britton 10009*; *Britton 9619*) are at NY, with internet-posted photographs on the NY type database. Peter Michael, in May 1982, annotated 9619 as follows: "Urban designated a *Suringar* specimen as type and listed 2 additional specimens—*Britton 10009* and *Britton, Britton and Cowell 9619*. The *Suringar* specimen no longer exists; I believe that the fruiting specimen, *Britton, Britton and Cowell 9619* should be designated lectotype." It obviously is somewhat arbitrary, but I suggest that the features of the species are better shown by plants of 10009 and designate it here as the LECTOTYPE: Cuba. Prov. Pinar del Rio, Boca de Galafre, hillside, 15 Mar 1911, N.L. *Britton 10009* (NY).

Gnaphalium subfalcatum Cabr., Rev. Mus. La Plata (n.s.) Bot. 4:174. 1941. *Gamochaeta subfalcata* (Cabr.) Cabr., Bol. Soc. Argent. Bot. 9:383. 1961. TYPE: ARGENTINA. PROV. BUENOS AIRES: Pdo. Avellaneda, Isla Maciel, 12 Oct 1920, *Cabrera 944* (HOLOTYPE: LP).

Cabrera (1961) cited collections of *Gamochaeta subfalcata* from Texas and Florida, extending the range far from northeastern Argentina, as circumscribed by the original citations (Cabrera 1941). Freire and Iharlegui (1997) also identified this species in the U.S.A. as *G. subfalcata*, and it seems inescapable that *C. antillana* and *G. subfalcata* are synonyms. *Gamochaeta antillana* is known to occur in Alabama, Arkansas, Florida, Georgia, Louisiana, North Carolina, Oklahoma, Mississippi, South Carolina, Tennessee, Texas, and Virginia; also in South America, Europe, and New Zealand.

Gamochaeta antillana is closely similar to *G. stagnalis* but the plants often are generally taller (6–40 cm vs. 2.5–20(–35) cm in *G. stagnalis*) and the basal leaves are oblanceolate with the cauline quickly becoming linear (in *G. stagnalis*, the cauline leaves and those subtending the clusters of heads are oblanceolate). *Gamochaeta antillana* occurs in humid climates and habitats while *G. stagnalis* is a species of arid climate and habitat. Further study of the distinction between these two taxa is needed.

- a. Involucres 3–3.5 mm, lightly arachnose only at the base or not at all; capitulescence interrupted at least distally, main axis visible to terminal heads; phyllaries in 5–7 series, outer and middle ovate-triangular with sharply acute-acuminate apices, 1/3–1/2 as long as the inner, none with purplish color; flowering May–Jul

Gamochaeta calviceps

- a. Involucres 2.5–3 mm, seated in tomentum; capitulescence initially cylindrical and uninterrupted, at least distally, main axis obscured by clustered heads; phyllaries in

3–4(–5) series, outer and middle ovate-lanceolate with narrowly to broadly acute apices, outer 1/2–2/3 as long as inner, at least innermost commonly tinged with purple at stereome-lamina junction; flowering (Feb–)Mar–May, sometimes later with moisture _____ **Gamochaeta antillana**

Gamochaeta calviceps in California

Gamochaeta calviceps occurs widely in the southeastern U.S.A. The first known North American records outside of that region are reported here. It is known to occur in Alabama, Arkansas, California, Florida, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Texas, Virginia, as well as South America, Europe, and New Zealand. As noted above, *G. calviceps* and *G. antillana* constitute the plants in the eastern U.S.A. most commonly identified in the past as *Gamochaeta falcata*.

CALIFORNIA. Contra Costa Co.: Tilden Regional Park Botanic Garden, Wildcat Canyon; a rapidly spreading weed [that] probably came with plant material from Delano, Kern Co., 27 Jun 1975, True 7872A (TEX). **San Diego Co.:** Peninsular Ranges, near Riverside Co. line, E of I-15 off Pala Road along Rancho Heights Rd, 1364 ft, chaparral, mostly past flower, 24 Jun 2003, Spjut and Marin 15384 (BRIT, UCR).

Gamochaeta stachydifolia in California

This species is known to me by two collections from central California, the localities separated by about 200 kilometers. The 1990 collection suggests that it has probably is naturalized in that region and should be expected at more localities. The plants are recognized by their slender-taprooted habit (probably annual), oblanceolate and concolorous leaves, cylindrical capitulescence, acute to acute-acuminate outer and middle phyllaries, inner phyllaries with brownish-hyaline, rounded-apiculate lamina, and yellowish-tipped florets. The GH collection (Mason 6991) was annotated by Peter Michael in 1990 as *Gamochaeta berteriana* (DC.) Cabr., but this identification is problematic, as *G. berteriana* apparently is perennial, thicker stemmed, and bears heads in capitate clusters; it is native to high elevation habitats in Chile (type: Chile, 1833, Bertero 8222, B, photo-TEX!). Freire and Iharlegui (1997) noted that the range of *G. stachydifolia* includes Argentina, Brasil, and Uruguay.

Gamochaeta stachydifolia (Lam.) Cabr., Bol. Soc. Argent. Bot. 9:382. 1961.

Gnaphalium stachydifolium Lam., Encycl. 2:757. 1786. *Gnaphalium purpureum* L. var. *stachydifolium* (Lam.) Baker in Martius, Fl. Bras. 6(3):125. 1882. Probable HOLOTYPE (see comments by Cabrera 1961): Uruguay or Argentina. “Des environs de Montevideo et de Buenos Aires,” without date, Commerson s.n. (P, photo-F, photo-LL). Lamarck noted that “Commerson a trouvé cette espèce à Monte-Video. (vs.)”

Plants annual, slender taprooted. **Stems** 4–15 cm high, erect, single from the base, densely and loosely gray-white tomentose-arachnoid. **Leaves** basal and cauline, basal mostly withered and withering by flowering, oblanceolate, 1–2 cm long, 2–4 mm wide, cauline similar to basal, oblanceolate, commonly folded, subclasping but not auriculate, 2–3 cm long, 3–6 mm wide, continuing nearly unreduced into lower inflorescence but none longer than heads, dark apical

micro of ten evident, evenly gray-white tomentose-arachnoid on both surfaces. **Capitulescence** a continuous cylinder 2–3(–4) cm long, 10–12 mm wide (pressed). **Involucres** campanulate, 3.5–4 mm high; phyllaries in 4–5 gradate series, outer ca. 1/3 as long as innermost, outer and middle narrowly ovate-triangular, apically acute to acute-acuminate, lightly tomentose at the very base, innermost oblong, stereome ca. 1/2 length, lamina brownish-hyaline, apically rounded-apiculate; receptacles shallowly concave. **Florets**: bisexual 2–4; all corollas yellowish. **Cypselae**: mature fruits not seen.

Collections examined. **CALIFORNIA. Amador Co.**: Sierra Nevada foothills, hill above Lone, 25 Apr 1932, *Mason 6991* (GH, LL). **Butte Co.**: ca. 1/4 mi S of the Feather River, ca. 0.4 mi W of Pacific Heights Road, ca. 4.5 mi SW of Oroville, T18, R3E, ne/S3, riparian woodland (destroyed), 100 ft, uncommon, inconspicuous, growing on dry, bare disturbed, sandy soil in the borrow area, 28 Apr 1990, *Ahart 6466* (MO).

***Gamochaeta coarctata* in Arkansas, California, and Virginia**

Gamochaeta coarctata (Willd.) Kerg. was previously noted to occur in California (Nesom 1990), but it was identified as *Gamochaeta americana*. In view of the rapid spread and pervasive occurrence of this species in the southeastern U.S.A., it seems likely that it also is becoming increasingly common in California. It is common throughout Louisiana, and its representation in southern Arkansas probably is already significantly greater in herbaria than the single record reported here. I have seen the following specimens.

ARKANSAS. Bradley Co.: “Southern Bluff” ca. 2.3 mi NW (by air) of the center of Warren, 26 Jun 1976, *Locke 2002* (BRIT). **CALIFORNIA. Humboldt Co.**: Canyon Creek, 6 mi SE of Blue Lake, hillside pasture in logged area, local and scarce, 1200 ft, 1 Aug 1936, *Tracy 15057* (NCU, TEX). **Sacramento Co.**: weed in irrigated alfalfa field, Aschwanden farm, 3 mi W of Galt, 10 Aug 1953, *Tucker 2674* (SMU). **Stanislaus Co.**: San Joaquin Valley, near Ceres and Turlock, 2 mi WSW of Keyes, uncommon annual weed in almond orchard, 80 ft, 8 Jul 2000, *Sanders 23532* (BRIT). **VIRGINIA. Northampton Co.**: north end of Hog Island, inner dune, 1 Jul 1996, *McAvoy 1603* (DOV).

Further comments on biology and nomenclature of *Gamochaeta coarctata* are given in two other papers in this issue (Nesom 2004; Pruski & Nesom 2004).

Nativity of North American *Gamochaeta* species

Assessment of the nativity of North American species of *Gamochaeta* is problematic. Most *Gamochaeta* species are native to South America, and most of the North American species characteristically occur in ruderal habitats, commonly in company of known non-native species of various families. Some, if not all, of the North American *Gamochaeta* species occur as weeds in parts of the world other than South America (although inconsistencies in identification and application of names make it difficult to accurately evaluate overall distributions of the widespread species). Thus by behavior and association, all ruderal *Gamochaeta* species in North America might also be expected to be non-native. The mode of introduction of those clearly non-native is not known.

Circumstantial evidence, however, suggests that some of the North American *Gamochaeta* species are native. *Gamochaeta purpurea* and *G. ustulata* were described from collections made early in the history of the U.S.A., presumably before non-native colonizers became abundant; others are known only from more recent collections. Several species are distributed over broad latitudinal and ecological range, suggesting that geographic differentiation may have occurred; the geographic range (and presumed genetic variability) of others is more restricted. Four of the species suggested as native on a geographic-ecological basis form two species pairs (the two of each pair with strong morphological similarities: *G. purpurea* and *G. sphacilata*, *G. argyrinea* and *G. ustulata*), suggesting that the evolutionary differentiation was autochthonous. *Gamochaeta pensylvanica*, *G. antillana*, and *G. stagnalis* are similar among themselves and possibly closely related; their nativity is uncertain, but at least it seems likely that *G. stagnalis* is native. For those non-native, evidence is strong that they are naturalized (*sensu* Nesom 2000a).

For each of the *Gamochaeta* species recorded for North America (north of Mexico), a hypothesis of nativity is given, with a brief rationale. Distribution maps for *G. purpurea*, *G. argyrinea*, *G. ustulata*, *G. chionesthes*, *G. simplicicaulis*, and *G. coarctata* are provided in Nesom (2004).

Gamochaeta purpurea (L.) Cabr.—Native: widespread in the eastern U.S.A. over a broad latitudinal and ecological range; early collections from known range in the U.S.A.; possibly closely related to *G. sphacilata*, which apparently occurs natively over a wide area, including South America and Mexico, into southwest Texas. *Gamochaeta purpurea sensu stricto* is found over a wide area of peninsular Florida, but *G. argyrinea* and *G. chionesthes*, both segregated from the concept of *G. purpurea* in the U.S.A., are restricted to the northern counties of the state (a loan of specimens from USF was extremely helpful in establishing this).

Gamochaeta sphacilata (Kunth) Cabr.—Native: widespread from South America to the U.S.A., occurs in essentially undisturbed habitats at mid and relatively high-elevation in Mexico and the northern extension of its range in trans-Pecos Texas; possibly closely related to *G. purpurea*, which apparently is native to the eastern U.S.A.

Gamochaeta argyrinea Nesom—Native(?): widespread in the eastern U.S.A. over a considerable latitudinal and ecological range and also known from Puerto Rico; early collections from known range in the U.S.A.; probably closely related to *G. ustulata*, which apparently is native to the western U.S.A.

Gamochaeta ustulata (Nutt.) Holub—Native: distinctive habitat and geographic range in Pacific coast states, over a wide latitude, mostly in coastal and near-coastal habitats; early collections from known range in the western U.S.A.; closely similar and probably closely related to *G. argyrinea*, which perhaps is native to the eastern U.S.A.

Gamochaeta chionesthes Nesom—Non-native: relatively scattered and recent collections in the southeastern U.S.A. (see Nesom 2004). It possibly has been identified in South America by a misapplied name (*G. americana*?); possibly closely related to *G. simplicicaulis*, a native of South America.

Gamochaeta simplicicaulis (Willd. ex Spreng.) Cabr.—Non-native: scattered and recent collections in the southeastern U.S.A., the earliest known in 1957–1959, when it was discovered in nine counties of North Carolina and South Carolina (Nesom 1999, 2000b). Widely distributed in South America and known from early collections there; recorded as adventive in other parts of the world before its discovery in North America.

Gamochaeta coarctata (Willd.) Kerg.—Non-native: collections from the U.S.A. before about 1970 are rare. Small (1933) did not include this distinctive species in his treatment of the Southeastern flora. Godfrey (1958) noted that he knew the species (as *Gnaphalium spicatum* Lam.) from collections from around Wilmington, North Carolina, and from Florida, “in and around Tallahassee, thence westward to Pensacola.” Perhaps the earliest collection or one of the earliest was made in 1949 in Wilmington (Godfrey 49341, originally identified as *Gnaphalium purpureum*, SMU, NCU), where it was “abundant in vacant lots and weedy places”; it was collected again in Wilmington in 1950 (Godfrey 50362, SMU), identified as an “unusual form” of *Gnaphalium purpureum*. The range of *G. coarctata* in the southeastern U.S.A. is now apparently much more continuous than indicated by existing collections (personal observation), suggesting a recent and rapid expansion. The type of *Gnaphalium coarctatum* and its synonym *Gnaphalium spicatum* was described from Uruguay from a collection made in the 1700s (Pruski & Nesom 2004), and it seems likely that the species is native to South America. It is documented as adventive in other parts of the world.

Gamochaeta pensylvanica (Willd.) Cabr. (synonyms: *Gnaphalium spathulatum* Lam. [non Burm. f.], *Gnaphalium peregrinum* Fernald)—Non-native(?): common in the southeastern U.S.A. (nearly restricted to Atlantic Coast and Gulf Coast states); common in eastern South America and throughout the world as a weed. Similar and perhaps related to *G. antillana*, for which the nativity also is uncertain but suggested to be North American and Antillean. On balance, however, it seems likely that *G. pensylvanica* arrived early as an adventive in North America, especially in view of its apparent complete fidelity to ruderal habitats on this continent and its near-cosmopolitan occurrence as a weed. In Willdenow’s proposal of the name *Gnaphalium pensylvanicum*, he noted that the ‘habitat’ was in Virginia and in Pennsylvania, north of its characteristic range in the U.S.A. My guess is that it was collected as a ballast waif in Philadelphia prior to 1809, the year of Willdenow’s proposal. The species is shown only in Pennsylvania County by Wherry et al. (1979), who noted that it is “introduced” in the state; it was not included at all in a later summary of the

Pennsylvania flora (e.g., Rhoads & Block 2000). The type of *Gnaphalium spathulatum*, described by Lamarck in 1788, was from plants cultivated at the "Jardin du Roi" in Paris; Lamarck noted that he did not know the origin of the garden plants but that Commerson had found a similar form near Buenos Aires. In his description of *Gnaphalium peregrinum*, Fernald (1943) noted that *G. spathulatum* was a later homonym (non Burm. f. 1768) and probably the same species as *G. peregrinum*, but because of his uncertainty regarding the identity of the plant in the type photo (*G. spathulatum* Lam.), he chose a new type for the new name. Burman's name (*Prodromus florae capensis* 25. 1768) is validated by citation of a figure in Breyne's *Prodromi* (tab. 18, fig. 3. 1738) and accompanying legend (p. 29)—it apparently is a species of *Helichrysum*.

Gamochaeta antillana (Urb.) Anderb.—Native(?): common in the southeastern U.S.A., most in coastal states; described from Cuba in 1915, known from most islands of the Antilles, South America, and apparently weedy in other parts of the world. Closely similar to and possibly closely related to *G. stagnalis*.

Gamochaeta stagnalis (I.M. Johnst.) Anderb.—Native(?): common in northern Mexico and reaching southern Arizona and southwestern New Mexico, where it flowers in early spring in desert habitats. Probably closely related to *G. antillana* but different in geography and ecology.

Gamochaeta calviceps (Fern.) Cabr.—Native(?): described in 1935 from Virginia and known mostly from recent collections in eastern North America (states of the Atlantic Coast and Gulf Coast); apparently widespread in South America other parts of the world.

Gamochaeta stachydifolia (Lam.) Cabr.—Non-native: known in North America only from two counties in central California. Native to South America.

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