

STENOTIS (RUBIACEAE), A NEW SEGREGATE GENUS FROM BAJA CALIFORNIA, MEXICO

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ABSTRACT

Seven former *Hedyotis* (Rubiaceae) species native to Baja California, Mexico, are revised and placed in a new genus, *Stenotis*, on the basis of seed and other morphological characters, chromosome number, and recent DNA evidence. Keys, descriptions, distributions, and synonyms are provided. Two of the species are annual herbs (*Stenotis arenaria*, *S. asperuloides*), and five are perennial woody herbs or shrublets (*S. australis*, *S. brevipes*, *S. gracilentia*, *S. mucronata*, and *S. peninsularis*). Two varieties are recognized in *S. asperuloides*.

RESUMEN

Se revisan siete especies de *Hedyotis* (Rubiaceae) originarias de Baja California, México, y se colocan en un nuevo género, *Stenotis*. La ubicación en este género se basa en caracteres de la semilla y en otros caracteres morfológicos, en el número de cromosomas, y en evidencias recientes derivadas del ADN. Se presentan claves taxonómicas, descripciones, distribuciones y sinónimos. Dos de estas especies son hierbas anuales (*Stenotis arenaria* y *S. asperuloides*), y cinco son plantas perennes de tallo leñoso o pequeños arbustos (*S. australis*, *S. brevipes*, *S. gracilentia*, *S. mucronata*, y *S. peninsularis*). Se reconocen dos variedades dentro de la especie *S. asperuloides*.

INTRODUCTION

Early explorations in Baja California, Mexico, by T.S. Brandegee, I.M. Johnston, and others from 1844 to 1924 turned up eight new species assigned to *Houstonia* or *Hedyotis* (Hedyotideae; Rubiaceae). Seven of these species (excluding *Hedyotis vegrandis* W.H. Lewis [*Houstonia prostrata* Brandegee] of uncertain affinity), sometimes termed the *Hedyotis mucronata* group, include two annual herbs and five perennial herbs or shrublets. An additional species, *Hedyotis greenei* A. Gray, occurs in Arizona and is closely related to *H. arenaria*, but is excluded from the present study pending further study of its relationships. These species differ in morphology from the approximately six so-called *Hedyotis* species occurring in Mexico outside of Baja California, whose relationships require further study.

Previous work on *Houstonia* (Terrell 1996) and other related genera showed that two taxonomically meaningful characters are seed morphology and chromosome number. The seeds (Fig. 1) of the seven Bajan species are generally ellipsoid with a more or less centric punctiform hilum, but some species have a

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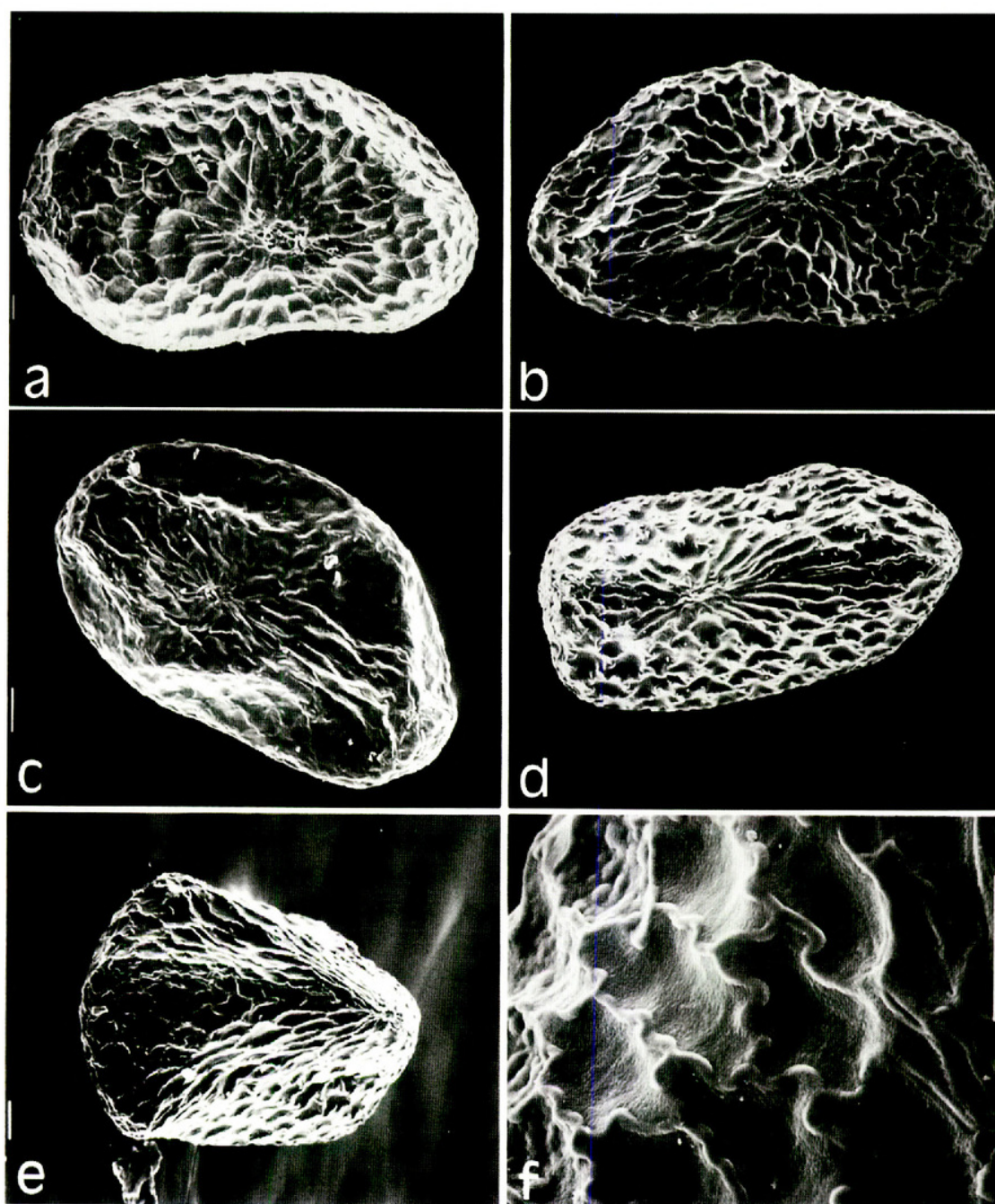


FIG. 1. Seeds of *Stenotis* examined by scanning electron microscopy. Scale bars at left/right borders are 50 microns. a-e. ventral views showing centric hilums. A. *Stenotis mucronata*, Wiggins 14424 (TEX). B. *Stenotis australis*, Carter et al. 2337 (GH). C. *Stenotis asperuloides*, Carter 2606 (US). D. *Stenotis arenaria*, Brandegees s.n., 10/14/1893 (NY, US). E. *Stenotis arenaria*, same collection. F. Testa surface and sinuous areole walls, *Stenotis arenaria*, Lewis 5341 (US).

conspicuous ventral hilar ridge or vary somewhat in being irregularly and obtusely angulate, with a punctiform hilum more or less centered on the ventral ridge. Generally, these seeds exhibit morphology distinctive among Mexican and American species of *Hedyotis* s.l. Five of these species are reported to have a

chromosome number of $x=13$ (Lewis 1962), a unique number in the Hedyotideae (Terrell 1996). A recent DNA study (Church 2001, unpublished) has shown that four of the species form a clade distinct from species of *Houstonia* (Terrell 1996) and *Stenaria* (Terrell 2001).

The heterogeneous genus *Hedyotis* was discussed by Terrell (1996) and compared with *Houstonia* and *Oldenlandia* species. More recently, DNA results from Bremer and Manen (2000) found *Hedyotis* to be paraphyletic. All North American species of *Hedyotis* are distinct from the type species, *H. fruticosa*, which is representative of a group of Sri Lankan and other Asian species. One species of the Asian group has a chromosome number of $2n=90-160$ (Kiehn 1986), and the seeds of these species also differ from the North American species (Terrell 1996).

In consideration of the uniqueness of the Asian species, the Baja Californian species heretofore treated as *Hedyotis* need a new generic name. The name chosen here, *Stenotis*, is derived in two parts: first, "Sten-," from *Stenaria*, a recently named genus (Terrell 2001), whose name was based on *Houstonia* subgenus *Stenaria* Raf.; second, from the root "-otis," meaning "ear," which terminates the name *Hedyotis*. Also, the Greek word, "stenos," meaning "narrow," is descriptive of the narrow leaves of the plants in the new genus.

SYSTEMATIC TREATMENT

***Stenotis* Terrell, gen. nov.** TYPE SPECIES: *Stenotis mucronata* (Benth.) Terrell.

Herbae annuae vel perennes lignosae; folia 3–50 mm longa, 0.3–6.0 mm lata, plerumque linearia vel anguste elliptica; inflorescentia cymosa, floribus heterostylis; corollae 2–18 mm longae infundibuliformes vel hypocrateriformes albae vel roseolae; capsulae 1.3–5.0 mm longae 1.3–4.0 mm latae subglobosae vel turbinatae; semina 0.3–1.0 mm longa 0.2–0.7 mm lata paulo compressa plus minusve ellipsoidea pagina ventralis convexa vel rotundata hilo punctiformi; chromosomatum numerus $x=13$.

Annual, soft-stemmed, or perennial woody-stemmed herbs or shrublets. Stems 3–100 cm tall, terete or angular, branched. Leaves 3–50 mm long, 0.3–6.0 mm wide, linear, filiform, or subterete to narrowly elliptic or narrowly oblanceolate, thin or thickish. Stipules to 1.5 mm long, to 2 mm wide, whitish, scarious, toothed, lobed, or entire. Inflorescence cymose, terminal or axillary, earliest flowers sometimes sessile, later flowers pedicelled. Flowers heterostylous. Hypanthium (calyx cup) hemispherical or cup-shaped; calyx lobes 0.5–2.5 mm long, usually linear or lanceolate. Corollas 2–18 mm long, salverform or funnel-form, white, pink, or rose, 8-nerved, tube longer than lobes. Pin flowers with stigma lobes 0.3–1.8 mm long. Thrum flowers with anthers 0.5–1.7 mm long. Capsules 1.3–5.0 mm long, 1.3–4.0 mm wide, subglobose or turbinate, 2/3 to 7/8 inferior, with 8 dark nerves, dehiscing loculicidally then septicidally; placenta attached ca. 1/3 to 2/5 of distance from base to top of septum. Seeds to ca. 47 per capsule, 0.3–1.0 mm long, 0.2–0.7 mm wide, brown or black, slightly or some-

what dorsiventrally compressed, elliptic, oblong or irregularly obtusely angled in outline, dorsal face flat or convex, ventral face flat or convex to rounded with large hilar ridge, hilum punctiform, centric, testa reticulate. Chromosome number $x=13$ for five species, others unknown.

Distribution.—Baja California, Mexico.

The following key is partly derived from Johnston (1924) and Wiggins (1980).

1. Plants annual, soft-stemmed.
 2. Leaves 0.5–6.0 mm wide; oldest flowers mostly sessile; corollas white _____ **1. *S. arenaria***
 2. Leaves 0.3–2.0(–3.5) mm wide; flowers all or mostly pedicelled; corollas pink, rose, or white _____ **2. *S. asperuloides***
1. Plants perennial, stems woody at least at base.
 3. Plants densely canescent or densely puberulent; rare species of southern Baja California Sur _____ **7. *S. peninsularis***
 3. Plants glabrous or glabrate.
 4. Stems angular in cross section; leaves often fascicled, to 18 mm long.
 5. Plants stout, bushy; leaves numerous, crowded _____ **6. *S. mucronata***
 5. Plants slender, not bushy; leaves not numerous, not crowded; known mainly from San Diego Island _____ **5. *S. gracilentia***
 4. Stems terete; leaves not fascicled, to 50 mm long.
 6. Corollas (4–)5–10(–11) mm long _____ **3. *S. australis***
 6. Corollas (8–)10–18 mm long _____ **4. *S. brevipes***

1. *Stenotis arenaria* (Rose) Terrell, comb.nov. *Houstonia arenaria* Rose, in Vasey, G. and J.N. Rose, Contr. U.S. Natl. Herb. 1:70.1890. *Hedyotis arenaria* (Rose) W.H. Lewis, Rhodora 63:221.1961. TYPE: MEXICO. BAJA CALIFORNIA: La Paz, 20 Jan–5 Feb 1890, Palmer 28 (LECTO-TYPE, here designated: US!; ISOLECTOTYPES: FI GH! NY!).

Small annual herb. Stems 3–30 cm tall, slender, quadrangulate to terete, erect or spreading, glabrous to scaberulous, with slender branches 2–20 cm long from any or all nodes. Leaves 5–40 mm long, 0.5–6.0 mm wide, sessile or lower leaves with short petioles, thin, 1-nerved, narrowly oblanceolate, narrowly elliptic, or linear, glabrous. Stipules to ca. 1 mm long and wide, rounded, with several marginal teeth, some gland-tipped. Inflorescence with earliest flowers sessile in axils of peduncles or branches, surpassed by later erect peduncles or pedicels to 16 mm long, (sometimes appearing secund), buds obovate. Hypanthium glabrous; calyx lobes 0.5–2.0 mm long, 0.2–0.4(–0.7) mm wide, lanceolate or narrowly lanceolate. Corollas 2–6 mm long, funnellform, white; tube 1–3.5 mm long, 0.6–3 mm wide at throat, sometimes abruptly flared at throat, glabrous within; lobes 1–3 mm long, 0.5–2 mm wide, ovate. Pin flowers with stigma lobes 0.3–1.0 mm long, linear, exserted to ca. 1 mm beyond throat, anthers at or just below corolla sinuses. Thrum flowers with anthers 0.5–1.0 mm long, oblong, subsessile or on filaments to 1 mm long, exserted to ca. 1 mm beyond throat, stigmas near mid-point of tube. Capsules 2–3(–4) mm long and wide, 3/4–7/8 inferior, subglobose to subturbinate, tan or straw-colored with 8 darker nerves, thin-walled. Seeds 0.4–0.9 mm long, 0.25–0.60 mm wide, in outline oblong or elliptic or irregu-

larly obtusely angled, dorsal face flat or convex, ventral face with large rounded hilar ridge, testa reticulate. Chromosome number $n=13$ (Lewis 1962).

Phenology.—Flowering August–September to April.

Distribution.—Sandy places, granitic talus, and similar habitats at low elevations; Mexico, Baja California Sur in Cape region from La Paz south to end of peninsula.

Selected representative specimens examined: **MEXICO. Baja California**: 1 km S of Caduano, *Lewis 5341* (MO, SMU, TEX, US); 11 km N of Santa Anita, *Moran 6919* (ARIZ, GH, K, MEXU, MICH, TEX); San José del Cabo, *Purpus s.n.*, Jan–Feb 1901 (F, MO, NY, US); Arroyo de San Bartolo, 1.5 mi NW of village of San Bartolo, *Wiggins 14751* (ARIZ, GH, K).

An Arizona species, *Hedyotis greenei* A. Gray, is being studied to determine whether it is conspecific with *S. arenaria*.

I have examined 26 collections of *S. arenaria*. This species appears to intergrade slightly with *S. asperuloides*.

2. *Stenotis asperuloides* (Benth.) Terrell, comb. nov. *Hedyotis asperuloides* Benth., Bot. Voy. Sulphur 19, t. 13. 1844. *Houstonia asperuloides* (Benth.) A. Gray, Proc. Amer. Acad. Arts 5:158. 1861. TYPE: MEXICO. BAJA CALIFORNIA: Cape San Lucas, *Hinds s.n.*, 1841 (LECTOTYPE, here designated: K!, not found at BM).

Small annual herb. Stems to 2.8 dm tall (28 cm), very slender, terete or slightly angulate, ascending or decumbent, spreading, glabrous or puberulent-scabrous near base, diffusely much-branched from base or all nodes, internodes longer than leaves. Leaves 3–30 mm long, 0.3–2.0(–3.5) mm wide, sessile, linear or filiform, glabrous or scabrous above, glabrous beneath, obtuse or acutish. Stipules to 1 mm long, to 2 mm wide, rounded or truncate, margin with several linear or lanceolate teeth, some gland-tipped. Inflorescence spreading, flowers often numerous, earliest flowers sessile or shortly pedicellate, later flowers on filiform pedicels to ca. 30 mm long, buds obovate. Hypanthium glabrous to pubescent; calyx lobes 0.6–2.3 mm long, linear or lanceolate, obtuse or acute. Corollas 3–11 mm long with lobes extended, funnelform or subsalverform, pink, rose, or white, sometimes with blue or green central nerves on lobes and reddish spots at throat and with black spots externally near midpoint of tube, glabrous or puberulent externally; tube 2–7 mm long, 1–4 mm wide at throat, sometimes abruptly widened distally, glandular-puberulent or puberulent within especially near throat; lobes 1.5–5.0 mm long, 1–4 mm wide, ovate. Pin flowers with stigma lobes 1.0–1.4 mm long, linear, exserted to 1 mm long, anthers sessile near midpoint of corolla tubes. Thrum flowers with anthers 1.0–1.3 mm long, linear, sessile or subsessile, exserted just beyond corolla sinuses, stigmas included. Capsules 1.3–5.0 mm long, 1.3–2.0 mm wide, about 7/8 inferior, turbinate, oblong, or elliptic, brown, pale brown, or whitish with ca. 8 conspicuous dark nerves, thin-walled. Seeds 0.3–0.6 mm long, 0.2–0.4 mm wide, dorsal face flat or convex, shape quite variable, ventral face with conspicuous angulate hi-

lar ridge or irregularly angulate or elliptic or oblong in outline with more rounded hilar ridge, with testa shallowly reticulate. Figure 2 (from Bentham's protologue, 1844).

Phenology.—Flowering October to May.

The species is quite variable, especially in flower shape. Certain collections appear to resemble *H. arenaria* to some extent. Number of collections examined: 26.

Two varieties have been recognized, as follows.

KEY TO VARIETIES

1. Calyx lobes 0.8–2.3 mm long, often acute; corollas 6–11 mm long; capsules 2–5 mm long, usually longer than wide _____ var. **asperuloides**
1. Calyx lobes 0.6–1.3 mm long, often obtuse; corollas 3–6 mm long; capsules 1.3–2.0 mm long, usually equally long and wide _____ var. **brandegeana**

2a. *Stenotis asperuloides* var. *asperuloides*

Calyx lobes 0.8–2.3 mm long, often acute. Corollas 6–11 mm long; tubes 3.5–6.5 mm long; lobes 2–5 mm long, 1–4 mm wide. Capsules 2–5 mm long, 1.5–2.0 mm wide, narrowly turbinate, oblong, or elliptic. Chromosome number: $n=13$ (Lewis 1962).

Distribution.—Sandy or gravelly flats or slopes, dunes, dry banks, stream beds, and similar habitats at low elevations near ocean and inland. Mexico: Baja California Sur, Cape region from La Paz area to southern end of peninsula.

Selected representative specimens examined: **MEXICO. Baja California**: plateau E of La Paz, along road to Punta Coyote, *Carter 2606* (GH, K, LL, MO, US); Pacific coast N of Arroyo de Candelaria, NE of Cabo San Lucas, *Constance 3187* (F, GH, K, LL, MICH, MO, NY, US); 1 km NW of El Triunfo off hwy 11, *Lewis 5337* (MO, SMU, TEX, US); 2.5 km NE of Cabo San Lucas, *Moran 7044* (ARIZ, GH, K, MEXU, MICH, TEX); 2 mi E of Buena Vista, *Reeder & Reeder 6754* (ARIZ, ENCB); 8 mi N of Todos Santos, *Shreve 7216* (ARIZ, MICH, US).

2b. *Stenotis asperuloides* var. *brandegeana* (Rose) Terrell, comb. nov. *Houstonia brandegeana* Rose, in Vasey, G. and J.N. Rose, Contr. U.S. Natl. Herb. 1:70. 1890. *Hedyotis asperuloides* f. *brandegeana* (Rose) W.H. Lewis, Rhodora 63:221. 1961. *Houstonia asperuloides* var. *brandegeana* (Rose) Wiggins, in Shreve, F. & I.L. Wiggins, Veg. & Fl. Sonoran Desert 2:1400. 1964. *Hedyotis asperuloides* var. *brandegeana* (Rose) Terrell, Phytologia 71:224. 1991. TYPE: Mexico. Baja California: La Paz, 20 Jan–5 Feb 1890, Syntypes: *Palmer 31* and *24a* (LECTOTYPE, here designated: *Palmer 31* (US!); ISOLECTOTYPES: FI, GH!, KI, MEXU!). Rose in the protologue cited *Palmer 31* and *24a* together, which therefore are syntypes. *Palmer 31* is the better and most widely distributed collection.

Calyx lobes 0.6–1.3 mm long, often obtuse. Corollas (3–)3.5–6.0 mm long, tubes 2–3 mm long, lobes 1.5–3.3 mm long, 1.0–2.2 mm wide. Capsules 1.3–2.0 mm long and wide, shortly turbinate to elliptic. Chromosome number: $n=13$ (Lewis 1962).

Distribution.—Mexico. Baja California. Same distribution as var. *asperuloides*. In the protologue Rose noted that this taxon occurred in the same habitats as *H. asperuloides*.

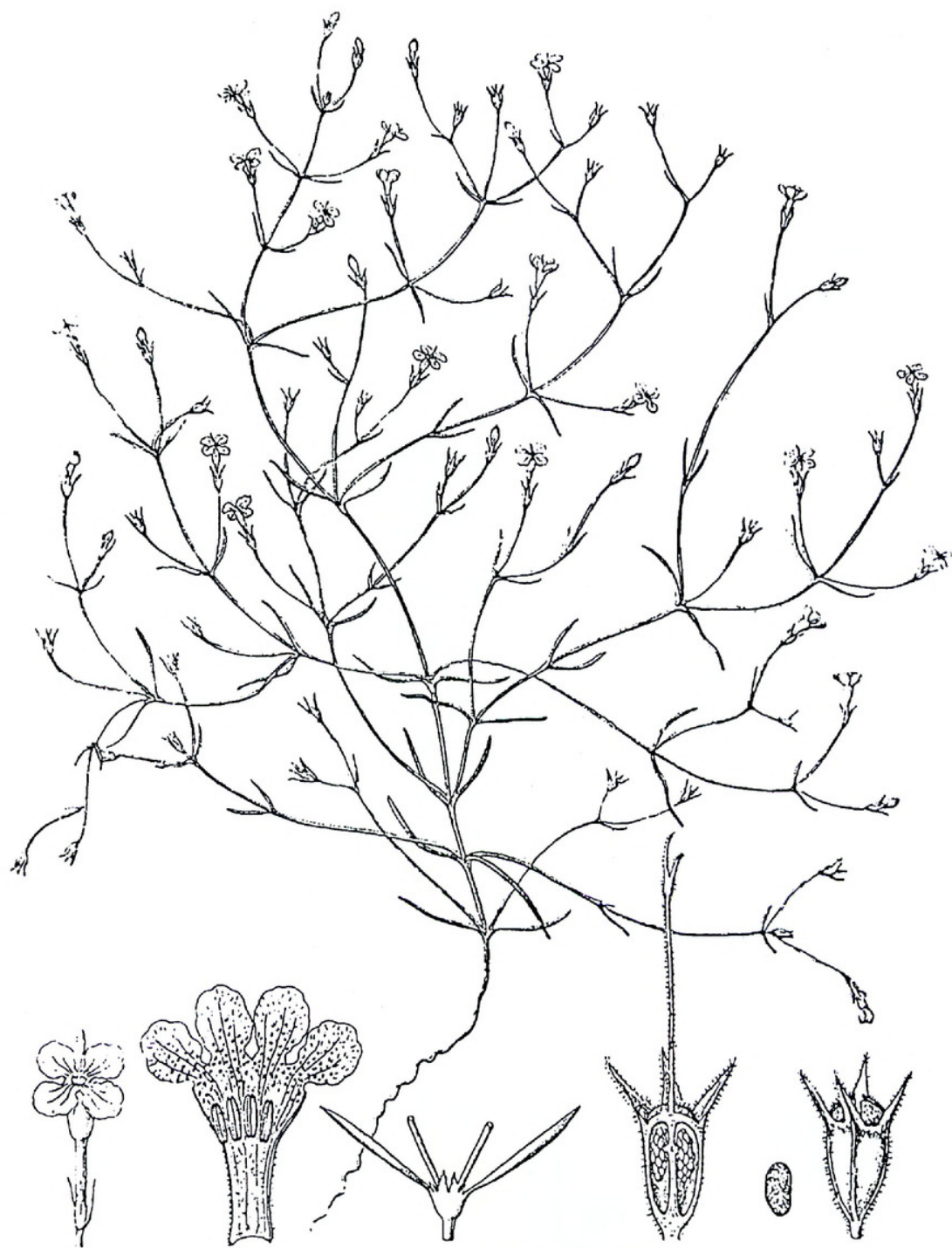


FIG. 2. *Stenotis asperuloides*. Drawing of holotype, Plate XIII, Bentham's protologue, 1844. Left to right (all magnified): flower; corolla cut open; leaves and stipules; ovary section; seed; capsule.

Selected representative specimens examined: **MEXICO. Baja California:** La Paz, *Palmer 24a*, 20 Jan–5 Feb 1890 (US); near hwy 1 SE of San Bartolo, 28.2 mi SE of El Triunfo, *Daniel 2522* (ASU); valley 4.8 km SW of Santiago, *Carter et al. 2182* (ARIZ, F, GH, K, MO, US); 4 km SE of San Pedro, *Lewis 5336* (MO, SMU, TEX, US); Punta Frailes, *Dawson 1113* (MICH).

This variety intergrades somewhat with var. *asperuloides*; however, I here follow Wiggins (1964) in maintaining it as a variety, although Johnston (1924) noted that it “can scarcely be distinguished”. In herbarium specimens I found certain collections with conspicuously smaller capsules and somewhat smaller flowers. Without having seen these plants in the field or having available other evidence I prefer to retain var. *brandegeana*. Number of collections seen: 8.

3. *Stenotis australis* (I.M. Johnst.) Terrell, comb. nov. *Houstonia australis* I.M. Johnst., Univ. Calif. Publ. Bot. 7:446. 1922. *Hedyotis saxatilis* W.H. Lewis, Rhodora 63:222. 1961, non *Hedyotis australis* W.H. Lewis & D.M. Moore, Southw. Naturalist 3:208. 1959. TYPE: MEXICO. BAJA CALIFORNIA: Binorama, 27 Sep 1899, T.S. Brandegee s.n. (HOLOTYPE: UC-201101!).

Perennial woody herb. Stems to ca. 6 dm tall, woody toward base, slender, subterete, ascending or spreading, glabrous or minutely puberulent in inflorescence, epidermis brownish or grayish, often shredding. Leaves to 40 mm long, to 2 mm wide, sessile, linear or filiform, glabrous or minutely puberulent, obtuse or acute and somewhat indurate at apex. Stipules 0.5–1.5 mm long and wide, truncate to deltoid, with 1–few marginal teeth to ca. 1.5 mm long, sometimes gland-tipped. Inflorescence cymose, terminal. Earliest flowers sessile or subsessile, later flowers on pedicels to 10 mm long. Hypanthium glabrous or densely puberulent; calyx lobes 1–2 mm long, lanceolate or linear-lanceolate, acute. Corolla (4–)5–10(–11) mm long, narrowly funnelform, pink, light pink, or lavender-pink, throat sometimes yellow, glabrous or densely whitish-puberulent externally; tube 3–7 mm long, somewhat widened distally, glabrous or puberulent distally within; lobes 1.5–3.5 mm long, 1–2 mm wide, ovate. Pin flowers with stigma lobes 1–1.5 mm long, linear, exserted ca. 1 mm beyond throat, anthers included just below throat. Thrum flowers with anthers ca. 1 mm long, elliptic or oblong, sometimes curved, purplish, subsessile or filaments to 0.4 mm long, partly or fully exserted. Capsules (1.5–)2–2.5(–3) mm long, equally wide, 3/4–4/5 inferior, subglobose, often whitish with dark ribs. Seeds 0.45–0.8 mm long, 0.3–0.6 mm wide, usually longer than wide, rather shiny, in outline oblong or irregular, dorsal and ventral faces flat or slightly convex, testa minutely and shallowly reticulate. Chromosome number: $2n = 26$ (Lewis 1962).

Phenology.—Flowering and fruiting September to April.

Distribution.—Granite outcrops, rocky cliffs, canyon walls, among granite boulders in oak forest; altitudes 250–2000 m (750–6000 feet); Mexico. Baja California: Cape Region from San Bartolo (south of La Paz) south to tip of peninsula in the Sierra de la Laguna and Sierra de la Victoria. The type locality (“Binorama” or Vinorama) is apparently southeast of La Paz. Number of collections seen: 13.

Selected representative specimens examined. **MEXICO. BAJA CALIFORNIA:** Ca. 2.4 km SE of Rancho San Bernado, *Carter* 2693 (LL, US); La Laguna, Sierra de la Laguna, E of Todos Santos, *Carter et al.* 2337 (GH, US); Sierra de la Laguna, *Hammerly* 392 (CAS, GH, US); near canyon mouth, El Chorro, *Moran* 7300 (GH, MEXU, US).

4. *Stenotis brevipes* (Rose) Terrell, comb. nov. *Houstonia brevipes* Rose, in Vasey, G. & J.N. Rose, Contr. U.S. Natl. Herb. 1:83. 1890. *Hedyotis brevipes* (Rose) W.H. Lewis, Rhodora 63:221. 1961. TYPE: MEXICO. BAJA CALIFORNIA: protologue stated "only a single specimen collected near Santa Rosalia, in a cañon, 24 Feb–3 Mar, 1890, Palmer 202 (LECTOTYPE, here designated: US!; ISOLECTOTYPES: F! GH! NY! US!). See explanation below.

Perennial herb or shrublet. Stems to ca. 1 m tall, herbaceous or becoming woody toward base, crown or base to 1 cm thick, terete, ascending or spreading, glabrous, epidermis gray, sometimes shedding. Leaves 5–30(–50) mm long, 0.3–1(–2) mm wide, sessile, linear or filiform, glabrous, acute or mucronulate at apex. Stipules less than 2 mm long and wide, subtriangular, apices truncate or rounded, with marginal teeth. Inflorescences cymose, terminal, few-flowered. Earliest flowers short-pedicelled or subsessile, later flowers with pedicels to ca. 12 mm long. Hypanthium glabrous; calyx lobes 0.5–2 mm long, 0.2–0.8 mm wide, (in fruit equalling or slightly surpassing capsule), triangular to lanceolate, acute or obtuse. Corolla (8–)10–18 mm long, salverform, pink, lavender, rose, or white, glabrous externally; tube (6–)8–13 mm long, usually about 3–4 times longer than lobes, slender, abruptly widened around anthers in pin flowers, glabrate or puberulent distally within; lobes 1.5–4(–5) mm long, 1–2.5(–3) mm wide, ovate, glabrous or minutely densely puberulent. Pin flowers with stigma lobes 0.7–1.8 mm long, linear, exserted 1–2 mm beyond throat, anthers included, located near 3/4-point of tube. Thrum flowers with anthers 1–1.5 mm long, versatile, elliptic or oblong, subsessile or on filaments to 0.5 mm long, exserted partly or fully at corolla lobe sinuses. Capsules 1.5–3.5 mm long, equally wide, subglobose, 2/3–4/5 inferior, light tan with slightly darker nerves. Seeds 0.6–1 mm long, 0.3–0.7 mm wide, in outline elliptic or oblong, ventral face flat or slightly concave, testa shallowly reticulate. Chromosome number: $2n=26$ (Lewis 1962).

Phenology.—Flowering October to June.

Distribution.—In sandy, rocky, or gravelly places, canyon walls and floors, talus slopes, granitic outcrops, bay margins, at low altitudes; Mexico: Baja California, central and east side of Baja California peninsula and on various offshore islands in Gulf of California, from ca. 24° to 29° N latitude. Number of collections examined: 41.

Selected representative specimens examined. MEXICO. BAJA CALIFORNIA. Arroyo del Salto, E of La Paz, Carter 2593 (K, LL, US); Isla Coronado, Carter 4337 (ENCB, MICH); Arroyo Culebriado, Sierra de la Gigantea, Carter & Ferris 4064 (ARIZ, MICH, TEX, US); 4.4 mi NW of El Triunfo, Daniel 2488 (ASU); Coyote Bay, Bahia Concepcion, Gentry 4063 (GH, MO, NA); San Nicholas Bay, Johnston 3723 (F, GH, K, MO, NY, US); Arroyo del Salto, Cape Region, Moran 7140 (ARIZ, GH, TEX); NW side of San Marcos Island, Bay of California, Moran 8945 (KANU, LL, MO, NY, PH); Carmen Island, Palmer 836 (F, GH, K, MICH, NY, US); Isla Cerralvo, Gulf of California, Wiggins 17754 (ENCB, MEXU, MICH, US); Santispaquis, Bahia de la Concepcion, Wiggins & Wiggins 17975 (BM, MEXU, MICH, TEX, US).

Vasey and Rose (1890) provided a detailed explanation of Palmer's collecting activities, but data on the type labels are confusing. The collections were made

in 1890, although the US and GH specimens are labeled 1889. Palmer collected at Santa Rosalia from February 20 to March 3, 1890, then departed, but returned on March 15. Of the type specimens cited, the lectotype and GH isotype are labeled as "February 24 to March 3," but the US isotype is labeled as just "1889". The F and NY isotypes also bear the collection number 202 and look like pieces of the same plant as the other types, but are labeled "March 15, 1890". As only one specimen was collected originally, the US and GH specimens must be parts of the same plant. The F and NY specimens were apparently collected on March 15 on Palmer's return. These are cited here as isotypes; possibly they should be considered paratypes.

This species and *H. mucronata* are the two most wide-ranging species of *Stenotis*.

5. *Stenotis gracilenta* (I.M. Johnst.) Terrell, comb. nov. *Houstonia gracilenta* I.M. Johnst., Proc. Calif. Acad. Sci. ser. 4, 12:1174. 1924. *Hedyotis gracilenta* (I.M. Johnst.) W.H. Lewis, Rhodora 63:222. 1961. TYPE: MEXICO. BAJA CALIFORNIA: rocky slope facing sea, San Diego Island, 27 May 1921, I.M. Johnston 3927 (HOLOTYPE: CAS-1306; ISOTYPES: GH! K! US!). (Isotypes labeled "gracillima").

Limited description based on holotype and two isotypes with damaged or immature flowers and description in Johnston (1924) and Wiggins (1964).

Perennial shrublet with thick woody base. Stems to 20 cm or more tall, slender, angulate, woody, decumbent, glabrous or slightly glandular, much-branched, epidermis on old stems gray or brown, shredding. Leaves to 15 mm long, to 1 mm wide, sessile, frequently fasciculate, filiform, coriaceous, acute or mucronulate. Stipules less than 1 mm long, subtriangular or lobed, sometimes with short, glandular teeth. Hypanthium glabrous; calyx lobes to 2.5 mm long, linear-lanceolate. Corollas 10–12 mm long with lobes extended, salverform, pink with darker rose lines extending to throat; tube 5–6 long; lobes ca. 2 mm or more long. Capsules 1.5–2.5 mm long and wide, 2/3–3/4 inferior subglobose or slightly longer than wide. Seeds (2 seen) ca. 0.8 mm long. Flowering May. Chromosome number unknown.

Distribution.—Mexico: Type collection from San Diego Island, Gulf of California, Baja California. This small island is 75 miles NNW of La Paz and just south of San José Island. Another collection from San Francisco Island (Wiggins *et al.* 377, DS) agrees with the protologue.

Johnston (1924) noted that the type collection resembled both *H. brevipes* and *H. mucronata*, particularly the latter; consequently, it seems likely that *H. gracilenta* is a hybrid of these two species, and my study tends to confirm this. *Hedyotis gracilenta* needs field study and is here provisionally treated as a species. The taxonomic treatment by Wiggins (1980) stated that it occurs on several islands in the Gulf of California between Loreto and La Paz, but I have seen only the two collections cited.

Wiggins 17812 (MICH) from San Diego Island and *Wiggins et al. 378*, (DS, MEXU, MICH, US) from San Francisco Island were labeled by Wiggins as *H. gracilentia*; however, the former is *H. mucronata*, the latter *H. brevipes*. *Houstonia mucronata* was collected on San Diego Island by Moran (9592, MICH).

6. *Stenotis mucronata* (Benth.) Terrell, comb. nov. *Hedyotis mucronata* Benth., Bot. Voy. Sulphur 19. 1844. *Houstonia mucronata* (Benth.) B.L. Rob., Proc. Amer. Acad. Arts 45:401. 1910. TYPE: MEXICO. BAJA CALIFORNIA: Bay of Magdalena, Oct–Nov 1839, G.W. Barclay 3093 (LECTOTYPE, here designated: BM!; ISOLECTOTYPE: K!).

Houstonia fruticosa Rose, Contr. U.S. Natl. Herb. 1:132. 1892. TYPE: MEXICO. BAJA CALIFORNIA: Beach, Carmen Island, 1–7 Nov 1890, Palmer 885 (LECTOTYPE, here designated: US-47256!; ISOLECTOTYPES: CAS!, F!, GH!, K!, MO!, NY!, US!); photo F! of US type.

Perennial shrublet or herb. Stems 2–9 dm tall, stout, to 1.5 cm thick at base, glabrous, with gray, tan, or yellowish shredding epidermis, densely leafy, much-branched, branches erect or ascending. Leaves 3–18 mm long, to 1.8 mm wide, sessile, fascicled, linear or subterete, thickened, straight or falcate, glabrous or scabridulous, mucronulate. Stipules to 1 mm long and wide, deltoid or ovate, entire or lobed, with brownish marginal glands. Inflorescences terminal, cymose, few-flowered. Flowers subsessile, or with pedicels to ca. 10 mm long. Hypanthium glabrous; calyx lobes 1.3–3 mm long, 0.5–1.2 mm wide, lanceolate, ovate, or obovate, thickened, acute, sometimes with a stipitate gland on sinus margin. Corolla 8–14 mm long, salverform, white or tinged or lined with pink or rose; tube 6–10 mm long, about 1 mm wide at base, only slightly widened distally, glabrate within; lobes 1.5–4 mm long, 1–3 mm wide, ovate. Pin flowers with stigma lobes 1–1.5 mm long, linear, exserted 1–2 mm beyond corolla throat, anthers included, attached at 3/4- to 4/5-point of corolla tube. Thrum flowers with anthers 1.0–1.5 mm long, elliptic or oblong, whitish, sessile at corolla sinuses, somewhat exserted, stigma included, extended to ca. 1/2- to 2/3-point of corolla tube. Capsules 2–3 mm long and wide, 3/4–7/8 inferior, subglobose, broadly rounded or retuse at apex. Seeds 0.65–0.95 mm long, 0.35–0.6 mm wide, in outline elliptic, oval, or oblong, ventral face flat or slightly convex, testa shallowly reticulate. Chromosome number: $2n=26$ (Lewis 1962).

Phenology.—Flowering November to June.

Distribution.—Beaches, dunes, salt flats, and rocky slopes and cliffs near beaches; Baja California between approx. 24° and 26° N; coastal areas along the Gulf of California and offshore islands from Coronados Island (ca. 26°) south to La Paz area (ca. 24°); also, Magdalena Bay area (S of 25°) on west side of B.C. peninsula. This species is fairly frequent in suitable habitats, judging by the many specimens seen (27 collections).

Selected representative specimens examined. **MEXICO. BAJA CALIFORNIA:** Punta Prieta, Bahia de la Paz, Carter & Kellogg 3221 (K, MICH, US); Carmen Island, SE shore, Johnston 3836 (BM, F, GH, MO, NY, US); San Francisco Island, Johnston 3954 (GH, NY, US); Cerralbo Island, Gulf of California, Johnston 4035 (GH,

MO, NY, US); Magdalena Bay, *Mason* 1947 (F, GH, K, NY, US); San Francisco Island, *Moran* 3726 (BM, MICH, TEX, US, WIS); Santa Margarita Island, *Rose* 16306 (US); 6.8 mi E of La Paz on road to Pichilingue Bay, *Wiggins* 14751 (ENCB, GH, K, TEX); Las Cruces, 22.5 mi SE of La Paz, *Wiggins* 15671 (BM, MICH, US).

- 7. *Stenotis peninsularis*** (Brandege) Terrell, comb. nov. *Houstonia peninsularis* Brandege, *Zoe* 5:160. 1903. *Hedyotis peninsularis* (Brandege) W.H. Lewis, *Rhodora* 63:222. 1961. TYPE: MEXICO. BAJA CALIFORNIA SUR: Sierra de la Trinidad, Cape region, Nov 1902, T.S. Brandege s.n. (LECTOTYPE, here designated: UC!; ISOLECTOTYPES: GH!, US!, VT!).

Perennial woody herb or shrublet. Stems to 50 cm tall, woody toward base (to at least 1 cm thick), subterete, erect, very densely canescent or densely puberulent with grayish or brownish hairs to 0.2 mm long, epidermis brownish, shredding. Leaves to 40 mm long, 0.5–2 mm wide, sessile, sometimes fasciculate, linear, very densely canescent, some hairs gland-tipped, obtuse, revolute. Stipules to ca. 1 mm long and wide, truncate, with 1–few marginal hair-like teeth, often gland-tipped. Inflorescences terminal, cymose. Flowers sessile or with pedicels to 5 mm long. Hypanthium densely canescent; calyx lobes 0.8–3 mm long, lanceolate or narrowly lanceolate, acute or obtuse. Corolla to 17 mm long, salverform, purple, densely to sparsely pubescent externally, pubescent to glabrate within; tube 6–12 mm long, narrow, scarcely or only slightly wider at throat; lobes 2–6 mm long, 1–3.3 mm wide, ovate. Pin flowers with stigma lobes ca. 1 mm long, exserted ca. 1 mm beyond corolla throat, anthers included just below throat. Thrum flowers with anthers 1.1–1.7 mm long, linear-oblong, exserted on filaments to ca. 1 mm long. Capsules 2–2.8 mm long and wide, 2/3–7/8 inferior, subglobose, dark brown varying to whitish with conspicuous nerves, hirtellous. Seeds (only seen from *Purpus* 427; one capsule), 0.6–0.75 mm long, 0.35–0.5 mm wide, in outline oblong, elliptic, or irregularly angular, dorsal face flat or slightly convex, ventral face broadly rounded or more angulate, testa shallowly reticulate. Chromosome number unknown.

Phenology.—Flowering November to March.

Distribution.—Mexico: Baja California Sur in the Sierra de la Trinidad, Cape region. Only the two collections known. Brandege (1903) stated that “It grows abundantly ... generally on nearly perpendicular bluffs barren of other vegetation.”

Additional specimens examined. **MEXICO. BAJA CALIFORNIA SUR:** Sierra de la Trinidad, Cape region, Jan–Mar 1901, C.A. *Purpus* 427 (MO! US!).

Brandegee (1903) stated that the species was based on collections by *Purpus* and himself, but he did not cite particular collections in the protologue for *H. peninsularis*. The collections by Brandege and *Purpus* are the only two collections known to me of this rare species. The better collection and the one labeled as a new species was the Brandege collection. This little-known species appears to be related to the other perennial Baja California species, *H. brevipes* and *H. mucronata*. Two Marcus E. Jones collections (24341: GH, and 27137: BM, F,

MO, NY) were labeled *H. peninsularis*, but are actually *H. australis* and *H. brevipes*, respectively.

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