

REINSTATEMENT OF THE GENUS TIQUILIA (BORAGINACEAE: EHRETIOIDEAE) AND DESCRIPTIONS OF FOUR NEW SPECIES

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The genus *Coldenia* L. sensu Gray (1862) and Johnston (1924) presently comprises twenty nine taxa which, with one exception, occur in North America and South America. The type species, *C. procumbens* L., the only Old World taxon, is found mainly in southeastern and southwestern Asia and to a lesser extent in Africa and Australia. This paper is presented in anticipation of a forthcoming monograph.

Earlier workers displayed a reluctance to place the New World taxa in the genus *Coldenia*, describing such genera as *Eddya* (Torrey and Gray, 1857), *Galapagoa* (Hooker, 1847), *Ptilocalyx* (Torrey and Gray, 1857), *Stegnocarpus* (Torrey and Gray, 1857), *Tiquilia* (Persoon, 1805), and *Tiquiliopsis* (Heller, 1906). Gray (1862), dealing with only eight species, combined *Eddya*, *Ptilocalyx*, *Stegnocarpus* and *Tiquilia* with *Coldenia*, but noted, "Those who regard the reduction here foreshadowed as too great, might be better satisfied with three genera, viz. *Coldenia*, *Ptilocalyx*, and *Tiquilia*."

Recent examination of all taxa has shown that the genus *Coldenia* as it stands contains two groups with distinct characters and without intermediates. These groups are distinct geographically as well as morphologically. I therefore am reinstating the New World genus *Tiquilia* Pers., giving a well-marked, cohesive New World genus and a monotypic Old World genus. The two genera are distinguished by the following characters.

TABLE 1. Contrasting characters of *Coldenia* L. and *Tiquilia* Pers.

<i>Coldenia</i> L.	<i>Tiquilia</i> Pers.
1. Habitat forest and woodland, riverbanks and dried rice fields, Old World.	1. Habitat xeric regions, New World.
2. Annual herbaceous weed.	2. Perennial, woody, or herbaceous with a woody base, not a weed.
3. Adventitious roots.	3. No adventitious roots.
4. Leaf markedly asymmetrical.	4. Leaf symmetrical.
5. Flowers solitary, extra-axillary, not subtended by bracts.	5. Flowers solitary or in clusters, axillary or subtended by bracts.
6. 4 sepals, 4 petals, 4 stamens.	6. 5 sepals, 5 petals, 5 stamens.

Following are the necessary new combinations in the genus *Tiquilia* Pers., Synopsis Plantarum 1:157. 1805. **TIQUILIA atacamensis** (Phil.) A. Richardson, comb. nov., *Coldenia atacamensis* Phil., Florula Atacamensis 211. 1860. **TIQUILIA canescens** (DC.) A. Richardson, comb. nov., *Coldenia canescens* DC., Prodrum Systematis Naturalis 9:559. 1845. **TIQUILIA CANESCENS** var. **pulchella** (I. M. Johnst.) A. Richardson, comb. nov., *Coldenia canescens* var. *pulchella* I. M. Johnst., J. Arnold Arbor. 20:379. 1939. **TIQUILIA conspicua** (I. M. Johnst.) A. Richardson, comb. nov., *Coldenia conspicua* I. M. Johnst., J. Arnold Arbor. 16:183. 1935. **TIQUILIA cuspidata** (I. M. Johnst.) A. Richardson, comb. nov., *Coldenia cuspidata* I. M. Johnst., Proc. Calif. Acad. Sci. 12:1137-1139. 1924. **TIQUILIA darwinii** (Hook. f.) A. Richardson, comb. nov., *Galapagoa darwinii* Hook. f., Trans. Linn. Soc. London 20:196, 197. 1847. **TIQUILIA elongata** (Rusby) A. Richardson, comb. nov., *Coldenia elongata* Rusby, Description of Three Hundred New Species of South American Plants. Rusby. New York. p. 107. 1920. **TIQUILIA ferreyrae** (I. M. Johnst.) A. Richardson, comb. nov., *Coldenia ferreyrae* I. M. Johnst., J. Arnold Arbor. 37: 296-298. 1956. **TIQUILIA fusca** (Hook. f.) A. Richardson, comb. nov., *Galapagoa fusca* Hook. f., Trans. Linn. Soc. London 20:196. 1847. **TIQUILIA gossypina** (Woot. and Standl.) A. Richardson, comb. nov., *Eddya gossypina* Woot. and Standl., Contr. U.S. Natl. Herb. 16:164. 1913. **TIQUILIA grandiflora** (Phil.) A. Richardson, comb. nov., *Coldenia grandiflora* Phil., Anales Mus. Nac. Hist. Nat. Chile 2:55. 1892. **TIQUILIA greggii** (T. and G.) A. Richardson, comb. nov., *Ptilocalyx greggii* T. and G., Senate Executive Doc. No. 78, 33rd Congr., 2nd Sess. Vol. 2:p. 170, Plate 8. 1857. **TIQUILIA hispidissima** (T. and G.) A. Richardson, comb. nov., *Eddya hispidissima* T. and G., Senate Executive Doc. No. 78, 33rd Congr., 2nd Sess. Vol. 2:pp. 170, 171. Plate 9. 1857. **TIQUILIA latior** (I. M. Johnst.) A. Richardson, comb. et stat. nov., *Coldenia hispidissima* var. *latior* I. M. Johnst., Contr. Gray Herb. 68:92. 1923. The above change is made after examination of 113 collections of Johnston's *C. hispidissima* var. *latior*. It is separated geographically from *Tiquilia hispidissima* and is easily distinguished from that species by its larger, broader leaves with densely ciliate petioles, and its larger, obpyriform nutlets. **TIQUILIA litoralis** (Phil.) A. Richardson, comb. nov., *Coldenia litoralis* Phil., Florula Atacamensis 211. 1860. **TIQUILIA mexicana** (Wats.) A. Richardson, comb. nov., *Coldenia mexicana* Wats., Proc. Amer. Acad. Arts 18:119, 120. 1883. **TIQUILIA nesiotica** (J. T. Howell) A. Richardson, comb. nov., *Coldenia nesiotica* J. T. Howell, Proc. Calif. Acad. Sci. (4) 22:237. 1941; (*C. conspicua* J. T. Howell, Proc. Calif. Acad. Sci. (4) 22:105, 106. 1937, not *C. conspicua* I. M. Johnst., J. Arnold Arbor. 16:183. 1935). **TIQUILIA nuttallii** (Benth.) A. Richardson, comb. nov., *Coldenia nuttallii* Benth. in Hooker, W. J., Hooker's J. Bot. Kew Gard. Misc. 3:296. 1851. **TIQUILIA palmeri** (Gray) A. Richardson, comb. nov., *Coldenia palmeri* Gray, Proc. Amer. Acad. Arts 8:292, 293. 1870. **TIQUILIA paronychioides** (Phil.) A. Richardson, comb. nov., *Coldenia paronychioides* Phil., Anales Mus. Nac. Hist. Nat.

Chile 2:55. 1892. *TIQUILIA plicata* (Torr.) A. Richardson, comb. nov., *Tiquilia brevifolia* var. *plicata* Torr. In Emory, Bot. United States and Mexican Boundary Survey 2:136. 1859; (*Coldenia plicata* Cov., Contr. U. S. Natl. Herb. 4:163. 1895). *TIQUILIA purpusii* (Brandeg.) A. Richardson, comb. nov., *Coldenia purpusii* Brandeg., Univ. Calif. Publ. Bot. 4:186. 1911. *TIQUILIA simulans* (I. M. Johnst.) A. Richardson, comb. nov., *Coldenia simulans* I. M. Johnst., J. Arnold Arbor, 37:298, 299. 1956.

Two new species from gypseous areas in Mexico, and two new species from Peruvian deserts are here described.

TIQUILIA tuberculata A. Richardson, sp. nov.

Suffrutex parvus nodosus tortus ad 2.0 cm altus 3.0 cm diametro caudice ad 0.8 cm diametro. Caules hornotini villosi lanatique vel moderate villosi. Rami brevissimi fragiles foliiferes. Folia fasciculata linearia vel oblonga 2.8-4.5 mm longa 0.6-1.2 mm lata margine revoluta; laminae virides setis crassis 0.8-2.2 mm longis raro paululum cinereae minute hispidaeque pilis ca 0.2 mm longis; petiolus transectione elliptica vel parum rectangulari glabrus vel raro paululum villosus lineis 2 lateralibus ciliatis. Flores axillares solitarii. Calyx 2.0-2.5 mm longus ciliatus extus glabrus intus duabus tertiis partibus distalibus pilis adpressis setisque rigidis paucis 0.5 mm longis. Mericarpia 1-4 ovoidea nigra tuberculis albis 1.0-1.1 mm longis 0.5-0.6 mm crassis.

TYPE: MEXICO: Nuevo Leon: Km. 100 on highway from Monterrey to Monclova, gypseous soil, 28 Aug. 1973, *Alfred Richardson 2181*. (Holotype: TEX. Isotype: MEXU).

Distribution: Known only from the type locality and nearby gypseous areas ca. 20 km. distant in Nuevo Leon.

The specific epithet refers to the unusual tuberculate (as defined by Stearn, 1966) ornamentation of the nutlets. No other species of *Tiquilia* has this condition.

Tiquilia tuberculata is in section *Eddyia* Gray, and is most closely related to *T. gossypina*. It differs from that species in its tuberculate nutlets, unappendaged corollas, and the usually glabrous condition of the abaxial surfaces of the petioles.

TIQUILIA turneri A. Richardson, sp. nov.

Suffrutex nodosus tortus tumuliformis ad 9.0 cm diametro. Caudex ad 10.0 cm diametro. Caules hornotini villosi lanatique vel moderate villosi. Rami brevissimi fragiles foliiferes in plantis veteribus congestissimis. Folia fasciculata linearia oblongave 2.5-5.5 mm longa 0.6-1.5 mm lata margine revoluta utrinque dense villosa cinereaque vel paululum villosa viridiaque setisque 0.7-1.7 mm longis; petioli transectione ellipticis vel parum rectangularibus omnino dense villosi ciliatis. Flores axillares solitarii. Calyx 2.0-3.0 mm longus dense villosus ciliatusve intus pilis subtilibus adpressis in quoque lobo apice setis 1-2 rigidis 0.7-1.7 mm longis. Mericarpia 1-2 ovoidea nitida nigra laeviaque vel subtiliter aspera 0.8-1.5 mm longa 0.6-0.8 mm lata.

TYPE: MEXICO: Coahuila: 20 km. south and 3 km. west of Cuatro Ciénegas, in gypsum dunes, 29 June 1971, *Alfred Richardson 1595*. (Holotype: TEX. Isotype MEXU).

Distribution: Two populations, separated by about 160 kilometers, are known: The type locality, and another gypseous area about 100 kilometers northwest of Monterrey, Nuevo Leon, Mexico.

The species is named for B. L. Turner who first collected this taxon and called it to my attention.

Tiquilia turneri is in section *Eddya* Gray, and is the only member of the section to have nutlets with thin and relatively soft and smooth pericarps. It is most closely related to *T. gossypina* and is distinguished from that species by its smaller leaves and flowers, the shrubby habitat and often reduced stem internodes, and the nutlet characters mentioned above.

TIQUILIA hunteri A. Richardson, sp. nov.

Suffrutices semierecti ad 4.0 dm. diametro; caudices ad 5.0 mm. crassi. Laminae foliorum anguste ovatae 4.0-6.0 mm. longae 2.0-2.5 mm. latae margine saepe crenatae profunde plicatae supra pubescentes setis ad 1.1 mm. longis antrorse inclinatis subtus pilis effusis pro parte maxima secus nervos, nervis lateralibus utroque costae latere 2-3(-4) extremis sinusialibus; petioli filiformes 3.0-4.5 mm. longi. Corollae 5.5-6.5 mm. longae azureae. Stamina inaequalia inclusa, filamentis brevibus ad 0.3 mm. longis in 3 altitudinibus affixis, nervis substaminalibus basi anguste alatis. Mericarpia 4 sphaeroidea 0.7-0.8 mm. diametro. Chromosomatum numerus $n = 14$.

TYPE: PERU: Arequipa: Km. 714 S of Lima, between Chala and Camaná, 8 Apr. 1973, *Richardson 2106*. (Holotype TEX. Isotypes to be distributed).

Distribution: Known only from the type locality.

The species is named for John H. Hunter of Brownsville, Texas, who has for many years encouraged and aided young students interested in the biological sciences.

T. hunteri is in section *Sphaerocarya* I. M. Johnst. and is most closely related to *T. elongata* and *T. litoralis*. The species are compared in Table 2.

TIQUILIA tacnensis A. Richardson, sp. nov.

Herbae procumbentes tegetes formantes 5.0 dm. diametro; caudices ad 10.0 mm. crassi. Laminae foliorum ovatae 4.5-5.5 mm. longae 3.0-3.5 mm. latae margine integrae plicatae supra sparse pubescentes pilis ad 0.3 mm. longis setisque inclinatis ad 0.7 mm. longis subtus dense pubescentes pilis effusis vel adpressis ad 0.5 mm. longis, nervis lateralibus utroque costae latere 3 (vel 2); petioli filiformes 3.0-4.0 mm. longi. Corollae 5.0-6.0 mm. longae exappendiculatae limbis caeruleis faucibus flavis. Stamina subaequalia 1.5-2.5 mm. exserta aequaliter tubo adnata. Mericarpia 4 sphaeroidea 1.0-1.1 mm. alta 0.9-1.2 mm. diametro. Chromosomatum numerus $n = 16$.

TYPE: PERU: Tacna: Ca. 10 km. S of Camiara, 70 km. N of Tacna, 13 Apr. 1973, *Richardson 2130* (Holotype TEX. Isotypes to be distributed).

TABLE 2

CONTRASTING CHARACTERS OF TIQUILIA TACNENSIS, T. LITORALIS, T. ELONGATA, AND T. HUNTERI

	<i>T. tacnensis</i>	<i>T. litoralis</i>	<i>T. elongata</i>	<i>T. hunteri</i>
1. Habitat.	1. Coastal.	1. Coastal.	1. Inland, medium altitudes.	1. Coastal.
2. Habit.	2. Prostrate.	2. Prostrate.	2. Semi-erect or prostrate.	2. Semi-erect.
3. Leaf Blade.				
a. Shape.	3a. Ovate.	3a. Ovate.	3a. Narrowly ovate lanceolate, or narrowly obovate.	3a. Narrowly ovate.
b. Length.	3b. 4.5-5.5 mm.	3b. 3.5-8.0 mm.	3b. 10.0-23.0 mm.	3b. 5.0-6.0 mm.
c. Lateral Veins.	3c. 3 pr.	3c. 2-3 pr.	3c. 3-4 pr.	3c. 2-3 pr.
d. Margin	3d. Entire.	3d. Entire.	3d. Crenate.	3d. Crenate.
4. Corolla.				
a. Color.	4a. Sky-blue	4a. Sky-blue to milk-white.	4a. Blue.	4a. Blue.
b. Length.	4b. 5.0-6.0 mm.	4b. 4.5-8.0 mm.	4b. 5.5-12.2 mm.	4b. 5.5-6.5 mm.
5. Stamens.	5. Exserted.	5. To limb.	5. Included.	5. Included.
6. Nutlet Size.	6. 0.9-1.2 mm.	6. 0.8-1.1 mm.	6. 0.8-0.9 mm.	6. 0.7-0.8 mm.
7. Chromosome Number.	7. $n = 16$.	7. $n = 15$	7. $n = 16$	7. $n = 14$.

Distribution: Peru, southern Tacna, near the Chilean border. One large uniform population is known, extending for ca. 30 kilometers.

The specific epithet refers to the department of Tacna, Peru, to which this species is endemic.

T. tacnensis is in section *Sphaerocarya* I. M. Johnst. and is most closely related to *T. atacamensis*, having similar flavonoid chromatograph pattern and similar calyxes and general pubescence. It is distinguished from that species by its usually more slender and elongate internodes, its smaller, ovate leaves with usually 3 pairs of lateral veins, its sky-blue unappendaged corollas with slightly longer stamens, and its spheroid, smaller nutlets with slightly larger collicula.

T. tacnensis is also closely related to *T. litoralis*, differing in flavonoid chromatograph pattern, chromosome number, leaf blades with usually 3 pairs of lateral veins, paucity or absence of long stiff bristles on the calyxes, and its nutlets with a protruding lip above the attachment scar and with slightly larger collicula. There are also some similarities to *T. elongata* and *T. hunteri*. The four species are contrasted in Table 2.

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