TWO NEW COMBINATIONS IN PEYRITSCHIA
(POACEAE: POOIDEAE: AVENINAE)

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ABSTRACT
Trisetum howellii Hitchc., an endemic species from the Galapagos Islands, Ecuador, and Trisetum pinetorum Swallen, an endemic species from Guatemala, are transferred into Peyritschia [P. howellii (Hitchc.) Finot & P.M. Peterson; P. pinetorum (Swallen) Finot & P.M. Peterson]. Peyritschia is now circumscribed to include seven species with new areas of distribution documented in South America. A key distinguishing the species and table comparing the salient morphological features of all species within Peyritschia are provided.

RESUMEN
Trisetum howellii Hitchc., especie endémica de las islas Galápagos, Ecuador, y Trisetum pinetorum Swallen, especie endémica de Guatemala se transfieren a Peyritschia [P. howellii (Hitchc.) Finot & P.M. Peterson; P. pinetorum (Swallen) Finot & P.M. Peterson]. Peyritschia, así circunscrita, incluye siete especies con nuevas áreas de distribución documentadas en Sudamérica. Se proporciona una clave para distinguir las especies y un cuadro donde se comparan las características morfológicas sobresalientes de todas las especies de Peyritschia.

The genus Peyritschia was described by Fournier (1886) and originally included only one species, P. koelerioides (Peyr.) E. Fourn., based on Aira koelerioides Peyr., from southern México and Guatemala (Finot et al. 2004). A second species from México, Deschampsia pringlei Scribn., was transferred to Peyritschia by S.D. Koch in 1979 [= P. pringlei (Scribn.) S.D. Koch], and is also known from Guatemala, Costa Rica, Venezuela, and Ecuador (Hernández-Torres & Koch 1988; Pohl & Davidse 1994; Finot et al. 2004). This small genus (Peyritschia) was later included within Trisetum by Hernández-Torres and Koch (1987). When placed in Trisetum, P. koelerioides and P. pringlei are named: Trisetum altijugum (E. Fourn.) Scribn. and T. kochianum Hern.-Torres., respectively.

Peyritschia has isomorphic to sub-isomorphic, linear, 1-3-nerved glumes; bilobed lemmas that are awned near the base or the middle of the back or the awn reduced to a subapical mucro; paleas that are tightly enclosed by the margins of the lemma; linear lodicules; and an androecium composed of two stamens. In contrast, Trisetum has heteromorphic, ovate-lanceolate or oblanceolate, 1-5-nerved glumes [first glume 1(-3)-nerved, second glume 3(-5)-nerved]; lemmas with 2 to 4 short setae at the apex due to the prolongation of the nerves and a dorsal awn born on the upper third of the lemma, rarely located near the middle of the back; paleas that are free from the margins of the lemma; lodicules with 2- or 3-lobed apices; and an androecium with three stamens (Finot et al. 2004).
Peyritschia includes perennial herbs with flat leaf blades, membranous ligules, narrow to contracted-spiciform or lax and somewhat open panicles, 2(-3)-flowered spikelets, rachillas disarticulating above the glumes and between the florets, glabrous ovaries, and caryopses with liquid endosperm. Previous studies showed that the micromorphology of the lemmatal epidermis has good characters to distinguish Trisetum from Peyritschia. Most species of Peyritschia lack prickles hairs (present in all species of Trisetum), although, if present, they are restricted to the keel or the apex of the lemma in P. deyeuxioides and P. pinetorum. All species of Peyritschia have bordered hooks alternating with epidermal long cells (hooks not bordered, nor alternating with long cells in Trisetum) and lack macrohairs (macrohairs are present in some species of Trisetum) [Finot et al. 2006]. These characteristics along with the salient features of the spikelet, were considered important for resurrecting the genus by Finot (2003a) who transferred three additional species into Peyritschia: P. conferta (Pilg.) Finot (=Trisetum confertum Pilg.) from Bolivia, Ecuador and Venezuela; P. deyeuxioides (Kunth) Finot (=T. deyeuxioides Kunth) widely distributed in México, and extending into Central and South America (Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panamá and Venezuela); and P. humilis (Louis-Marie) Finot (=T. humile Louis-Marie), an endemic in México (Finot et al. 2004).

Trisetum confertum was originally described from an Ecuadorian specimen (Crescit in Prov. Imbabura, ad Loma de Canaballa et locis vicinis; alt. 2100-2300 m; A. Stübel I52; holotype, B; isotypes, US-81771 ex B! CONC fragm. and photo ex B!). Hitchcock (1927) cited this species as occurring in Cochabamba, Bolivia. Later, Valencia (1941) moved the species to Deschampsia [D. conferta (Pilg.) Valencia]. However, Parodi (1949) and Chiapella (2000) excluded it from Deschampsia. More recently, two species, Trisetum deyeuxioides and T. humilis, were transferred in Peyritschia, based on spikelet and floret characteristics (Finot 2003a; Finot et al. 2004).

Three of the five currently recognized species of Peyritschia are found in Guatemala: P. koelerioides (the type species of the genus) also extends into southern México; P. pringlei also present in México, Costa Rica, Venezuela, and Ecuador; and P. deyeuxioides ranging from southern México to Ecuador (Pohl & Davidse 1994; Espejo-Serna et al. 2000; Finot 2003a; Finot et al. 2004).

The following seven species of Trisetum have been mentioned as occurring in Guatemala: T. angustum Swallen from San Marcos near Volcán Tajumulco, also extending into southern México; T. pinetorum Swallen here transferred to Peyritschia, from Quetzaltenango near Volcán Santo Tomás, and now known from México; T. viride (Kunth) Kunth (syn. T. altum Swallen) from El Progreso also widespread in México; T. trazuense (Kuntze) Hitchc. from Huehuetenango near Tunimá, mentioned for the first time by Finot et al. (2004), also from Costa Rica, Honduras, Panama, Colombia, Venezuela, Ecuador, and Peru; T. rosei Merr. from Huehuetenango from near Volcán Santa María, also extending into México; T. pringlei (Scribn. ex Beal) Hitchc. from Huehuetenango and Totonicapán, also found in México, Costa Rica, and Panama; and T. spicatum (L.) K. Richt. with a wide distribution in the Americas (Swallen 1955; Pohl 1980; McVaugh 1983; Hernández-Torres 1988; Pohl & Davidse 1994; Finot 2003b; Finot et al. 2004, 2005a, 2005b).

In Ecuador, the following four species of Trisetum have been reported: T. andinum Benth., endemic to Ecuador; T. spicatum and T. oreophilum Louis-Marie var. oreophilum ranging from Ecuador to Perú and Bolivia (Finot et al. 2005b); and T. howellii here trans-
ferred to Peyritschia. Species of Peyritschia found in Ecuador are: *P. deyeuxioides* and *P. pringlei* (Finot 2003a).

Preliminary phylogenetic analyses using morphological characters within *Trisetum* s.l. (including *Trisetum* s.s., *Peyritschia*, and *Sphenopholis*) [Finot 2004], depicts a well-supported clad (bootstrap of 95 %) that includes *Peyritschia koelerioides*, *P. pringlei*, *P. deyeuxioides*, *P. conferta*, and *T. howellii* Hitchc. This clade is supported by three synapomorphies: terete lemmas in lateral view, two stamens, and ornamentation of the lemma.

In this paper we make two new combinations, *Peyritschia pinetorum* (Swallen) Finot & P.M. Peterson, from Volcán Atitlán and Santo Tomás, Guatemala, and *P. howellii* (Hitchc.) Finot & P.M. Peterson, from Galápagos, Ecuador. In addition, we include a key to distinguish all seven species, a table comparing their salient morphological features, and a new illustration, description, and SEM photo of the lemmatal surface of *P. pinetorum*.


Perennials; culms 35–60 cm tall, weak; internodes glabrous, 5–6 nodes per culm, nodes glabrous. Leaf sheaths shorter than the internodes, glabrous, striate; ligules 0.5–1.5(-2) mm long, apex obtuse, not ciliate, sometimes denticulate, glabrous; blades 8–15 cm × 2 mm, flat, glabrous, smooth, margins sometimes scabrous. Panicles 8–18 cm long, (0.5–)10–20 mm wide, contracted, narrow, lax, somewhat open, exserted or sub-included in the upper sheath; rachis and pedicels glabrous; spikelets 4.5–5.5 mm long, (1–)3-flowered; rachillas 1.5 mm long, copiously pilose, the hairs ca. 1.5 mm long, as long as the rachilla; glumes almost covering the florets, isomorphic, linear to linear-lanceolate, narrow, somewhat scabrous on the keel, the margins hyaline, apex acute, purplish; first glumes 4.3–4.7 × 0.3 mm, 1-nerved; second glumes 4.7–5.5 × 0.4 mm, 1–3-nerved; first lemmas 4–4.5 × 0.5 mm, linear-cylindrical to linear-lanceolate, glabrous, smooth, or scaberulous only towards the apex, purple towards the apex, rounded on the back, the margins enclosing the palea, 5-nerved, awned, the awn 5.5–7 mm long, twisted, geniculate, somewhat scabrous, borne on the upper third of the lemma, at 1–1.5 mm below the apex, the apex bidentate, toothed, acute with the intermediate and marginal nerves conspicuous towards the apex; callus obtuse, with stiff hairs, the hairs 0.5 mm long; paleas 3–4.3 mm long, shorter than the lemmas, 2-nerved, the nerves scabrous towards the apex, apex acute, hyaline; ovary glabrous; lodicules 0.6 mm long, linear, entire; stamens 2, anthers about 0.8 mm long. Caryopses 2 mm long, glabrous; endosperm liquid.

**Phenology.**—Flowering from September to January. Matures fruits are found from February to March.

**Distribution and habitat.**—*Peyritschia howellii* is an endemic species from Ecuador. Most of the studied collections come from Isla Santa Cruz (Indefatigable), Galápagos, growing between 480–1000 m; Jeppesen 76 (AAU) is the first collection of the species made from Isla San Cristóbal (Chatham).

**Comments.**—*Peyritschia howellii* was included by Valencia et al. (2000) in the Red Book of the endemic plants of Ecuador (as *Trisetum howellii*).

Additional specimens examined. ECUADOR. GALÁPAGOS ISLANDS: Isla Santa Cruz, in area that includes W slope of Media Luna, E slope of Cerro de los Caminos and flat plain between, 4 Sep 1975, D.A. & D.B. Clark 447 (AAU); Puntudo, 17 Mar 1977, A. & H. Adsersen 1413 (QCA); ca. 600 m, 8 Nov 1966, U. & J. Eliasson 557 (S); sur de Mt. Crocker, 710 m, 17 Oct 1966, U. & J. Eliasson 284 (S); Norte de Bella Vista, 480 m, 19 Oct 1966, U. & J. Eliasson 356 (S); no date, Fagerlind & Wibon 2957 (S); no date, Fagerlind & Wibon 3320 (S); highest mountain top, 860 m, 23 May
**Table 1.** Salient morphological characteristics to distinguish among the seven species of *Peyritesia.*

<table>
<thead>
<tr>
<th></th>
<th><em>P. conferta</em></th>
<th><em>P. deyeuxioides</em></th>
<th><em>P. howellii</em></th>
<th><em>P. humilis</em></th>
<th><em>P. pinetorum</em></th>
<th><em>P. koelerioides</em></th>
<th><em>P. pringlei</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panicle shape</strong></td>
<td>narrow, contracted</td>
<td>lax, somewhat open and nodding</td>
<td>narrow, somewhat open (1–3)</td>
<td>narrow, contracted</td>
<td>narrow, contracted</td>
<td>spiciform somewhat open</td>
<td>narrow, short or longer</td>
</tr>
<tr>
<td><strong>Number of florets</strong></td>
<td>2</td>
<td>2 or 3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2 or 3</td>
<td>2 or 3</td>
</tr>
<tr>
<td><strong>Spikelet, length (mm)</strong></td>
<td>5.0–55</td>
<td>4.5–8.0 linear</td>
<td>4.5–5.5 linear to linear-lanceolate</td>
<td>4.5–5.5 linear to lanceolate</td>
<td>4–5</td>
<td>5–7 lanceolate to ovate-lanceolate slightly shorter</td>
<td>4–5.5 lanceolate</td>
</tr>
<tr>
<td><strong>Glumes, shape</strong></td>
<td>oval-lanceolate</td>
<td>equal, shorter or longer</td>
<td>equal, shorter or longer</td>
<td>equal, shorter or longer</td>
<td>equal, shorter or longer</td>
<td>lanceolate to ovate-lanceolate longer</td>
<td>lanceolate</td>
</tr>
<tr>
<td><strong>Glumes, size verses spikelet</strong></td>
<td>longer</td>
<td>4–6</td>
<td>4–6</td>
<td>4</td>
<td>3–5</td>
<td>2–5</td>
<td>2–5</td>
</tr>
<tr>
<td><strong>Glumes, length (mm)</strong></td>
<td>5.2–5.5</td>
<td>(3.5–)4–5.5 (–8)</td>
<td>4.3–5.5</td>
<td>4</td>
<td>4.5–6</td>
<td>3–5</td>
<td>4–5.3</td>
</tr>
<tr>
<td><strong>Lemma, length (mm)</strong></td>
<td>3.5–5.0</td>
<td>4–6</td>
<td>4–4.5</td>
<td>3–3.5</td>
<td>5–6</td>
<td>2.5–4</td>
<td>3–4.3</td>
</tr>
<tr>
<td><strong>Lemma, apex</strong></td>
<td>bilobed, lobes obtuse</td>
<td>entire or bilobed to bidentate</td>
<td>bidentate, toothed, acute</td>
<td>bilobed, lobes obtuse</td>
<td>bifid, toothed, acute</td>
<td>bilobed, lobes obtuse</td>
<td>bilobed, lobes obtuse</td>
</tr>
<tr>
<td><strong>Rachilla, indument</strong></td>
<td>sparsely pilose</td>
<td>copiously pilose</td>
<td>copiously pilose</td>
<td>sparsely pilose</td>
<td>copiously pilose</td>
<td>sparsely pilose</td>
<td>sparsely pilose</td>
</tr>
<tr>
<td><strong>Awn, position</strong></td>
<td>basal</td>
<td>median</td>
<td>upper third</td>
<td>middle or lower third</td>
<td>median</td>
<td>apical if present (as a short micro)</td>
<td>basal</td>
</tr>
<tr>
<td><strong>Awn, shape</strong></td>
<td>geniculate, twisted</td>
<td>geniculate, twisted</td>
<td>geniculate, twisted</td>
<td>geniculate, twisted</td>
<td>geniculate, twisted</td>
<td>geniculate, twisted</td>
<td>geniculate, twisted</td>
</tr>
<tr>
<td><strong>Awn, length (mm)</strong></td>
<td>6–7</td>
<td>4.5–8 (–12)</td>
<td>5.5–7</td>
<td>4–5</td>
<td>7–12</td>
<td>0–1</td>
<td>4.5–7</td>
</tr>
<tr>
<td><strong>Callus indument</strong></td>
<td>short pubescent</td>
<td>short pubescent</td>
<td>short pilose</td>
<td>sparsely pilose</td>
<td>pilose</td>
<td>glabrous to short pubescent</td>
<td>short pubescent</td>
</tr>
</tbody>
</table>
Peyritschia pinetorum (Swallen) Finot & P.M. Peterson, comb. nov. (Fig. 1, Table 1). Trisetum
pinetorum Swallen, Phytologia 4:424. 1953. Type: GUATEMALA. QUEZALTENANGO: Volcan Santo Tomás,
on pine-Abies-clad slope, 2500–3700 m, 22 Jan 1940, J.A. Steyermark 34824 (holotype: F-1048257; isotypes:
MO fragm. ex F!, US-2240525 ex F!, US-2236478 fragm. ex F!).

Perennials; culms 33–70 cm tall, weak, internodes glabrous, 3–4 nodes per culm, nodes
glabrous. Leaf sheaths shorter than the internodes, glabrous, striate; ligules 1.5–3 mm long,
truncate, dentate-laciniate, glabrous; blades 5–10 cm long, 1.5–2 mm wide, flat, gla-
brous above and below. Panicles 5–15 cm long, 5–10 mm wide, contracted, narrow, somewhat
interrupted, exserted or sub-included in the upper leaf sheath; ra-
chis glabrous; pedicels scabrous or glabrous. Spikelets 5–7 mm long, 2-flowered; rachillas
c. 1 mm long, copiously pilose, the hairs about 1–2 mm long; glumes slightly shorter
than the florets, sub-isomorphic, lanceolate to ovate-lanceolate, the keel smooth to slightly
scabrous towards the apex, apex acute; first glumes 4.5–6 × 0.7–0.8 mm, a little shorter
and narrower than the second glumes, 1-nerved; second glumes 5–6 × 0.7–0.8 mm, 1- or 3-
nerved; first lemma about 5–6 mm long, lemmas glabrous, awned, rounded on the back
with involute margins on the lower 1/2 enclosing the palea, the awn 7–12 mm long, twisted,
geniculate, and inserted on the median portion of the back, the apex deeply bifid with
acute teeth, each tooth with two short awns derived from the prolongation of the mar-
ginal and intermediate nerves; callus obtuse, with short hairs, the hairs ca. 1 mm long;
paleas about 3.5–4 mm long, shorter than the lemmas, 2-nerved, the nerves scabrous to-
wards the apex, apex acute; lodicules about 0.5 mm long, linear, sometimes with a little
lateral lobe near the median portion, the apex subacum; stamens 2, anthers 0.9–1.5 mm
long; ovary glabrous. Caryopses not seen.

Lemma micromorphology. Long cells rectangular, 3–12 times longer than wide; anti-
clinal walls parallel and highly undulate, the undulations U- or V-shaped; periclinal walls
flat; silica cells about 10 μm in diameter, short, elliptical; stomata absent; prickle hairs
about 45 μm long, ovate-elliptical, restricted to the keel and with a short apical barb;
long cells about 10–12.5 μm in diameter, alternating with bordered hooks; macrohairs
absent (Fig. 2).

Phenology. — Flowering in January.

Distribution and habitat. — Known only from southwestern Guatemala in Departa-
mentos Quetzaltenango and Sololá. Apparently, P. pinetorum is restricted to volcanic soils
since the only two localities are from higher elevations (2500–3700 m) on slopes of Volcán
Atitlán and Santo Tomás.

Comments. — This new combination can be distinguished from all other known spe-
cies of Peyritschia by having lemma apices that are deeply bifid, and these apices end in
four hyaline setae derived from the apical extension of the marginal and intermediate
nerves (Table 1). The presence of these setae suggests that P. pinetorum, in a phylogenetic
sense, lies very near Trisetum. Nevertheless, because of the shape of the lodicules (entire
in Peyritschia and bilobed or toothed in Trisetum), the lemmas rounded on the back (ver-
sus keeled in Trisetum), the awn inserted on the median portion of the lemma [inserted
on upper 1/3 in Trisetum except in Trisetum subgen. Deschampsioideum (Louis-Marie)
Finot], paleas that are tightly enclosed by the margins of the lemma (gaping in Trisetum
and not tightly enclosed by the margins), an androecium with two stamens (3 stamens in *Trisetum*), and lemmatal epidermis with bordered hooks alternating with long cells (verses epidermis without bordered hooks, the hooks not alternating with long cells in *Trisetum*) [Fig. 2], we place the new species in the genus *Peyritschia*.

Additional specimen examined. GUATEMALA. Solola: Volcán Atitlán, crater (14°35′58.8″N-91°11′9.6″W), 11650 ft (3540 m), 23 Jan 1907, W.A. Kellerman s.n. (US-2181368).

KEY TO THE SPECIES OF *PEYRITSCHIA*

1. Lemma without a dorsal awn, apex muticous or with a subapical mucro ______________ *P. koelerioides*
2. Rachilla copiously pilose, the hairs 1–3 mm long; awn borne on the middle or the upper third of the back of the lemma.
3. Lemma with the apex deeply bifid; panicles 5–15 cm long, contracted, narrow __________ *P. pinetorum*
3. Lemma with the apex entire or shortly bidentate or bilobate; panicles 8–35 cm long, lax, somewhat open.
4. Rachillas with hairs 2–3 mm long; glumes linear 5.2–5.5 mm long; awn borne on the middle portion of the lemma
   \[ \text{P. deyeuxioides} \]
4. Rachillas with hairs about 1.5 mm long; glumes linear to linear-lanceolate 4.3–5.5 mm long; awn borne on the upper third of the lemma
   \[ \text{P. howellii} \]
2. Rachilla pubescent, the hairs 0.2–0.8 mm long; awn borne near the base of the lemma.
5. Culms 5–12 cm tall; leaf blades 2.3–3.5 cm long; panicles about 2.5 cm long, 0.5 cm wide
   \[ \text{P. humilis} \]
5. Culms 20–200 cm tall; leaf blades 5–15 cm long; panicles 5–20 cm long, 1–4(–4) cm wide.
6. Spikelets 2- or 3-flowered, 4–5.5 mm long; glumes 4–5.3 mm long; lemma 3–4.3 mm long
   \[ \text{P. pringlei} \]
6. Spikelets 2-flowered, 5–5.5 mm long; glumes 5.2–5.5 mm long; lemma 3.5–5 mm long
   \[ \text{P. conferta} \]

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