

NOTES ON *ERITRICHIMUM* (BORAGINACEAE) IN NORTH AMERICA III.
THREE NEW SPECIES OF *ERITRICHIMUM*

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ABSTRACT

Three new species of *Eritrichium* Schrad. ex Gaudin from boreal and arctic Alaska and Yukon are described: **E. arenosum**, **E. boreale**, and **E. grandiflorum**. These species are morphologically allied with the primarily Asiatic *E. sericeum* complex. *Eritrichium arenosum* is apparently restricted to sand dunes of the central Arctic Coastal Plain of Alaska. *Eritrichium boreale* and *E. grandiflorum* occur on mountain slopes and rocky summits from the western Brooks Range through the interior of Alaska, and east to Yukon, Canada.

RESUMEN

Se describen tres especies nuevas de *Eritrichium* Schrad. ex Gaudin de Alaska y Yukon boreal y ártico: **E. arenosum**, **E. boreale**, y **E. grandiflorum**. Estas especies están relacionadas morfológicamente con el complejo *E. sericeum* primariamente asiático. *Eritrichium arenosum* está aparentemente restringido a las dunas arenosas de la llanura central costera ártica de Alaska. *Eritrichium boreale* y *E. grandiflorum* aparecen en las laderas montañosas y cumbre rocosas de la Brooks Range occidental hacia el interior de Alaska, y por el este hasta Yukon, Canadá.

The three species described here are morphologically allied with the primarily Asiatic *E. sericeum* s.l. complex (Ovchinnikova 2001), which in Alaska and Yukon consists of *E. arctisibiricum* (V.V. Petrovsky) Khokhr. (Murray 2015) and *E. splendens* Kearney ex W. Wight. These taxa have in common a leaf indumentum of stout trichomes appressed and antrorse, i.e., oriented toward the apex of the leaves. This contrasts sharply with the finer, flexible and often tangled hairs of other Alaska and Yukon congeners *E. aretioides* (Cham.) DC., *E. chamissonis* DC., and *E. villosum* (Ledeb.) Bunge.

More than a century has passed since a new species of *Eritrichium* was named from North America. The three described here are from Alaska and Yukon where botanical exploration continues to hold surprises. Helicopter support has become very much a part of boreal and arctic logistics, and previously inaccessible areas are now within reach, many for the first time. Now collections at the Herbarium (ALA) of the University of Alaska Museum of the North have accumulated to the point that some, previously determined as *E. splendens* can now be seen as separate taxa.

1. *Eritrichium arenosum* D.F. Murray, sp. nov. (**Fig. 1**). TYPE. U.S.A. ALASKA. Teshekpuk Quad.: Kealok Creek, ca. 16 km NW of Pik Dunes, 70°23'N, 153°23'W, 11 Jul 2011, *Lipkin 11-18* (HOLOTYPE: ALA).

Plants greenish-brown, rhizomatous, forming loose mats, not forming dense mats or tufts; rhizomes with leafy sterile and fertile shoots without dense basal leaf clusters, without marcescent leaves; leaves persistent on rhizomes 4–8 × 1–1.5 mm, imbricate; apices acute. **Stems** 1–3, 2–5 cm, sparsely strigose. **Cauline leaves** oblanceolate, 1–3, 5–10 × 1–1.5 mm, apices acute. **Basal leaves** lanceolate, flat, 4–8 × 1–1.5 mm; indumentum strigose, hairs 1–2 mm, antrorse, without tufts of marginal hairs or brush tips at the apices, apices acute. **Inflorescence** simple, 1.5–4 cm. **Flowers** 1–3(–5) in terminal cymose clusters or short-racemose; corollas 5–8 mm diam., blue. **Nutlets** unknown.

Eritrichium arenosum stands apart from its congeners by its rhizomatous habit and absence of dense, basal leaf clusters on flowering stems. This species has shorter, flat leaves, and shorter inflorescences with fewer flowers than *E. splendens*, the species to which these plants had previously been assigned. While there are few specimens, there is remarkably little morphological variation among them.

Whereas it was first thought that *E. arenosum* was merely a sandy-soil ecotype of *E. splendens*, comparison



FIG. 1. *Eritrichium arenosum* D.F. Murray. U.S.A. Alaska. Teshekpuk Quad.: Kealok Creek, approximately 16 km NW of Pik Dunes, 70°23'N, 153°23'W. 11 Jul 2011, Lipkin 11-18 (holotype: ALA), photo by Ryota Kajita (Univ. Alaska Museum of the North).

of *E. arenosum* with specimens of *E. splendens* from the Kobuk Sand Dunes of the boreal Interior revealed that *E. splendens* retains a distinct basal leaf cluster, even in the sandy habitats, and its leaves are distally involute, not flat as in *E. arenosum*. The inflorescence of *E. splendens* is a multi-flowered raceme, in rather sharp contrast to the few-flowered terminal cluster of *E. arenosum*.

Eritrichium arenosum is a narrow endemic, restricted to sparsely vegetated exposed sands of the Gubik formation on the Arctic Coastal Plain. It occurs from sea level to 50 m elevation. The sand seas (sensu Carter 1981) become exposed by thermokarst processes (Britton 1967). ALA botanists have examined large areas of exposed sands in the Arctic Coastal Plain, and additional material of *E. arenosum* was not found. This plant should be looked for in adjacent northern Yukon and Northwest Territories, Canada, where two other sand specialists occur: *Poa ammophila* A.E. Porsild. and *Mertensia drummondii* (Lehm.) G. Don (Porsild & Cody 1980).

Other specimens examined: U.S.A. ALASKA. Meade River Quad.: Meade R. village [now Atqasuk], 70°28'N, 157°25'W, 3–7 Aug 1960, Geist



Fig. 2. *Eritrichium boreale* D.F. Murray, from type locality. U.S.A. Alaska. McGrath Quad.: upper Tin Creek, 62°23'N, 153°40'W, photo by Carolyn Parker.

s.n. (ALA); 5–8 Aug 1960, Hultén s.n. (ALA, TRH); 1 mi up Usuktuk River, 70°31'N, 157°22'W, 7 Aug 1960, Geist s.n. (ALA). **Teshkepuk Quad.:** Pic Dunes, 70°14'N, 153°10'W, 1 Aug 1980, Murray & Johnson 7139 (ALA).

2. *Eritrichium boreale* D.F. Murray, sp. nov. (Fig. 2). TYPE. U.S.A. ALASKA. McGrath Quad.: upper Tin Creek, 62°23'N, 153°40'W, 23 Jun 1983, Parker 646 (HOLOTYPE: ALA).

Plants green or occasionally gray, forming tufts; caudex ramified, woody at the base, often with abundant marcescent leaf bases. **Stems** lax, curved, simple or occasionally branched, 2–12 to as many as 20 in the larger tufts, 3–12 cm, sparsely strigose. **Cauline leaves** oblanceolate, 2–4, 10–25 × 1–2.5 mm. **Basal leaves** oblanceolate, mostly with a distinct blade and petiole; blades involute, 15–25 × 1–3 mm, pustulate; indumentum strigose, hairs 0.7–1.5 mm, antrorse, without tufts of marginal hairs or brush tips at the apices, apices acute or obtuse. **Inflorescence** simple or occasionally branched, 1–5 cm. **Flowers** 3–5 in compact terminal cymose clusters, occasionally the lowermost 1–2 flowers distant by 1 cm, exceptionally to 4 cm from the cluster; corollas 7–10 mm diam., blue. **Nutlets** unknown.

Eritrichium boreale differs from *E. splendens*, its closest morphological relative, by having lax, flexed stems, leaves less densely covered by trichomes, with the lamina broader distally and distinct from the long petioles. The basal leaves of *E. splendens* are long and slender with little difference between the petiole and blade. The flowers of *E. boreale* are consistently larger (7–10 mm diam.) than those of *E. splendens* (4–8 mm diam.). *Eritrichium boreale* is widely distributed on mountain slopes in the boreal Interior of Alaska and in Yukon, reaching the Arctic in the westernmost Brooks Range of Alaska, 200–1075 m elevation. When shown Fig. 2, S.V. Ovchinnikova (pers. comm.) was unable to name it, although there are similar species in northeastern Asia.



FIG. 3. *Eritrichium grandiflorum* D.F. Murray, from type locality: U.S.A. Alaska. Livengood Quad: Mt. Schwatka, 65°53'N, 147°14'W, photo by D.F. Murray.

Other specimens examined: **CANADA. Yukon:** Dempster Hwy. mile 141.8, 22 Jun 1973, *Kojima s.n.* (BABY); Keele Range, 67°00'N, 140°85'W, 2 Jul 2007, *Bennett, Line, Kennedy, & Memell 07-106* (BABY); Wind R. near confluence with Royal Creek, 65°06'N, 134°47'W, 4 Jul 2000, *Bennett 00-220* (BABY). **Ogilvie Quad.:** Ogilvie Mts., Churchward Hill, 65°34'N, 138°13'W, 2 Jul 1984, *Parker 1112* (ALA) **U.S.A. ALASKA. Ambler River Quad.:** Akillik R. valley vic VABM Nuna, 67°19'N, 158°08'W, 29 Jun 2002, *Parker & Fowell 11749* (ALA). **Healy Quad.:** between Teklanika R. and Comb Peak, 63°58'N, 149°25'W, 8 Jul 1998, *Roland 3199* (ALA). **Iditarod Quad.:** Kuskokwim Hills, vic Dishna R., 62°59'N, 157°28'W, 13 Jul 1985, *Parker & Miller 1588* (ALA). **Noatak Quad.:** Mt. Noak, Igichuk Hills, 67°11'N, 163°08'W, 14 Jul 2003, *Parker, Elven, & Solstad 14773* (ALA). **Selawik Quad.:** Waring Mtns., vic VABM Slam, 66°58'N, 159°37'W, 26 Jun 2002, *Parker & McIntyre 11530* (ALA). **Tanacross Quad.:** Sheep Creek, 63°23'N, 143°53'W, 16 Jun 1977, *Winters 184* (ALA).

3. *Eritrichium grandiflorum* D.F. Murray, sp. nov. (Fig. 3). TYPE: U.S.A. ALASKA. Livengood Quad: Mt. Schwatka, 65°53'N, 147°14'W, 14 Jun 1994, *Parker, Murray, Lipkin, & Emers 4907* (HOLOTYPE: ALA).

Plants gray-green, forming mats and dense tufts; caudex divided into short, stout branches, each with very dense conical or columnar accumulation of whole marcescent leaves. **Stems** 1–5 or up to 30 in larger, hemispheric tufts, 1–5 cm. **Cauline** leaves narrowly oblanceolate, 1–4, 6–12 × 0.8–1.5 mm. **Basal leaves** narrowly oblanceolate, 15–25 × 1–3 mm; blades flat or involute, tapering gradually to petioles, frequently pustulate, apices acute or obtuse; indumentum strigose, hairs 1–2 mm, antrorse, without tufts of marginal hairs or brush tips at the apices. **Inflorescence** simple or branched, 1–2 cm. **Flowers** 1–3(–6), single or in tight terminal clusters; corollas 8–15 mm diam., blue. **Nutlets** toothed.

With few, but typically large, flowers on short stems, *E. grandiflorum* is distinct from the other taxa of the *E. sericeum* complex in North America. It has been found in the mountains of boreal Interior of Alaska (Yukon-Tanana Upland, Denali National Park and Preserve, the Keele Range of Alaska and Yukon) and in the Kakagrak Hills near Cape Krusenstern on the northwest coast of arctic Alaska. It is a plant of rock crevices on summits, fellfields, and stable screes, 250–1000 m elevation.

On the basis of digital photographs, S.V. Ovchinnikova (pers. comm.) placed our specimens close to *E. putoranicum* S.V. Ovchinnikova, an endemic of Central Siberia and Yakutia (Sakha) (Ovchinnikova 2001).

Other specimens examined: **CANADA. Yukon:** Keele Range, 67°00'N, 140°51'W, 2 Jul 2007, *J. Line 07-428* (BABY). **U.S.A. ALASKA. Black River Quad.:** Salmon Fork Black R., Keele Range, 66°35'N, 141°10'W, 10 Jun 1991, *Lipkin 91-82* (ALA). **Livengood Quad.:** Victoria Mountain, 65°47'N, 147°10'W, 12 Jun 1995, *Murray & Parker 12067* (ALA). **Mt. McKinley Quad.:** Mt. Chitsia, Kantishna Hills, Denali National Park, 63°58'N, 150°17'W, 14 Jun 1999, *Roland & Batten 3630* (ALA). **Noatak Quad.:** Kakagrak Hills, 67°16'N, 163°40'W, 27 Jun 2001, *Parker, Batten, Denton & Heinlein 10273* (ALA).

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