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Luzula effusa var. *chinensis* (Juncaceae): the first record for the wood-rush genus in Vietnam

BRUCE A. FORD[1*], ANH TAI VU[2], KIM THANH NGUYEN[3] & JULIAN R. STARR[4]
[1]*Department of Biological Sciences, University of Manitoba, Winnipeg, Manitoba, R3T 2N2, Canada*
[2]*Institute of Geography, Vietnam Academy of Science and Technology, Hanoi, Vietnam*
[3]*Department of Botany, Faculty of Biology, VNU University of Science, Hanoi, Vietnam*
[4]*Department of Biology, University of Ottawa, Ottawa, Ontario, K1N 6N5, Canada*
[*]*Author for correspondence (bruce.ford@umanitoba.ca)*

Mount Fansipan, situated in the Hoang Lien Son Range, supports a rich subtropical and temperate flora of over 1700 species, including 25% of Vietnam's endemic plant taxa (Nguyen & Harder 1996, Sterling *et al.* 2006). At elevations above 2000 m, Mount Fansipan contains numerous temperate genera including *Acer* Linnaeus (19 spp., Sapindaceae Jussieu), *Alnus* Miller (*A. nepalensis*, Betulaceae Gray), *Betula* Linnaeus *(B. alnoides* Buchanan-Hamilton, Betulaceae), *Carex* Linnaeus (36 spp., Cyperaceae Jussieu), *Clematis* Linnaeus (9 spp., Ranunculaceae Jussieu), *Lithocarpus* Blume (13 spp., Fagaceae Dumortier), *Quercus* Linnaeus (9 spp., Fagaceae), *Rhododendron* Linnaeus (40 spp., Ericaceae Jussieu), *Rubus* Linnaeus (36 spp., Rosaceae Jussieu), *Tsuga* Carrière (*T. dumosa* Eichler, Pinaceae Sprengel ex F. Rudolphi), *Ulmus* Linnaeus (*U. lancifolia* Roxburgh, Ulmaceae Mirbel), *Vaccinium* Linnaeus (12 spp., Ericaceae), and *Viola* Linnaeus (12 spp., Violaceae Batsch) (Vietnam Plant Data Center 2015, Nguyen & Harder 1996) with many of these genera being both species-rich and locally common (Nguyen & Harder 1996, pers. obs.). In April 2012, a collection of a specimen, representing the temperate genus *Luzula* de Candolle (1805: 158), was made while conducting botanical studies on the *Carex* flora of Mount Fansipan, Lao Cai Province, Vietnam, which is about 30 km south of the border with Yunnan Province, China. While the specimen was immediately recognized as a *Luzula*, a new genus to the flora of Vietnam (Vietnam Plant Data Center 2015), it was not until our collection was identified using the keys in Wu & Clements (2000) and Kirschner (2002) that it was determined to be *Luzula effusa* Buchenau (1879: 88) (Figs. 1, 2). A Basic Alignment Search Tool (BLAST) search of an internal transcribed spacer region (ITS1+5.8S+ITS2) sequence obtained from our specimen (KM612280) showed a 100% match with an existing sequence for *L. effusa* var. *chinensis* (Brown 1903: 161) Wu (1992: 92) (AY727778.1, see Drábková & Vlcek 2010) in GenBank (National Center for Biotechnology Information 2014), supporting our identification based on morphology (Table 1). Eighteen other *Luzula* accessions, representing species placed in two different subgenera and four different sections, were found to have 100% coverage and 99% identity with the sequence from our specimen (National Center for Biotechnology Information 2014) (Table 1). In all cases, these sequences came from taxa that occur in regions that are more geographically disparate from Vietnam than the previously known closest location for *L. effusa* (see below). These taxa are also morphologically dissimilar to our specimen (see text below and Table 1).

Luzula effusa is a member of sect. *Diprophyllatae* Satake in T. Nakai & M. Honda (1938: 25), a polyphyletic group of 12, mostly subarctic, boreal, and alpine species (Kirschner 2002, Drábková & Vlcek 2010). Despite the artificial nature of this section, it can be distinguished from other *Luzula* infrageneric taxa by the combination of a perennial habit and a much-branched inflorescence with the flowers borne singly within the inflorescence. *Luzula effusa* is the only species in sect. *Diprophyllatae* with storied panicles (i.e., inflorescence subdivided into smaller panicles) that are > 1/3 the height of the plant. Our specimen is immature so other diagnostic features, such as anther length shorter than filaments (Wu & Clements 2000) and papillate capsules (Kirschner 2002), are difficult to evaluate. Although *Luzula effusa* s.l. is considered a highly variable taxon (Kirschner 2002), current treatments recognize two varieties: var. *effusa* and var. *chinensis*. Cauline leaves up to 12 mm wide and reddish brown tepals identify our specimen as var. *chinensis*, although stem diameter is less than 2 mm, which is more characteristic of var. *effusa*. Although this discrepancy in diagnostic characters could be explained by the immaturity of our specimen, intermediates between the two varieties are known, as are robust forms of var. *chinensis,* indicating that this polymorphic taxon is in need of further taxonomic study (Kirschner 2002). The identification of our specimen as var. *chinensis* was based upon our interpretation of the

Luzula effusa s.l. has one of the largest distribution ranges known in *Luzula* (cf. Kirschner 2002). It is found throughout Eastern Asia with populations recorded from Nepal, Bhutan, China, Taiwan, Malaysia, Borneo, Sulawesi, New Guinea, and the Philippines (Kirschner 2002). Its occurrence in the northern Vietnamese Province of Lao Cai is approximately 500 km southeast of the nearest populations in Yunnan (see distribution maps 45 and 46 in Kirschner 2002), a Chinese province that shares a common border and forest flora with Mount Fansipan and the Hoang Lien Son Range (Nguyen 1998, Sterling *et al.* 2006).

Luzula effusa was found at 2900 m in a bamboo [*Indocalamus petelotii* (A. Camus) Ohrnberger (Poaceae Barnhart)] dominated habitat along a heavily used hiking trail that leads to the summit of Mount Fansipan (3143 m). Other common associates were *Carex* spp. (Cyperaceae), *Dryopteris* Adanson sp. (Dryopteridaceae Herter), *Elatostema dissectum* Weddell (Urticaceae Jussieu), *Polypodium* Linnaeus sp. (Polypodiaceae J. Presl & C. Presl), and an unknown Bryophyta species (Fig. 2). One of us (Vu) has seen *L. effusa* at a number of other locations on Mount Fansipan where it is locally frequent in shrub habitats at elevations above 2900 m. Woody species found at these sites include *Eurya* Thunberg sp. (Theaceae Mirbel ex Ker Gawler), *Litsea* Lamarck sp. (Lauraceae Jussieu), *Prunus* Linnaeus sp. (Rosaceae), *Rhododendron sino-falconeri* Balfour f., *Rhododendron tanastylum* Balfour f. & Kingdon-Ward (Ericaceae), *Rhodoleia championii* Hooker (Hamamelidaceae R. Brown), *Sorbus* Linnaeus sp. (Rosaceae), and *Viburnum cordifolium* Wallich (Adoxaceae E. Meyer). Bamboos [*Indocalamus petelotii, Chimonobambusa fansipanensis* T. Q. Nguyen & Vucan (Poaceae)] and herbaceous eudicots, such as *Lindernia* Allioni sp. (Linderniaceae Borsch, Kai Müller & Eb. Fischer) and *Ophiopogon* Ker Gawler sp. (Asparagaceae Jussieu), are also regular associates. The fact that *L. effusa* was only encountered at elevations above 2900 m suggests that this species is restricted to the uppermost reaches of Mount Fansipan. Since very little high elevation habitat, above 2900 m, is found in Vietnam, *L. effusa* is probably highly localized and likely of conservation concern in this country.

Plant diversity on Mount Fansipan is reflective of its recent geological past (glacial refugium), geographical position in Southeast Asia, and different habitats created by variation in climate, soils, elevation, and aspect (Nguyen & Harder 1996, Nguyen 1998, Sterling *et al.* 2006). While Mount Fansipan has been the subject of recent floristic interest (e.g., Nguyen & Harder 1996, Nguyen *et al.* 2005a, Nguyen *et al.* 2005b, Nguyen *et al.* 2008, Vu 2012), our discovery of *L. effusa* is yet another indication that we are only beginning to understand the rich biodiversity that characterizes this part of Vietnam.

Specimen Examined:—VIETNAM. Lao Cai Prov., Sapa Dist., Hoang Lien National Park, Nui Xe Ranger Station at Tram Ton Pass. Main trail (Nui Xe) to summit of Mount Fan Si Pan, E103˚46’10.4”, N22˚18’35.9”, 15 April 2012, *Ford 1250, Starr, Nguyen, Vu, Regalado* (WIN).

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