

## Rare and Endangered Species of *Juncus* L. (Juncaceae) in North-East Himalaya

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DRAFT

### Abstract

The present paper deals with the 10 species of *Juncus* L. having restricted distribution and are rare in occurrence, with a few supposed to be endangered, distributed in North-East Himalaya.

**Keywords:** *Juncus*, Rare, North-East Himalaya

### INTRODUCTION

Taxonomic studies on the family Juncaceae under Flora of India Project have been carried out since 2004. Based on field survey and studies of herbarium specimens deposited at various herbaria including Central National Herbarium, Howrah (CAL) and Forest Research Institute Dehradun, (DD) as well as scrutiny of literature (Noltie 1994, Shukla *et al.* 2000, Bhaumik & Pathak 2004, etc.), it has been revealed that 10 species of *Juncus* have restricted distribution in North-East Himalaya and are rare and endangered. Of them nine species are recorded from Sikkim and one from Arunachal Pradesh. Three species *viz.* *Juncus bryophilus* Noltie, *J. glaucoturgidus* Noltie, *J. hydrophilus* Noltie are represented by only 2 or 3 specimens, mainly types, whereas six species *viz.* *Juncus amplifolius* A. Camus, *J. kingii* Rendle, *J. minimus* Buchenau, *J. nepalicus* Miyam. & Ohba, *J. spumososus* Noltie and *J. trichophyllus* W.W. Sm. are represented by less than 10 specimens. Only one species *i.e.* *J. uniflorus* W.W. Sm. has more than 10 specimens. Therefore, these species with restricted distribution in the country with less representation in herbaria and field are considered to be rare and endangered species of the genus *Juncus* L. Brief taxonomic account of these taxa are provided in the present paper to facilitate their identification in the field alongwith a sample illustration and a photograph (Fig. 1, Photo 1).

***Juncus amplifolius*** A. Camus in Not. Syst. 1(10): 281. 1910; Noltie in Fl. Bhutan 3(1): 261. 1994; Srivastava in J. Bombay Nat. Hist. Soc. 93: 327. 1996. *J. amplifolius* A. Camus var. *pumilus* A. Camus, Notul. Syst. (Paris) 1: 282. 1910.

Erect, perennial herbs, 8 – 38 cm high. Rootstocks stout, woody, creeping. Stem leaves 2 - 4, blades flat, shorter than stems, 50 – 200 x 1 – 4 mm, acute at apex. Leaf sheaths without auricles. Inflorescence branched, terminal, 1 – 4, unequally peduncled, capitula 2 – 5 flowered. Lowest bract, erect 1 – 6 cm long, shorter or just overtopping inflorescence. Tepals lanceolate, dark reddish-brown to pinkish-brown, acute to finely acuminate at apex, subequal or outer shorter 4.4 – 5.5 mm x 0.8 – 1.0 mm with scarious margins and greenish midribs, keeled; inner 4.5 – 6.2 x 1.0 – 1.5 mm. Stamens 6, shorter than tepals; filaments shorter than anthers; anthers 2 – 3 mm long. Style 2 – 3 mm long; stigma lobes 3 – 5 mm long, pinkish to dark brown. Capsules ellipsoid, 6 – 8 x 2.3 – 2.4 mm, exceeding tepals, brown to chestnut-brown, beak 2 – 3 mm long.

*Fl. & Fr.:* May – August.

*Distribution:* INDIA: Sikkim; BHUTAN, CHINA, NEPAL, MYANMAR, TIBET.

*Specimens examined:* **Sikkim:** Zuluk 8<sup>th</sup> June 2006, T.M. Hynniewta & G.M. Chhetri 30048 (BSHC).

***Juncus bryophilus*** Noltie in Edinb. J. Bot. 51(2): 137. t.1 (F-K) 1994 & in Fl. Bhutan 3(1): 270. 1994; Srivastava in J. Bombay Nat. Hist. Soc. 93: 327. 1996.

Erect, loosely tufted, rhizomatous, perennial herbs, 0.4 – 3.0 cm high. Rhizomes short. Flower stem filiform, swollen at base and clothed with dark brown & ribbed scale leaves. Stem leaf single, sub basal, filiform, about equalling flower stem, bitubular. Leaf sheath with minute, membranous & blunt auricles. Inflorescence reduced to a single, apparently lateral flower, lowest bract upto 1.5 cm long, suberect, foliaceous. Tepals linear-lanceolate, chestnut coloured, subequal 2.3 – 3.9 mm long, acute at apex. Stamens 6, shorter than tepals; filaments longer

XX Rare and Endangered Species of *Juncus* L.

than anthers; anthers 0.7 – 0.9 mm long. Style 0.5 – 0.7 mm long; stigma lobes short, 0.7 – 1.5 mm long, creamy. Capsules ellipsoid-trigonous.

*Flowers & Fruits:* July – August.

*Distribution:* INDIA: Sikkim; BHUTAN.

*Specimens represented:* **Sikkim:** Dzungri, 4000 m, 25<sup>th</sup> July 1992 *ESIK* 698 (E), *n.v.*

***Juncus glaucoturgidus*** Noltie in *Edinb. J. Bot.* 51(2): 132. 1994 & in *Fl. Bhutan* 3(1): 264. 1994; Srivastava in *J. Bombay Nat. Hist. Soc.* 93: 328. 1996.

Erect, rhizomatous, densely tufted, perennial herbs, 10 – 25 cm high. Rhizomes condensed. Upper part of stem bearing a leaf-like bract, sheath with membranous & subacute auricles, *ca* 2.2 mm long, blade bristle-like *ca* 6.5 mm long; lower part with numerous scale leaves. Stem leaf single, sub-basal, shorter than stem, 55 – 125 × 2.0 – 3.5 mm, suberect, glaucous, cylindrical, hollow, blunt at apex, with few, distant, weak, transverse septa, not visible externally even when dry, sheath short, with minute auricles (under 1mm). Inflorescence a terminal, 12-flowered capitulum; bracts forming an ‘involucre’, subequal, longest oblong-ovate, 15 – 22 × 7 – 8 mm, acute, dark reddish-brown, paler at margins. Tepals oblong-lanceolate, cream coloured, subacute at apex, subequal or outer slightly shorter, 6.0 – 6.5 × 1.4 – 1.7 mm, keeled. Stamens 6; filaments slightly shorter than tepals; anthers 2.0 – 3.4 mm, pale yellow, exserted. Style 2.0 – 2.7 mm; stigma lobes 1.0 – 1.5 mm long. Capsules ellipsoid, 4.0 – 4.5 × 2.5 mm, golden-brown, beak 1.0 – 1.5 mm long.

*Flowers & Fruits:* July – August.

*Distribution:* INDIA: Sikkim; BHUTAN; NEPAL.

*Specimens represented:* **Sikkim:** Samiti Lake, 4300 m, 21<sup>st</sup> July 1992, *ESIK* 572 (Holo. E. Iso. K) *n.v.*

***Juncus hydrophilus*** Noltie in *Edinb. J. Bot.* 51(2): 138. 1994 & in *Fl. Bhutan* 3 (1): 260. 1994; Srivastava in *J. Bombay Nat. Hist. Soc.* 93: 328. 1996.

Erect, loosely tufted, perennial herbs, 32 – 40 cm high. Rhizomes stoloniferous; stolons short, dark brown. Stem leaves 3 – 4, evenly spaced, longest 14 – 17 × 0.2 – 0.3 cm. Leaf sheaths lacking auricles. Inflorescence terminal with 3(-5) capitula; each capitula 4 – 9-flowered. Lowest bract shorter than inflorescence, blades bristle-like, base sheathing. Tepals narrowly lanceolate, cream coloured, acute at apex; outer tepals 3.5 – 5.0 × 0.8 – 1.4 mm, keeled; inner 4.0 – 5.3 × 0.9 – 1.0 mm. Stamens 6; filaments exceeding tepals; anthers exserted, 1.4 – 2.5 mm, pale yellow. Ovary, narrowly-ovoid, 5.0 – 6.5 (incl. style) × 1.0 – 1.5 mm, straw-coloured, Stigma lobes 0.5 – 1 mm ± spreading. Capsules narrowly ovoid, *ca* 6.0 × 1.8 mm, straw-coloured, shiny.

*Flowers & Fruits:* July – August.

*Distribution:* INDIA: Sikkim; BHUTAN; NEPAL.

*Specimens represented:* **Sikkim,** Prek Chu Bridge, below Bakhim, 2300 m, 27<sup>th</sup> July 1992, *ESIK* 771 (Holo. E. iso. K), *n.v.*

***Juncus kingii*** Rendle in *J. Bot.* 44: 45. 1960; Noltie in *Fl. Bhutan* 3(1): 266. 1994; Mandal in Hajra & Verma, (ed.) *Fl. Sikkim* 1: 175. 1996. *J. longibracteatus* A. M. Lu & Z. Y. Zhang, *Acta Phytotax. Sin.* 17: 126. 1979.

Erect, stoloniferous, perennial herbs, 11 – 24 cm high. Stolons stout, dark brown. Stem leaf single, cylindrical to semi-cylindrical, 60 – 150 × 1.2 – 2.0 mm, often reaching midpoint of stem, channelled above, bitubular with weak transverse septa (septae not visible externally). Leaf sheaths with 0.8 – 0.9 mm long, membranous, straw-coloured or brown, auricles, rounded at apex. Inflorescence terminal, capitulum solitary, subglobose, 8 – 13 (-22) flowered. Lowest bracts at least twice the length of capitulum, erect, other bracts equalling to or slightly longer than tepals, acute or sharply acuminate at apex. Tepals narrowly lanceolate, membranous, subequal or inner longer 4.0 – 6.7 × 1.0 – 1.5 mm, , outer keeled, acute at apex. Stamens 6, longer than tepals; filaments longer than anthers; anthers 1.8 – 2.5 mm long, completely exserted at maturity. Style 1.5 – 2.5 mm; stigma lobes 1 – 2 mm long. Capsules ellipsoid-trigonous, 3.0 – 4.2 × 1.0 – 1.5 mm, subequalling or shorter than tepals, chestnut brown, shiny, beak 1.2 – 2.0 mm long.

*Flowers & Fruits:* July – September.

*Distribution:* INDIA: Sikkim; BHUTAN, CHINA, NEPAL.

*Specimens examined:* **Sikkim:** Thangu, 3960 m, 12<sup>th</sup> July 2004, A. S. Chauhan & G. M. Chhetri 19898 (BSHC).

*Juncus minimus* Buchenau in Bot. Zeit. 25: 145. 1867; Hook. f., Fl. Brit. India 6: 400. 1892; Noltie in Fl. Bhutan 3(1): 261. 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim 1: 176. 1996. *J. unifolius* A. M. Lu & Z. Y. Zhang, Acta Phytotax. Sin. 17: 125. 1979.

Perennial, 1 – 7 cm high, erect, stout, tufted, rhizomatous herbs. Rhizomes short. Stem leaves 2 – 4 sub basal, blades flat broadly linear to narrowly lanceolate, 10 – 60 x 1 – 3 mm, margins slightly wavy, blunt at apex. Leaf sheaths without auricles. Inflorescence terminal, capitulum solitary (sometimes appearing lateral) 2 – 6 flowered, Lowest bracts 5 – 20 x 1.0 – 2.5 mm, often longer than capitulum, other bracts 5.0 – 6.5 x 0.8 – 1.2 mm, straw to chestnut coloured, acute at apex. Tepals narrowly lanceolate, sub equal or outer shorter 3.8 – 4.5 x 0.8 – 1.1 mm, acute to acuminate at apex, brownish-yellow to chestnut-yellow with green midribs, becoming chestnut coloured in fruit. Stamens 6, usually shorter than tepals; filaments longer than anthers; anthers oblong, 0.8 – 1.3 mm long. Style 0.5 – 1.5 mm long; stigma lobes 1.5 – 2.5 mm long, erect, twisted. Capsules oblong to ellipsoid-triangular, 4 – 6 x 2 – 3 mm, exceeding tepals, with short apiculate beak *ca* 0.4 mm long, dark chestnut coloured, shiny.

*Flowers & Fruits:* June – August.

*Distribution:* INDIA: Sikkim; BHUTAN, CHINA, NEPAL.

*Specimens examined:* **Sikkim:** Lunak La, *ca* 5000 m, near jheel, 5<sup>th</sup> August 1988, S. K. Rai 9475(BSHC).

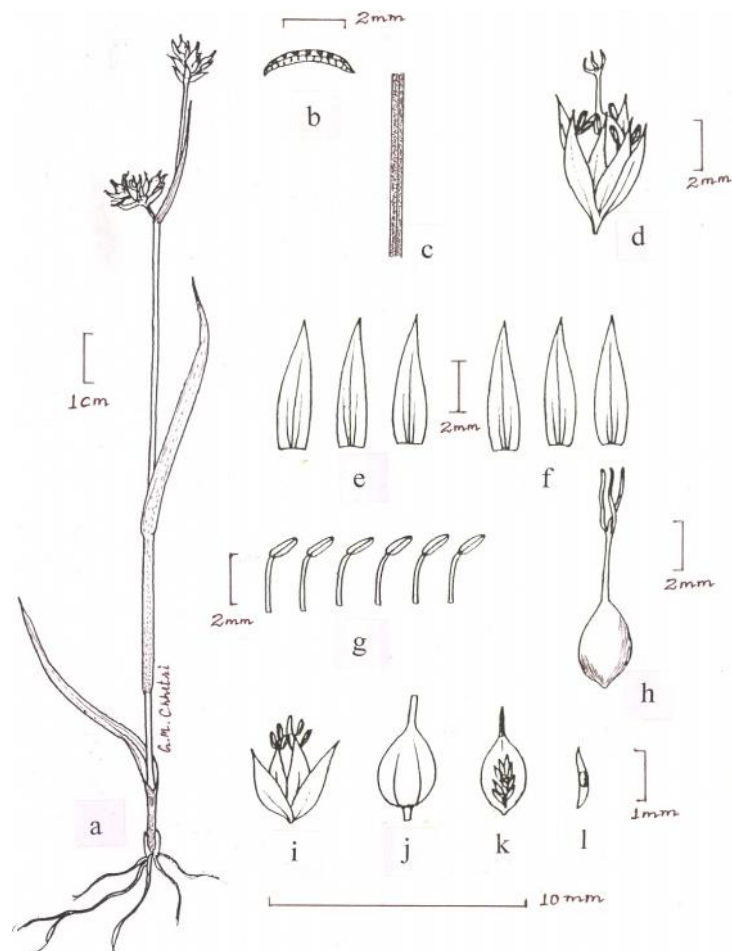
*Juncus nepalicus* Miyam. & Ohba J. Jap. Bot. 68: 28 – 30. 1993; Noltie in Fl. Bhutan 3(1): 262. 1994; Srivastava in J. Bombay Nat. Hist. Soc. 93: 328. 1996. (Fig. 1).

Erect, slender, tufted, perennial herbs, 5 – 20 cm high. Rhizomes woody, stout, creeping knobby. Scale leaves 1 – 2, pinkish or pale-brown. Stem leaves basal, 1 – 3, upper absent or one when present, blades flat, 20 – 50 x 2 – 3 mm. Leaf sheaths without auricles. Inflorescence with 1 or 2 capitula, each capitulum 3 – 8 flowered. Lowest bract upto 2 cm long, other bracts few, shorter than or equalling tepals. Tepals lanceolate, reddish-brown to purplish-brown, margins and tips paler and membranous, acuminate at apex, unequal, outer slightly shorter, 3.2 – 4.5 x 1.0 – 1.3 mm, keeled, inner 3.5 – 5.0 x 1.0 – 1.2 mm. Stamens 6, equalling to or slightly longer than tepals; filaments shorter than anthers; anthers 1.0 – 1.5 mm long, exserted. Style 2.0 – 3.2 mm long; stigma lobes 2 – 3 mm long. Capsules ovoid or ellipsoid-triangular, 3 – 5 x 2.0 – 2.5 mm including beak, equal tepals, deep brown.

*Flowers & Fruits:* June – August.

*Distribution:* INDIA: Sikkim; CHINA; NEPAL.

*Specimens examined:* **Sikkim:** Karpamway to Tamzey, 3910 m, 24<sup>th</sup> August 2004, G. M. Chhetri 27582 (BSHC).



**Fig. 1:** *Juncus nepalicus* Miyamoto & H. Ohba: a Habit; b Transverse section of leaf; c Longitudinal section of leaf; d Flower; e Outer tepals; f Inner tepals; g Stamens; h Gynoecium; i Capsule with tepals; j Capsule; k Longitudinal section of capsule; l Seed.

*Juncus spumosus* Noltie in Edinb. J. Bot. 51 (2): 139. 1994 & in Fl. Bhutan 3 (1): 261. 1994; Bhaumik & Pathak in J. Bombay Nat. Hist. Soc. 101(1): 196. 2004. *J. biluoshanensis* K. F. Wu, Acta Phytotax. Sin. 32: 463. 1994.

Erect, rhizomatous, Perennial herbs, 11 - 75 cm high. Rhizomes very condensed and woody. Stem leaves 2 - 5, evenly spaced, 30 – 320 × 2 – 5 mm, shorter than inflorescence, blades flat. Leaf sheaths lacking auricles. Inflorescence terminal with 2 - 12 flowered, 6 - 21 capitula. Lowest bract foliaceous, subequalling or slightly longer than inflorescence. Tepals narrowly lanceolate, unequal with outer shorter than inner, 2.4 – 3.0 × 0.7 – 1.0 mm, acute to mucronate, keeled, whitish-membranous, flushed pinkish- brown near centre and apex, midrib tinged greenish; inner 3.1 - 3.5 × ca 1 mm, whitish. Stamens 6, subequalling or longer than tepals; filaments exceeding tepals, filiform, longer than anthers; anthers oblong, 0.7 – 1.0 mm long, exserted, pale-yellow. Style 1.2 – 2.0 mm long; stigma lobes 0.6 -1.0 mm long, very fine. Capsules narrowly ovoid, 4.8 – 5.5 × 1.8 – 2.5 mm, dark reddish-brown, shiny, beak 0.5 mm long.

*Flowers & Fruits:* June – September.

*Distribution:* INDIA: Arunachal Pradesh; BHUTAN; CHINA.

*Specimens examined:* **Arunachal Pradesh:** Chitapani Camp, Dibang Valley, 1900 m, 28<sup>th</sup> June 2002, *M. Bhaumik & M.K. Pathak* 4070 (CAL).

*Juncus trichophyllus* W.W. Smith in Rec. Bot. Surv. India 6: 103. 1914; Noltie in Fl. Bhutan 3(1): 266, t. 25(f). 1994 & in Edinb. J. Bot. 51(2): 131. 1994; Mandal in Hajra & Verma(ed.)Fl.Sikkim1:177.1996. Erect, slender, small clump forming, perennial herbs, 4 - 12 cm high. Rhizomes short, stout. Stem leaf, basal single, 30 - 100 × 0.2 - 0.5 mm, filiform bitubular, acute at apex, upper leaves upto 3, bract like, ca 1.5 cm long, filiform, sheath enclosing small dark coloured bulbils developing into plantlets, auricles 0.1 - 0.9 mm long, conspicuous, transparent or brownish blunt or subacute at apex. Inflorescence terminal, capitulum solitary, 1 - 3 flowered; shorter than tepals, usually one is longer, keeled, acute, membranous, shiny. Tepals narrowly lanceolate, membranous, whitish to straw coloured, unequal, outer shorter, 2.6 - 3.5 × 0.6 - 0.8 mm, acute at apex. Stamens 6, longer than tepals; filaments longer than anthers; anthers 1.0 - 1.5 mm long, partly or completely exserted. Style 0.8 - 1.5 mm long; stigma lobes very short. Capsules ellipsoid – trigonous, 2.6 - 3.5 × 1.5 - 1.8 mm, usually shorter than tepals, beak 0.4 - 0.6 mm long.

*Flowers & Fruits:* July – September.

*Distribution:* INDIA: Sikkim; BHUTAN; NEPAL.

*Specimens examined:* **Sikkim:** Tamzey, 3850 m, 24<sup>th</sup> August 2004, *G. M. Chhetri* 27581 (BSHC).

*Juncus uniflorus* W.W. Smith in Rec. Bot. Surv. India 6: 104. 1914; Noltie in Fl. Bhutan 3 (1): 270, t. 25(l). 1994; Mandal in Hajra & Verma (ed.), Fl. Sikkim 1: 178. 1996.

Erect, densely tufted, perennial herbs, 2 - 3 cm high. Rhizomes brown to reddish-brown. Stem leaves 1 – 2, basal or subbasal, 10 – 45 × 0.1 – 0.4 mm, narrowly filiform, bitubular, deeply channelled above, blunt at apex, auricles 0.1 – 0.2 mm long, whitish, transparent, acute or subacute at apex. Inflorescence terminal, single flowered, bracts usually 2, lower one aristate, equalling or just exceeding tepals. Tepals narrowly lanceolate, pale reddish-brown or straw coloured, margins narrowly membranous, acute to acuminate at apex, subequal or inner slightly longer 2.5 - 4.0 × 0.5 - 0.9 mm. Stamens 6, shorter than tepals; filaments shorter than anthers, anthers 1.2 - 1.8 mm long. Style 1.0 - 1.8 mm long; stigma lobes 1.8 - 3.5 mm long, erect, very fine, pink or red. Capsules narrowly ellipsoid-trigonous, 3.0 - 3.5 × 0.5 – 1.5 mm, including beak, equalling to or slightly longer than tepals, dark brown to blackish-brown, shiny, beak short.

*Flowers & Fruits:* June – October.

*Distribution:* INDIA: Sikkim; BHUTAN; CHINA; NEPAL; TIBET.

*Specimens examined:* **Sikkim:** Kupup Lake surrounding 3900 m, 24<sup>th</sup> July 2005, *T. M. Hynniewta & G. M. Chhetri* 30113 (BSHC).

**Notes:** *Juncus sikkimensis* Hook.f. reported to be rare (Srivastava & Mitra 1990), has recently been recorded

from Arunachal Pradesh (Chhetri *et al.* 2007), thus its occurrence is not rare. This is further supported by availability of old herbarium collection of the species deposited at CAL from Arunachal Pradesh. In addition, during our field surveys it has been collected in good numbers from several localities of Sikkim.

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#### LITERATURE CITED

- Bhaumik, M. & Pathak, M.K. 2004. *Juncus spumosos* Noltie (Juncaceae) A new record for India, *J. Bombay Nat. His. Soc.* **101**(1): 196 – 197.
- Chhetri, Geetamani; Borthakur, S.K. & Sharma, T.P. 2007. Extended distribution of *Juncus sikkimensis* Hook.f. in Arunachal Pradesh. *Indian For.* **133**(8): 1141 – 1142.
- Noltie, H.J. 1994. Notes relating to the Flora of Bhutan : XXIV Juncaceae, *Edinb. J. Bot.* **51**(2): 129 – 143.
- Shukla, B. K.; Sinha, G. P. & Chauhan, A. S. 2000. The Family Juncaceae in Sikkim, *Indian J. for.* **23**(4): 466 – 489.
- Srivastava, R.C. & Mitra, B. 1990. In: M.P. Nayar, & A.R.K. Sastry (ed.), *Red Data Book of Indian Plants*. **3**: 161. BSI, Calcutta.