

TWO NEW RECORDS OF *JUNCUS* SPECIES (RUSH FAMILY - JUNCACEAE) IN SRI LANKA

D.M.D. Yakandawala¹, U.M. Sirisena and M.D. Dassanayake
Department of Botany, University of Peradeniya, Peradeniya.

ABSTRACT

Based on a study carried out to investigate the different species of *Juncus* that occur in Sri Lanka, four different *Juncus* species were identified: *Juncus effusus* L., *Juncus bufonius* L., *Juncus wallichianus* Laharpe. and *Juncus leschenaultii* J. Gay ex Laharpe. *Juncus wallichianus* Laharpe. and *Juncus leschenaultii* J. Gay ex Laharpe. are here recorded in Sri Lanka for the first time. Further, it became evident that *Juncus prismatocarpus* R. Br. does not occur in Sri Lanka and records of its occurrence are erroneous due to misidentification. The paper presents a revision for the family Juncaceae that occur in Sri Lanka.

"Rushes are round and sedges have edges" - in general, a good rule for differentiating these two grass-like families. The Juncaceae are grass-like herbaceous plants, characterized by glumaceous, usually complete, pentacyclic, trimerous flowers; occasionally one of the staminate whorls is lacking through reduction. Unlike in grasses, close examination of Juncaceae flowers reveals distinct flower parts: 3 sepals, 3 petals, 2 to 6 stamens and a pistil with stigma divided into 3 lobes.

This combination of characters has made the group easily recognizable, and its circumscription has hardly changed since its inception by Jussieu in 1789 (Balslev, 1996). The family is divided into six genera and about 400 species. *Juncus* is the largest genus of the family (Judd *et al.*, 1999). Rushes are best identified when in bloom, at other times of the year they are frustratingly identical.

In Sri Lanka, the family is represented by the genus *Juncus*. The taxonomic treatment by Trimen in the Handbook to the Flora of Ceylon (1898) recognizes two species, namely *J. effusus* L. and *J. prismatocarpus* R. Br. Abeywickrama in 1959, in his checklist recognizes three species of *Juncus*, *J. effusus* L., *J. inflexus* L. and *J. prismatocarpus* R. Br. The most recent taxonomic treatment by Harriman (1991), for the Revised Handbook to the Flora of Ceylon recognizes *J. bufonius* L. in addition to *J. effusus* L. and *J. prismatocarpus* R. Br. According to Harriman (1991), Thwaites, in his *Enumeratio Plantarum Zeylaniae* (1864) has erroneously cited that *J. glaucus* Ehrh. occurs in Sri Lanka. Later, *J. glaucus* Ehrh. has been reduced to the

synonymy of *J. inflexus* L. A recent study has revealed the occurrence of two additional species: *J. wallichianus* Laharpe and *J. leschenaultii* J. Gay ex Laharpe. Further, *J. prismatocarpus* R. Br. whose presence was assumed following erroneous identification more than one hundred years ago, does not occur in Sri Lanka. The detailed study has been discussed in a separate paper (Yakandawala *et al.*, 2005).

In this paper we give a detailed description of the species of *Juncus* that occur in Sri Lanka with a view to updating the taxonomic information.

Family: Juncaceae A. L. de Jussieu
(Rush family)

Gen. Pl. 43. 1789, nom. cons. Type genus: *Juncus* L., Sp. Pl. ed. 1, 325. 1753.

Annual or perennial glabrous herbs, often with rhizomes; silica bodies absent; stems tufted, terete and solid, sedge-like in aspect. Leaves alternate, 3-ranked, basal or along lower portion of the stem, composed of a sheath and blade, the sheath usually open; blade simple, entire, with parallel venation, linear, flat or convolute or terete (and then \pm nodose-septate), or the leaves represented only by basal sheaths, the blades then reduced to a terminal awn or apiculus on the summit of the sheath. Ligules and stipules lacking flowers numerous, minute, usually bisexual, but occasionally unisexual (plants then dioecious), hypogynous, 3 - merous; inflorescences always terminal but appearing to arise laterally in species with a single erect involucre leaf (*J. effusus* in Sri Lanka), pedicelled or nearly sessile but always from the axil of a \pm scarious bract; flowers with two small bracteoles (commonly called prophylls) immediately beneath the perianth, or

¹deepthiy@pdn.ac.lk

these lacking (always absent when the leaves are nodose-septate). Perianth chaffy, never with green sepals; petals dull coloured, green, red-brown or black, but sometimes white or yellowish, imbricate, persistent in fruit. Stamens 3 or 6, one stamen always opposite each sepal, and one opposite each petal when the flower is hexandrous. Filaments distinct. Ovary trilocular, connate, superior, but the septa variously developed, the ovary sometimes seemingly unilocular; Style with three stigmatic branches, usually elongate. Nectaries lacking. Fruit a loculicidal capsule, dehiscent from above into 3 valves; seeds numerous, apiculate (not tailed in the Sri Lankan species), reddish brown.

Distribution and Ecology: Worldwide, mostly temperate and cold and/or in tropics, montane. Often damp habitats.

Genera/species: 6/400

Genus: *Juncus*

L., Sp. Pl. ed. 1. 325. 1753. Type species: *Juncus acutus* L., op. cit.

Characters as of the family.

Key for the separation of the four Sri Lankan species;

1 Leaves aseptate, nontubular; leaf sheath without a hyaline margin or hyaline margin not prominent, without auricles; culms round in transverse section; 1 to less than 4 flowers per head, 2 bracteoles per flower; leafy outgrowths of propagation absent.

2 culms mostly up to 120 cm tall; leaves reduced to cataphylls, one lowermost culmlike involucre bract; inflorescence 1-4 cm long; 3 stamens per flower.....1. *J. effusus*

2 culms less than 10 cm tall; leaves not reduced, well developed, flat; 2 leafy lowermost involucre bracts, inflorescence 7-8 cm long; 6 stamens per flower..... 2. *J. bufonius*

1 Leaves septate, tubular; leaf sheath with a prominent hyaline margin, auricles present;

culms ovate or elliptic in transverse section; always more than 4 flowers per head, 1 bracteole per flower; leafy outgrowths of propagation present.

3 Leaves unitubulose with transverse septa only, terete; stigma maroon coloured, capsule equal to or shorter than tepals, ovoid in shape, always red apex3. *J. wallichianus*

3 Leaves pluritubulose with both longitudinal and transverse septa, compressed; stigma Greenish yellow coloured; capsule always exceeding tepals (by about 1 mm), narrow oblong, sometimes red apex ...4. *J. leschenaultii*

1. *Juncus effusus* L., Sp. Pl. ed. 1, 326. 1753; Trimen, Handb. Fl. Ceylon 4: 318. 1898; Harriman, A Revised Handb. Fl. Ceylon 7: 387 - 390. Fig. 1, A-C; Fig. 5, a-d.

Densely tufted hard-stemmed perennial with tough, short, scaly rhizomes (these often lacking in herbarium specimens), commonly up to a meter tall. Stems terete, dark green with 20-50 culm striations, with a pith containing stellate parenchyma. Leaves clothed at base with several red brown bladeless sheaths. The blades reduced to a fragile terminal bristle or mucro-like blade on a well developed open sheath (cataphyll); 6.5 - 8.5 cm long, abaxially maroon brown and adaxially straw brown or yellowish brown with a shine. Inflorescences many flowered, dense to diffuse, 1 - 4 cm long with numerous solitary flowers appearing to arise from the side of the stem, the erect involucre leaf simulating a continuation of the stem and overtopping the inflorescence by 11 - 37 cm. Flowers on pedicels up to 2 mm long, arising in axils of sheathing bracts on the inflorescences branches, with a pair of bracteoles at the summit of the pedicel and embracing the perianth. A prophyll (specialized two keeled bract) present at the base of the inflorescence branches adaxially above the bract. Six tepals in two whorls with acuminate to acute tip, center green and margins maroon striated with broad hyaline margins. Outer tepals 1.35 - 2 mm long, larger than or equaling inner tepals. Stamens 3, shorter than tepals, opposite the outer tepals only, and barely half as long. Filaments above 0.5 mm, anther 0.35 mm. Stigma trilobed dark pink. Capsule trigonous, slightly shorter or slightly exceeding the

outer tepals, broadly ovate, golden brown with an indistinct beak, 0.1 mm in length, dehiscent to the base; seeds numerous, dark yellow with maroon stripes, elliptical, apiculate, not tailed, 0.5 mm long.

2. *Juncus bufonius* L., Sp. Pl. ed. 1, 328. 1753; Harriman, A Revised Handb. Fl. Ceylon 7: 387 – 390. Fig. 2, A-C; Fig. 5, e-h.

Tufted annuals 4-30 cm tall. Culms terete, yellow green, less than 10 cm in length, 0.37 mm in diameter or slightly less. Leaves basal or cauline, flat or involute, very narrow, 0.4 - 0.5 mm wide. Sheath yellowish green on both surfaces. Inflorescences terminal, half to two thirds or more the height of the plant, usually elongated and the flowers well separated, secund on the branches, or somewhat congested and then the flowers in small clusters of 2-6, the individual flowers readily apparent nonetheless; flowers sessile or nearly so, always bibracteolate immediately at the base of the flower (in addition to the more distant bract on the inflorescence branch proper), with two lowermost leaf-like involucral bracts 2-3 cm long and generally shorter than the inflorescence. Tepals acuminate - aristate, greenish or brownish with age, outer tepals 4-5 mm long, much longer than the inner; the inner tepals similar but only 2.5-3.5 mm long. Stamens 3 or 6 (variable even on the same plant), shorter than outer tepals, filaments 0.75 mm long, anthers 0.5 mm. Stigma trilobed, yellowish green. Capsule always shorter than the perianth, ovoid, brownish yellow, 1.8 – 2 mm long, beak 0.15 – 0.2 mm in length, dehiscent to the base by three valves; seeds numerous, reddish brown, minutely apiculate at either end, less than 0.5 mm long.

3. *Juncus wallichianus* Laharpe, *Mém. Soc. Hist. Nat. Paris* ser. 2, 3: 89-181. 1827. Willson & Johnson, *Telopea* 9 (2): 357 – 394. 2001. Fig. 3, A-C; Fig. 6, a-d

Tufted rhizomatous perennials. Culms terete, dark green, 11-40 cm long, 1-1.25 mm broad. Leaves basal and cauline, long-sheathing, unitubulose, blade terete with a diameter of 1.1 - 1.35 mm, with transverse septa only. Auricles present at the summit of sheath and blade, more than 1 mm long. Leaf-like single lowermost

involucral bract present, 3 – 4.5 cm long. Inflorescence terminal with 17 – 20 flowered dense clusters and with 8-17 widely spread clusters per inflorescence; Flowers ebracteolate, 6 tepals in two whorls of three, with similar lengths, acute-tipped, reddish green in colour, with medium broad hyaline margins, 4 mm long, equaling the length of capsule. Stamens 3, opposite the outer whorl of tepals, each with 0.8 – 1.1 mm long filament; anthers about 0.4 mm long. Length of stamens less than half the length of tepals. Stigma tri-lobed, maroon. Capsule trigonous, 1-locular, 1.5 -2.5 mm long, equal in length to tepals or slightly shorter, with a prominent sterile beak of 0.25 mm, golden brown always with a red apex, ovoid, dehiscent by three valves. The valves not cohering at the summit. Seeds numerous, elongated, elliptical, orange yellow with one end maroon in colour, approximately 0.35 mm in length. Leafy outgrowths of propagation present.

4. *Juncus leschenaultii* J. Gay ex Laharpe, *Mém. Soc. Hist. Nat. Paris* ser. 2, 3: 89-181. 1827. Willson & Johnson, *Telopea* 9 (2) : 357 – 394. 2001. Fig. 4, A-C; Fig. 6, e-h.

Tufted perennials. Culms compressed, yellow to dark green shaded, 11-40 cm long, 1.3 – 2 mm broad. Leaves basal and cauline, long-sheathing, blade pluritubulose, compressed, 1.4 – 2.5 mm broad with both transverse and longitudinal septa. Auricles present at the summit of sheath and blade, less than 1mm long. Lowermost involucral bract leaf-like, 2.2 – 6.5 cm long. Inflorescence terminal with 6 – 15 loosely arranged flowers in clusters and widespreading with 8-17 clusters per inflorescence; Flowers ebracteolate, 6 tepals in two whorls of three, with similar lengths, acute-tipped, yellow green to maroon in colour, with narrow hyaline margins, 1.7 - 4 mm long and shorter than the capsule. Stamens 3, opposite the outer whorl of tepals, with 0.35 – 0.4 mm long filament, anthers about 0.3 mm long. Length of stamens less than half of the length of tepals. Stigma trilobed, greenish yellow. Capsule trigonous, 1-locular, exceeds tepals by about 1 mm, 4 -5 mm in length, with a blunt sterile beak of 0.15 - 0.2 mm, brownish yellow to golden brown with apical part sometimes red, narrow, oblong-shaped, dehiscent through three valves, the valves not cohering at the summit. Seeds numerous, elongated, elliptical, light yellow to white, approximately 0.35 mm in length. Leafy outgrowths of propagation present.

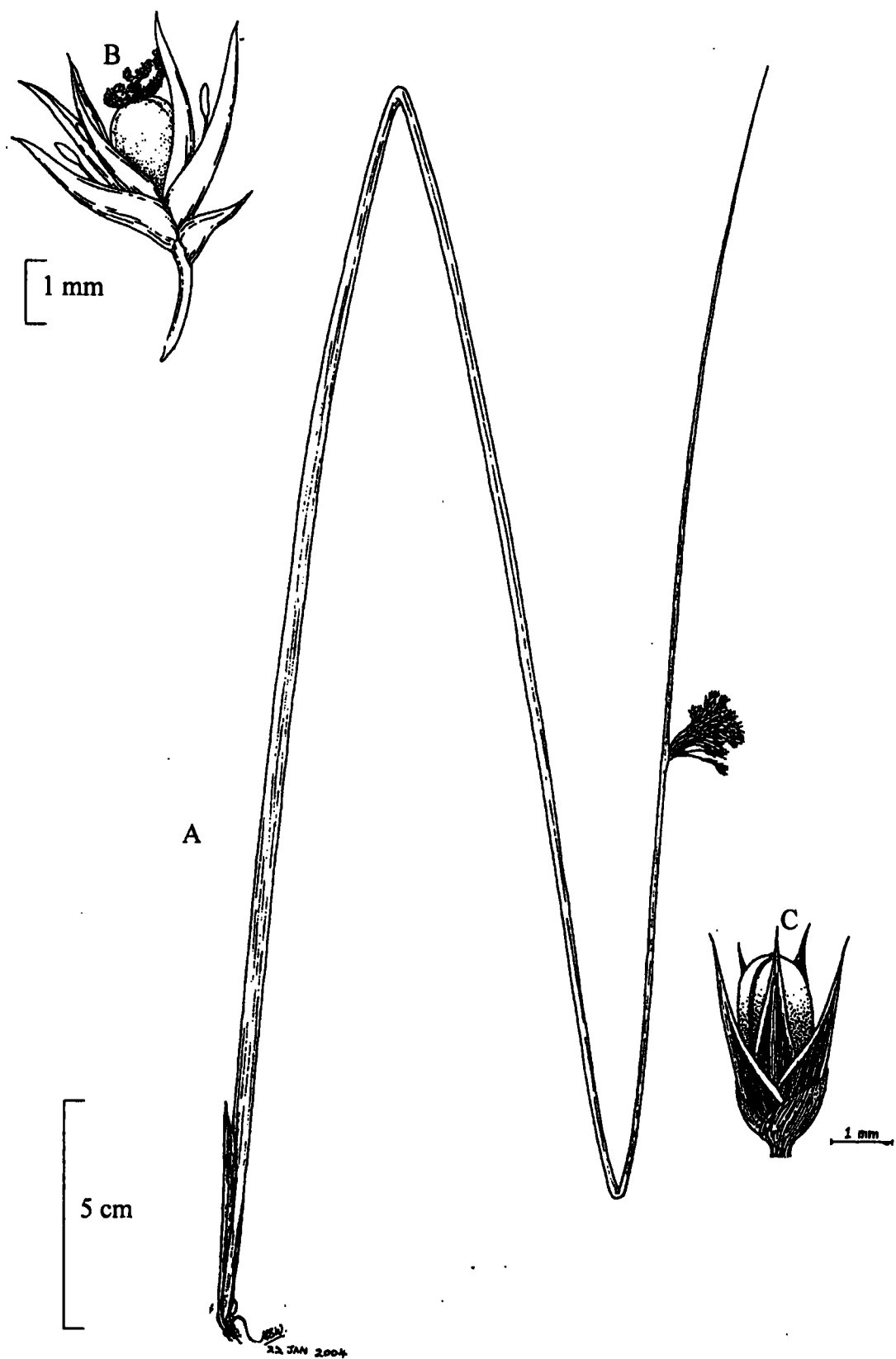


Figure 1. *Juncus effusus*: A) Habit; B) Flower and C) Fruit

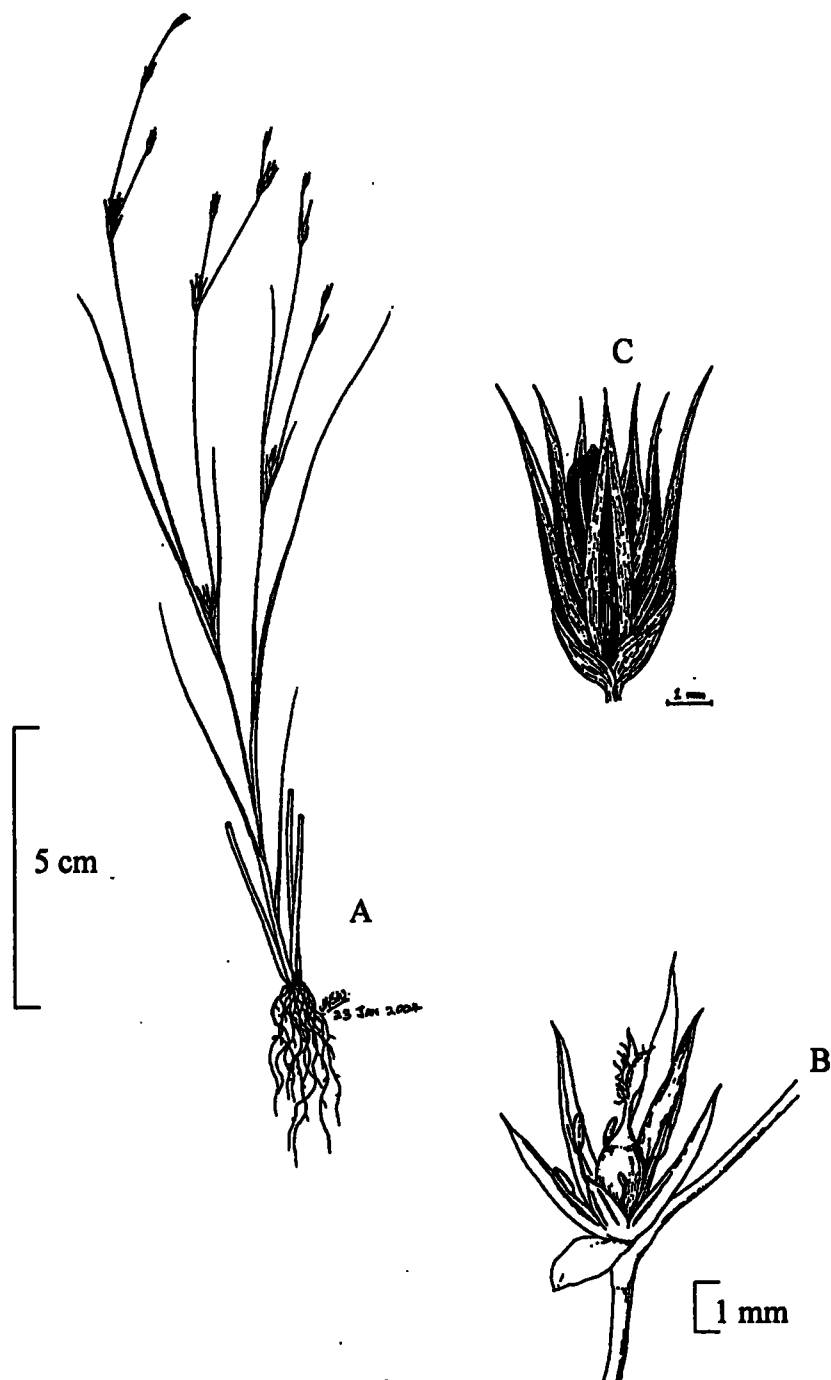


Figure 2. *Juncus bufonius*: A) Habit; B) Flower and C) Fruit

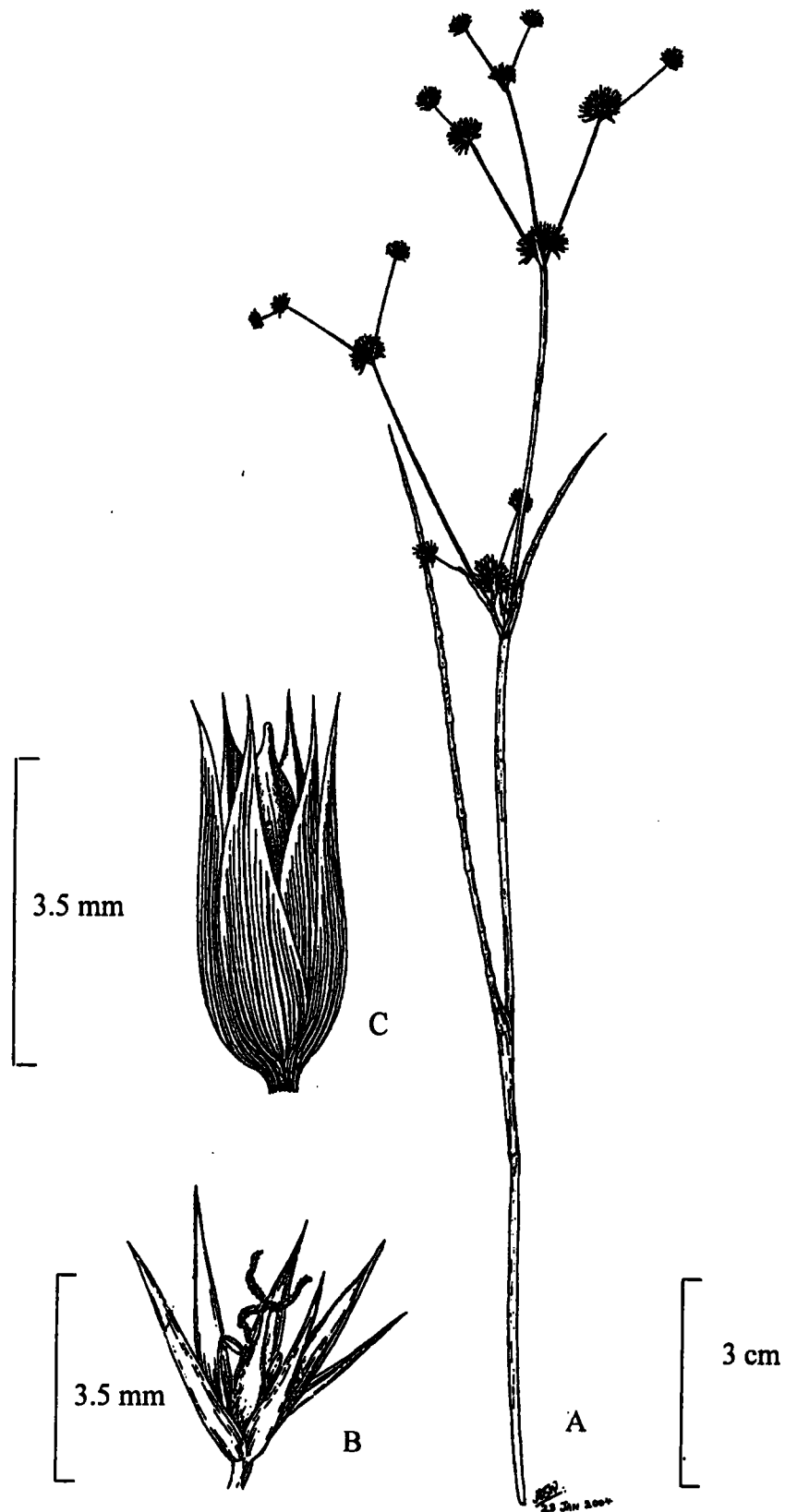


Figure 3. *Juncus wallichianus*: A) Habit; B) Flower and C) Fruit



Figure 4. *Juncus leschenaultii*: A) Habit; B) Flower and C) Fruit

Two new records of *Juncus* species in Sri Lanka



Figure 5. Habit, Flower, Fruit and Seed/s of *J. effusus* (a -d) and *J. bufonius* (e-h) respectively.



Figure 6. Habit, Flower, Fruit and Seed/s of *J. wallichianus* (a -d) and *J. leschenaultii* (e-h) respectively.

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