

AUSTRALIAN BIOLOGICAL RESOURCES STUDY, CANBERRA



# SPECIES PLANTARUM

FLORA OF THE WORLD

*Part 7. JUNCACEAE 2: Juncus subg. Juncus*

compiled by Jan Kirschner



Department of the Environment and Heritage

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## INTRODUCTION

*Species Plantarum* aims to provide in concise format, and with standardised data fields, basic taxonomic information on the vascular plants of the world, including accepted names and synonyms with bibliographic data, types of names, keys and descriptions from family to varietal levels, geographical distributions, ecological information and other related matters, and to publish it in both hard copy and electronic form.

The format of the *Species Plantarum* is based on that of *Flora of Australia*, with some departures made necessary by the different scale of the project. Initially at least, the series is being edited and published for the Species Plantarum Project and IOPI by the Australian Biological Resources Study (ABRS), producers of *Flora of Australia*.

Treatments are contributed on a voluntary basis. Each part of *Species Plantarum* is intended to provide a complete account of a family, subfamily, large genus or other related taxonomic group. While treatments of small families may be shorter, it is intended that contributions will, in general, cover at least 50 to 100 species. The taxonomy adopted is that of the author, although the family delimitations recommended are initially those of R.K.Brummitt, *Vascular Plant Families and Genera* (1992). The order of taxa within families, genera and species in the *Species Plantarum* is intended to reflect natural relationships, so far as this is possible in a linear sequence.

Maps are provided for each species, or in those cases where infraspecific taxa are recognised, for each of the terminal taxa. Distribution maps are based on those in R.K.Brummitt, *World Geographical Scheme for Recording Plant Distributions* ed. 2 (2001), and the 'countries' adopted are those of Level 3 and 4 of that work. Description of distribution follows the same work, with a two-digit code for regions and a three-letter code for the 'country'. Upper case letters for the 'country' indicate native distribution; lower case letters indicate that the taxon is only present in that 'country' as an introduced and naturalised plant. If a taxon is extinct in a 'country', this is indicated by a dagger. Distribution of species as cultivated plants is not included.

Misapplied and invalid names are, in general, omitted. Journal titles are abbreviated according to G.D.R.Bridson & E.R.Smith, *Botanico-Periodicum-Huntianum / Supplementum* (1991). Book titles are abbreviated according to F.A.Stafleu & R.S.Cowan, *Taxonomic Literature* (2nd edn) Vols 1–7, and *Supplements* (1976–), except that upper case initial letters are used for proper names and significant words. Authors of plant names are abbreviated according to R.K.Brummitt & C.E.Powell, *Authors of Plant Names* (1992).

A separate part, *Introduction to the Series*, provides a history of the project, a glossary, guide for contributors and key to the conventions used in describing distribution. These resources will also be available on the World Wide Web, initially through the ABRS site (currently <http://www.anbg.gov.au/abrs/flora/spplant/spplant.htm>) with links from the IOPI site (currently <http://life.csu.edu.au/iopi/iopihome>) and others.

A.E.Orchard  
Canberra  
July 2002

## PREFACE

This volume is the second of a three-part treatment of the Juncaceae.

The co-operative monographic study was completed in the period 1997 to 2000, under grant no. 206/97/0936 of the Czech National Grant Agency. Almost all the current experts in the taxonomy of the family kindly participated in the project, and their expertise covered both the centres of taxonomic diversity and the most intricate groups in the family. The monograph thus presents the cumulative knowledge of the Juncaceae at this time. Some groups received special attention and their accounts represent new revisions (e.g., *Luzula* sect. *Atlanticae*, sect. *Alpinae*, subg. *Pterodes*) or recent revisions were incorporated (e.g., *Juncus* sect. *Caespitosi*, in part, and *Juncus* sect. *Juncus*). The project benefited from an important coincidence: the Juncaceae have been included in recent volumes of important regional or continental floras, either published in 1999 or 2000, or prepared for publication; the authors of several regional accounts participated in our project (including those from *Flora of North America*, *Flora of China*, *Flora of Australia* and *Flora Neotropica*). Despite this, some groups or sections still require a thorough revision in future, and a number of questions remain unanswered, particularly in *Luzula* sect. *Luzula* in China and Japan, *Juncus* sect. *Stygiopsis* and *Juncus* sect. *Juncotypus*.

While the text represents the combined work of many authors, the final version was prepared by JK, and he accepts responsibility for any errors or missing data.

In addition to the authors and advisers, many other botanists participated in solving numerous problems with old literature, nomenclatural problems and geographical distribution. I would like to express my thanks for their generous help. Invaluable technical assistance was provided by Ms Věra Matějovičová. Dr R.K.Brummitt of Kew, the Secretary of the *Flora of the World* project, showed unfailing interest, and without his support the present volumes would never have come into being.

Jan Kirschner

Pruhonice

July 2002



## 7. JUNCUS

*Juncus* L., *Sp. Pl.* 1: 325 (1753)

T: *Juncus acutus* L., *fide* N.L.Britton & S.Brown, *Ill. Fl. N. U.S.*, ed. 2, 1: 465 (1913).

*Cephaloxys* Desv., *J. Bot. (Desvaux)* 1: 321 (1809), *nom. illeg.* T: *Cephaloxys flabellata* Desv., *nom. illeg.*; *Juncus repens* Michx.

*Tenageia* (Dumort.) Fourr., *Ann. Soc. Linn. Lyon*, sér. 2, 17: 172 (1869); *Juncus* sect. *Tenageia* Dumort., *Fl. Belg.* 142 (1827). T: *Juncus tenageia* L.f.

*Tristemon* Raf., *Fl. Tellur.* 4: 32 (1838), *nom. illeg.* T: not designated.

*Juncastrum* Fourr., *Ann. Soc. Linn. Lyon*, sér. 2, 17: 171 (1869), *nom. inval.*

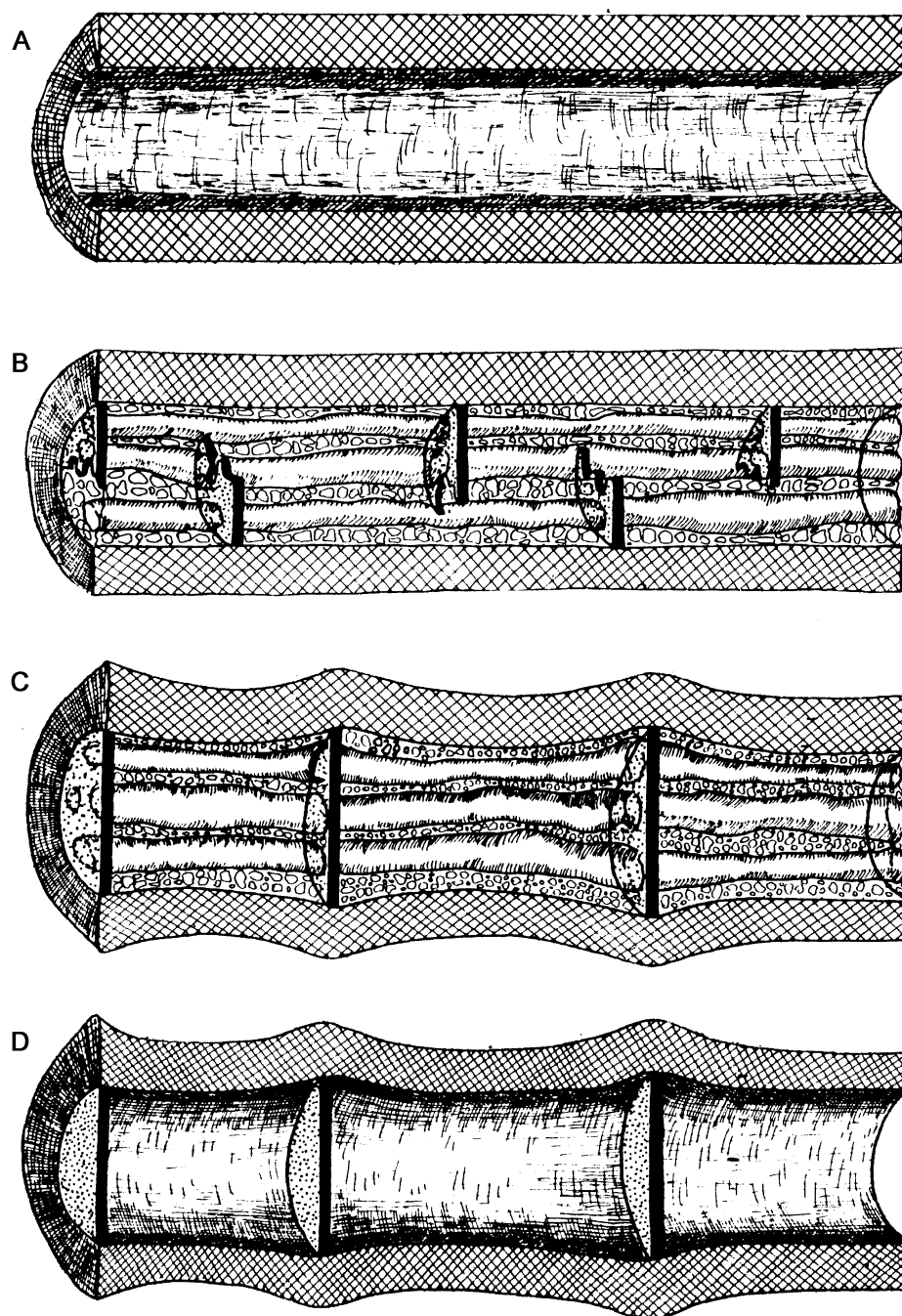
*Juncinella* Fourr., *Ann. Soc. Linn. Lyon*, sér. 2, 17: 171 (1869), *nom. inval.*

*Phylloschoenus* Fourr., *Ann. Soc. Linn. Lyon*, sér. 2, 17: 172 (1869), *nom. inval.*

Perennial or rarely annual herbs, caespitose to rhizomatous, seldom mat-forming, totally glabrous, smooth or papillose. Stem erect, procumbent or ascending, terete to compressed. The most basal leaves usually lacking blade or blade much reduced (cataphylls); fully developed leaves alternate, basal and/or cauline, flat (flat side facing stem), not septate, or flat with raised margins and enlarged cells on adaxial surface, or terete either solid or hollow and with or without septa, or laterally flattened (arranged perpendicular to stem) and imperfectly septate; sheaths open, rarely closed and later split, often with distinct auricles at the junction to blade. Bracts leaf-like or reduced. Inflorescence compound, often decomposed, cymose or racemose, often anthelate, sometimes congested, or flowers borne singly in drepania with or without a pair of bracteoles below each flower. Flowers bisexual, rarely unisexual; usually trimerous, rarely dimerous. Tepals usually 6, entire, equal or unequal, persistent, green, stramineous, castaneous to blackish, smooth or scabrid, narrowly ovoid to linear lanceolate. Stamens (2–) 3–6, exerted or not so; filaments filiform or flattened; anthers linear to oblong; connective indistinct or slightly apiculate. Ovary sessile; style almost absent to very long; stigmas (2–) 3, filiform, twining, papillose, of variable length and colour. Capsule unilocular, triseptate or perfectly trilocular; seeds many, usually ellipsoid to ovoid; outer seed-coat tight and hyaline to loose, scarious, smooth to reticulate, forming one apical and one basal whitish appendages or not so; inner seed-coat brown, castaneous or yellowish, ±smooth to reticulate.  $x = 10$  (many additional secondary basic numbers exist, ranging from  $x = 9$  to  $x = 25$  at least, the role of agmatoploidy being unknown).

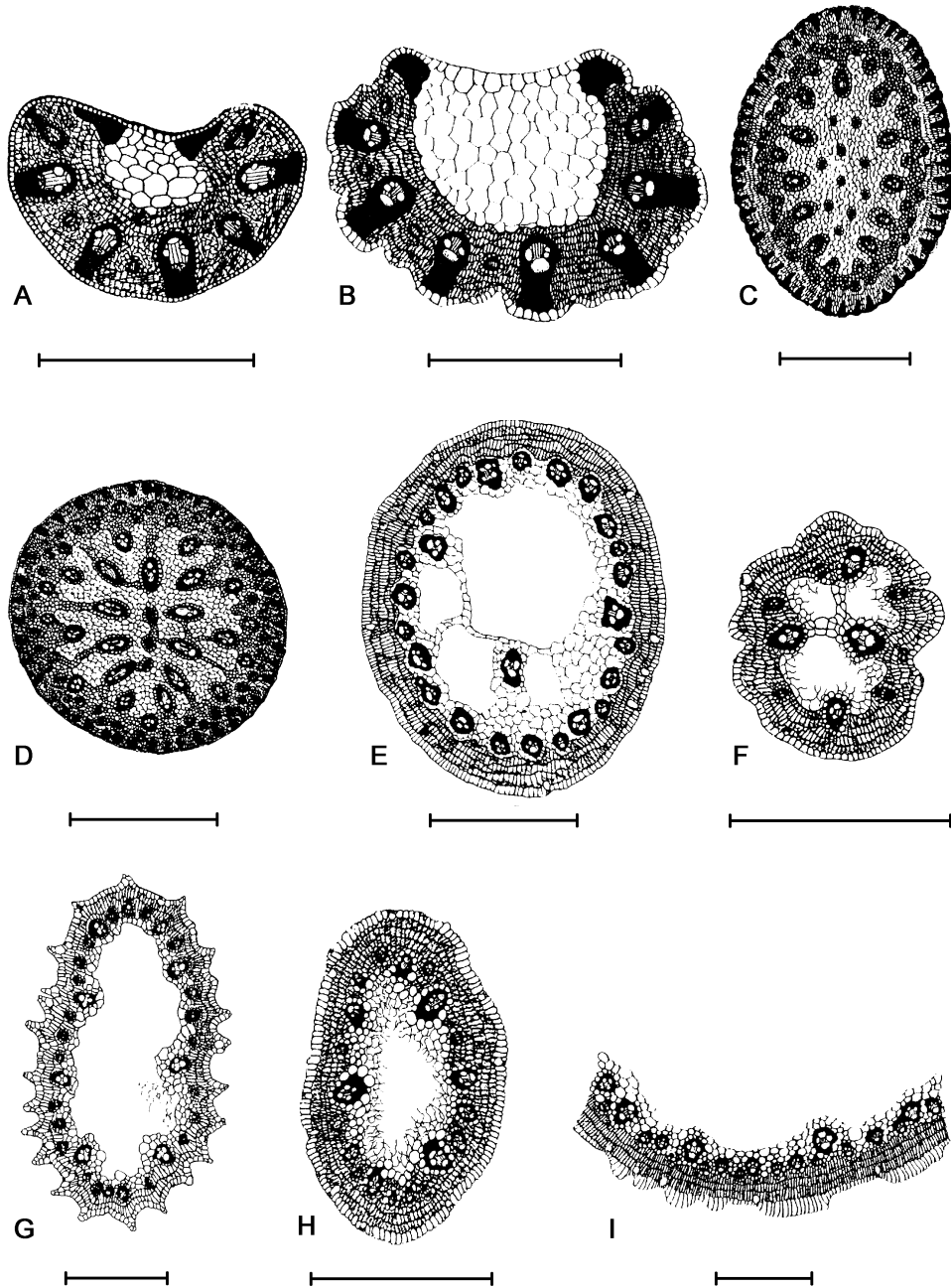
A genus of c. 315 species, almost cosmopolitan, much rarer in the tropics, with major centres of diversity in W North America, the Mediterranean, the Sino-Himalayan region, the Far East, South Africa and Australasia. Of rather marginal economic importance.

F.G.P.Buchenau, Monographia Juncacearum, *Bot. Jahrb. Syst.* 12: 1–495 (1890); F.G.P.Buchenau, Juncaceae, in H.G.A.Engler, *Pflanzenr.* (iv.36) Heft 25: 1–284 (1906); D.F.Cutler, Juncaceae, in C.R.Metcalf, *Anat. Monocotyl.* 4: 1–358 (1969). S.Snogerup, Juncaceae, in K.H.Rechinger, *Fl. Iranica* 75: 1–35 (1971); L.J.Novara, Contribución al conocimiento de las inflorescencias de *Juncus* y su significación taxonomica, *Kurtziana* 9: 41–61 (1976); V.S.Novikov, Kratkiy obzor vidov roda *Juncus* L., rasprostranennykh v Sredney Azii [A synopsis of the genus *Juncus* L. in Middle Asia], *Novosti Sist. Vyssh. Rast.* 15(1978): 77–93 (1979); C.Fernández-Carvajal, Revisión del género *Juncus* L. en la Península Ibérica 1–4, *Anales Jard. Bot. Madrid* 38: 79–89 (1981), 38: 417–467 (1981), 39: 79–151 (1982), 39: 301–379 (1982); B.J.Ertter, The *Juncus trififormis* complex, *Mem. New York Bot. Gard.* 39: 1–90 (1986); V.S.Novikov, Konspekt sistemy roda *Juncus* L. (Juncaceae), *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.* 95/5: 111–125 (1990); S.Snogerup, A revision of *Juncus* subgen. *Juncus* (Juncaceae), *Willdenowia* 23: 23–73 (1993); H.J.Noltie, Juncaceae, in H.J.Noltie, *Fl. Bhutan* 3/1: 246–273 (1994); J.Kirschner, L.J.Novara, V.S.Novikov, S.Snogerup & Z.Kaplan, Supraspecific division of the genus *Juncus* (Juncaceae), *Folia Geobot. Phytotax.* 34: 377–390 (1999); K.L.Wilson & L.A.S.Johnson, The genus *Juncus* (Juncaceae) in Malesia and allied septate-leaved species in adjoining regions, *Telopea* 9: 357–397 (2001).



**Figure 36.** Leaf L.S. of selected species of *Juncus*. **A**, leaves without septa (*J. gerardii*); **B**, pluritubulose, imperfectly septate (*J. bulbosus*); **C**, pluritubulose, perfectly septate (*J. subnodulosus*); **D**, unitubulose, perfectly septate (*J. articulatus* subsp. *articulatus*). (According to specimens from FCO and JAEN). Reproduced with permission, from C.Fernández-Carvajal, R.García & T.E.Díaz-Gonzales, *Acta Bot. Malacit.* 14: 100 (1989).

JUNCACEAE (*Juncus*)



**Figure 37.** Leaf T.S. of *Juncus* sect. *Steirochloa* (A, B), sect. *Juncus* (C, D), sect. *Ozophyllum* (E, G-I) and sect. *Stygiopsis* (F). (According to specimens from FCO and JAEN). A, *J. capillaceus*; B, *J. imbricatus*; C, *J. acutus* subsp. *acutus*; D, *J. maritimus*; E, *J. subnodulosus*; F, *J. triglumis* subsp. *triglumis*; G, *J. striatus*; H, *J. emmanuelis*; I, *J. acutiflorus* subsp. *rugosus*. Scale bars: A, B, E-I = 0.5 mm; C, D = 1 mm. Reproduced with permission, from C.Fernández-Carvajal, R.García & T.E.Díaz-Gonzales, *Acta Bot. Malacit.* 14: 100 (1989).

## KEY TO SUBGENERA AND SECTIONS

- 1 Inflorescence racemose, with the pair of floral bracteoles absent; flowers usually in heads or clusters, rarely borne  $\pm$ singly (subg. *Juncus*)
- 2 Leaves terete, stem-like, pungent, basal, not septate; vascular bundles scattered over most of T.S.; lower bract apparently forming a prolongation of stem sect. 1. **Juncus** (p. 5)
- 2: Leaves flat, compressed, canaliculate or if terete then usually septate, not stem-like, basal or cauline; vascular bundles usually in subepidermal position; lower bract usually not appearing as a stem prolongation
- 3 Leaves unitubulose or pluritubulose, perfectly septate; if pluritubulose (not bitubulose) and imperfectly septate, then terete, or flattened but then not arranged perpendicular to stem sect. 6. **Ozophyllum** (p. 151)
- 3: Leaves flat or with raised margins, not septate, or bitubulose and septate, or laterally compressed and pluritubulose and imperfectly septate (then arranged perpendicular to stem), if unitubulose and perfectly septate then with anthers distinctly exerted
- 4 Annuals sect. 3. **Caespitosi** (p. 57)
- 4: Perennials
- 5 Anthers distinctly to at least partly exerted from perianth in later stages of flowering sect. 4. **Stygiopsis** (p. 74)
- 5: Anthers not exerted
- 6 Most of inflorescence not fertile, of golden-coloured feather-like branchlets sect. 4. **Stygiopsis** (**J. ochraceus**) (p. 74)
- 6: Inflorescence usually fully fertile, not of the above appearance
- 7 Leaves laterally compressed, pluritubulose, imperfectly septate, arranged perpendicular to stem sect. 5. **Iridifolii** (p. 135)
- 7: Leaves dorsiventrally compressed or  $\pm$ canaliculate, not septate, arranged with adaxial flat side facing the stem
- 8 Seeds with two distinct appendages [Sino-Himalayan region] sect. 4. **Stygiopsis** (p. 74)
- 8: Seeds without appendages, or if appendages present then W North America sect. 2. **Graminifolii** (p. 5)
- 1: Inflorescence cymose, with a pair of floral bracteoles present below each flower; flowers usually borne singly or in loose groups (subg. *Agathryon* [subg. *Poiophylli*])
- 9 Annuals sect. 7. **Tenageia**\*
- 9: Perennials
- 10 Inflorescence seemingly lateral (pseudolateral); lower inflorescence bract terete, erect, seeming to be a continuation of stem; basal leaves bladeless; cauline leaves  $\pm$ absent; sterile shoots terete, stem-like sect. 9. **Juncotypus**\*
- 10: Inflorescence obviously terminal; lower bract flat, canaliculate or terete, not appearing as a continuation of stem; at least some basal or sub-basal leaves with a well developed blade; sterile shoots not stem-like
- 11 Cauline leaves terete; leaf epidermal cells of the same size; pith of astericiform cells sect. 10. **Forskalina**\*
- 11: Cauline and/or basal leaves flat to canaliculate; leaf blade with at least some cells of adaxial epidermis enlarged, and margins with thin sclerenchymatous strands; inner part of leaves of chlorenchyma, rarely with air channels, not of astericiform cells sect. 8. **Steirochloa**\*

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\* Sections included in Part II of the *Juncus* treatment.

## JUNCACEAE (*Juncus*)

### Subg. 1. JUNCUS

#### Sect. 1. JUNCUS

##### *Juncus* L. sect. *Juncus*

*Juncus* sect. *Acuti* [Fr. ex] T.Marsson, *Fl. Neu-Vorpommern* 454 (1869); *Juncus* subg. *Thalassici* Buchenau, *Monogr. Junc. Cap* 500 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 500 (1875)]; *Juncus* sect. *Pungentes* Cout., *Bol. Soc. Brot.* 8: 89 & 96 (1890); *Juncus* sect. *Juncastrum* [Fourr. ex] Kuntze, in G.E.Post & O.Kuntze, *Lex. Gen. Phan.* 303 (1903); *Juncus* sect. *Thalassici* (Buchenau) Vierharpper, in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a: 216 (1930); *Juncus* subg. *Juncastrum* (Kuntze) V.I.Krecz. & Gontsch., in V.L.Komarov, *Fl. URSS* 3: 543 (1935); *Juncus* subsect. *Acuti* [V.I.Krecz. & Gontsch. ex] Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 117 (1990). T: *Juncus acutus* L.

*Juncus* [unranked] *Maritimi* Engelm., *Trans. Acad. Sci. St. Louis* 2: 433 (1866); *Juncus* sect. *Maritimi* (Engelm.) Rouy, *Fl. France* 13: 230 (1912); *Juncus* subsect. *Maritimi* (Engelm.) Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 117 (1990). T: *Juncus maritimus* Lam.

*Juncus* subsect. *Roemeriani* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 117 (1990). T: *Juncus roemerianus* Scheele.

Perennials, tall, rigid. Leaves basal, terete, non-septate, pungent; leaf tip sclerenchymatous, sharp-pointed; medulla of rounded cells; vascular bundles scattered over most of T.S.; auricles absent. Stomata in longitudinal furrows. Lower bract apparently forming a prolongation of stem. Inflorescence terminal. Flowers in heads; floral bracteoles absent; peduncles  $\pm$ incrassated. Stamens 6, rarely 3. Seeds with distinct outer seed-coat forming two appendages or rarely appendages inconspicuous.

- 1 Rhizome short; plants densely caespitose; shoots intravaginal
- 2 Inner tepals with a wide scarious apical part but not notched **4. J. socotranus**
- 2: Inner tepals with broad scarious terminal? auricles, apex conspicuously notched
- 3 Capsule 4–6 mm, with 80–120 seeds; apex conical to obtuse **1. J. acutus**
- 3: Capsule 2.5–4 mm, with 25–75 seeds; apex conical to pyramidal; if capsule obtuse, inflorescence of several separate dense groups of heads
- 4 Capsule dark brown; apex pyramidal **2. J. littoralis**
- 4: Capsule pale (rarely dark) brown; apex conical to obtuse **3. J. heldreichianus**
- 1: Rhizome stout, creeping; stems dense or in elongated rows
- 5 Seeds 1.25 mm or longer; anthers 3 mm or longer; intravaginal shoots frequent **9. J. cooperi**
- 5: Seeds to 0.9 mm; anthers to 2.5 mm long; intravaginal shoots rare
- 6 Capsule trigono-ovoid or narrowly so, pale brown; apex usually attenuate or pyramidal
- 7 Capsule not or slightly exceeding tepals; apex obtuse or abruptly attenuate; anthers up to 2.5 times as long as filaments **5. J. maritimus**
- 7: Capsule exceeding tepals; apex  $\pm$ narrowly pyramidal; anthers 3–5 times as long as filaments **6. J. rigidus**
- 6: Capsule trigono-ellipsoidal to obovoid, dark brown to castaneous brown; apex usually obtuse
- 8 Seed-coat forming two small but conspicuous appendages; capsule substantially longer than wide, trigono-ellipsoidal to obovoid **7. J. kraussii**
- 8: Seed-coat tight; appendages inconspicuous; capsule broadly trigono-ellipsoidal to almost globular **8. J. roemerianus**

**1. *Juncus acutus* L., *Sp. Pl.* 325 (1753)**

*Juncus acutus* L. var. *conglobatus* Trautv., *Trudy Imp. S.-Peterburgsk. Bot. Sada* 5: 480 (1878); *Juncus acutus* L. var. *conglomeratus* Buchenau, *Bot. Jahrb. Syst.* 12: 250 (1890); *Juncus acutus* Rasse *megalocarpus* Asch. & Graebn., *Syn. Mitteleur. Fl.* 2(2): 453 (1904). T: [Europe]; lecto: LINN 449/1, left hand specimen, *vide* S.Snogerup, in P.H.Davis, *Fl. Turkey* 9: 4 (1985).

Map: S.Snogerup, *Willdenowia* 23: 36, fig. 3 (1993).

Perennials, densely caespitose; shoots intravaginal; rhizome abbreviated. Young plants often with some vegetative shoots. Inflorescence of various forms, composed of many (1–) 2–4-flowered often confluent heads. Lower two bracts leaf-like, 3–25 (–40) cm long, including the (2–) 3–6 (–10) cm long sheath; middle bracts with broad amplexicaul base; upper bracts shorter than perianth, ovate, usually brownish-membranous. Tepals  $\pm$ equal; inner tepals with prominent, scarious apical auricles, notched. Stamens 6, slightly shorter than or equalling tepals. Capsule (3–) 4–6 mm long, with 80–120 seeds; apex subconical to obtuse. Seeds ellipsoidal to narrowly ovoid, c. 20–25-striate, light brown with darker tips; outer seed-coat distinct; appendages distinct,  $\pm$ equal.

The large, mostly coastal, very disjunct distribution includes the Mediterranean and the Near East, South Africa, Atlantic Islands and NW Africa, Pacific coast of N America from Mexico to Nevada, and temperate South America. Introduced to Australasia. Two subspecies are recognized.

Capsule with conical apex, light to dark brown; inflorescence usually condensed **1a. subsp. *acutus***

Capsule with obtuse to subconical apex, usually dark brown; inflorescence usually lax **1b. subsp. *leopoldii***

**1a. *Juncus acutus* L. subsp. *acutus***

*Juncus spinosus* Forssk., *Fl. Aegypt.-Arab.* 75 (1775). T: [Egypt] Alexandria, 1761–1762, *P.Forskål*; lecto: C-FORSK 29 (Cent. III, no. 38), *vide* S.Snogerup, *Willdenowia* 23: 34 (1993).

*Juncus multibracteatus* Tineo, in G.Gussone, *Fl. Sicul. Prodr. Suppl.* 105 (1832); *Juncus acutus* L. var. *effusus* Buchenau, *Bot. Jahrb. Syst.* 12: 250 (1890); *Juncus acutus* subsp. *multibracteatus* (Tineo) K.Richt., *Pl. Eur.* 1: 179 (1890). T: [Italy] 'In humentibus Castronuovo', *A.Todaro* 556; syn: BM, FI, K, W.

*Juncus karelinii* Steud., *Syn. Pl. Glumac.* 297 (1855). T: Middle Asia, Astrabad, *G.S.Karelin*; lecto: LE, *vide* S.Snogerup, *Willdenowia* 23: 34 (1993).

*Juncus acutus* L. var. *longibracteatus* Buchenau, in P.E.Boissier, *Fl. Orient.* 5: 354 (1882). T: [Iraq] Tall 'Afar between Sindschar and Mosul, 1867, *H.C.Hausknecht* 978, syn: G-BB.

*Juncus acutus* var. *decompositus* Guss., *Enum. Pl. Inarim.* 345 (1854); *Juncus acutus* subsp. *decompositus* (Guss.) Arcang., *Comp. Fl. Ital.* 715 (1882). T: [Italy] Inarime Is [Ischia], 1812, *Thomas*; syn: FI, *n.v.*

*Juncus acutus* [Rasse] *megalocarpus* Asch. & Graebn., *Syn. Mitteleur. Fl.* 2(2): 453 (1904). T: [not designated].

Illustration: S.Snogerup, *Willdenowia* 23: 35, fig. 2, A–H (1993).

Map: S.Snogerup, *Willdenowia* 23: 36, 38, fig. 4 (1993).

Stem 50–150 cm tall, rigid, 2–4 (–6) mm in diam.; leaves (10–) 30–80 (–120) cm long, 1.5–4 mm in diam. Inflorescence 5–15  $\times$  3–7 cm, usually dense, almost sphaerical, rarely lax, elongated or wide, with (10–) 50–100 (–200) heads. Tepals (2.8–) 3.5–4 (–4.5) mm long, usually equal, oblong, with broad hyaline margins; outer tepals slightly cymbiform, basally  $\pm$ keeled, obtuse, with a mucro up to 0.3 mm long. Anthers 1.5–1.8 (–2.0) mm, 2.5–4 times as long as filaments; style 0.5–0.8 mm long; stigmas 1.5–2 mm long. Capsule 4–6 mm long, spheroidal to ovoid, conical above, glossy, stramineous to dark brown, triseptate; mucro very short. Seeds 0.8–1.1 mm long, or 1.8–2.5 mm long including appendages.  $2n = 48$ , *vide* Snogerup, *Willdenowia* 23: 37 (1993). Figs 37, 38.

Coasts of W Europe, Mediterranean, Near East, Black Sea and S Caspian area. Introduced to Australia and New Zealand. 10: GRB, IRE. 12: BAL, COR, FRA, POR, SAR, SPA. 13: ALB, GRC, ITA, KRI, SIC, TUE, YUC. 20: ALG, EGY, LBY, MOR, TUN. 32: TKM. 33: TCS. 34: CYP, EAI, IRN, IRQ, LBS, PAL, SIN, TUR. 35: KUW. 50: nsw, soa, vic, wau. 51: nzn. Sandy habitats, including sand dunes, salt marshes, rarely freshwater marshes, almost always at the sea coast. Map 174.

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**Figure 38.** *Juncus acutus* subsp. *acutus*. **A**, habit of young plant with depauperate inflorescence; **B**, **C**, inflorescences; **D**, flower; **E**, inner and outer tepals with stamens; **F**, flower with ripe fruit; **G**, ripe capsule; **H**, seeds. *Juncus acutus* subsp. *leopoldii*. **J**, **K**, inflorescences; **L**, flower head in late flower; **M**, flower with young fruit; **N**, flower with ripe fruit and capsule; **O**, seeds. (**A**, M.N.El Hadidi 24 Aug 1952, LD; **B**, S.Snogerup 1473, LD; **C**, **F**–**H**, S.Snogerup 23608, LD; **D**, **E**, S.Snogerup, cult. no. 360, LD; **J**, **N**, **O**, E.Wängsjö 231, LD; **K**–**M**, S.Snogerup, cult. no. 3850, LD). Scale bars: **A**–**C**, **J**, **K** = 10 cm; **D**, **E** = 2 mm; **F**, **G**, **L**–**N** = 3 mm; **H**, **O** = 1 mm. Drawn by B.Johnsen. Reproduced with permission from S.Snogerup, *Willdenowia* 23: 35, fig. 2 (1993).

10. GREAT BRITAIN: England, Norfolk, Burnham Overby, *A.C.Jermy & G.Simmons 535* (BM). 12. FRANCE: Bouches-du-Rhône, Les Stes Maries, *S.Snogerup 360* (LD). CORSE: Ajaccio, *H.Roessler 3557* (M). 13. GREECE: Kerkyra, *S.Snogerup 23608* (LD). 20. ALGERIA: between Boufakir and Kolea, *P.H.Davis 59506* (E, BM). EGYPT: El Dikheila, *M.N.El Hadidi s.n.* (LD). 34. IRAN: Nov-Char, *Sabeti 111* (W). JORDAN: Azraq, *V.Täckholm 9088* (CAI, K). TURKEY: Istanbul, Catalca, *Tutel & Delice 32935* (ISTF). 50. NEW SOUTH WALES: Clyde R., Nelligen, *E.F.Constable 43125* (UC). 51. NORTH ISLAND: Papuke turnoff at head of Whangaroa inlet, *R.Melville 5346*, 12 Nov 1961 (NSW).

**1b. *Juncus acutus* subsp. *leopoldii* (Parl.) Snogerup, *Bot. Not.* 130: 187 (1978)**

*Juncus leopoldii* Parl., *Giorn. Bot. Ital.* 2(1): 324 (1846); *Juncus acutus* var. *leopoldii* (Parl.) Buchenau, *Monogr. Junc. Cap* 421 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 421 (1875)]. T: South Africa, Sommerset, Stellenbosch, *C.F.Ecklon & C.Zeyher 4308*; lecto: FI, *fide* S.Snogerup, *Willdenowia* 23: 37 (1993); iso: S, W.

*Juncus acutus* L. var. *sphaerocarpus* Engelm., in J.Wheeler, *Rep. U.S. Geol. Survey, Bot.* 6: 376 (1878); *Juncus robustus* S.Watson, *Proc. Amer. Acad. Arts* 14: 302 (1879). T: California, S. Barbara [not found].

*Juncus acutus* L. f. *xanthosus* Jeps., *Fl. Calif.* 1: 249 (1921). T: California, NW of Indio, Thousand Palms Cañon, *W.L.Jepson 6041*; holo: UC.

Illustration: S.Snogerup, *Willdenowia* 23: 35, fig. 2, J–O (1993).

Map: S.Snogerup, *Willdenowia* 23: 36, 68, fig. 22 (1993).

Stem (50–) 80–150 (–200) cm tall, usually 1.5–2.5 (–6) mm in diam.; leaves 40–100 cm long, 1.5–3 mm in diam.; sheaths wide, up to 25 cm long. Inflorescence 5–30 (–40) × 2–6 (–8) cm, lax or rarely congested, with (10–) 35–100 (–250) heads; heads often densely aggregated into ±large groups. Tepals 2.2–3.7 mm long; outer tepals inserted slightly below the inner, oblong with broad hyaline margins; inner tepals cymbiform with small distal auricles; mucro up to 0.5 mm long. Anthers 1.4–1.8 mm long, (2–) 2.5–4 times as long as filaments. Style 0.6–1.3 mm long; stigmas 1.5–2.5 mm long. Capsule (3–) 3.5–5 mm long, obovoid, usually castaneous to dark or rarely light brown, basally lighter, trilocular or when ripe triseptate; apex usually obtuse; mucro 0.2–0.6 mm. Seeds 0.7–0.8 (–0.9) mm long, or 1.1–1.4 mm long including appendages. 2n = 48, *fide* S.Snogerup, *Willdenowia* 23: 39 (1993). Fig. 38.

Large disjunct distribution range: Atlantic Islands, NW African Coast and Iberian Peninsula, South Africa, C temperate South America, W coast of Mexico, California and Nevada, Bermuda. 12: POR, SPA. 20: EGY, LBY, MOR. 21: CNY, CVI, MDR. 27: CPP, LES, NAM, NAT, OFS. 28: ASC. 76: ARI, CAL, NEV. 79: MXN. 81: BER. 84: BZS. 85: AGE, AGS, AGW, CLN, CLS, JNF, URU. Coastal sandy habitats, salt marshes and inland saline or marshy habitats, from sea level to 1400 m (in South Africa). Map 175 [the map includes intermediates between the subspecies in the Azores and Iberian Peninsula].

12. PORTUGAL: Estremadura, Sacavém, Rio Trancão, *Foules & Rainha 15381* (S). SPAIN: La Coruña, 2 Oct 1852, *J.M.C.Lange* (C, GB). 20. MOROCCO: Tanger, *H.Lindberg 1532* (H). 21. CANARY IS.: Gran Canaria, *E.Wängsjö 231* (LD). 27. CAPE PROVINCE: Laingsburg, *R.H.Compton 6761* (BOL). 76. CALIFORNIA: Los Angeles, *S.Snogerup & B.Snogerup 3850* (LD). 85. ARGENTINA NORTHWEST: Salta, Chicoana, La Maroma, Río Arias, Cabra Corral Dam, 1030 m, *L.J.Novara 10577* (MCNS). ARGENTINA NORTHEAST: Buenos Aires, Laguna Sauce Grande, *R.Santesson 97* (S). CHILE: Antofagasta, Taltal, *Johnston 5126* (K).

Rare intermediates between the subspecies are known from SW Europe, Libya and Egypt, and Azores [e.g., Egypt, Ain Murun, *Ascherson 513* (CAI, G, K, M, W, WU)]. Occurrence in NW Africa, Spain and Portugal may be a result of a relatively recent introduction.

**2. *Juncus littoralis* C.A.Mey., *Verz. Pfl. Casp. Meer.* 34 (1831)**

*Juncus acutus* L. var. *littoralis* (C.A.Mey.) Trautv., *Trudy Imp. S.-Peterburgsk. Bot. Sada* 5: 480 (1831); *Juncus acuto-maritimus* E.Mey., in C.F. von Ledebour, *Fl. Ross.* 4: 234 (1853), *nom. illeg.*; *Juncus acutus* subsp. *littoralis* (C.A.Mey.) Feinbrun, *Fl. Palaestina* 4: 143 (1986). T: Insula Sara, 26 Jun 1830, *C.A.Meyer 138*; lecto: LE, *fide* S.Snogerup, in K.H.Rechinger, *Fl. Iranica* 75: 6 (1971); iso: G, G-BOIS, W.

*Juncus tommasinii* Parl., *Fl. Ital.* 2: 315 (1852); *Juncus acutus* L. subsp. *tommasinii* (Parl.) Arcang., *Comp. Fl. Ital.* 715 (1882); *Juncus acutus* L. var. *tommasinii* (Parl.) Buchenau, *Bot. Jahrb. Syst.* 12: 250 (1890); *Juncus acutus* proles *tommasinii* (Parl.) Rouy, *Fl. France* 13: 230 (1912). T: [Italy] 'Nei paludi presso Monfalcone, Grado', *M.G.S.Tommadini*, lecto: FI, *fide* S.Snogerup, *Willdenowia* 23: 40 (1993).



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*Juncus adriaticus* Gand., *Contrib. Fl. Terrae Slav. Merid.* 1: 29 (1883). T: [Croatia] Dalmatia, in litore maris, [collector not given]; syn: LY, *n.v.*; [Italy] prope Rimini, *L.Caldesi*; syn: LY, *n.v.*

*Juncus acutus* L.  $\beta$  [unranked] *microcarpus* Loret & Barrandon, *Fl. Montpellier*, ed 2, 512 (1886), *n.v.*; *Juncus acutus* L. var. *microcarpus* (Loret & Barrandon) Husn., *Joncées* 9 (1908). T: [neither protologue nor authentic material seen], *n.v.*

*Juncus acutus* B.II. [unranked] *gallicus* Asch. & Graebn., *Syn. Mitteleur. Fl.* 2(2): 455 (1904); *Juncus acutus* var. *gallicus* (Asch. & Graebn.) Rouy, *Fl. France* 13: 230 (1912). T: [S France] Süd-Frankreich [otherwise not indicated].

*Juncus acutus* L. [unranked] *tyraicus* Pacz., *Fl. Chers.* 1: 381 (1914); *Juncus tyraicus* (Pacz.) V.I.Krecz. & Gontsch., in V.L.Komarov, *Fl. URRS* 3: 544 (1935); *Juncus acutus* subsp. *tyraicus* (Pacz.) I.Grint., in E.J.Nyárády, *Fl. Rep. Soc. Roman.* 11: 556 (1966). T: [Ukraine] 'In maritimis subhumidis arenosis salsis in insula ad ostia Tyrae fluv. copiose', 9 & 22 Jun 1906, *J.K.Paczoski*, lecto: LE, *fide* S.Snogerup, *Willdenowia* 23: 42 (1993); iso: G.

Illustration: S.Snogerup, *Willdenowia* 23: 41, fig. 5 (1993).

Map: S.Snogerup, *Willdenowia* 23: 43, fig. 6 (1993).

Perennials, 50–100 cm tall, densely caespitose; shoots intravaginal; rhizome short. Stem rigid, usually 2–4 mm in diam. Basal leaves 2–6, 25–100 cm long, 1.5–3.0 mm in diam. Lower two bracts leaf-like, pungent, 4–15 (–20) cm long, including 2–4 (–7) cm long sheath, shorter than inflorescence; middle bracts  $\pm$ without blades, base broad, amplexicaul; bracts subtending heads shorter than flowers. Inflorescence 5–20 (–40)  $\times$  2–7 cm, lax to  $\pm$ dense, of (10–) 50–200 usually 2–3-flowered heads. Flowers hermaphrodite. Tepals 2.5–3.0 mm long, with inner tepals slightly longer, with border broad, scarious; outer tepals with narrow scarious wings above, obtuse and mucro up to 0.4 mm; inner tepals with broad distal auricles, notched, with mucro very short. Stamens 6, equalling tepals; anthers 1.2–1.9 mm long, 4–5 times as long as filaments; style 0.8–1.3 mm long; stigmas 1.5–2 mm long, contorted. Capsule 2.5–3.5 (–4) mm long, exceeding tepals, subglobose to trigono-ovoid, dark brown to castaneous above, triseptate, c. 25–60-seeded; apex pyramidal, with mucro 0.2–0.5 mm. Seeds 0.8–1.1 mm long, 1.5–2.0 mm long including appendages, inconspicuously reticulate with 25–30 longitudinal striae; appendages  $\pm$ equal.  $2n = 48$ , *fide* S.Snogerup, *Willdenowia* 23: 42 (1993). Fig. 39.

S and SE Europe along the N coast of the Mediterranean Sea, N Egypt, E Mediterranean coast, Black Sea Coast, S Caspian area. 12: FRA, SPA. 13: ALB, BUL, GRC, ITA, KRI, ROM, TUE, YUC. 14: KRY, UKR. 20: EGY. 32: TKM. 33: TCS. 34: CYP, EAI, IRN, LBS, PAL, SIN, TUR. On moving sand and other sandy coastal habitats, rarely in saline inland habitats. Map 176.

12. SPAIN: Barcelona, Castelldefels, 11 Jun 1920, *E.M.Sennen* (K, G-BB). 13. ITALY: Emilia, Valli di Commachio, 24 May 1957, *S.Snogerup s.n.* (LD). GREECE: Naxos, *S.Snogerup* 1727, 1697, 1702 (LD). ROMANIA: Dobrogea, St. Gheorge, *E.J.Nyárády* [*Fl. Rom. Exs.*] 362 (BM, C, E, G, H, K, O, S, WU). 20. EGYPT: Minia, Abu Qurqas, 13 Mar 1952, *V.Täckholm* (CAI, LD). 33. AZERBAJDZHAN: Karai-Emoney, *Doroshko* & *M.E.Heideman* (LE). 34. IRAN: Farahabad, Caspian shore, *Furse* 7146 (K). ISRAEL: Negev, coast, *Naftolsky* 13455 (HUJ, LD). TURKEY: Hatay, Iskenderun, *P.H.Davis* & *I.C.Hedge* 26955 (K, BM, E).

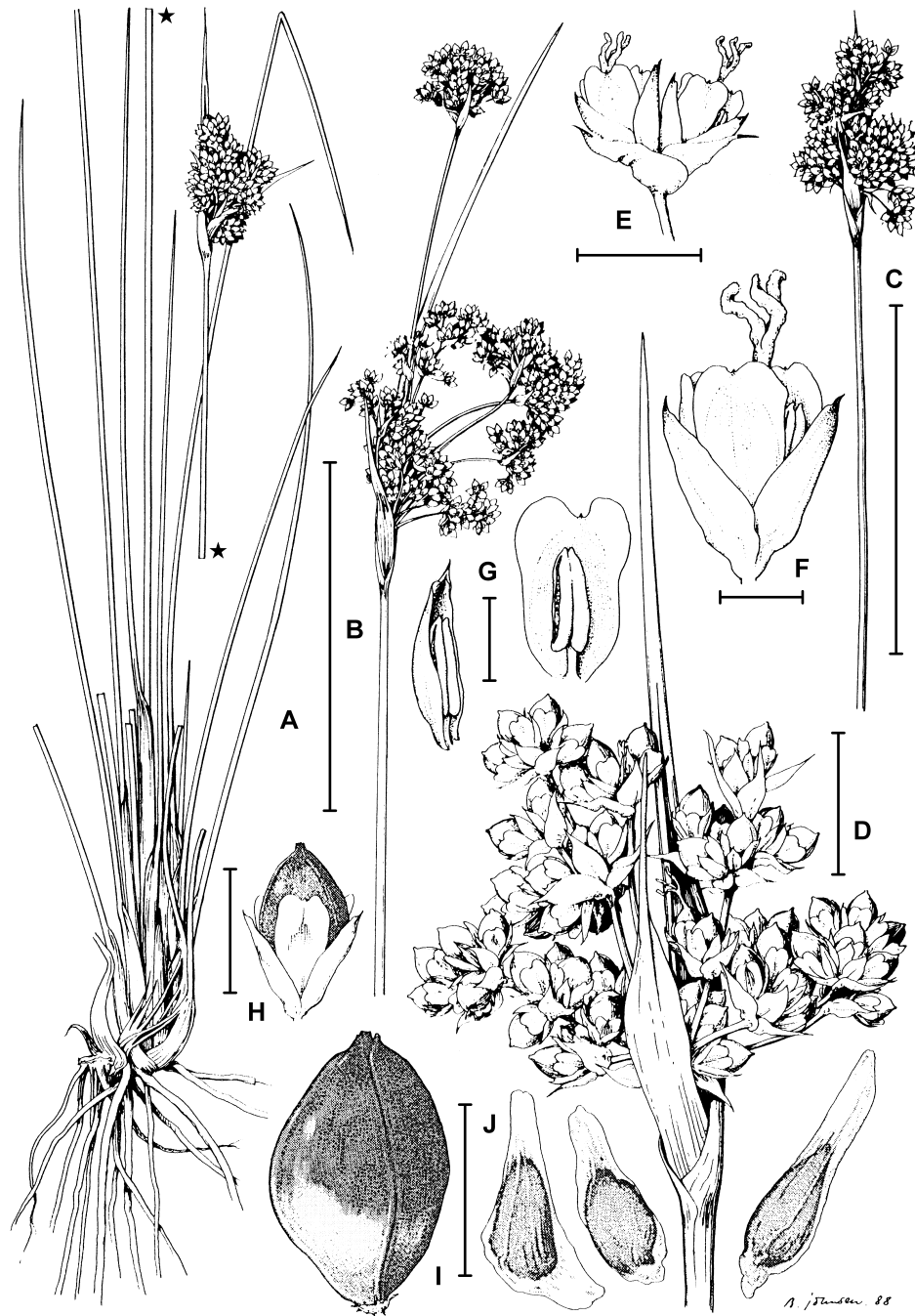
### 3. *Juncus heldreichianus* T.Marsson ex Parl., *Fl. Ital.* 2: 315 (1852)

*Juncus acutus* L. var. *heldreichianus* (Parl.) Halácsy, *Consp. Fl. Graec.* 3: 280 (1904). T: [Greece] 'ad Phalerum Atticae', 13 Jun 1851, *T.H.Heldreich* 1993; lecto: FI, *fide* S.Snogerup, in K.H.Rechinger, *Fl. Iranica* 75: 6 (1971), iso: FI, G-BOIS, K.

*Juncus phalereus* Gand., *Contrib. Fl. Terrae Slav. Merid.* 1: 29 (1883). T: [Greece] ad Phalerum Atticae, *T.H.Heldreich* 466; syn: W.

Map: S.Snogerup, *Willdenowia* 23: 48, fig. 9 (1993).

Perennials, densely caespitose; shoots intravaginal; rhizome abbreviated, inconspicuous. Lower two bracts leaf-like, pungent, with large sheaths; middle bracts with broad amplexicaul base; bracts below heads non-herbaceous, amplexicaul, ovate, light brown, pointed. Inflorescence lax, of various forms, with 8–200 heads, with usually even upper bracts possessing small laminas. Flowers light brown. Tepals equal or subequal, oblong with broad hyaline margins; outer tepals with small distal scarious wings; inner tepals with



**Figure 39.** *Juncus littoralis*. **A**, base of culm and inflorescence; **B–D**, inflorescences; **E**, two-flowered head; **F**, flower; **G**, tepals with stamens; **H**, flower with ripe fruit; **I**, capsule; **J**, seeds. (**A**, Naftolsky13455, HUI, LD; **B–D**, **H**, **K**, **L**, *S. Snogerup*, cult. nos. 1727, 1697, 1702, LD; **E–G**, *S. Snogerup* s.n., 24 May 1957, LD). Scale bars: **A–C** = 10 cm; **D** = 1 cm; **E**, **H** = 3 mm; **F**, **G**, **J** = 1 mm; **I** = 2 mm. Drawn by B. Johnsen. Reproduced with permission from S. Snogerup, *Willdenowia* 23: 41, fig. 5 (1993).

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**Figure 40.** *Juncus heldreichianus* subsp. *heldreichianus*. **A**, stem with depauperate inflorescence from young tussock; **B**, **C**, **I**, inflorescences; **D**, flower head; **E**, tepals with stamens; **F**, flower with ripe fruit; **G**, capsule; **H**, seeds. (**A**, *S.Snogerup*, cult. no. 2637, LD; **B**, **G**, *S.Snogerup*, cult. no. 1784, LD; **C**, **E**, **I**, *H.Runemark & S.Snogerup* 6566, LD; **D**, *S.Snogerup & Bothmer* 31749, LD; **F**, **H**, *H.Runemark & Bentzer* 29945, LD). Scale bars: **A–C** = 10 cm; **D**, **F** = 5 mm; **E**, **G** = 2 mm; **H** = 1 mm; **I** = 1 cm. Drawn by B.Johnsen. Reproduced with permission from *S.Snogerup*, *Willdenowia* 23: 45, fig. 7 (1993).

prominent scarious distal auricles, notched; tepals and bracts usually brown to reddish brown, punctulate-striulate. Stamens 6,  $\frac{3}{4}$ – $\frac{4}{5}$  as long as tepals. Capsule 2.8–4 (–4.5) mm long, ovoid to spheroidal, light to dark brown; apex conical to obtuse; seeds 40–75. Seeds obliquely ovoid, c. 20–25-striate; seed-coat distinct.

From Greece, Aegean area and Turkey to N Iran, Caucasus and Turkmenistan. Two subspecies are known.

Capsule usually with conical apex; inflorescence elongated, usually of numerous small heads

**3a. subsp. heldreichianus**

Capsule usually with obtuse apex; inflorescence of few heads or groups of heads, not elongated

**3b. subsp. orientalis**

**3a. *Juncus heldreichianus* T.Marsson ex Parl. subsp. *heldreichianus***

Illustration: S.Snogerup, *Willdenowia* 23: 45, fig. 7 (1993).

Map: S.Snogerup, *Willdenowia* 23: 48, fig 9 (1993).

Stem 40–100 (–150) cm tall, rather rigid but usually compressed and ±arcuate, usually 1.5–2.5 mm in diam.; leaves (10–) 40–100 (–150) cm long, 1.5–3 mm in diam. Inflorescence 10–40 × 3–5 cm, lax, elongated, with (10–) 40–100 (–200) heads; heads sometimes in several clusters. Lower bract 6–40 cm long, including a sheath (2–) 4–6 (–10) cm long, usually shorter than inflorescence; second lowest bract 3–7 cm long, including sheath (1–) 2–3 (–5) cm long; middle bracts often with small pungent laminas. Heads (1–) 2–5 (–8)-flowered. Tepals 3–4 mm long; outer tepals slightly cymbiform, not or little keeled basally, obtuse, mucronate. Anthers 1.5–2.2 mm long, 5–8 times as long as filaments; style 0.8–1.5 mm long; stigmas 1–1.5 mm long. Capsule 3–4 (–4.5) mm long, up to 1.5 times as long as tepals, ovoid or rarely subspheroidal; apex conical or rarely obtuse or slightly angular; mucro very short. Seeds 0.8–0.9 mm long, or 1.0–1.5 mm long including appendages; appendages slightly unequal.  $2n = 48$ , *fide* S.Snogerup, *Willdenowia* 23: 44 (1993). Fig. 40.

Greece, Aegean area, W, C and S Turkey, Cyprus. 13: GRC, KRI, TUE. 34: CYP, TUR. Sand dunes, sandy places, salt and freshwater marshes, along streams, from sea level to 1700 m. Map 177.

13. GREECE: Naxos, S.Snogerup 2637 (LD); Ikaria, *H.Runemark & S.Snogerup 6566* (LD); Korinth, *S.Snogerup 20405* (LD); Zakynthos, *Stamatiadou 11483* (ATH). KRITI: Iraklio, *H.Merxmüller & Wiedmann 19/54* (M); Sitia, *H.Runemark & S.Snogerup 17920* (LD). 34. CYPRUS: Akhyritou, *R.D.Meikle 2613* (C, K). TURKEY: Istanbul, Halkali, *Argöksel 25326* (ISTF); Mugla, Fethyie, *Fitz 359* (W).

**3b. *Juncus heldreichianus* subsp. *orientalis* Snogerup, in K.H.Rechinger, *Fl. Iranica* 75: 7 (1971)**

*Juncus orientalis* (Snogerup) Filim., *Opred. Rast. Sred. Azii* 5: 110 (1976). T: Iran, 94 km N Khvoy inter Shahabad & Maku, *K.H.Rechinger 32735*, holo: W.

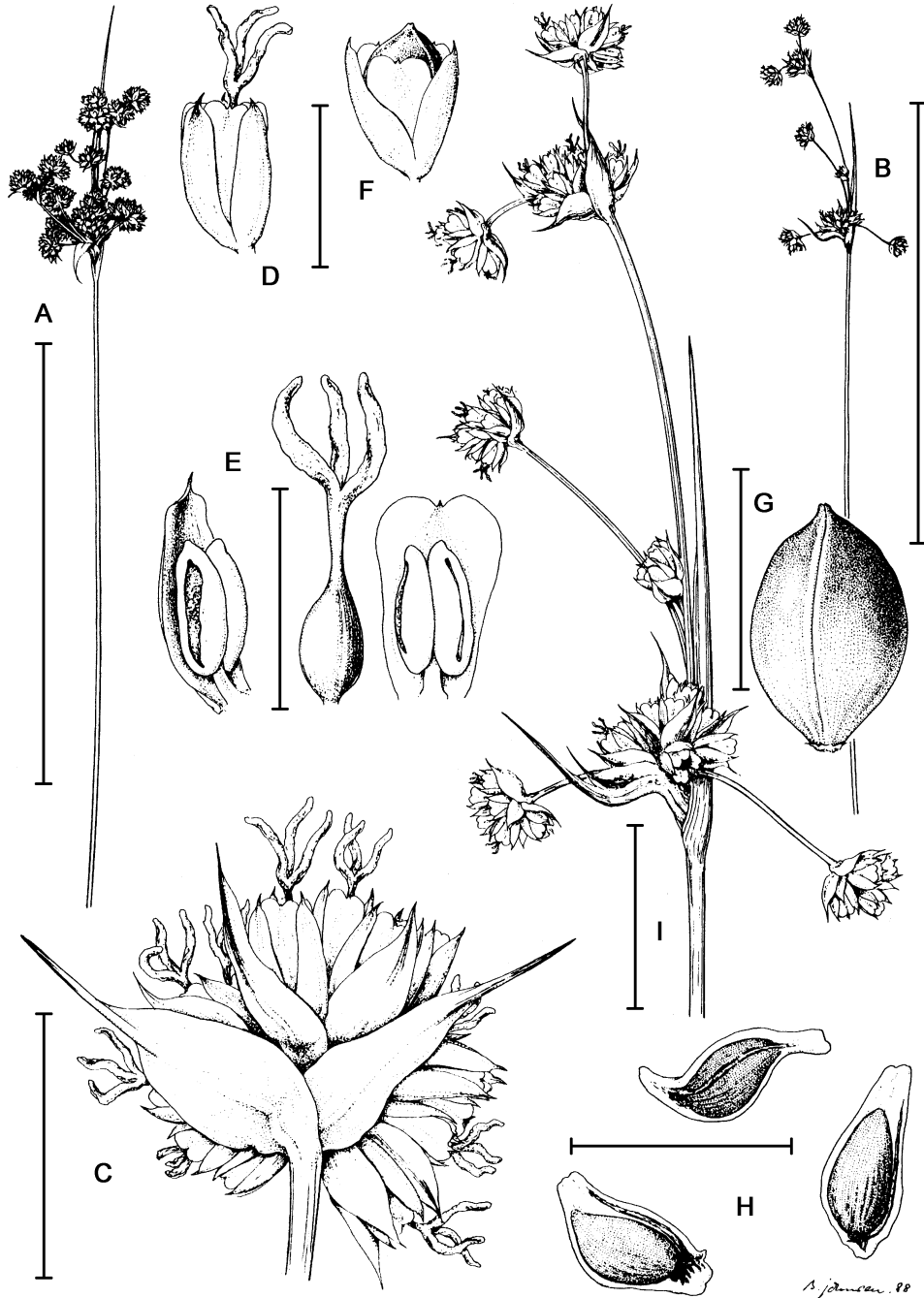
*Juncus tenax* Banks & Sol., in *A.Russel, Nat. Hist. Aleppo*, ed. 2, 2: 251 (1794), *nom. illeg., non* Sol. in Forster (1786). T: Syria, Aleppo, *Russel*; syn: BM.

Illustration: S.Snogerup, *Willdenowia* 23: 47, fig. 8 (1993).

Map: S.Snogerup, *Willdenowia* 23: 48, fig. 9 (1993).

Stem 30–70 cm tall, rigid, erect, usually 1.5–2.5 mm in diam.; leaves (10–) 20–45 cm long, 1.5–3 mm thick. Inflorescence 4–10 × 2–5 cm, lax, with 8–30 well separated heads. Lower bract 3–7 (–15) cm, including a sheath 1.5–2.5 cm long, longer or slightly shorter than inflorescence; second lowest bract usually inconspicuous, 1.5–4 cm long, including sheath 1–2 cm long; middle bracts usually with no or only small laminas. Heads (3–) 4–5 (–8)-flowered. Tepals 2.5–3.5 mm long; outer tepals cymbiform, keeled and thickened by spongy tissue basally, obtuse, with mucro 0.1–0.3 mm long. Anthers 1.4–2.0 mm long, 4–8 times as long as filaments; style 1–1.5 mm long; stigmas 1–1.5 mm long. Capsule 2.8–3.5 mm long, equalling or slightly exceeding tepals, spheroidal with obtuse or shortly conical apex; mucro c. 0.2 mm long. Seeds 0.75–0.8 mm long, or 1.2–2.0 mm long including appendages; appendages conspicuously unequal. Fig. 41.

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**Figure 41.** *Juncus heldreichianus* subsp. *orientalis*. A, B, I, inflorescences; C, flower head; D, flower; E, tepals and pistil; F, flower with ripe fruit; G, capsule; H, seeds. (A, Hewitt 258, E; B-E, I, Secmen & al. 3442, LD; F-H, Secmen & E. Leblebici 3076, LD). Scale bars: A, B = 10 cm; C = 5 mm; D, F = 3 mm; E, G = 2 mm; H = 1 mm; I = 1 cm. Drawn by B. Johnsen. Reproduced with permission from S. Snogerup, *Willdenowia* 23: 47, fig. 8 (1993).

From Turkey (C and E Anatolia) and Syria to N Iran, Caucasus and Middle Asia. 32: TKM, TZK. 33: TCS. 34: IRN, LBS, TUR. Permanently or seasonally wet places, slightly to strongly saline habitats, known from sites between 800–1700 m. Map 178.

32. TADZHIKISTAN: Zeravshan, Peyshambe, *B.Fedtschenko 1280* (K). 33. GEORGIA: Kartalinia, Gori, *V.F.Brotherus* (BM, H). 34. IRAN: Khoi, *Furse 2315* (E, K, W); Lake Rezaiyeh, *Jacobs 6894* (E, K, L, W). SYRIA: Aleppo, *Russel* (BM). TURKEY: Agri, Diyadin, *Hewitt 258* (E); Eskisehir, *Secmen & al. 3442* (LD); Konya, Ak Göl, *Secmen & E.Leblicici 3076* (LD).

#### 4. *Juncus socotranus* (Buchenau) Snogerup, *Willdenowia* 23: 49 (1993)

*Juncus maritimus* Lam. var. *socotranus* Buchenau, *Bot. Jahrb. Syst.* 12: 258 (1890). T: Socotra, Kisher, 1000–600 m, 29 Apr 1881, *G.A.Schweinfurth 604*; holo: K; iso: WU.

Illustration: S.Snogerup, *Willdenowia* 23: 50, fig. 10 (1993).

Map: S.Snogerup, *Willdenowia* 23: 51, fig. 11 (1993).

Perennials, 80–150 (–200) cm tall, densely caespitose; shoots intravaginal; rhizome short. Stem 2–4 (–6) mm in diam. Basal leaves up to 10, 25–110 cm long, 2–4 mm in diam.; leaf sheaths broad, basally brown, forming a thick cover around the base. Lower two bracts leaf-like, pungent, with longer one 8–25 (–40) cm long including a 4–8 cm long sheath, usually shorter than inflorescence; middle bracts small, amplexicaul, with small pointed blade; head bracts shorter than flowers, ovate, acuminate. Inflorescence (13–) 20–40 × (2–) 5–10 (–15) cm, ±lax, often storied, of (60–) 200–500 or more (1–) 2–4 (–6)-flowered heads. Tepals 2.2–3.0 mm long, equal or with the inner ones slightly longer; margin scarious; outer tepals slightly broader apically; mucro to 0.2 mm long; inner tepals oblong, obtuse, distally widely bordered silvery hyaline and cucullate, not or slightly notched. Bracts and tepals ±conspicuously red punctulate-striulate. Stamens 6, 2/3–3/4 as long as tepals; anthers 1.1–1.7 mm long, (2.5–) 4–6 times as long as filaments; style 1–1.5 mm long; stigmas 1.5–2.5 mm long. Capsule 2.5–3 mm long, exceeding tepals, trigono-ovoidal to spheroidal, abruptly contracted to (0.1–) 0.3–0.6 mm mucro, dark brown, trilocular, 25–35-seeded. Seeds 0.6–0.8 × 0.25–0.35 mm, or 0.85–1.5 mm long including appendages, narrowly ovoid, c. 20-striate; appendages ±unequal. Fig. 42.

Middle East from Socotra and Saudi Arabia to Iran. 24: SOC. 34: IRN. 35: GST, OMA, SAU, YEM. Along streams, saline habitats, most often between 600–1000 m, rarely to 2500 m. Map 179.

24. SOCOTRA: Adhein, 950 m, *Gwynne 194* (BM). 34. IRAN: Bandar-Abbas, 35 km from Senderk to Araghin Deh-e-Ziaraton, 1000 m, *V.Mozaffarian 44488* (LD). 35. GULF STATES: Fujairah Emirate, between Khatt and Dibla, *Western 19* (E). OMAN: Mascate, *P.M.R.Aucher-Eloy 5475* (K); Amlah near Ibri, Nadi al Ayn, 500 m, *Whitcombe 71* (E); Yangul, *H.W.Lawton 2274* (BM). SAUDI ARABIA: Khaybar, *Zeller 16403* (BM); *Popov 71/64* (BM); Bashawat Shimran, *Al-Sheik 528E* (CAI). YEMEN: Dhamar, 10 km W, *Wood 2986* (BM, K).

#### 5. *Juncus maritimus* Lam., *Encycl.* 3: 264 (1789)

T: 'en Angleterre, en France'; lecto: P-LAM, photo 657, *fide* S.Snogerup, *Willdenowia* 23: 52 (1993).

*Juncus broteroi* Steud., *Syn. Pl. Glumac.* 2: 297 (1855). T: [Portugal] Lusitania, *F.M.J.Welwitsch [It. Lusit.] 330*; syn: BM, G, K.

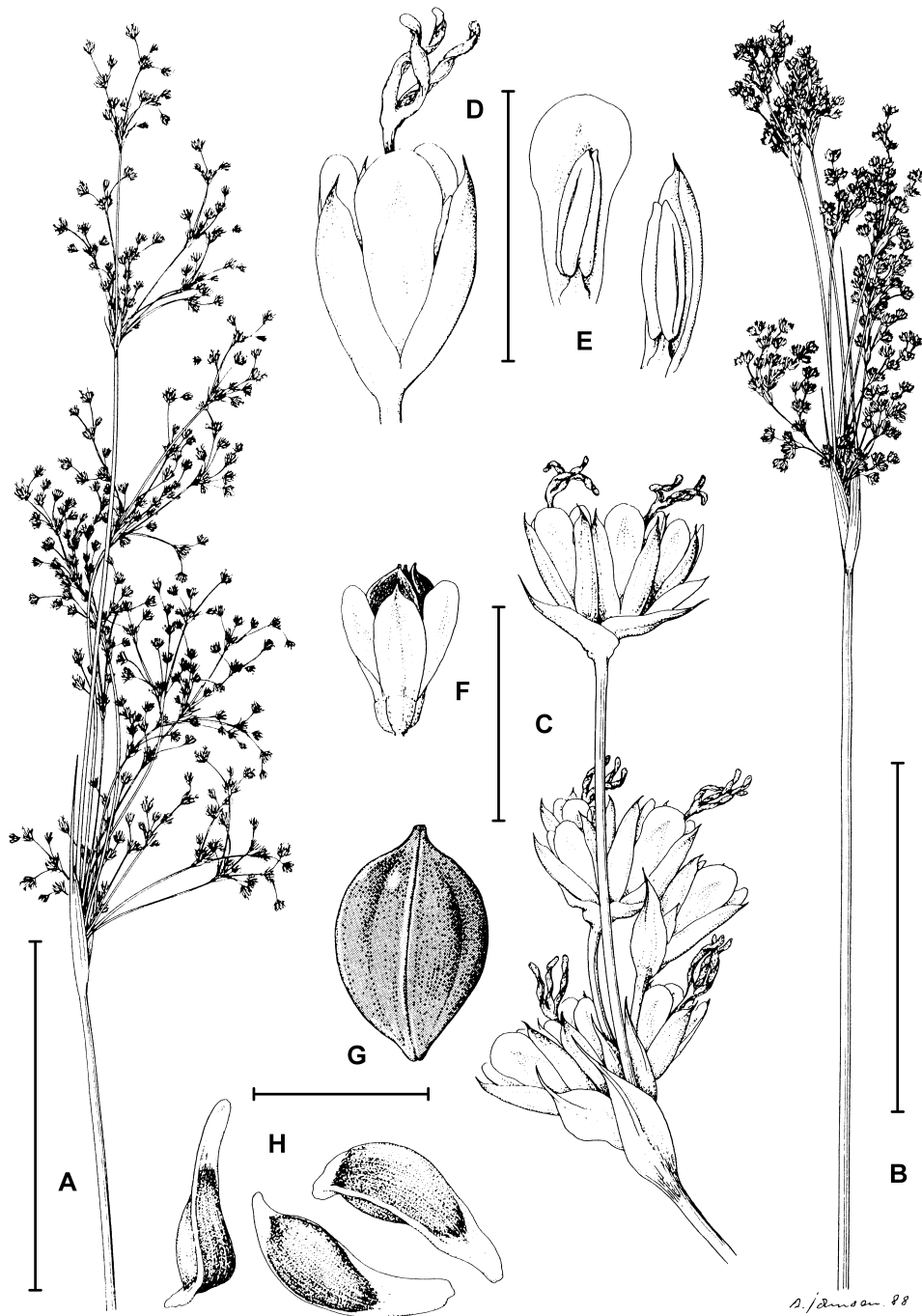
*Juncus ponticus* Steven, *Bull. Soc. Imp. Naturalistes Moscou* 3: 94 (1857); *Juncus maritimus* B. [unranked] *ponticus* (Steven) Asch. & Graebn., *Syn. Mitteleur. Fl.* 2(2): 456 (1904). T: [Ukraine, Crimea], 'Taur. merid.', 1803, *C.Steven*; holo: H.

*Juncus pseudacutus* Pau, *Not. Bot. Fl. Espan.* 6: 100 (1895). T: Spain, Monreal del Campo, Aug 1894, *Juan Benedicto*; syn: *n.v.*

*Juncus paui* Sennen, *Pl. Espagne*, no. 5432 (1925). T: Spain, Barcelona, Castelldefels, *E.M.Sennen [Pl. Espagne] 5432*; syn: BM, G, LD.

*Juncus maritimus* var. *congestus* L.B.Hall, *J. Bot.* 66: 361 (1928); *Juncus spinosus* var. *congestus* (L.B.Hall) Druce, *Bot. Soc. Exch. Club Brit. Isles* 9(2): 240 (1930). T: Great Britain, Dorset, near Poole Harbour, *L.B.Hall*; syn: BM, K, NMW.

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**Figure 42.** *Juncus socotranus*. **A, B**, inflorescences; **C**, detail of inflorescence; **D**, flower; **E**, tepals with stamens; **F**, flower with ripe fruit; **G**, capsule; **H**, seeds. (**A**, Popov 71/64, BM; **B–E**, Popov GP/SO/256, BM; **F–H**, Zeller 16403, BM). Scale bars: **A, B** = 10 cm; **C, F** = 5 mm; **D, E** = 3 mm; **G** = 2 mm; **H** = 1 mm. Drawn by B. Johnson. Reproduced with permission from S. Snogerup, *Willdenowia* 23: 50, fig. 10 (1993).

*Juncus maritimus* var. *atlanticus* J.W.White, *J. Bot.* 52: 19 (1914). T: Great Britain, Isles of Scilly, Great Ganinick, *J.W.White*; syn: BRISTM, *n.v.*, NMW.

Illustration: S.Snogerup, *Willdenowia* 23: 53, fig. 12 (1993).

Maps: H.Meusel, E.Jäger & E.Weinert, *Vergl. Chorol. Zentraleur. Fl.* 1: 84 (1965); S.Snogerup, *Willdenowia* 23: 55, fig. 13 (1993).

Perennials, 50–100 cm tall; rhizome creeping, up to 8 mm in diam., with internode length variable; intravaginal shoots usually lacking. Stem usually 1.5–2 mm thick, rigid. Leaves (10–) 25–80 cm long, 1–3 mm in diam. Lower two bracts leaf-like, with broad sheaths, (7–) 10–25 (–40) cm long, including sheath 2.5–4 cm long, usually exceeding inflorescence; middle bracts with blade reduced to small mucro; bracts subtending heads shorter than flowers, amplexicaul, apiculate. Inflorescence (4–) 10–20 × (2–) 3–5 (–8) cm, usually lax, rarely contracted to one or a few large clusters, with 20–100 (–200) heads. Heads (1–) 2–6-flowered. Tepals with membranous margins, 3–4 mm long; outer tepals ±longer, ovate, cymbiform, acute, with mucro 0–0.3 mm long; inner tepals narrowly elliptic, with ±broader margins apically, obtuse. Stamens 6 (rarely 3), c.  $\frac{2}{3}$  as long as tepals; anthers 0.8–1.2 mm long, 1.5–2 (–2.5) times as long as filaments; style 1–1.5 mm long; stigmas 1–2 mm long. Capsule 2.5–3.5 mm long, equalling or slightly exceeding tepals, trigono-ovoid, obtuse or abruptly attenuate, with mucro 0.3–0.6 mm long, trilocular; seeds 60–100. Seeds 0.6–0.7 mm long, 0.8–1.2 mm including appendages, obliquely ovoid, c. 25-striate; appendages unequal, white. Figs 37, 43.

From W and NW Europe (with isolated occurrence in C Europe) and N coasts of the Mediterranean to Turkey and the Black Sea region, Iran and Central Asia. Casually introduced to E USA and Uruguay in the past. 10: DEN, GRB, IRE, SWE. 11: AUT, BGM, GER, HUN, NET. 12: BAL, COR, FRA, POR, SAR, SPA. 13: ALB, BUL, GRC, ITA, KRI, ROM, SIC, TUE, YUC. 14: KRY, UKR. 21: AZO. 32: UZB, TKM, TZK. 33: TCS. 34: AFG, CYP, EAI, IRN, PAL, TUR. 75: nwj, nwy. 85: uru. Most common in coastal to brackish salt marshes, less often in maritime sands and inland saline to subsaline habitats, in Iran up to 1200 m. Map 180.

10. GREAT BRITAIN: Anglesey, Black Creek, 24 Aug 1999, *T.C.G.Rich* (NMW). SWEDEN: Skåne, Ljunghusen, *S.Snogerup 1445* (LD). 11. AUSTRIA: Neusiedler-See, 1957, *Neumann* (W). 12. BALEARES: Mallorca, Albufeira, *Bowden & Sims 535* (BM, O). 13. GREECE: Xanthis/Rodopis, Porto Lago, *A.Strid & al. 24277* (C, LD). 21. AZORES: Pico, Lajes, *T.G.Tutin & E.F.Warburg H469* (K, O). 32. TURKMENISTAN: Bajsun, Kaltaminor, 1000 m, *B.Fedtschenko 1169* (B); Amu-Darya, Kyzyl Kala, Jul 1967, *A.A. van Pelt* (W). 34. TURKEY: Ankara, Tuz Gölü, *Darrah 225* (E). 75. USA: New Jersey, Philadelphia, 1845, *Watson* (E). 85. URUGUAY: Maldonado, Piriápolis, *C.Osten 5708* (CORD).

A form with more diffuse inflorescence and a relatively shorter lower bract was described as var. *atlanticus* J.W.White. It is stable in cultivation but coexists with the typical variant within populations. A form with subcongested inflorescence, described as var. *congestus* L.B.Hall, seems to be stable in cultivation as well.

## 6. *Juncus rigidus* Desf., *Fl. Atlant.* 1: 312 (1800)

*Juncus maritimus* var. *rigidus* (Desf.) Rouy, *Fl. France* 13: 231 (1912). T: [NW Africa] 'in arenis ad maris littora', *R.L.Desfontaines*; lecto: P-DESF, *fide* S.Snogerup, *Willdenowia* 23: 54 (1993).

*Juncus procerus* Bianca, *Atti Acad. Gicoenia Sci. Nat. Catania*, ser. 2, 3: 65 (1846), *nom. illeg., non* E.Mey. (1828); *Juncus maritimus* subsp. *rigidus* (Desf.) Nyman, *Consp. Fl. Eur.* 745 (1882); *Juncus maritimus* Lam. var. *biancae* Lojac., *Fl. Sicul.* 3: 152 (1909). T: Sicily, Noto, *G.Bianca*, syn: FI.

*Juncus maritimus* Lam. var. *arabicus* Asch. & Buchenau, in P.E.Boissier, *Fl. Orient.* 5: 354 (1882); *Juncus arabicus* (Asch. & Buchenau) Adamson, *J. Linn. Soc., Bot.* 50: 10 (1935). T: [Egypt] Sinai, 'Ad scaturigines Raphidim', 17 Jul 1835, *Schimper 495*; lecto: W, *fide* S.Snogerup, *Willdenowia* 23: 54 (1993); iso: CAS, E, FI, M.

*Juncus nevskii* V.I.Krecz. & Gontsch., in V.L.Komarov, *Fl. URSS* 3: 629 (1935) T: Turkmenistan, 'ad fonticulum Kara-su prope pag. Kughitang', 12 Jul 1931, *S.A.Nevski 763*; holo: LE.

Illustration: S.Snogerup, *Willdenowia* 23: 56, fig. 14 (1993).

Map: S.Snogerup, *Willdenowia* 23: 58, fig. 15 (1993).



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**Figure 43.** *Juncus maritimus*. **A**, rhizome with a row of stems; **B**, **C**, inflorescences; **D**, flower head; **E**, flower; **F**, tepals; **G**, one-flowered head (right) and flower in fruit; **H**, capsule; **I**, opened capsule; **J**, seeds. (**A**, *A.Strid & al.* 24277, LD; **B**, **D**–**J**, *S.Snogerup* 1445, LD; **C**, *E.M.Sennen* 5432, LD). Scale bars: **A**–**C** = 10 cm; **D**, **G** = 3 mm; **E**, **F**, **H**, **I** = 2 mm; **J** = 1 mm. Drawn by B.Johnsen. Reproduced with permission from S.Snogerup, *Willdenowia* 23: 53, fig. 12 (1993).

Perennials, (50–) 75–150 cm tall; rhizome creeping, branched, to 10 mm in diam., with internode length variable. Culms rigid, usually 2–5 mm thick. Leaves 25–110 cm long, 1.5–3 mm thick. Lower two bracts leaf-like, 5–25 cm long, including a sheath 2–5 cm long, shorter than to much exceeding the inflorescence; middle bracts small; bracts subtending heads much shorter than flowers, ovate, amplexicaul, cuspidate. Inflorescence 5–40 × 2–5 cm, lax, usually elongated, with (20–) 50–150 (–300) heads. Heads (1–) 2–4 (–6)-flowered. Tepals 3.5–5 mm long, equal or outer ones  $\pm$ longer; margins broad, scarious; outer tepals narrowly ovate, cymbiform, acute to obtuse, sometimes with small mucro; inner tepals oblong, obtuse, with margins  $\pm$ expanded apically. Stamens 6,  $^{2/3}$ – $^{3/4}$  as long as tepals; anthers (1.0–) 1.5–2.0 (–2.5) mm long, 3–6 times as long as filaments; style 0.7–1.2 mm long; stigmas 1–1.5 mm long. Capsule 3.5–5 mm long, conspicuously exceeding or rarely equalling tepals, narrowly trigono-ovoid, trilocular, usually straw-brown; apex trigonous, tapering, sometimes abruptly contracted; mucro to 0.5 mm; seeds usually 70–90. Seeds 0.6–0.7 mm long, or 0.9–1.8 mm long including appendages, 0.2–0.3 mm broad, narrowly obliquely ovoid, 20–25-striate; appendages equal or subequal.  $2n = 46, 48$ , *vide* S.Snogerup, *Willdenowia* 23: 57 (1993). Fig. 44.

Common in N Africa, and from scattered localities in W and E Africa. Widely distributed in S Africa. From Cyprus, Syria, Israel, Red Sea and the Arabian Peninsula, to S Afghanistan and S Pakistan, and Turkmenistan in the north. Not found in Europe recently. 12: SAR. 13: ITA, SIC. 20: ALG, EGY, LBY, MOR, TUN. 22: MLI, NGR, SEN. 23: ZAI. 24: CHA, SUD, SOC, SOM. 26: ANG, MLW, MOZ, ZAM, ZIM. 27: BOT, CPP, CPV, LES, NAM, NAT, OFS, SWZ, TVL. 32: KGZ, TKM, TZK, UZB. 34: AFG, CYP, IRN, IRQ, LBS, PAL, SIN, TUR. 35: GST, KUW, OMA, SAU, YEM. 40: PAK. Usually sandy saline localities (both coastal and inland), in desert and steppe regions often near wells, in seasonally wet depressions. Map 181.

13. ITALY: Sicilia, Noto, Avola, *G.Bianca* 283 (FI). 20. EGYPT: Wadi Kurkur, 16 Dec 1964, *L.Boulos* (CAI, LD). MOROCCO: Jebel Kebir, *Dahlgren & P.Lassen* 140-22 (LD). 24. CHAD: Oasis Tekro, *J.Hutchinson* 2 (BM). 26. ZAMBIA: Mazabuka, Kafue R., *van Rensburg* 2501 (K). 27. SOUTHERN AFRICA: Cape Province, Taung, *MacDonald* 76/2 (NBG); Cape Province, Richmond, Leopard's Vlei, *H.Bolus* 13838 (BOL). 32. TADZHIKISTAN: Amu-Darya, between Kuljab and Gullag, 12–24 Oct 1881, *E.A.Regel* (LE). 34. ISRAEL: Dead Sea, near Sedom, 18 Dec 1938, *M.Zohary & Yehoudai* [*Fl. Terr. Israel. Exs.*] 721 (BM, E, FI, G, K, LD, NSW). 40. PAKISTAN: ENE Karachi, Khadeji, *K.H.Rechinger* 28569 (W).

### 7. *Juncus kraussii* Hochst., in C.Krauss, *Flora* 28: 342 (1845)

T: South Africa, George Distr., Notsinakama R., Jan 1839, *C.Krauss*; lecto: G-BOIS, *vide* S.Snogerup, *Willdenowia* 23: 57 (1993); iso: M.

Perennials, c. 40–130 (–200) cm tall; rhizome creeping, short-noded, densely branched. Leaves terete, 20–100 cm long, 1–5 mm in diam. Lower two bracts leaf-like with wide sheaths, usually exceeding inflorescence; middle bracts narrowly ovate, amplexicaul, acuminate, often with a small, distinct lamina; bracts subtending heads ovate, shorter to  $\pm$ equalling flowers, scarious. Inflorescence usually lax, rarely consisting of a few clusters. Flowers dark. Tepals  $\pm$ unequal; outer tepals longer, with base and midrib herbaceous, with margins scarious, ovate, cymbiform, keeled, with scarious margin slightly broader distally, very fragile; mucro 0.1–0.3 mm long; inner tepals oblong, subobtuse to obtuse. Anthers shorter than tepals. Capsule 2–2.5 (–3) mm long, trigono-obovoid to trigono-ellipsoidal, usually obtuse, dark brown to castaneous at least in apical part. Seeds with very short unequal appendages.

Disjunct in three areas: Southern Africa, along the S and SE coast to Mozambique; Australia, Tasmania and New Zealand; and temperate South America. There are three subspecies.

- |   |                                 |
|---|---------------------------------|
| 1 Dioecious, with functionally unisexual flowers; inflorescence broad | 7a. subsp. <b>kraussii</b>      |
| 1: Flowers usually hermaphrodite; inflorescence elongated to broad    |                                 |
| 2 Capsule exceeding perianth; inflorescence elongated                 | 7b. subsp. <b>australiensis</b> |
| 2: Capsule equalling perianth; inflorescence broad                    | 7c. subsp. <b>austerus</b>      |

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**Figure 44.** *Juncus rigidus*. **A**, rhizome and young inflorescence; **B**, **C**, inflorescences; **D**, flower head; **E**, flower; **F**, tepals with stamens; **G**, flower with ripe fruit; **H**, capsule; **I**, seeds. (**A**, Dahlgren & P.Lassen 140-22, LD; **B**, **D**-**F**, S.Snogerup & al. 2827, LD; **C**, L.Boulos s.n., 16 Dec 1964, CAI, LD; **G**, **H**, **J**, M.Zohary & Yehoudai 721, LD). Scale bars: **A**-**C** = 10 cm; **D**, **E**, **G** = 3 mm; **F**, **H** = 2 mm; **I** = 1 mm. Drawn by B.Johnsen. Reproduced with permission from S.Snogerup, *Willdenowia* 23: 56, fig. 14 (1993).

**7a. *Juncus kraussii* Hochst. subsp. *kraussii***

*Juncus spretus* J.A.Schult. & J.H.Schult., in J.J.Roemer & J.A.Schultes, *Syst. Veg.*, ed. 7, 2: 1655 (1830), *nom. inval.* [not accepted by authors].

*Juncus caffer* Bertol., *Mem. Reale Accad. Sci. Ist. Bologna* 3: 253, Pl. 19, fig. 3 (1851). T: Mozambique, 'Inhambane Mocambici', 6 Dec 1848, *Fornasinio*, holo: BOLO.

*Juncus fasciculiflorus* Adamson, *J. Linn. Soc., Bot.* 50: 8 (1935). T: South Africa, Ceres, Zwarttruggens, *R.S.Adamson 123*; holo: BOL.

*Juncus kraussii* Hochst. var. *parviflorus* Adamson, *J. Linn. Soc., Bot.* 50: 8 (1935). T: South Africa, Buffalo R., 15 miles from E London, 18 Jan 1930, *R.S.Adamson 179*; lecto: BOL, *fide* S.Snogerup, *Willdenowia* 23: 59 (1993).

*Juncus kraussii* Hochst. var. *effusus* Adamson, *J. Linn. Soc., Bot.* 50: 8 (1935). T: South Africa, Port Alfred, 24 Dec 1898, *Galpin 2946*; lecto: K, *fide* S.Snogerup, *Willdenowia* 23: 59 (1993).

Illustration: S.Snogerup, *Willdenowia* 23: 60, fig. 16, A-G (1993).

Maps: H.Meusel, E.Jäger & E.Weinert, *Vergl. Chorol. Zentraleur. Fl.* 1: 84 (1965) [South African part of the depicted range]; S.Snogerup, *Willdenowia* 23: 61, fig. 17 (1993).

Intravaginal shoots absent. Lower bract 5–20 (–40) cm long, including a sheath 1.5–4 cm long. Inflorescence 5–20 × 3–7 (–10) cm, lax, usually broad but sometimes elongated by subdivision in two parts, rarely congested to a few clusters, with 50–1000 heads. Heads 2–6-flowered. Most flowers functionally unisexual, male smaller than female; female flowers with rudimentary filaments; male flowers with degenerating ovary and reduced stigmas. Tepals 2.5–3 (–4) mm long. Stamens 6, c.  $\frac{2}{3}$  as long as tepals; anthers 1.3–1.6 mm long, 3.5–6.5 times as long as filaments; style 0.4–0.75 mm long; stigmas 1.0–1.3 (–1.8) mm long. Capsule 2–2.5 (–3) mm long, equalling or exceeding tepals by up to 0.5 mm, trilobular with distinct placental wings centrally; mucro 0–0.3 mm; seeds usually 25–35. Seeds 0.7–0.8 mm long, or 0.8–0.9 mm long including appendages, 0.35–0.4 mm broad, 20–25-striate, with transverse striae inconspicuous, c. 20 per longitudinal field; appendages small, unequal. Fig. 45.

Along the S and SE coast of southern Africa from the Cape to Mozambique. 26: MOZ. 27: CPP, LES, NAT, OFS. Slightly to strongly saline marshes, along rivers, rarely on coastal sands, up to 1700 m. Map 182.

26. MOZAMBIQUE: Delagoa Bay, Inhaca Is., *D.Weintraub 20451* (BOL); Lagoa Poelala, Inharrime, *E.Schelpke 4516* (BM, BOL). 27. SOUTH AFRICA: Cape Provinces, Milneston, Nov 1914, [*Anonymous*] 9164 (NBG); Cape Town, *H.Bolus 4811* (BOL); Cape Provinces, Uitenhage, *C.F.Ecklon & C.Zeyher 3* (LD); *C.F.Ecklon & C.Zeyher 4* (LD); KwaZulu Natal, Umtamvuna, *R.G.Strey 7116* (K, PRE); Zululand, Mtungini, *Mogg 5869* (K, LD); Free State, Thaba Nehu, *Roberts 2918* (PRE).

**7b. *Juncus kraussii* subsp. *australiensis* (Buchenau) Snogerup, *Willdenowia* 23: 61 (1993)**

*Juncus maritimus* Lam. var. *australiensis* Buchenau, *Bot. Jahrb. Syst.* 12: 257 (1890). T: West Australia, Swan River, 1839, *J.Drummond, First Coll.*; lecto: BM, *fide* S.Snogerup, *Willdenowia* 23: 61 (1993); possible isolecto K, MEL.

Illustration: S.Snogerup, *Willdenowia* 23: 60, fig. 16, H–O (1993).

Maps: H.Meusel, E.Jäger & E.Weinert, *Vergl. Chorol. Zentraleur. Fl.* 1: 84 (1965) as *J. maritimus* [Australasia]; S.Snogerup, *Willdenowia* 23: 62, fig. 18 (1993).

Intravaginal shoots sometimes present. Lower bract 4–40 cm long, including sheath 1.5–2.5 (–4) cm. Inflorescence 6–25 × 2.5–6 cm, usually elongated, sometimes conspicuously bipartite, with 50–400 heads. Heads 3–6 (–10)-flowered. Most flowers hermaphrodite, rarely some functionally female. Tepals 2.2–2.8 (–3.3) mm long. Stamens 6 (rarely 3), rarely in some flowers all rudimentary; anthers 0.7–1.2 mm long, 1.3–2.5 times as long as filaments; style 0.25–0.5 mm long; stigmas c. 1.5 mm long. Capsule 2–2.5 mm long, equalling or exceeding tepals by up to 0.5 mm, trigono-ellipsoidal, acute to obtuse, glossy castaneous, trilobular with distinct placental wings centrally; mucro up to 0.3 mm long; seeds usually 15–20 (–25). Seeds dark brown with one blackish blunter end, 0.6–0.8 (–0.9) mm long, or 0.7–1.0 mm long including appendages, 0.3–0.4 mm broad, ellipsoidal to obliquely ovoid, (20–) 25–30-striate, with transverse striae inconspicuous; appendages small, unequal. Fig. 45.

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**Figure 45.** *Juncus kraussii* subsp. *kraussii*. **A**, inflorescences of male individual; **B**, head of male individual; **C**, male flower; **D**, inflorescences of female individual; **E**, **F**, female flowers at different stages; **G**, seed. *Juncus kraussii* subsp. *australiensis*. **H**, rhizome; **J**, **K**, inflorescences; **L**, flowers in early flower and fruit; **M**, hermaphrodite flower and tepals with stamens; **N**, capsule; **O**, seeds. (**A–C**, C.F.Ecklon & C.Zeyher *Junc.* 3, LD; **D**, **F**, C.F.Ecklon & C.Zeyher *Junc.* 4, LD; **E**, **G**, E.Schelpe 4516, BM; **H**, **J–M**, S.Snogerup, *cult. nos.* 3519, 3521, LD; **N**, **O**, F.Müller s. n., LD). Scale bars: **A**, **D**, **H**, **J**, **K** = 10 cm; **B**, **E**, **L** = 3 mm; **C**, **F**, **M**, **N** = 2 mm; **G** = 1 mm; **O** = 0.5 mm. Drawn by B.Johnsen. Reproduced with permission from S.Snogerup, *Willdenowia* 23: 60, fig. 16 (1993).

Coastal areas and rarely at inland saline sites of SW, SE and S Australia: Northern Territory, South Australia, Queensland, Tasmania, Victoria, Western Australia; and both main islands and Chatham Island of New Zealand. 50: NSW, NTA, QLD, SOA, TAS, VIC, WAU. 51: NZN, NZS, CTM. Salt marshes, mangrove swamps, coastal sands, river banks, rarely lake shores. Map 183.

**50.** NEW SOUTH WALES: Eden, *E.F.Constable 53937* (K, W). NORTHERN TERRITORY: 32 km E of Kings Canyon, George Gill Range, *A.C.Beaglehole 20515* (NSW, MEL). QUEENSLAND: Bribie Is, *M.S.Clemens s.n.* (RSA). SOUTH AUSTRALIA: c. 2 km N of Struan on Naracoorte road, *K.L.Wilson 1220 & L.A.S.Johnson* (NSW). TASMANIA: Gordon Point, *R.Melville 2440* (K). VICTORIA: Point Lonsdale, *J.E.Tilden 716* (E, K). WESTERN AUSTRALIA: Leschenault Estuary, *K.H.Rechinger 59716* (W). **51.** NORTH IS: Wellington, *Walker 5189* (UC). SOUTH IS: South Is., NW of Nelson, estuary of Motuere R., *W.R.Barker, B.V.Sneddon & E.Vitek 51-2* (W). CHATHAM IS.: Chatham Is., *H.H.Travers* (K).

**7c. *Juncus kraussii* subsp. *austerus* (Buchenau) Snogerup, *Willdenowia* 23: 63 (1993)**

*Juncus austerus* Buchenau, *Junc. S.-Amer.* 389 (1879) T: Chile, San Carlo, *W.Lechler 3089*; lecto: K, *fid.* S.Snogerup, *Willdenowia* 23: 63 (1993).

Illustration: S.Snogerup, *Willdenowia* 23: 64, fig. 19 (1993).

Map: S.Snogerup, *Willdenowia* 23: 65, fig. 20 (1993).

Intravaginal shoots absent. Cataphylls 3–5, pale brown, with uppermost 2–10 cm long, sometimes with a short lamina. Lower bract (3–) 9–20 (–60) cm long, including a sheath 2–6 cm long. Inflorescence (3–) 8–12 × (1.5–) 3.5–5 cm, usually ±dense, with flowers in (15–) 75–200 (–c. 1000) heads. Heads (1–) 3–8 (–10)-flowered. Tepals 2.5–3.5 mm long. Stamens 6 (rarely 3), c.  $\frac{2}{3}$  as long as tepals; anthers rarely well preserved in fruiting flowers, 0.8–1.7 mm long, 1.5–3 times as long as filaments; style 0.2–0.5 mm long; stigmas 1–1.5 mm long. Capsule 2.5–3 mm long, about equalling tepals, trigono-ellipsoidal to trigono-obovoid, obtuse to acute, light brown to glossy castaneous, trilocular; mucro up to 0.3 mm long; seeds usually 20–25. Seeds 0.7–0.9 mm long, or 0.8–1.2 mm long including appendages, 0.3–0.4 mm broad, ellipsoidal to obliquely ovoidal, dark brown, c. 25-striate; appendages small, unequal. Fig. 46.

Restricted to temperate South America. 84: BZL, BZS. 85: AGS, CLS, URU. Probably only on coastal habitats, often maritime sands. Map 184.

**84.** BRAZIL SOUTHEAST: São Paulo, Santos, 10 Jan 1875, *C.W.H.Mosén 3502 p.p.* (LD, O, S); São Paulo, Santos, S. Vicente, 10 Feb 1875, *C.W.H.Mosén 3502 p.p.* (S). BRAZIL SOUTH: Santa Catarina, [*J.D.Hooker*] (K). **85.** ARGENTINA SOUTH: 'Coast of Patagonia', Oct 1832, *C.Darwin* (K). CHILE SOUTH: Llanquihue, Maullín, 28 Jan 1944, *E.Barros 3076* (SI); Chile, Corral, *W.Lechler 3089* (K). URUGUAY: Montevideo, Carrasco, *C.Osten 21788b* (S).

**8. *Juncus roemerianus* Scheele, *Linnaea* 22: 348 (1849)**

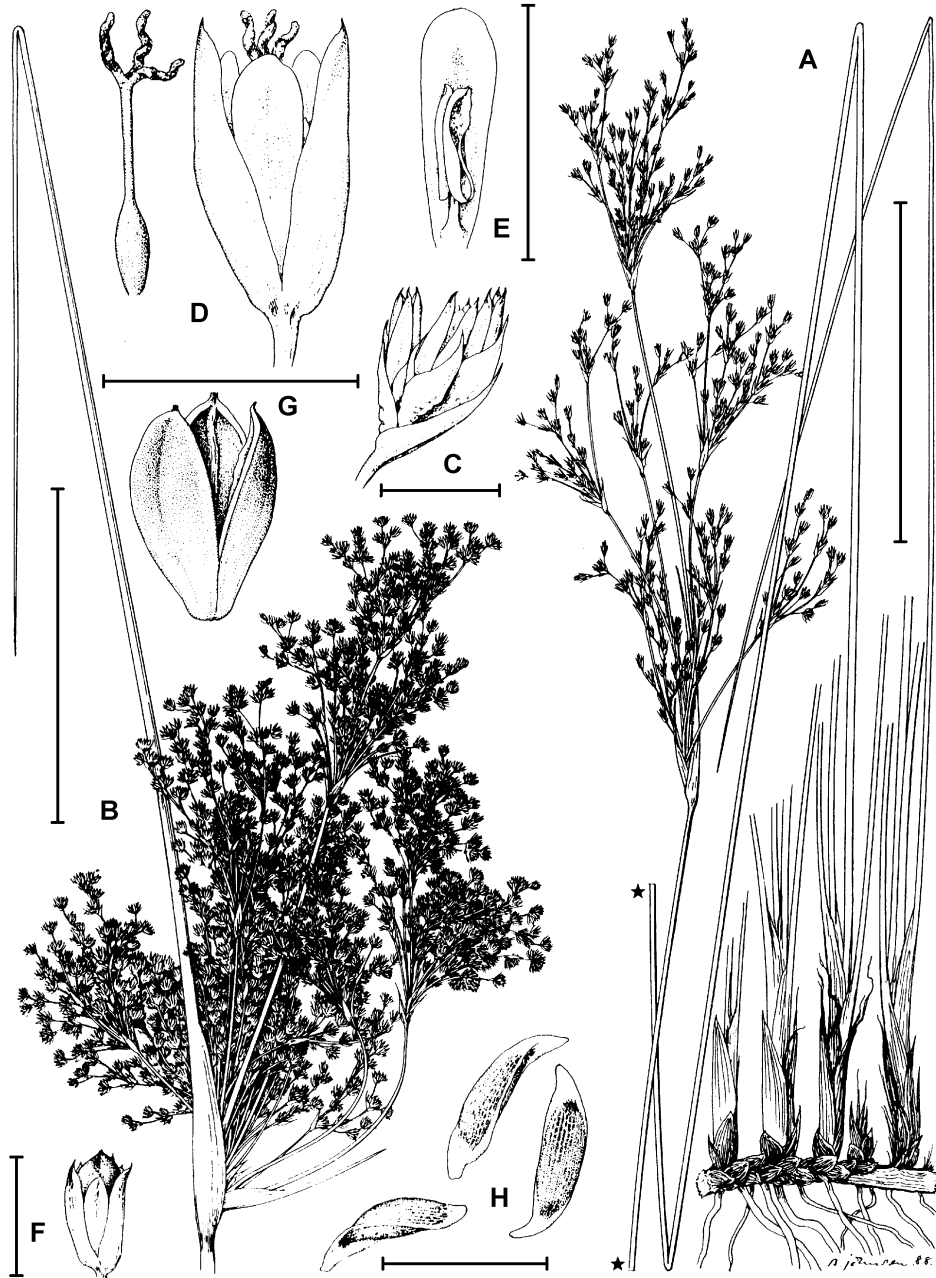
T: [USA, Texas] 'Galveston island auf feuchtem Muschelsand', 4 Apr 1846, *Römer*; holo: B, destroyed.

Illustrations: S.Snogerup, *Willdenowia* 23: 66, fig. 21 (1993); R.E.Brooks & S.E.Clemants, *Fl. N. Amer.* 22: 236 (2000)

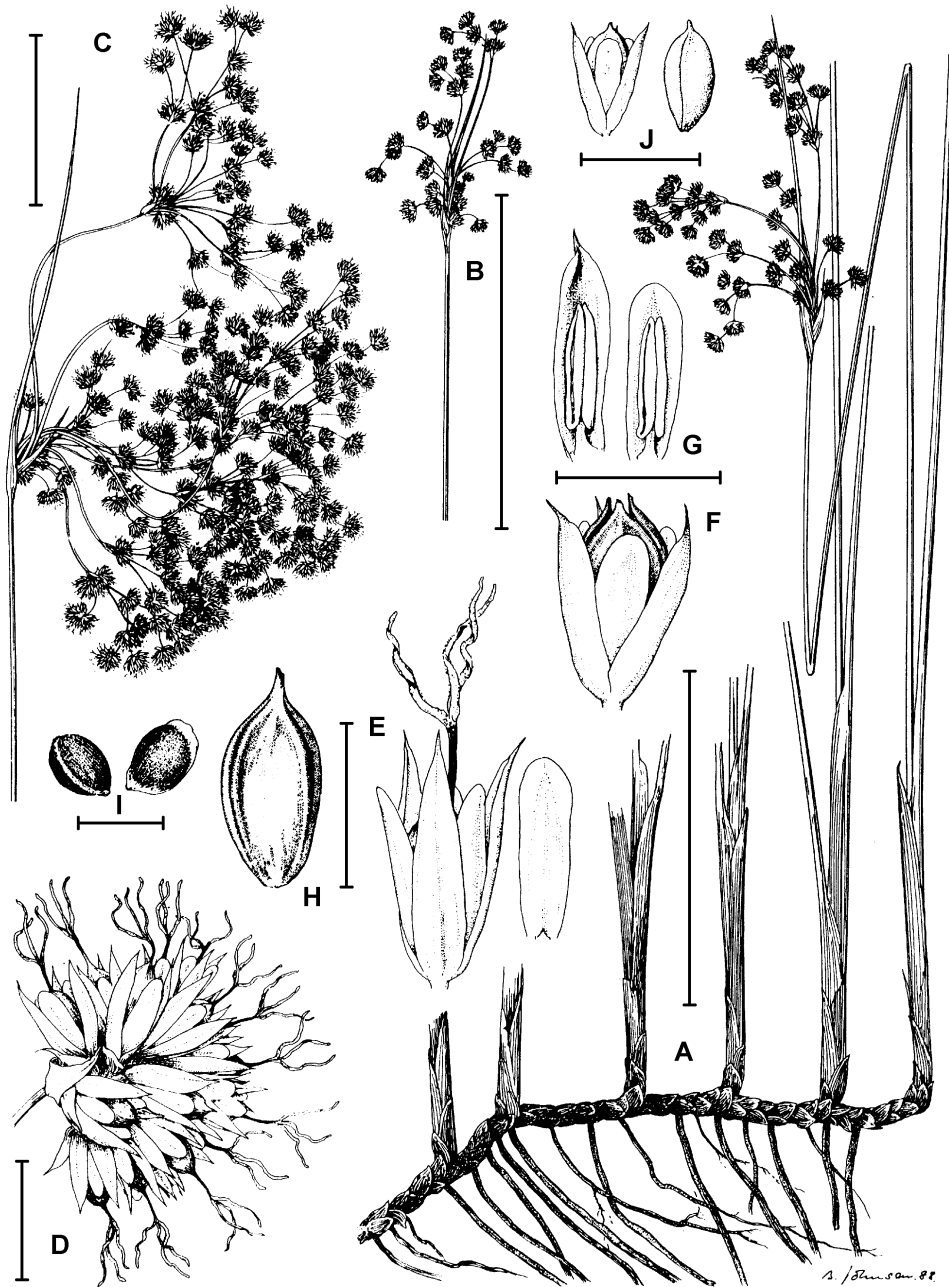
Map: S.Snogerup, *Willdenowia* 23: 68, fig. 22 (1993); R.E.Brooks & S.E.Clemants, *Fl. N. Amer.* 22: 238 (2000).

Perennials, (15–) 50–150 (–230) cm long; rhizome creeping, stout, with internodes usually short; intravaginal shoots absent. Cataphylls 2–5, to 10 cm long; blade tiny. Leaves 40–125 cm long, 1.5–4 mm in diam. Lower bract (2–) 5–20 (–90) cm long, including a sheath 1.5–3 (–5) cm long; middle bracts small, amplexicaul, with blade ±absent; bracts subtending heads considerably shorter than flowers. Plant gynodioecious, with female and ±hermaphrodite clones. Inflorescence (2–) 5–20 (–45) × 3–6 (–12) cm, usually lax, ±broad; heads (15–) 30–100 (–200), 2–8 (–25)-flowered. Tepals 2.2–3.5 mm long, subequal, with margins scarious; outer tepals ±narrowly ovate, with base keeled, distally scarious margins slightly broader and mucro up to 0.3 mm long; inner tepals oblong, obtuse, with scarious part broad near apex. Stamens 6, equalling tepals or slightly shorter, rudimentary in pistillate flowers;

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**Figure 46.** *Juncus kraussii* subsp. *austerus*. **A**, rhizome with several culms; **B**, inflorescence; **C**, head in late bud stage; **D**, flower and pistil; **E**, inner tepal with stamen; **F**, flower with ripe fruit; **G**, opened capsule; **H**, seeds. (**A**, **C–E**, *C. Osten 21788b*, S; **B**, **F–H**, *C.W.H. Mosén 3502*, S). Scale bars: **A**, **B** = 10 cm; **C**, **F** = 3 mm; **D**, **E**, **G** = 3 mm; **H** = 1 mm. Drawn by B. Johnsen. Reproduced with permission from S. Snogerup, *Willdenowia* 23: 64, fig. 19 (1993).



**Figure 47.** *Juncus roemerianus*. A, plant base and inflorescence; B, C, inflorescences; D, female head; E, flowers and tepals of female individual; F, hermaphrodite flower in fruit; G, tepals of hermaphrodite flower with stamens; H, capsule of female flower; I, seeds; J, hermaphrodite flower in fruit and capsule. (A, C–H, J, D.Persson, 25 Jul 1978, LD). Scale bars: A, B = 10 cm; C = 5 cm; D, J = 3 mm; E–H = 2 mm; I = 0.5 mm. Drawn by B.Johnsen. Reproduced with permission from S.Snogerup, *Willdenowia* 23: 66, fig. 21 (1993).



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anthers 1.4–1.7 (–2.0) mm long, 5–7 times as long as filaments; stigmas 1.5–2.5 mm long. Capsule in hermaphrodite flowers 2.5–3 mm long, in pistillate flowers 3–5 mm long,  $\pm$ exceeding tepals, broadly trigono-ellipsoidal, obtuse, light to dark brown, glossy, trilocular with thick placentas; mucro 0.1–0.3 mm long. Seeds 0.5–0.7 mm long, or 0.6–0.8 mm long including appendages, 0.3–0.4 mm broad,  $\pm$ ellipsoidal, yellowish brown, c. 25-striate; appendages indistinct or with one to 0.1 mm long. Fig. 47.

Endemic to S and SE coast of USA, from Texas and Louisiana to Virginia; Bahamas and Bermuda in the Caribbean. 77: TEX. 78: ALA, DEL, FLA, GEO, LOU, MSI, NCA, SCA, VRG. 81: BAH. Salt marshes and stabilized coastal sands, in large stands in upper part of tidal pools. Map 185.

78. ALABAMA: Fort Morgan Peninsula, *H.H.Iltis 21484* (BM, UC). FLORIDA: Gulf Co., 25 Jul 1978, *D.Persson* (LD). GEORGIA: Chatham Co., *Harper 1821* (E). MISSISSIPPI: Jackson Co., *S.T.McDaniel & R.E.Brooks 21209* (RSA). NORTH CAROLINA: Carteret Co., *Blomquist 10375* (UC). SOUTH CAROLINA: Georgetown Co., *R.K.Godfrey & R.M.Tryon 20301* (UC, CAS). Virginia: Norfolk, *Krause 4298* (B). 81. BAHAMAS: Andros, *W.T.Gillis 12907* (BM). BERMUDA: Spittle Pond, *N.L.Britton & J.Bisset* (K).

### 9. *Juncus cooperi* Engelm., *Trans. Acad. Sci. St. Louis* 2: 590 (1868)

T: USA, California, Camp Cady, Mohave River, *Cooper*; holo: probably MO, *n.v.*

Illustration: S.Snogerup, *Willdenowia* 23: 70, fig. 23 (1993).

Maps: S.Snogerup, *Willdenowia* 23: 68, 22 (1993); R.E.Brooks & S.E.Clemants, *Fl. N. Amer.* 22: 237 (2000).

Perennials, (40–) 50–80 (–100) cm tall, densely caespitose; rhizome short-noded, branching. Intravaginal shoots present. Cataphylls 2–4 (–5), to 10 cm long. Leaves 15–60 cm long, including sheaths up to 10 (–25) cm long, (1.5–) 2–3 mm in diam., striate. Lower bract leaf-like, thin, (2.5–) 6–22 cm long, including a sheath 1.8–4 cm long; middle bracts with large sheath and small lamina; bracts subtending heads usually shorter than flowers. Inflorescence (3–) 4–15  $\times$  (1–) 1.5–3 (–5) cm, with 3–20 (–25) heads. Heads (1–) 4–8 (–12)-flowered. Tepals 5–6.5 mm long, subequal, later with thick spongy bases; outer tepals aristate with arista to 1 mm long, with distal margin scarious and to 0.5 mm wide; inner tepals oblong, with broad distal thin fragile scarious wings,  $\pm$ emarginate. Stamens 6,  $2/3$ – $3/4$  as long as tepals; anthers (2.2–) 2.5–3.5 mm long, (2.5–) 5–7 times as long as filaments; style 1.5–2 mm long; stigmas 2.5–3.5 mm long. Capsule 4–5.5 mm long,  $\pm$ exceeding tepals, trilocular, thick-walled, ovoid,  $\pm$ trigonus, attenuate, acute to obtuse, straw-brown; mucro inconspicuous; seeds c. 60–70. Seeds 0.9–1.1 mm long, or 1.5–1.9 mm long including appendages, 0.4–0.6 mm broad, ellipsoidal to ovoid, c. 25-striate; appendages short,  $\pm$ unequal. Fig. 48.

Endemic to California and Nevada, USA. 76: CAL, NEV. Saline and brackish marshes, in desert valleys on soils with high salinity. Map 186.

76. CALIFORNIA: Salton Lake, Travertine Terraces, *S.B.Parish 8428* (CAS); Inyo Co., Death Valley, Furnace Ck, *S.Riebe [cult. S.Snogerup 4165, 4166]* (LD); Inyo Co., Saline Valley, *M.DeDecker 2617* (RSA); Harmony Borax Works, *S.Snogerup & B.Snogerup 3440* (LD). NEVADA: Clark Co., Redgypspring, *Gullion 502* (UC).

## Hybrids

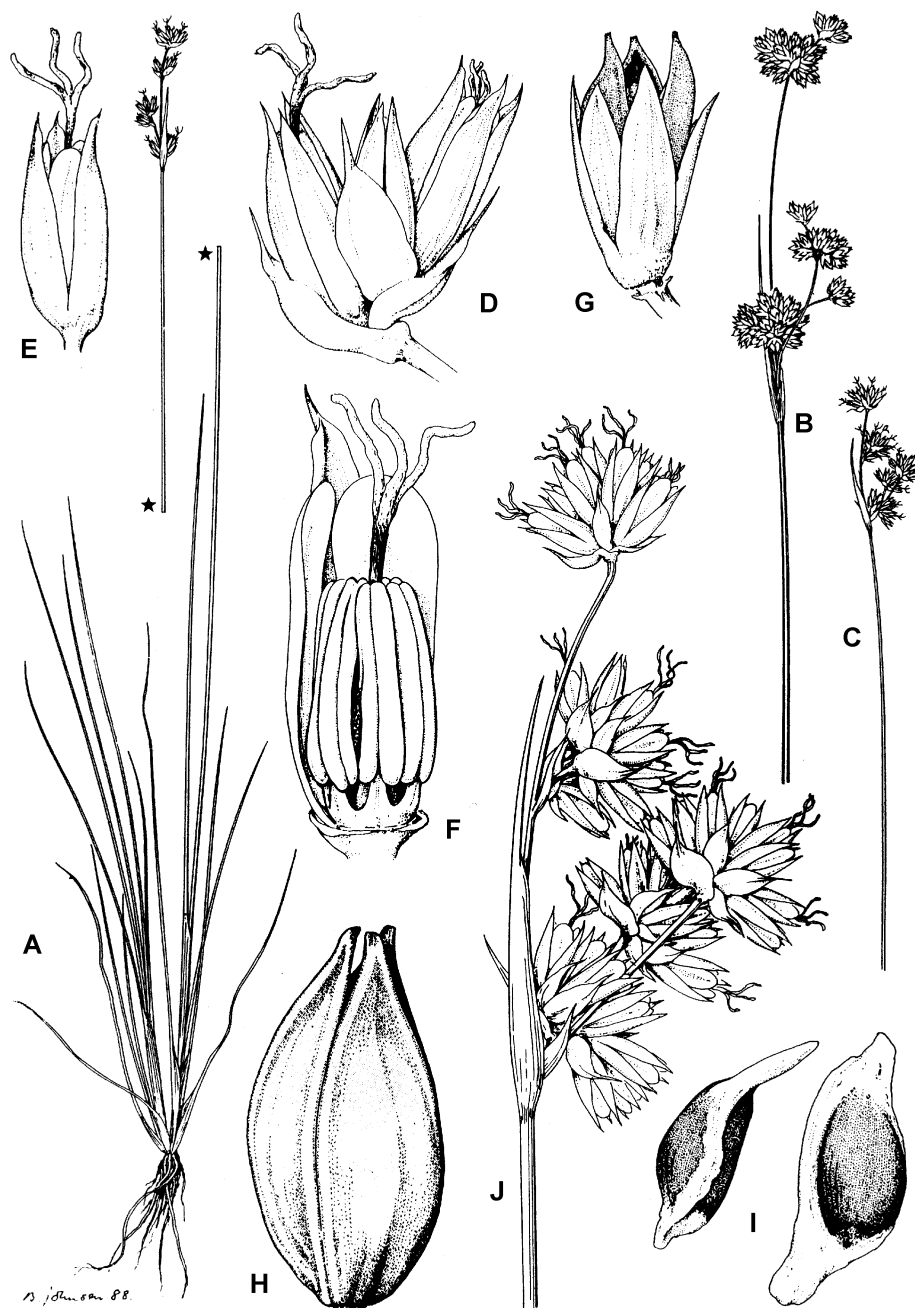
*Juncus acutus* L.  $\times$  *J. heldreichianus* T.Marsson ex Parl.

Usually a moderate-sized plant. Inflorescence slightly elongate, capsules often light coloured with a long conical tip, appearing unfilled. Seed set irregular, from 0% up to at least 30% in the best developed capsules. Pollen almost 100% staining. Found repeatedly in Greece.

13. GREECE: Naxos, *S.Snogerup 1676, 1707, 1728* (LD).

*Juncus acutus* L.  $\times$  *J. littoralis* C.A.Mey.

Usually a tall plant forming large tussocks. Inflorescence and flowers like those of *J. littoralis*. Capsules differently developed; the large ones with a conical top. Seed set



**Figure 48.** *Juncus cooperi*. **A**, young plant in first flower; **B**, **C**, **J**, inflorescences; **D**, head in onset of flowering; **E**, flower; **F**, dissected flower; **G**, flower with opened fruit, apices of inner tepals collapsed; **H**, capsule; **I**, seeds. (**A**, **C**–**F**, **H**–**J**, *S.Riebe*, *S.Snogerup*, *cult. nos.* 4166, 4165, LD; **G**, *S.Snogerup* 3440, LD). Scale bars: **A**–**C** = 10 cm; **D**, **E**, **G** = 5 mm; **F** = 3 mm; **H** = 2 mm; **I** = 1 mm; **J** = 2 cm. Drawn by B.Johnsen. Reproduced with permission from *S.Snogerup*, *Willdenowia* 23: 70, fig. 23 (1993).

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irregular, from 0% to c. 50% in the best developed capsules. Pollen almost 100% staining. Found in Italy, Greece and Israel.

34. ISRAEL: Acre Plain, Qishon R., 12 Apr 1925, *Smoly* (HUJ, S, W)

*Juncus heldreichianus* T.Marsson ex Parl. × *J. littoralis* C.A.Mey.

In habit like moderately tall *J. heldreichianus*. Inflorescence variable, often with long ±erect branches and dense groups of heads. Capsules small and blunt, dark above. Most seeds degenerated, good seeds often few, but in the best capsules at least up to 30%. Pollen 80–95% staining and of normal form. Found in Greece.

13. GREECE: Naxos, *S.Snoogerup 1681, 1690, 1691, 1713, 1718* (LD).

### Doubtful names:

*Juncus variegatus* Caruel, *Nuovo Giorn. Bot. Ital.* 2: 276 (1870)

*Juncus acutus* subsp. *variegatus* (Caruel) Nyman, *Consp. Fl. Eur.* 746 (1882). T: Italy, Toscana, Val-di-Cecina, Monte Cerboli, May 1869, *E.Almansi*.

Probably a synonym of *Juncus acutus* L. subsp. *acutus*.

*Juncus maritimus* var. *luxurians* Lojac., *Fl. Sicul.* 3: 152 (1909).

T: Sicily, Girgenti, Jul 1874, *Lojacono*; syn: *n.v.*; Sicily, *A.Todaro*; syn: *n.v.*

*Juncus maritimus* var. *nervatus* Lojac., *Fl. Sicul.* 3: 152 (1909).

T: Trapani, *Lojacono*; syn: *n.v.*; Val Demone, *A.Todaro*; syn: *n.v.*

## Sect. 2. GRAMINIFOLII

*Juncus* sect. *Graminifolii* Engelm., *Trans. Acad. Sci. St. Louis* 2: 434 (1866)

*Juncus* subg. *Graminifolii* (Engelm.) Buchenau, *Monogr. Junc. Cap* 500 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 500 (1875)]; *Juncus* sect. *Falcati* Novikov, *Nov. Sist. Vyssh. Rast.* 19: 56 (1982); *Juncus* subsect. *Falcati* [Novikov] Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 120 (1990); *Juncus* subsect. *Graminifolii* (Buchenau) Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 121 (1990). T: *Juncus falcatus* E.Mey.; lecto, designated here [*J. capensis* selected by V.S.Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 120 (1990), is not eligible].

*Cephaloxys* Desv., *J. Bot. (Desvaux)* 1: 321 (1809), *nom. illeg.*; *Juncus* subg. *Cephaloxys* [Desv.] Rchb., *Deutsch. Bot. Herb.-Buch* 46 (1841); *Juncus* sect. *Cephaloxys* ([Desv.] Rchb.) Post & O.Kuntze, *Lex. Gen. Phan.* 303 (1903). T: *C. flabellata* Desv. = *Juncus repens* Michx.

*Juncus* [unranked] *Graminei* Engelm., *Trans. Acad. Sci. St. Louis* 2: 435, 1866; *Juncus* sect. *Graminei* (Engelm.) Engelm., *Bot. Gaz.* 7: 6 (1882); *Juncus* subsect. *Repentes* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.* 95: 120 (1990). T: *Juncus repens* Michx.; lecto, *fide* J.Kirschner & al, *Folia Geobot. Phytotax.* 34: 386 (1999).

*Juncus* subg. *Singulares* Buchenau, *Monogr. Junc. Cap* 500 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 500 (1875)]; *Juncus* sect. *Singulares* (Buchenau) Kuntze, in G.E.Post & O.Kuntze, *Lex. Gen. Phan.* 303 (1903); *Juncus* subsect. *Singulares* (Buchenau) Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 121 (1990). T: *Juncus singularis* Steud.

*Juncus* [unranked] *Cyperoidei* Boiss., *Fl. Orient.* 5: 351 (1884). T: *Juncus sparganiifolius* Boiss. & Kotschy ex Buchenau.

*Juncus* ser. *Perennes* Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 238 (1906). T: *Juncus lomatophyllus* Spreng.; lecto, *fide* J.Kirschner & al., *Folia Geobot. Phytotax.* 34: 388 (1999).

*Juncus* subsect. *Longistyli* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 120 (1990). T: *Juncus longistylis* Torr.

*Juncus* subsect. *Regelii* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 119 (1990). T: *Juncus marginatus* Rostk.

*Juncus* subsect. *Cyperoidei* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 120 (1990), *nom. illeg.* T: *Juncus cyperoides* Laharpe

*Juncus* subsect. *Dregeani* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 121 (1990).  
T: *Juncus dregeanus* Kunth

Perennials, caespitose or rhizomatous; stems terete to slightly compressed, with leaf blade flat and not differentiated dorsiventrally, without septa. Flowers in compound to decompound anthelate inflorescences of 1 to many flower heads; individual flowers in the axil of a floral bract; bracteoles absent. Seeds with or without appendages, usually reticulate.

A section of 22 species with centres of diversity in W North America, southern Africa and the Australasian region, extending to South America, Turkey and the Far East. It may not be monophyletic.

- 1 Seeds with two appendages at least 0.2–0.4 mm long
- 2 Anthers c. 0.9–1.5 mm long, slightly longer than filaments; style longer than 1 mm; auricles lacking or subacute, to 0.7 mm long **20. J. regelii**
- 2: Anthers 1.8–2.6 mm long, usually 2–3 times as long as filaments; style c. 0.6 mm long; auricles at least 1 mm long **21. J. howellii**
- 1: Seeds without appendages or with a whitish apex to 0.1 mm long
- 3 Stamens 3; if in some flowers stamens 4–6 then triandrous flowers predominating
- 4 Plants dwarf, to c. 5–6 cm tall, mat-forming; leaves to 0.5 mm wide in the middle **18. J. antarcticus**
- 4: Plants at least medium-sized, at least 10 cm tall, densely to ±loosely caespitose, not mat-forming; leaves wider than c. 0.8 mm
- 5 Inner tepals acuminate to subulate-acuminate, usually 3.8–5.0 mm long
- 6 Style c. 0.2 mm long; stem either creeping and rooting (with leaf rosettes 5–10 cm apart), or floating with leaf rosettes evenly spaced along stem, or ±loosely caespitose with densely branched short rhizome; capsule linear to lanceolate in outline **22. J. repens**
- 6: Style 0.4–0.5 mm long; plants densely caespitose with a short rhizome, with stem erect; leaves basal and cauline; capsule oblong-ovoid **24. J. filipendulus**
- 5: Inner tepals obtuse, subobtuse or subacute, sometimes mucronate, 2.4–3.0 (–3.5) mm long
- 7 Auricles present, 0.5–3.0 mm long **25. J. marginatus**
- 7: Auricles absent
- 8 Longer tepals at least 3.0 mm long; inner tepals usually slightly shorter than the outer ones; capsule ±shorter than perianth; leaves usually 0.8–3.0 mm wide **13. J. dregeanus**
- 8: Longer tepals up to 2.3 (–2.8) mm long; inner tepals as long as or longer than the outer ones; capsule ±exceeding perianth; leaves usually 2.5–6 mm wide **19. J. planifolius**
- 3: Stamens 6 or in a minority of flowers only 3–5
- 9 Capsule narrowly prismatic-pyramidal, gradually narrowing, 4.5–5.5 mm long, much exceeding perianth [Turkey] **10. J. sparganiifolius**
- 9: Capsule ellipsoid to subglobose, retuse, truncate, obtuse or ±abruptly narrowing, up to 4.5 mm long, shorter than or equalling or exceeding perianth (and then apex rounded to retuse) [Not in Turkey]
- 10 Anthers at least 1.5–2 times as long as filaments
- 11 Leaves (5–) 9–13 (–15) mm wide **12. J. lomatoxyllus**
- 11: Leaves up to 5 (–6) mm wide, usually much narrower
- 12 Capsule usually distinctly exceeding perianth
- 13 Seeds c. 0.4 mm long; outer seed-coat tight, distinctly reticulate [Pacific North America] **27. J. covillei**
- 13: Seeds c. 0.7 mm long; outer seed-coat loose, shining, faintly reticulate [Russian Far East and Japan] **28. J. prominens**

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- 12:** Capsule usually shorter than or equalling perianth
- 14** Capsule 2.7–3.1 mm long **15. *J. capensis***
- 14:** Capsule 3.5–4.8 mm long
- 15** Plants densely caespitose; rhizome short or indistinct; tepals with a smooth central band; auricles distinct, 1.2–2.5 mm long **31. *J. macrophyllus***
- 15:** Plants loosely caespitose; rhizome creeping-ascending; tepals with a scabrid (papillose) central band; auricles absent or short (to 1 mm long) or up to 2 mm long
- 16** Style 1.3–1.9 mm long; tepals usually with castaneous or translucent-brownish margins **29. *J. orthophyllus***
- 16:** Style 0.5–1.0 mm long; tepals with broad or narrow scarious (less often membranous) margins
- 17** Auricles 1–2 mm long; tepals pale, greenish or pale brownish; basal leaves not exceeding  $\frac{1}{2}$  of stem; stem usually longer than 20 cm **30. *J. longistylis***
- 17:** Auricles absent or up to 1 mm long; tepals deep castaneous-brown; basal leaves usually exceeding  $\frac{2}{3}$  of stem; stem usually 10–20 cm long **26. *J. falcatus***
- 10:** Anthers shorter than filaments or  $\pm$ equalling them
- 18** Rhizome ascending-creeping, distally loosely branched and gradually changing in stem; leaves usually  $\pm$ regularly distributed along stem; all tepals linear-lanceolate, acuminate, with a smooth central band **23. *J. cyperoides***
- 18:** Rhizome short, densely branched, or creeping-ascending but then not gradually changing in stem; leaves entirely or mostly in a basal rosette; tepals lanceolate to ovate-lanceolate, at least some of them not acuminate (i.e., subacute and mucronate or obtuse), central band scabrid (papillose) or almost smooth
- 19** Longest tepals c. 1.5–1.8 mm long; capsule c. 2 mm long, exceeding perianth **17. *J. meianthus***
- 19:** Longest tepals longer than 1.9 mm; capsule at least 2.4 mm long, shorter than or equalling perianth
- 20** Capsule 3.5–4.5 mm long; tepals 4.0–5.2 mm long **26. *J. falcatus***
- 20:** Capsule to 3 mm long; tepals 2.4–4.2 mm long
- 21** Style 0.4–0.8 mm long; tepals 3.7–4.2 mm long **14. *J. sonderianus***
- 21:** Style 0.2–0.4 mm long; tepals 2.4–3.5 mm long
- 22** Leaves c. 5–8 mm wide in the middle; lower bract distinctly shorter than inflorescence **11. *J. engleri***
- 22:** Leaves 0.8–3.5 mm wide in the middle, lower bract usually  $\pm$ equalling inflorescence or longer
- 23** Capsule dark golden brown to red-brown; inner tepals usually slightly longer than outer ones, to 3.0 mm long [Australasian region] **16. *J. caespiticus***
- 23:** Capsule usually blackish brown; outer tepals usually longer than the inner ones, c. 3.0–3.5 mm long [Southern and East Africa] **13. *J. dregeanus***

**10. *Juncus sparganiifolius* Boiss. & Kotschy ex Buchenau, *Krit. Verz. Juncac.* 88 (1879)**

T: *Plantae Syriae borealis ex Amano occidentali supra Arsus, supra Ursusa pagum* [Turkey, Hatay, Arsuz], 2 Jun 1862, *C.G.T.Kotschy 102*; lecto: Z, *fide* S.Snogerup, in P.H.Davis, *Fl. Turkey* 9: 19 (1986); iso: BM, K, L, P, W [One of four isotype specimens from W bears a note in Buchenau's hand: 'An excellent new species' [translated], and should be given preference].

Illustration: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 242, fig. 114 (1906).

Perennials, 30–40 (–50) cm tall, loosely caespitose, robust; rhizome creeping, branched, with internodes 1–3 cm long, c. 3 mm in diam.; sterile shoots/stolons short. Stem erect or ascending, compressed. Cataphylls c. 1–3, to 5–8 cm long, with base brownish-purplish. Cauline leaves 3–6, dense, usually to 10–13 cm long, flat to V-shaped, (2.5–) 4.0–6.0 (–8.0) mm wide; margins smooth; apex acute. Lower bract leaf-like, c. 1–3 cm long, shorter than inflorescence. Inflorescence decompound, sometimes supra-decompound, much branched, anthelate; branches erecto-patent, diffuse, of numerous 2–6-flowered echinate heads c. 3–5 mm wide. Capitulum bracts ovate-acuminate, aristate, to 2 mm long, ±scarious. Tepals ±unequal, linear-lanceolate, acuminate, subaristate, greenish, sometimes suffused reddish, smooth; outer tepals shorter, 2.4–2.8 mm long; inner tepals c. 2.7–3.5 mm long, margins narrow, paler green or purplish. Stamens 6, rarely 3–5; anthers c. 0.8–0.9 mm long; filaments c. 0.3 mm long, flat; style not easy to distinguish from distal part of capsule, to c. 0.5 mm long; stigmas c. 1.0 mm long. Capsule trigonous, unilocular, narrowly prismatic-pyramidal, elongated, to c. 4.5–5.5 mm long, much exceeding perianth, very gradually narrowing into style, pale brown. Seeds 0.6–0.7 mm long, pale brown, faintly reticulate; appendages absent.

Restricted to C and S Turkey. 34: TUR. Wet places, mostly along, or even in streams. Map 187.

34. TURKEY: Gediz, Murat Dagh, 1400 m, *P.H.Davis 36712* (E); İçel, Giosna [Gözne], 800 m, *W.Siehe 196* (W); Afyon, Sultan Dagh, 1500 m, *J.F.N.Bornmüller [It. Anatol. 3] 5614* (W); Adana, 18 km N of Kamisli, 1400 m, *Sorger 7729-7* (W); 7 km W of Fetiye, 5 Jun 1977, *H.Woldring E12* (L).

#### 11. *Juncus engleri* Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 248 (1906)

T: Ostafrikanisches Waldgebiet, West-Usambara, 1400–1600 m [Tanzania, W Usambara Mtns], *A.Engler 1060*; syn: B, destroyed; *A.Engler 1409*; syn: B, destroyed.

Perennials, 25–40 (–60) cm tall, loosely caespitose; rhizome creeping-ascending; stolons absent; stems ascending, rooting, with internodes short; cataphylls absent. Leaves only basal, mid-green, 12–20 (–40) cm long, (3–) 5–8 (–12) mm wide near base, ±flat to channelled; sheaths closed, to 2 cm long, later split, usually tinged reddish, with margins colourless or whitish, c. 0.1 mm wide; auricles absent; leaf apex subulate. Stems terete, ±smooth, leafless. Lower bract subherbaceous, c. 1.0–4.0 cm long, shorter than inflorescence. Inflorescence ±erect, anthelate; main branches usually 5–10, (1–) 2–6 (–8) cm long, ±smooth; secondary branches subdistal; upper bracts blackish-brown, scabrid (papillose), subtending hemispherical (1–) 3–7 (–10)-flowered heads; uppermost bracts c. one per flower, c. 3 mm long, ±triangular, brownish. Tepals ±unequal; outer tepals lanceolate, carinate, acuminate, c. 2.4–2.7 mm long, dark brown, often scabrid on midrib, with margins narrow and indistinct; inner tepals ovate-lanceolate, broader, c. 2.5–2.8 × c. 1.0 mm, obtuse, dark brown, with margins broad, membranous. Stamens 6; anthers 0.5–0.8 mm long; filaments 0.6–0.7 mm long; style c. 0.2 mm long; stigmas ±reddish, patent-contorted, c. 0.6–0.9 mm long, long papillose. Capsule oblong-ovoid, subtrigonous, ±abruptly contracted in an apiculate apex, c. 1.9–2.5 mm long, shorter than to subequalling perianth, shiny, red-brown above. Seeds ±ovoid, paler brown, 0.4–0.5 mm long including a short whitish apex, c. 0.3 mm wide, faintly reticulate to almost smooth; appendages ±absent.

Confined to a very limited area in the Usambara Mtns and the Pare Mtns, Tanzania. 25: TAN. Boggy places, along streams in open mountain forest. Map 188.

25. TANZANIA: Lushoto, Magamba, Mkuzi R., c. 1750 m, *P.J.Greenway 9664* (S); Lushoto, between Mkuzi and Kifungilo, *R.B.Drummond & Hemsley 2214* (K); Pare, Mtonto, *P.J.Greenway 6548* (K).

Closely related to *J. lomatophyllus* of southern Africa but having very short style and stigmas, smaller flowers and, on average, substantially narrower leaves. The third original specimen cited, Usambara, Mlato [Mlalo] *Holst 334a* (W), is a *Juncus* inflorescence. It may belong to *J. engleri* but tepals are longer than those in the rest of the material. Buchenau himself listed the specimen with a question mark. Another unnumbered gathering from the same locality [*Holst s.n.* (PR)] represents *Juncus oxycarpus*.

## JUNCACEAE (*Juncus*)

### 12. *Juncus lomatoxyllus* Spreng., *Neue Entdeck. Pflanzenk.* 2: 108 (1821)

*Juncus lomatoxyllus* var. *typicus* Buchenau, *Bot. Jahrb. Syst.* 12: 430 (1890), *nom. inval.* T: 'in promontorio bonae spei' [Cape Peninsula], *Bergius*; holotype: B, destroyed.

*Juncus cymosus* Lam., *Encycl.* 3: 267 (1789), *nom. rejic. propos.* T: Cap de Bonne-Espér., *P.Sonnerat*; lecto: P-LAM, *vide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 82 (1985) [the lectotype is the inflorescence].

*Juncus capensis* var. *latifolius* E.Mey., *Syn. Junc.* 48 (1822). T: [without locality and collector]; lecto: S, *designated here*.

*Juncus lomatoxyllus* var. *lutescens* Buchenau, *Monogr. Junc. Cap* 466 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 466 (1875)]. T: Dutoitskloof, 2–3000 Fuss [Cape, Du Toitskloof], *J.F.Drège a*; syn: W.

*Juncus lomatoxyllus* var. *aristatus* Buchenau, *Monogr. Junc. Cap* 466 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 466 (1875)]. T: Dutoitskloof [Cape, Du Toitskloof], *J.F.Drège f*; lecto: W, *vide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 82 (1985).

*Juncus lomatoxyllus* var. *congestus* Adamson, *J. Linn. Soc., Bot.* 50: 18 (1935). T: Cape, Swartberg Pass, 4 Feb 1930, *R.S.Adamson 181*; lecto: BOL, *vide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 82 (1985).

*Juncus viridifolius* Adamson, *J. Linn. Soc., Bot.* 50: 20 (1935). T: Cape, Kirstenbosch, Table Mountain, Skeleton Ravine, 11 Oct 1931, *R.S.Adamson 247*; holotype: BOL.

Illustration: F.G.P.Buchenau, *Monogr. Junc. Cap* pl. 10 (1875).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 157, fig. 6 (1946); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 82, map 65 (1985).

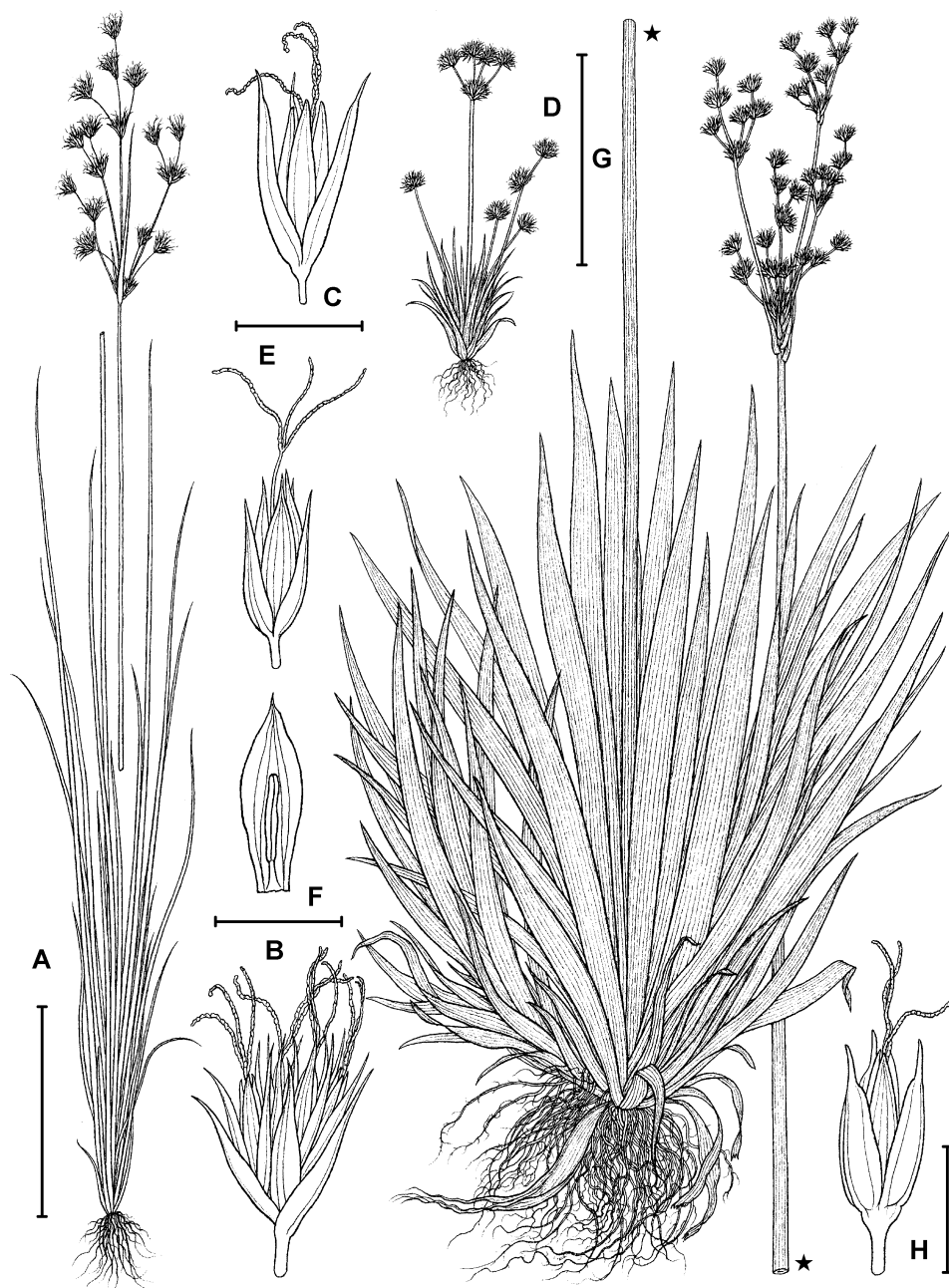
Perennials, c. (15–) 35–80 cm tall, robust; rhizome creeping, leafy distally, to c. 4 mm in diam.; stolons often present, long, leafy. Leaves in basal rosette, usually bluish green, rarely pale green, c. 10–20 (–32) cm long, (5–) 9–13 (–15) mm wide, ±flat, base often purplish; sheaths closed, later split, short; margins hyaline, 0.1–0.2 mm wide; apex subulate. Stem thick, rigid, ±smooth to papillose. Lower bract herbaceous, c. 1.0–3.5 cm long, much shorter than inflorescence. Inflorescence usually 5–25 cm long, supra-decompound, less often reduced; main branches ±erect to umbelloid; secondary branches subdistal to median, ±erecto-patent, of (1–) 3 to many, c. (6–) 12–15 (–20)-flowered ±hemispherical heads c. 8–11 mm wide; uppermost bracts scarious with distinct midrib, subaristate, c. 3.5–4.0 mm long. Tepals ±unequal; outer tepals lanceolate, carinate, acuminate-subaristate, c. (3.0–) 3.6–4.7 mm long, with central band ±prominent, usually scabrid, brown to dark brown, often with green midrib, rarely entirely pallid; inner tepals ovate-lanceolate, ±acute to obtuse, c. (3.0–) 3.2–4.0 mm long, with central band ±brown, often with green midrib, with margins membranous, broad. Stamens 6; anthers 1.3–1.6 mm long; filaments, 0.4–0.5 mm long; style (including stylar beak) c. 1.5 mm long; stigmas red, c. 2 mm long, exserted. Capsule trilocular, ±ovoid, ±trigonal, subabruptly contracted in a beak (0.2–) 0.4–0.6 mm long, c. 2.4–2.7 mm long, ±shorter than perianth, usually dark castaneous; capsule segments c. 1.4 mm wide. Seeds ±brown, ovoid, c. 0.4–0.6 mm long, 0.3 mm wide; apex whitish apiculate; surface faintly reticulate. Fig. 49.

Widespread from SW Cape to Transvaal (Northern Provinces) in South Africa, also found in Zimbabwe and S Mozambique. Introduced in New Zealand. 26: MOZ, ZIM. 27: CPP, LES, NAT, SWZ, TVL. 51: nzs. Along streams, shores of ponds and reservoirs, permanently wet mountain habitats. Map 189 (secondary distribution not shown).

26. MOZAMBIQUE: Beira, Mt Yogogo, *K.L.Tinley 2216* (P); Maputo, Marracuene, Bobole, *F.M.A.Barbosa & Lemos 7919* (K). ZIMBABWE: Chimanimani [Melsetter], Glencoe Reserve, *R.B.Drummond 4959* (K, S); between Pungwe R. and Inyanga, 1800 m, *T.C.E.Fries, T.Norlindh & H.Weimarck 3765* (LD). 27. CAPE PROVINCE: Tafelberg, 14 Jan 1963, *P.Vermeulen* (L 300360); Cape Peninsula, Claremont, *N.S.Pillans 10822* (UPS). NATAL: Howick, Shafton, *W.Hutton 190* (BM); Alexandra, Dumisa, 600 m, *H.Rudatis 760* (L). TRANSVAAL: Pilgrimsrest, Lower Mariepskop, *D.J.B.Killick & R.G.Strey 2546* (LD). 51. SOUTH IS.: South Is., N of Charleston, *R.Mason & N.Moar CHR 81290 A, B, C, D* (CHR, NSW).

### 13. *Juncus dregeanus* Kunth, *Enum. Pl.* 3: 344 (1841)

*Juncus dregeanus* var. *genuinus* Buchenau, *Monogr. Junc. Cap* 463 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 463 (1875)], *nom. inval.* T: 'inter Coloniam [Cape Colony] & Port Natal', *J.F.Drège [4387]*; holotype: B, destroyed.



**Figure 49.** *Juncus capensis*. A, habit; B, flower head; C, flower. *Juncus cephalotes*. D, habit; E, flower; F, inner tepal. *Juncus lomatophyllus*. G, habit; H, flower. (A–C, mainly J.P.H.Acock 3733, K, S; D–F, mainly R.S.Adamson 224, BOL; G, H, mainly according to Hafström, 16 Dec 1934, LD). Scale bars: A, D, G = 5 cm; B–F, H = 3 mm. Drawn by © E.Smrčínová.



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Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 159, fig. 7 (1946); L.Croizat, *Mem. Soc. Brot.* 20: 85, map 135 (1968).

Perennials, c. (10–) 15–25 (–45) cm tall, densely (rarely loosely) caespitose; rhizome usually short, vertical; stolons absent. Leaves basal, (5–) 10–20 (–28) cm long, filiform to narrowly linear, often ±dilated (to 5 mm) and hyaline-bordered at base, otherwise 0.8–1.5 (–3.0) mm wide, slightly canaliculate to subinvolute; sheaths initially closed, later split, with apex acute; auricles absent. Stem leafless, ±smooth. Lower bract narrow, leaf-like, usually 2.5–7 cm long, longer or seldom shorter than inflorescence. Inflorescence usually subcongested, an irregular head of 1–10 subsessile clusters, often with 1–3 (–5) clusters or groups of clusters pedunculate; peduncles short, c. 0.5–3.0 cm long; clusters at first hemispherical, later subglobose, c. 0.7–1.1 cm wide (groups of clusters to 2 cm wide); upper bracts c. 3.5 mm long, subaristate, ±scabrid. Tepals ±unequal; outer tepals lanceolate, acuminate, subaristate, carinate, c. 3.0–3.5 mm long, with central band prominent, sometimes scabrid, rarely pale; inner tepals ovate-lanceolate, subobtuse, c. 2.7–3.0 mm long, with margins broad, membranous. Stamens 3–6; anthers 0.4–0.5 mm long; filaments 0.6–0.8 mm long; style c. 0.2 (–0.3) mm long; stigmas patent, recurved, to c. 1 mm long. Capsule 3-locular, trigonous ovoid to subglobose, ±obtuse to subacute, c. 2.2–2.6 mm long; mucro c. 0.1 mm long; capsule segments c. 1.4–1.6 mm wide, shiny, castaneous-brown to blackish brown, ±shorter than perianth. Seeds ovoid, pale brown, faintly transversely reticulate, c. 0.3–0.5 × 0.25–0.35 mm; apex whitish apiculate.

East Africa from S Sudan and Ethiopia to Cape Province, South Africa, and Cameroon. Edges of streams, swamps, and wet mountain areas in woodlands and grasslands. Two subspecies are recognized.

Stamens 3 or 4–6; seeds (0.25–) 0.30–0.35 (–0.40) mm long; tepals pale brown to dark brown

**13a. subsp. dregeanus**

Stamens 6, seeds 0.35–0.55 mm long, tepals blackish brown to dark brown

**13b. subsp. bachitii**

### **13a. *Juncus dregeanus* Kunth subsp. *dregeanus***

*Juncus submonocephalus* Steud., *Syn. Pl. Glumac.* 2: 303 (1855); *Juncus dregeanus* var. *submonocephalus* (Steud.) Buchenau, *Monogr. Junc. Cap* 463 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 463 (1875)]. T: Cape, *J.F.Drège 1604f*; syn: W; *J.F.Drège 1604c*; syn: S.

*Juncus dregeanus* var. *conglomeratus* Buchenau, *Monogr. Junc. Cap* 463 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 463 (1875)]. T: Hassagaibosch [Assegaaibos], *C.F.Ecklon & C.Zeyher 10*; syn: BOL, W; Albany, *C.F.Ecklon*; syn: *n.v.*

*Juncus diaphanus* Buchenau, *Monogr. Junc. Cap* 442, tab. VII (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 442, tab. VII (1875)]. T: Cape, Albany, *H.Bolus 188\**; holo: S.

*Juncus subcuneatus* C.E.Moss ex Adamson, *J. Linn. Soc., Bot.* 50: 23 (1935); *Juncus subcuneatus* var. *latifolius* Adamson, *J. Linn. Soc., Bot.* 50: 23 (1935). T: Transvaal, Carolina, *Rogers 21308*; lecto: J, designated here.

*Juncus subcuneatus* var. *minor* Adamson, *J. Linn. Soc., Bot.* 50: 23 (1935). T: Johannesburg, Rosebank, *C.E.Moss 7986*; holo: J, *n.v.*

*Juncus subglobosus* C.E.Moss ex Adamson, *J. Linn. Soc., Bot.* 50: 24 (1935). T: Transvaal, Florida, *C.E.Moss 7922bis*; holo: J.

*Juncus dregeanus* var. *sphaerocephalus* Adamson, *J. Linn. Soc., Bot.* 50: 21 (1935). T: Cape, Cape Flats, *R.S.Adamson 234*; lecto: BOL, *fide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 84 (1985).

*Juncus mollifolius* Hilliard & B.L.Burt, *Notes Roy. Bot. Gard. Edinburgh* 43: 367 (1986). T: Natal, Mpendhle distr., Mulangane Ridge above Carter's Nek, ca. 7000 ft. 5 Feb 1984, *O.Hilliard & B.L.Burt 17596*; holo: E; iso: E, K, NU, P, S.

Illustration: F.G.P.Buchenau, *Monogr. Junc. Cap* plate 6 (1875).

Map: A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 84, map 67 (1985).

Capitulum bracts scarious. Tepals pale brown, brown or dark brown. Stamens 3 or 4–6. Seeds c. (0.25–) 0.30–0.35 (–0.40) mm long.

Confined to, and widely distributed in, S and E South Africa from SW Cape to Transvaal. Naturalised in the North Island of New Zealand. 27: CPP, LES, NAT, SWZ, TVL. 51: nzn. A wide range of wet habitats from sea level to the mountains, mostly along streams and in seepage areas. Map 190.

27. CAPE PROVINCES: Amabela, *M. de Vries* 2601 (LD); Uitenhaag, Zwartkopsrivier, *C.F.Ecklon & C.Zeyher* 13 (LD); 799 (S); Port Elizabeth, Winterhoek Mtns, *T.C.E.Fries, T.Norlindh & H.Weimarck* 811, 874, 875 (LD); Fraserburg, Layton, *J.P.H.Acocks* 23534 (K); Stellenbosch, Firgrove, *R.S.Adamson* 129, 137 (BOL). LESOTHO: Sehlabathebe, Tsoelikana Valley, *F.K.Hoener* 2152 (K). NATAL: Port Shepstone, *C.J.Ward* 5209 (K, PRE); Clairwood, Durban, *R.E.Fries & T.C.E.Fries* 3137 (LD). TRANSVAAL: Lydenburg, Lisabon State Forest, *C.Reid* 823 (K, PRE).

The type of *J. diaphanus*, the *H.Bolus* 188\* specimen, evidently a (major) part of the holotype, annotated by Buchenau before the time of publication of his study (1875), originally in herb. O.W.Sonder, nowadays in S, in all likelihood represents a pallid, hexandrous, ±broad-leaved *Juncus dregeanus*. The plant may well be perennial, although its base is more slender than in the typical form. In its general habit, it also approaches plants described as *J. sonderianus*. Another rather aberrant form was described as *J. mollifolius*. It differs in its flaccid leaves and slender stems and, most notably, in a more loosely caespitose growth; in all the more substantial characters it is identical with *J. dregeanus* s. str., only the seed size is at the upper limit. It might represent a third subspecies of *J. dregeanus* but further study is needed.

**13b. *Juncus dregeanus* subsp. *bachitii* (Steud.) Hedberg, *Symb. Bot. Upsal.* 15(1): 61 (1957)**

*Juncus bachitii* Hochst. ex Steud., *Syn. Pl. Glumac.* 2: 305 (1855). T: 'Abyssin.' [Ethiopia, Tigre Province], Mt Bachit, 11000 ft., *Schimper* 114; holotype: P, n.v.; iso: PRE, W.

Illustrations: S.Carter, in E.Milne-Redhead & R.M.Phillip *Fl. Trop. E. Africa, Juncaceae* 5, fig. 1 (1966); K.A.Lye, in S.Edwards, Sebsebe D. & I.Hedberg, *Fl. Ethiop. Eritr.* 6: 388, fig. 211.1 (1997).

Capitulum bracts brownish. Tepals blackish brown to dark brown. Stamens 6. Seeds 0.35–0.55 mm long.  $2n = c.40$ , *vide* I.Hedberg & O.Hedberg, *Bot. Not.* 130: 11 (1977). Fig. 50.

In the mountains of the NE, E, and W-C parts of South Tropical Africa. 23: CMN, RWA, ZAI. 24: ETH, SUD. 25: KEN, TAN, UGA. 26: MLW, ZAM, ZIM. In marshes and along streams, mainly in mountain forests, rarely in wet alpine grasslands, usually above 2000 m. Map 191.

23. CAMEROON: Bamenda Highlands, Mt Oku, 2900 m, *I.Fokom* 141 (K). ZAIRE: Karisimbi, 3300 m, *J.-H.Humbert* 8588 (P). RWANDA: Karisimbi, Visoke saddle, Hagenia Zone, *W.D'Arcy* 7563 (CHR, MO, n.v., NSW). 25. KENYA: Mt Elgon, 3800 m, *H.Granvik* 140 (LD); Mt Kenya, 3125 m, *O.Hedberg* 2005 (LD); Aberdare Range, W part of the Nyeri track, 3070 m, *O.Hedberg* 1599 (LD). TANZANIA: Kilimanjaro, 2700 m, *Volkens* 1309 (BM, K). UGANDA: Ruwenzori, Mobuku Valley, 3250 m, *O.Hedberg* 752 (LD); Muhavura – Mgahinda saddle, 3050 m, *Purseglove* 2205 (K). 26. ZIMBABWE: Inyanga, Niarerua Ck, c. 1700 m, *T.C.E.Fries, T.Norlindh & H.Weimarck* 2407 (LD); Mare Dam in Nyanga Park, 2000 m, *S.Laegaard* 16038 (LD).

Plants from the southernmost part of the subspecies' range usually have slightly paler perianth; otherwise they correspond to the typical plants from the north.

**14. *Juncus sonderianus* Buchenau, *Monogr. Junc. Cap* 476 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 476 (1875)]**

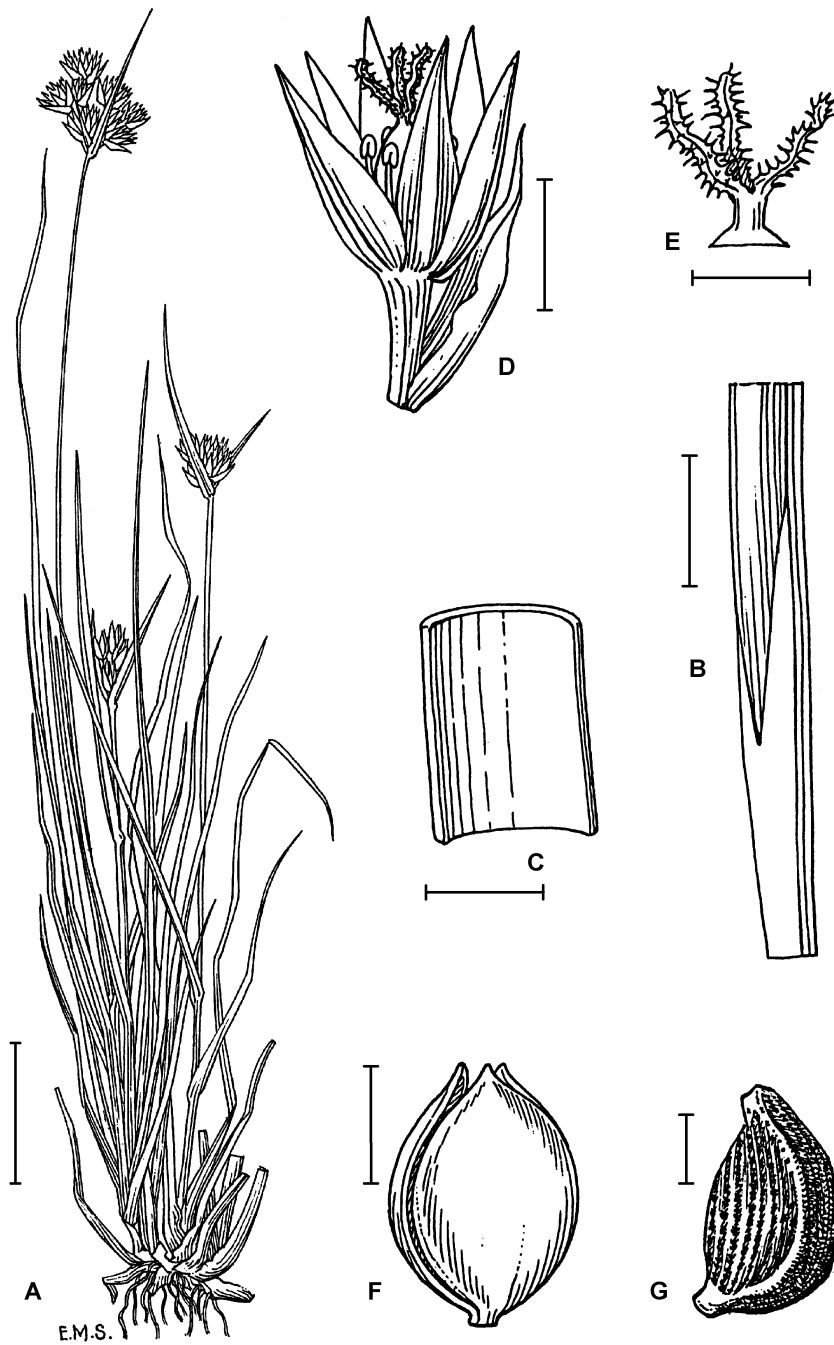
T: [Cape] Port Elizabeth, *J.F.Drège e*; syn: G, K, LD, P, W [J.F.Drège e' was generally proposed as a type by Adamson, *J. Linn. Soc., Bot.* 50: 26 (1935)]; [Cape] bei Cap Recief und Port Elizabeth, *C.F.Ecklon & C.Zeyher* 9; syn: BOL, W, S; *C.F.Ecklon & C.Zeyher* 780; syn: n.v.

Illustration: F.G.P.Buchenau, *Monogr. Junc. Cap* pl. 10 (1875).

Map: H.Weimarck, *Svensk Bot. Tidskr.* 40: 160, fig. 8 (1946).

Perennials, 11–35 cm tall, caespitose; rhizome shortly ascending, many-headed; stolons absent. Leaves basal and subbasal (densely inserted to 5 cm up the stem), mid-green to pale green, 5–17 cm long, c. (1.5–) 2–5 (–7) mm wide; margins partly hyaline-bordered; apex acute;

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**Figure 50.** *Juncus dregeanus* subsp. *bachitii*. **A**, habit; **B**, closed sheath; **C**, leaf section; **D**, flower and bract; **E**, style and stigmas; **F**, capsule; **G**, seed. (**A**, **D**, **E**, *Fries 1189*, K; **B**, **C**, **F**, **G**, *Brenan & P.J.Greenway 8218*, K). Scale bars: **A** = 3 cm; **B** = 2 cm; **C**, **E**, **F** = 1 mm; **D** = 2 mm; **G** = 0.1 mm. Drawn by E.M.Stones. Reproduced by kind permission of the Board of Trustees of the Royal Botanic Gardens Kew, from *Fl. Trop. E Africa*, Juncaceae, p. 5, fig. 1 (1966).

sheaths closed, later split, base green; auricles  $\pm$ absent. Lower bract leaf-like, c. 1.5–3.5 cm long, usually exceeding inflorescence. Inflorescence usually congested, a globose head of 1–3 (–12) usually 6–12-flowered clusters, or 1–3 clusters shortly pedunculate. Tepals subequal; outer tepals lanceolate, carinate, acuminate-aristate, c. 3.7–4.2 mm long, greenish or pale brown to castaneous-brown, with central band often greenish,  $\pm$ scabrid; inner tepals ovate-lanceolate,  $\pm$ obtuse, sometimes shorter than the outer; margins membranous, broad. Stamens 6; anthers 0.5–0.7 mm long; filaments 0.6–0.8 mm long; style 0.4–0.8 mm long; stigmas to c. 1 mm long, suberect. Capsule  $\pm$ ovoid, trigonous, subacute, apiculate, c. 2.5–3.0 mm long, shorter than perianth, pale greenish brown to castaneous; mucro to c. 0.2 mm long. Seeds ovoid, pale brown, 0.4–0.5  $\times$  c. 0.3 mm, faintly reticulate; apex whitish apiculate; appendages absent.

Restricted to S Cape, South Africa, with the most common occurrence in the vicinity of Port Elizabeth. Introduced in New Zealand. 27: CPP. 51: nzn. Wet sandy places, seepage areas, along streams. Map 192 (secondary distribution not shown).

27. CAPE PROVINCE: Riversdale, Droogvlakle, c. 150 m, *J.Muir 3400* (K); Port Elizabeth, Cape Recife, 24 Dec 1813, *W.J.Burchell 4386* (BOL, K, W); Port Elizabeth, *T.C.E.Fries, T.Norlindh & H.Weimarck 163* (BOL, LD); Port Elizabeth, *T.C.E.Fries, T.Norlindh & H.Weimarck 210* (LD); Port Elizabeth, *F.Paterson 2318* (BOL). 51. NORTH IS.: Whatipu, *E.Cameron 6336*, 17 Dec 1990 (AKU, NSW, PRE).

The relatively high variability, occasional sterility and the intermediate character supports the hypothesis expressed by Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 85 (1985), that *J. sonderianus* may be of hybrid origin, of *J. dregeanus* and *J. lomatophyllus* parentage. The sample *T.C.E.Fries & al. 210* is closer to *J. lomatophyllus* while *W.J.Burchell 4386* is similar to typical *J. dregeanus*. The problem requires a field study.

### 15. *Juncus capensis* Thunb., *Prodr. Pl. Cap.* 1: 66 (1794)

T: Caput bonae spei [Cape of Good Hope], *C.P.Thunberg [8702]*; lecto: UPS, *vide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 83 (1985); probable iso: LD.

*Juncus sulcatus* Hochst., in C.Krauss, *Flora* 28: 342 (1845); *Juncus capensis* f. *depauperatus* Buchenau, *Monogr. Junc. Cap* 489 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 489 (1875)]. T: Cape, Uitenhage, Zitzikamma, Mar 1839, *C.Krauss s.n.*; lecto: W, *designated here*.

*Juncus delicatulus* Steud., *Syn. Pl. Glumac.* 2: 304 (1855); *Juncus capensis* subsp. *delicatulus* (Steud.) Buchenau, *Monogr. Junc. Cap* 490 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 490 (1875)]; *Juncus capensis* var. *delicatulus* (Steud.) Adamson, *J. Linn. Soc., Bot.* 50: 28 (1935). T: Africa australis [Cape, Grahamstown Valley], *J.F.Drège 1604e*; holo: P; iso: G, S, W.

*Juncus flaccidus* Steud., *Syn. Pl. Glumac.* 2: 303 (1855); *Juncus capensis* var. *flaccidus* (Steud.) Buchenau, *Monogr. Junc. Cap* 488 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 488 (1875)]. T: Pr[omontorium] b[ona]e sp[eci]i [Cape of Good Hope], *J.F.Drège [Juncus capensis d E.Mey]*; syn: W.

*Juncus capensis* var. *angustifolius* E.Mey, *Linnaea* 3: 372 (1828); *Juncus stenophyllus* Steud., *Syn. Pl. Glumac.* 2: 303 (1855); *Juncus capensis* subsp. *angustifolius* [(E.Mey.) ex] Buchenau, *Monogr. Junc. Cap* 484 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 484 (1875)]; *Juncus capensis* var. *ecklonii* Buchenau, *Monogr. Junc. Cap* 485 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 485 (1875)]. T: Cape, Teufelsberg, *C.F.Ecklon 897, Unio Itin., no 35* [annotated by E.Meyer under no 18]; syn: BOL, S, W.

*Juncus anonymus* Steud., *Syn. Pl. Glumac.* 2: 304 (1855). T: Cape, du Toitskloof, *J.F.Drège 1604a*; holo: P; iso: G, K, S, W.

*Juncus indescritus* Steud., *Syn. Pl. Glumac.* 2: 304 (1855). T: Africa australis [Cape, Berg River near Paarl], *J.F.Drège 1604h*; holo: P; iso: G, K, L, MEL, S, W.

*Juncus acutangulus* Buchenau, *Monogr. Junc. Cap* 480 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 480 (1875)]. T: Somerset, Stellenbosch, *C.Zeyher 4318*; syn: BOL, S, W; Wynberg, *C.F.Ecklon 100*; syn: B, destroyed, S; isosyn: W.

*Juncus capensis* var. *sphagnetorum* Buchenau, *Monogr. Junc. Cap* 489 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 489 (1875)]; *Juncus sphagnetorum* (Buchenau) Adamson, *J. Linn. Soc., Bot.* 50: 29 (1935). T: Cape, du Toitskloof, *J.F.Drège c*; lecto: W, *vide* R.S.Adamson, *J. Linn. Soc., Bot.* 50: 30 (1935); iso: S; *J.F.Drège cc*; para: S, W.

*Juncus capensis* f. *frondescens* Buchenau, *Monogr. Junc. Cap* 490 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 490 (1875)]. T: Cape, Tafelberg, *J.F.Drège aa*; syn: P, S, W; Gipfel des Tafelberges, *C.Zeyher 47*; syn: B, destroyed.

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*Juncus capensis* subsp. *longifolius* [E.Mey ex] Buchenau, *Monogr. Junc. Cap* 482 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 482 (1875)]. T: [Cape] zwischen Paarl und Franschehoek, *J.F.Drège b*; syn: P, S, W; [loc. unknown] *J.F.Drège 1604 k*; syn: S; Tulbagh, *C.F.Ecklon [?] 12*; syn: S; District George, *C.Zeyher 4317*; syn: S.

*Juncus capensis* var. *gracilior* Buchenau, *Monogr. Junc. Cap* 483 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 483 (1875)]. T: Caput bonae spei, 5 Mar 1816, *Bergius*; lecto (as holo): B, destroyed, *fide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 83 (1985); iso: W.

*Juncus capensis* var. *strictissimus* Buchenau, *Monogr. Junc. Cap* 482 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 482 (1875)]. T: Cape, Hottentottsholland, *Gueinzus*; lecto (as holo): W, *fide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 83 (1985); iso: S.

*Juncus capensis* subsp. *parviflorus* Buchenau, *Monogr. Junc. Cap* 491 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 491 (1875)]. T: Cape, Swellendam, Rivier Zondereinde, Nov 1838, *C.Krauss s.n.*; lecto (as holo): W, *fide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 83 (1985); iso: WRSL.

*Juncus capensis* subsp. *geniculatus* Buchenau, *Monogr. Junc. Cap* 492 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 492 (1875)]; *Juncus apiculatus* Adamson, *J. Linn. Soc., Bot.* 50: 27 (1935). T: Cape, Howieson's Poort, *P.MacOwan 2020*; lecto: W, *designated here*; iso: BOL, S, SAM.

*Juncus atropurpureus* Adamson, *J. Linn. Soc., Bot.* 50: 30 (1935). T: Cape Flats near Lakeside, *R.S.Adamson 171*; holo: BOL.

*Juncus umbellatus* Adamson, *J. Linn. Soc., Bot.* 50: 38 (1935). T: Cape, Berg River at Wellington, *R.S.Adamson 314*; holo: BOL.

*Juncus capensis* var. *macranthus* Adamson, *J. Linn. Soc., Bot.* 50: 28 (1935). T: Cape Province, Kommetje, *R.S.Adamson 88*; syn: BOL; *R.S.Adamson 89*; syn: BOL.

Illustrations: F.G.P.Buchenau, *Monogr. Junc. Cap* pl. 11 (1875); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 86, fig. 25, 1 (1985).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 160, fig. 8 (1946); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 83, map 66 (1985).

Perennials, c. 12–35 (–80) cm tall, loosely to densely caespitose; rhizome thin, short vertical or elongated ascending; stolons absent. Leaves only basal, variable in length and width, usually 15–25 (–35) cm long, narrow, c. 0.7–2.0 (–3.0) mm wide in the middle, ±dilated at base (to 6 mm wide), flat to canaliculate or involute; sheath initially closed, later split, narrowly hyaline-bordered; auricles usually present, narrow, obtuse, sometimes ±absent (often not visible on older plants); margins smooth; apex subulate. Lower bract narrow, leaf-like, 1.5–5.0 (–12) cm long, usually shorter, rarely longer than inflorescence. Capitulum bracts ovate-lanceolate, acuminate, ±scarious, c. 2.5–3.5 mm long. Inflorescence compound or decomposed, anthelate, of variable size and shape, of (3–) 5–15 (–50) cup-shaped hemispherical or subglobose 8–15 (–25)-flowered heads usually 7–8 (–11) mm wide. Tepals ±equal or unequal; outer tepals often shorter, rarely ±longer, carinate, lanceolate, acuminate-aristate, (2.8–) 3.5–4.0 (–5.2) mm, with central band straw-brown to brown, bordered deep castaneous, smooth to slightly scabrid, with margins broad and membranous; inner tepals ovate-lanceolate, ±obtuse to subacute, c. 3.0–4.5 (–5.2) mm long, with margins very broad, membranous. Stamens 6; anthers (0.9–) 1.2–1.7 mm long; filaments 0.4–0.6 mm long; style (0.8–) 1.2–1.7 mm long; stigmas (0.6–) 0.8–1.2 (–1.8) mm long, red. Capsule oblong-ovoid, subtrigonal, ±trilocular, c. 2.7–3.1 mm long, acute to subacuminate, top smooth, castaneous-brown to pale brown, usually shorter than perianth; mucro often to 0.5 mm long. Seeds ±ovoid, ±castaneous-brown, c. 0.55–0.60 (–0.75) mm long, faintly reticulate; appendages absent. Fig. 49.

Widespread in SW Cape, distributed in S Cape and reaching S KwaZulu Natal (Transkei). Introduced to St Helena (specimens not seen) and Australia. 27: CPP, NAT. 28: sth [?]. 50: nsw, tas. In a variety of (seasonally) wet habitats, ditches and paths, along streams and near pools, and often also on grassy slopes. Map 193 (secondary distribution not shown).

27. CAPE PROVINCE: Caledon Division, Vogelgat, *I.Williams 2677* (K, NBG, S); Bottelary Hills, 30 Nov 1934, *J.P.H.Acock 3733* (K, S); Grabouw near Palmiet R., *H.Bolus 4220* (BOL); Kirstenbosch, N of Window Stream, *E.Esterhuysen 23272* (BOL); Worcester, Theewaterskloof, *Thompson 3838* (NBG); Knysna, Portland, *J.F.Duthie 966* (LD). NATAL: Transkei, Kentani, *A.Pegler 1107* (BOL). 50. NEW SOUTH WALES: Centennial Park, xii.1900, *E.Cheel 7* (BRI, NSW), *L.A.S.Johnson & E.F.Constable NSW 26267* (K, NSW); Matriville, *O.Evans & E.F.Constable NSW 52734* (K, NSW); La Perouse, 28 Oct 1975, *R.Coveny 7293*, (A, CANB, CHR, K, L, LE, MO, NSW, RSA).

A very variable species, exhibiting variation in some features  $\pm$ constant in other taxa (e.g., the length of rhizome). The characters used for discrimination of the numerous taxa believed to be distinct from the typical *J. capensis* (names listed in the above synonymy) mostly concern the richness and shape of inflorescence, size of flowers and general growth. The common intermediates between the ecotypic forms and other morphological extremes show that all the morphotypes belong to a single, variable species.

**16. *Juncus caespiticus*** E.Mey., in J.G.C.Lehmann, *Pl. Preiss.* 2: 47 (1846)

T: [Western Australia, Perth, Canning R.] ad fluvium Canning (Perth) novae Hollandiae, 2 Nov 1839, *L.Preiss [Pl. Austral. Occid.] 1733*; lecto: W, designated here; iso: BM, BREM, K, L, MEL, NSW, P, W.

*Juncus similis* Buchenau, *Krit. Verz. Juncac.* 93 (1879). T: [Western Australia] Swan River, *J.Drummond 937*; syn: W; 'Australasia S. R.', *Hügel*; syn: W; [South Australia] Schieckens Schlucht, [*H.H.]Behr*; syn: W; [South Australia] Third Ck, Jan 1848, *F.Mueller*; syn: MEL, P, W; [Tasmania] Van Diemensland, *C.Stuart*; syn: W.

*Juncus caespiticus* var. *bracteatus* Buchenau, *Bot. Jahrb. Syst.* 12: 439 (1890). T: New Zealand, *Stephenson 97*; lecto: K, fide E.Edgar, in L.B.Moore & E.Edgar, *Fl. New Zealand* 2: 68 (1970); iso: W.

Perennials, (5–) 10–55 cm tall, densely caespitose; rhizome short; stolons absent. Stem smooth, sometimes flowering in the first year and then plants very slender. Leaves basal,  $\pm$ flat to canaliculate, narrowly linear, c. 5–8 (–15) cm long, usually 1.0–1.2 (–3.5) mm wide, (to 8 mm wide near base); margins often narrowly hyaline; apex acute to mucronate; auricles absent. Lower bract 2–11 cm long, narrow, subequalling inflorescence or longer than it. Inflorescence anthelate or umbelloid, rarely  $\pm$ congested, of 1–10 (–20) hemispherical to cup-shaped 2–10 (–20)-flowered clusters c. 5–7 mm wide. Capitulum bracts  $\pm$ ovate-lanceolate, stramineous to castaneous, to c. 2.5 mm long. Tepals  $\pm$ unequal; outer tepals shorter or equalling inner ones, lanceolate, carinate, acuminate to acute, 1.5–3.0 mm long, pale castaneous-brown with paler  $\pm$ minutely papillose to smooth midrib; inner tepals subobtusate,  $\pm$ ovate, c. 2.4–3.0 mm long, broadly membranous-bordered. Stamens 6; anthers 0.4–0.8 mm long; filaments 0.4–0.6 mm long; style 0.2–0.4 mm long; stigmas 0.6–0.8 mm long. Capsule ovoid to ellipsoid, subacute to  $\pm$ obtuse, subtrigonal, c. 2.5 mm long, trilocular, smooth, dark golden brown to red-brown, shorter than or equalling outer tepals. Seeds broadly ovoid, 0.4–0.6  $\times$  c. 0.35 mm, pale brown, faintly reticulate; appendages absent. Fig. 51.

Widely distributed in southern Australia and New Zealand. 50: NSW, SOA, TAS, VIC, WAU. 51: NZN, NZS. In damp, sandy places, often in swampy, brackish ground. Map 194.

50. NEW SOUTH WALES: La Perouse, 16 Mar 1973, *L.A.S.Johnson 7603, Jacobs & R.Coveny*, (NSW). SOUTH AUSTRALIA: c. 32 km SE of Mt Gambier, Piccaninnie Ponds Natl Park, *Cornwall 153*, (AD, NSW). TASMANIA: Tea Tree Ck swamp, c. 2 km E of Buckland, 14 Dec 1968, *Robinson s.n.*, (HO, NSW255185); King Island, SE of Dead Sea Lagoon, 4 Mar 1966, *J.Willis s.n.*, (MEL, NSW255186). VICTORIA: Near Mallecoota aerodrome, *R.Melville 2762 & N.A.Wakefield*, 9 Jan 1953 (K, NSW); Coimadai Ck, Bacchus Marsh, Long Forest Flora Reserve, 2 Feb 1991, *Stajsic 153*, (BRI, HO, MEL, NSW). WESTERN AUSTRALIA: Ellen Brook, Bullsbrook area, Twin Swamps Wildlife Sanctuary, 28 Dec 1971, *N.T.Burbidge 7951*, (CANB, NSW). 51. NORTH IS.: Hawera, Taranaki, *T.F.Cheeseman 19* (W). SOUTH IS.: S end of lagoon at mouth of Styx & Waimakariri Rivers, 14 Feb 1966, *E.Edgar s.n.* (CHR, K, NSW90865); S of Waimakariri River mouth, 25 May 1960, *E.Edgar 7* (CHR, NSW).

New Zealand plants from less wet habitats sometimes have subcongested to almost globular inflorescences, and were described as var. *bracteatus*. Western Australian plants often have small flowers (tepals c. 1.5 mm long) but the plants are still as robust as in eastern Australia.

**17. *Juncus meianthus*** L.A.S.Johnson ex K.L.Wilson, in J.Kirschner & Z.Kaplan, *Taxon* 50: 1112 (2001)

*Juncus gracilis* R.Br., *Prodr.* 259 (1810), *nom. illeg., non* Roth (1787) *nec* Sm. (1800) T: 'M' [=Ora Meridionalis]; [Western Australia], King George III's Sound, *R.Brown [Bennett 5782]*; holo: BM; iso: K.

*Juncus gracilis* var. *humilis* Benth., *Fl. Austral.* 7: 125 (1878). T: [Western] Australia, Karri Dale [Karridale], Dec 1867, *P.Walcott*; holo: K; iso: MEL.

Perennials, (6–) 10–25 (–30) cm tall, loosely caespitose; rhizome long,  $\pm$ vertical, distally  $\pm$ leafy; stolons absent. Leaves basal, 5–18 (–29) cm long, canaliculate but almost terete near

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**Figure 51.** *Juncus caespiticius*. A, inflorescence; B, flower; C, habit. (A–C, K.L.Wilson 1143 & L.A.S.Johnson, NSW). *Juncus antarcticus*. D, habit; E, flower. (D, E, J.Pickard & R.Coveny 2741, NSW). *Juncus meianthus*. F, inflorescence; G, flower. (F, G, C.R.P.Andrews, Dec 1902, NSW 50048). *Juncus planifolius*. H, flower; I, inflorescence. (H, I, B.G.Briggs 3480 & L.A.S.Johnson, NSW). *Juncus falcatus* subsp. *falcatus*, Australian form. J, inflorescence; K, flower. (J, K, M.Gray & C.Totterdell 6210, NSW). Scale bars: A, D, F, I, J = 2 cm; B, E, G, H, K = 2 mm; C = 5 cm. Drawn by D.Mackay. Reproduced with permission, from G.J.Harden (ed.), *Fl. New South Wales* 4: 284–285 (1993).

apex, 0.4–1.0 mm wide; apex acute; auricles absent. Lower bract filiform, 0.3–1.5 cm long, shorter than or rarely longer than inflorescence; capitulum bracts scarious, to c. 2 mm long, scabrid on midrib. Inflorescence umbelloid to rarely anthelate, of 1–10 (–20) heads; heads 2–8-flowered, c. 4–5 mm wide. Tepals unequal,  $\pm$ narrowly ovate; outer tepals (1.0–) 1.2–1.5 mm long, acute to broadly-acute, mucronate, without hyaline margins; inner tepals 1.3–1.8  $\times$  1.0 mm, rounded-obtuse, with broad whitish margins. Stamens 6, rarely 3 or 4; anthers (0.4–) 0.6–0.8 mm long; filaments 0.4–0.7 mm long; style 0.2–0.5 mm long; stigmas 0.3–0.8 mm long, pale yellow. Capsule ellipsoid to ovoid, subobtuse, shortly mucronate, dark golden brown to red-brown near apex, 1.5–2.0 mm long, distinctly longer than perianth. Seeds broadly ovoid, 0.4–0.6 mm long, 0.2–0.3 mm wide, pale castaneous, faintly reticulate; appendages absent. Fig. 51.

Endemic in Western Australia. 50: WAU. In damp places. Map 195.

50. WESTERN AUSTRALIA: [without locality], *J.Drummond 103* (W); Nornalup village, *K.L.Wilson 9038* & *K.Frank* (CHR, K, NSW, PERTH); Albany, Sep 1902, *C.Andrews s.n.*, (NSW50048); Bluff Knoll, 4 May 1975, *G.J.Keighery UWA1975* (NSW, UWA).

The number of stamens is usually 6, but occasionally varies from 3 to 6 on the same plant. A few plants appear intermediate between this and *J. planifolius*, which may suggest hybridisation. Outer tepals are always narrower and less obtuse than the inner ones, which have broad whitish margins.

### 18. *Juncus antarcticus* Hook.f., *Fl. Antarct.* 1: 79, tab. 46 (1844).

T: Campbell's Island, 1200 ft, *J.D.Hooker 1623*; lecto: K, *fide* E.Edgar, in L.B.Moore & E.Edgar, *Fl. New Zealand* 2: 69 (1970); iso: BM, MEL *s.n.*, NSW *s.n.*, UPS.

*Juncus pauciflorus* Kirk, *Trans. & Proc. New Zealand Inst.* 9: 551 (1877), *nom. illeg.*, *non* R.Br. (1810); *Juncus brevifolius* Kirk, *Trans. & Proc. New Zealand Inst.* 14: 384 (1882), *nom. illeg.*, *non* R.Br. (1810). T: New Zealand, Castle Hill Basin, Broken River, T.Kirk; holotype: WELT11170; iso: K [as T.Kirk 630].

Illustration: J.D.Hooker, *Fl. Antarct.* 2(1): pl. 46 (1844).

Perennials, 1–5 (–12) cm tall, dwarf, loosely caespitose, turf-forming; rhizomes thin, c. 1 mm in diam., vertical and ascending, branched or many-headed; stolons  $\pm$ absent. Leaves basal and sub-basal,  $\pm$ flat to canaliculate, distally canaliculate to subinvolute, almost terete near apex, to 2–3 cm long, c. 0.5–0.9 mm wide near base; margins  $\pm$ smooth and narrowly hyaline; apex  $\pm$ obtuse to subobtuse, rarely minutely mucronate; sheaths loose, open, c. 4–8 mm long, with margins distinct, membranous; auricles absent. Bracts  $\pm$ ovate, acuminate, pale castaneous-brown to brownish scarious, 2–6 mm long, shorter than or equalling inflorescence. Inflorescence terminal, c. 1 cm long, of a 2–10-flowered head; flowers on pedicels to c. 1.2 mm long. Tepals  $\pm$ equal, 2.5–3.5 mm long, usually dark castaneous-brown, with a paler brownish-membranous border or unbordered, acute to acuminate; outer tepals  $\pm$ lanceolate, carinate, 3-veined; inner tepals ovate-lanceolate. Stamens 3, rarely to 6; anthers 0.5–0.7 mm long; filaments 1.0–1.2 mm long; style c. 0.2 mm long; stigmas c. 0.6–0.8 mm long. Capsule narrow-ellipsoid,  $\pm$ trilocular, subtrigonal, subabruptly narrowing into a short mucro, c. 2.8–3.1 mm long, golden brown to very dark red-brown, usually darker near apex, shorter than or equalling perianth. Seeds broadly ovoid, pale brown, 0.4–0.6  $\times$  0.35 mm, distinctly transversely reticulate; appendages absent. Fig. 51.

In Australia (Tasmania, Victoria and New South Wales), and New Zealand (North, South, Stewart and subantarctic Islands). 50: NSW, TAS, VIC. 51: ATP, NZN, NZS. Boggy ground, mostly at altitudes above 500 m but down to sea-level in southern New Zealand and associated islands. Map 196.

50. NEW SOUTH WALES: Rawsons Pass, Kosciusko National Park, 19 Mar 1974, *R.Coveny 5376*, (CHR, K, L, LE, MEL, NSW, RSA); base of Mt Piper, near Smiggins – Guthega road, Kosciusko National Park, 23 Jan 1976, *J.Thompson 2438B part*, (CANB, CHR, K, L, MEL, NSW.). TASMANIA: Pelion Gap, Cradle Mtn, Lake St Clair N.P., 26 Mar 1992, *K.L.Wilson 8366*, (CHR, HO, NSW). VICTORIA: Watchbed Ck, Bogong High Plains, 27 Jan 1966, *A.C.Beauglehole 15642* (NSW). 51. NORTH IS.: Wellington, Tararua State Forest Park, Tararua Range, NW of Powell Hut, Mt Holdsworth area, 1320 m, *W.R.Baker, E.Vitek & al. 38-1* (W). SOUTH IS.: South Is., Canterbury, Thomas River, *T.Kirk 1043* (WELT11143); Table Hill, Stewart Island, *R.Melville 6291* & *E.F.Melville* (K, NSW). ANTIPODEAN IS.: Auckland Island, Carnley Harbour, *T.Kirk 1212* (K).



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### 19. *Juncus planifolius* R.Br., *Prodr.* 1: 259 (1810)

T: 'J. D.' [Port Jackson; Insula Van Diemen]; [New South Wales] Port Jackson, *R.Brown [Bennett 5786]*; lecto: BM, *designated here*; iso: DBN, K, NSW [The other original syntype from Tasmania, Table Mountain [Mt Wellington], *R.Brown*; orig. syn: BM, belongs to *J. caespiticus*. The lectotype is a more mature plant on the type herbarium sheet].

*Juncus homalophyllus* Steud., *Syn. Pl. Glumac.* 2: 303 (1855). T: Chile, Valdivia, *W.Lechler 450a*; syn: G, P.  
*Juncus xantholepis* Steud., *Syn. Pl. Glumac.* 2: 303 (1855). T: Chile, Angachilla, *W.Lechler 413*; syn: G, K, P.  
*Juncus demissus* Steud., *Syn. Pl. Glumac.* 2: 303 (1855); *Juncus planifolius* var. *demissus* (Steud.) Buchenau, *Bot. Jahrb. Syst.* 12: 434 (1890). T: Chile, Valdivia, *R.A.Philippi 38*; syn: G, P.  
*Juncus planifolius* var. *tenellus* Benth., *Fl. Austral.* 7: 126 (1878). T: Australia, Mt M'Ivor, *F.Mueller* s.n.; syn: K.  
*Juncus planifolius* var. *chathamensis* Buchenau, *Krit. Verz. Juncac.* 87 (1879). T: New Zealand, Chatham Is., *H.H.Travers*; holotype: W; iso: K, n.v.

*Juncus planifolius* var. *humilis* Ostenf., *Bidl. Meddel. Kongel. Danske Vidensk. Selsk.* 3(2): 15 (1921). T: Western Australia, Albany, *C.H.Ostenfeld 148*; holotype: C.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 250, fig. 117 (1906); M.Barros, *Darwiniana* 10: 455, fig. 58 (1953).

Map: H.Balslev, *Brittonia* 32: 52, fig. 1 (1980).

Perennials, (6–) 15–50 (–70) cm tall, densely caespitose; rhizome short; stolons absent; cataphylls absent. Leaves basal; sheaths open, pale brownish, usually suffused reddish; auricles absent; blades to c. 20 (–30) cm long, (1.5–) 2.5–6.0 (–11) mm wide, flat; apex acute. Lower bract leaf-like, to c. 10 cm long, shorter than inflorescence. Inflorescence usually diffuse, rarely subcongested, 2–12 cm long, anthelate, of 3–20 (rarely to 70) hemispherical (3–) 5–12 (–30)-flowered clusters c. 5–7 mm in diam.; peduncles slightly scabrid to smooth. Capitulum bracts lanceolate, acute, castaneous, paler towards margins. Tepals subequal or inner longer, (1.4–) 1.8–2.3 (–2.8) mm long; outer tepals carinate, castaneous to reddish brown, acute, usually with paler and thicker central band; inner tepals ovate-lanceolate, obtuse to ±acute, ±castaneous-brown, often with greenish later brownish central band; margins broad, membranous. Stamens 3 (rarely 4–6); anthers c. 0.4–0.5 mm long; filaments to c. 1.0 mm long; style 0.2–0.3 mm long; stigmas 0.4–0.5 mm long. Capsule ellipsoid to narrowly trigonous-ovoid, c. 2.0–2.5 mm long, golden brown to castaneous-brown, shiny; apex subobtusate, shorter than or ±equalling perianth, subabruptly narrowed into mucro 0.3–0.5 mm long. Seeds ±ovoid, c. 0.35–0.50 × 0.20–0.25 mm, pale brown, distinctly transversely reticulate; appendages absent. Fig. 51.

A species with a wide disjunct distribution. It is native in SW Australia, New Zealand, Chile and Juan Fernández Is., introduced in Hawaiian Is., Ireland and Oregon, USA. 10: ire. 50: NSW, QLD, SOA, TAS, VIC, WAU. 51: NZN, NZS. 63: haw. 73: ore. 85: CLC, CLS, JNF. Open, wet, usually sandy sites, along shores, wet tracks, and seepage sites. Map 197.

10. IRELAND: Lough Atrohaunderg, near Carna, West Galway, 20 Oct 1976, *M.Scannell* s.n. (DBN, NSW256329). 50. NEW SOUTH WALES: Botany Bay, Jan 1908, *J.L.Boorman* (NSW 19897, NY, W). TASMANIA: Arve River, c. 12 km W of Geeveston on Hartz Mountains road, 26 Feb 1986, *K.L.Wilson 6631* (HO, K, MO, NSW, PRE). WESTERN AUSTRALIA: Albany, 16 Jan 1903, *C.Andrews 1046* (BM). 51. NORTH IS.: Waikato, Whangamarino Swamp, *R.Mason & N.T.Moar 6950* (PR). SOUTH IS.: Knights Point, South Is., 12 Mar 1983, *M.D.Tindale 7047 & W.R.Sykes* (CHR, K, MO, NSW). 63. HAWAII: Kuani Prison Road, *J.Henrickson 4120 & L.A.S.Johnson* (NSW). 73. OREGON: Coos Co., Bandon, *D.S.Corrall & Correll 37803* (NY). 85. CHILE: Valdivia, Cordillera de la Costa, La Unión, *W.J.Eyerdam 10633* (K, NY). JUAN FERNÁNDEZ IS.: Masatierra, Cumberland Bay, *C.Skottsberg & I.Skottsberg 185* (K).

### 20. *Juncus regelii* Buchenau, *Bot. Jahrb. Syst.* 12: 414 (1890)

T: Washington State, Mt Paddo, *W.Suksdorf 678* [ut *Juncus falcatus*]; holotype: W.

*Juncus jonesii* Rydb., *Fl. Rocky Mts.* 153 (1917). T: Utah, Alta, Wasatch Mountains, 6 Aug 1879, *M.E.Jones* s.n.; holotype: NY [at the same time an isoparatype of *Juncus regelii*].

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 240, fig. 113 (1906); C.L.Hitchcock & al., *Vasc. Pl. Pacif. Northw.* 1: 206 (1969).

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 227 (2000).

Perennials, c. 15–55 cm tall, loosely caespitose; rhizome long, creeping, usually with long internodes; stolons present. Stem slightly compressed, papillose. Cataphylls absent or 1–2, dull brownish, to c. 3 cm long; basal leaves few. Cauline leaves 1–3; lower leaves c. 10–25 cm long; upper leaves with blade 4–7 cm long, c. 1.5–2.5 (–4.0) mm wide; sheaths narrow, with a very narrow membranous margin; auricles  $\pm$ absent or linear, subacute, to 0.5–0.7 mm long; apex subulate. Lower bract reduced, c. 0.5–2.0 cm long,  $\pm$ shorter than inflorescence; middle bracts lanceolate, acuminate, to c. 6 mm long, scarious. Inflorescence a single sessile head (rarely up to 3–4 heads), globose, rarely hemispherical, 8–15 (–30)-flowered, with other heads on peduncles to c. 5 cm long. Tepals  $\pm$ equal, c. 4.5–5.3 (–5.7) mm long, usually abaxially scabrid; outer tepals sometimes slightly longer, lanceolate, acute or subacute, bright castaneous, with central band green or later stramineous; inner tepals ovate-lanceolate, obtuse, broadly bordered, with margins membranous. Stamens 6; anthers 0.9–1.5 mm long; filaments 0.7–1.2 mm long; style c. 1.0–1.4 mm long; stigmas 1.5–2.5 mm long. Capsule  $\pm$ ovoid, trilocular, trigonous,  $\pm$ truncate with a short mucro,  $\pm$ equalling perianth, c. 3.5–4.5 mm long. Seeds narrowly ellipsoid,  $\pm$ pale brown, c. 0.6–0.7  $\times$  c. 0.2 mm long, or 1.4–1.8 mm long including two appendages each 0.5–0.6 mm long,  $\pm$ smooth; outer seed-coat  $\pm$ loose. Fig. 52.

Pacific North America from British Columbia and Alberta in SW Canada to California. 71: ABT, BRC. 73: IDA, MNT, ORE, WAS, WYO. 76: CAL, NEV, UTA. Wet meadows, boggy slopes, seepage areas, in the mountains above 1000 m. Map 198.

73. IDAHO: Valley Co., SW of Warm Lake, *W.H.Baker 11851* (W). OREGON: Baker Co., Blue Mtns, Elkhorn Ridge, 5 km N of Anthony Lake, *B.Maguire & A.H.Holmgren 26936* (W). WASHINGTON: Mt Paddo, 1 Aug 1908, *W.Suksdorf [A.Kneucker, Cyper. Junc. Exs.] 269* (W); Mt Adams, Aug 1882, *Henderson 1527* (W). 76. UTAH: Alta, Wahsatch Mtns, 6 Aug 1879, *M.E.Jones 1199* (para: W)

### 21. *Juncus howellii* F.J.Herm., *Leaflet. W. Bot.* 5: 182 (1949)

T: USA, California, Trinity Co., N of Carrville, summit of Scotts Mtns, 24 Aug 1936, *J.T.Howell 12750*; holo: USNA; iso: CAS.

Illustration: C.L.Hitchcock & al., *Vasc. Pl. Pacif. Northw.* 1: 200 (1969).

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 227 (2000).

Perennials, 20–30 cm tall, loosely caespitose; rhizome creeping, long; stems slightly compressed, loosely tufted or spaced. Cataphylls 0–2, loose, brownish, to c. 7 cm long; basal leaves 2–4. Cauline leaves 2–3, flat, 12–15 (–30) cm long, 2–4 mm wide; sheaths  $\pm$ loose; margins membranous; auricles scarious, oblong, obtuse, 1–2 (–3) mm long. Lower bract reduced, to c. 3 cm long, much shorter than inflorescence; margins papillose-serrulate. Inflorescence decomposed, anthelate, loose, c. 4–9 cm long, of (2–) 3–9 hemispherical 3–8 (–10)-flowered heads c. 10–15 mm wide. Tepals subequal; outer tepals usually slightly shorter, ovate-lanceolate, 5.2–6.4 mm long, with central band pale green bordered deep castaneous and distally scabrid; apex acuminate, dark; margins membranous to brownish-scarious, broad, subabruptly narrowing (apex obtuse or mucronate), sometimes forming very short auricles. Stamens 6; anthers 1.8–2.6 mm long; filaments 0.5–1.0 mm long; style c. 0.6 mm long. Capsule trilocular, obovoid; apex subobtuse, subabruptly narrowing in a short mucro, c. 3.5–4.8 mm long, shorter than perianth, tan. Seeds  $\pm$ ellipsoid, 0.5–0.7  $\times$  c. 0.25 mm long, conspicuously reticulate, brown; appendages distinct, 0.2–0.4 mm long each. Fig. 53.

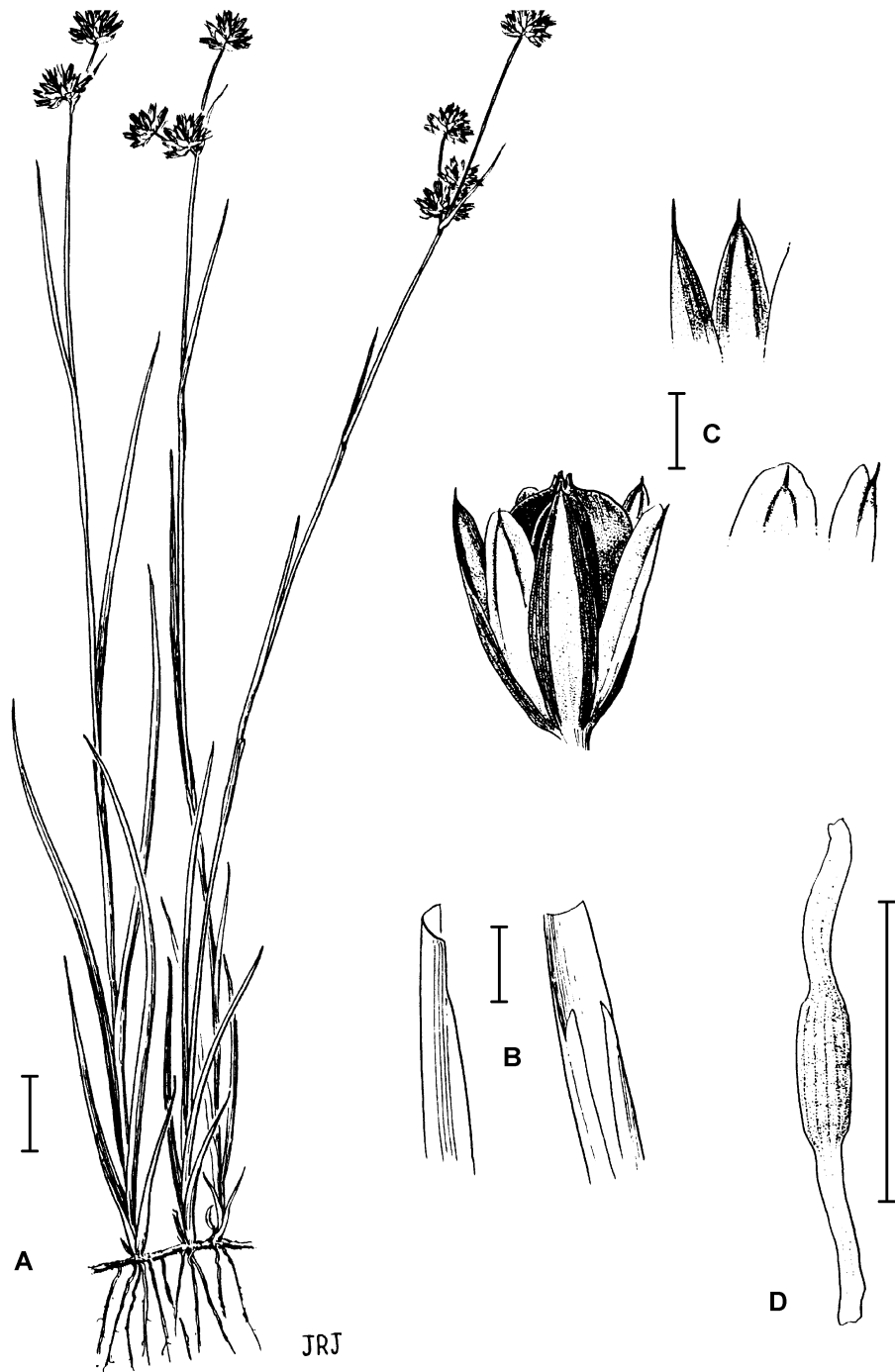
Endemic in the mountains of California, Oregon and Washington; an occurrence in Idaho requires confirmation but is possible. 73: ?IDA, ORE, WAS. 76: CAL. Moist meadows and open damp places in the mountains. Map 199.

76. CALIFORNIA: Plumas Co., Butterfly Valley, W of Keddie, *L.S.Rose 66068* (AAU); Siskiyou Co., Bear Springs area, c. 1600 m, *W.J.Ferlatte 2109* (UC); Siskiyou Co., Parks Ck Road, c. 1.5 km N of Trinity Co. border, c. 2100 m, 23 Jul 1986, *W.J.Ferlatte* (UC); Lassen National Park, Hat Ck, c. 2100 m, *H.Bailey & V.Bailey 2908* (UC).

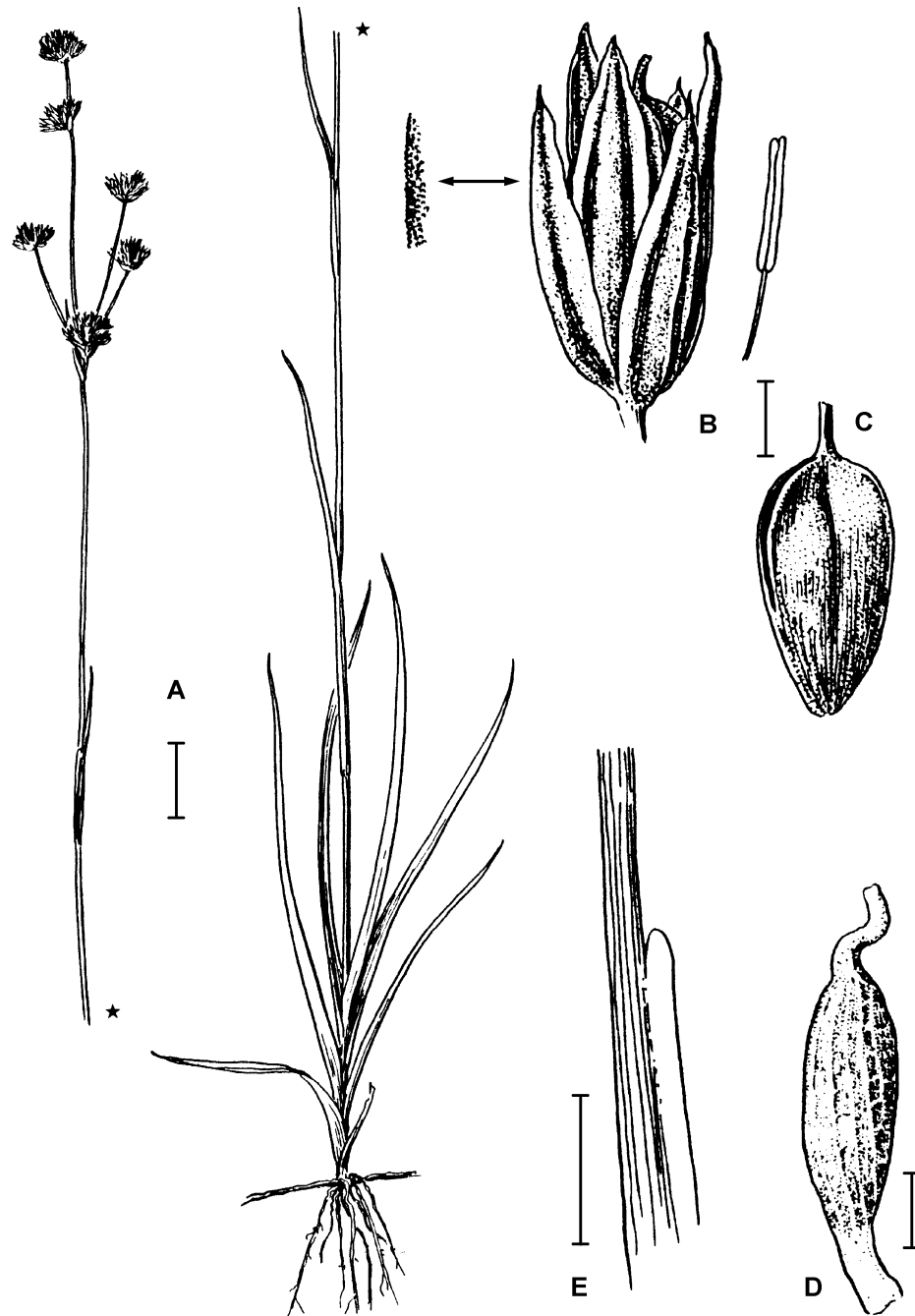
### 22. *Juncus repens* Michx., *Fl. Bor.-Amer.* 1: 191 (1803)

*Cephaloxys flabellata* Desv., *J. Bot. (Desvaux)* 1: 324 (1809), *nom. illeg.* T: USA, Carolina, Georgia, *A.Michaux*; lecto: P, *fide* H.Balslev, *Fl. Neotrop Monogr.* 68: 104 (1996); iso: MO, P, W [two specimens from Carolina, *L.A.G.Bosc.*].

JUNCACEAE (*Juncus*)



**Figure 52.** *Juncus regelii*. **A**, habit; **B**, details of auricles; **C**, perianth with ripe capsule and details of tepal apices; **D**, seed. Scale bars: **A** = 2 cm; **B–D** = 1 mm. Drawn by J.R.Janish. Reproduced with permission, from C.L.Hitchcock, A.Cronquist, M.Ownbey & J.W.Thompson, *Vasc. Pl. Pacif. Northw.* 1: 206 (1969). © University of Washington Press.



**Figure 53.** *Juncus howellii*. **A**, habit; **B**, stamen and perianth with a detail of tepal papillosity; **C**, capsule; **D**, seed; **E**, auricle. Scale bars: **A**, = 2 cm; **B–D**, = 1 mm; **E** = 1 cm. Drawn by J.R.Janish. Reproduced with permission, from C.L.Hitchcock, A.Cronquist, M.Ownbey & J.W.Thompson, *Vasc. Pl. Pacif. Northw.* 1: 200 (1969). © University of Washington Press.

## JUNCACEAE (*Juncus*)

*Juncus subincurvus* Steud., *Syn. Pl. Glumac.* 2: 303 (1855). T: Louisiana, *R.Hartmann* 86; holo: P; iso: P.

Illustration: H.A.Gleason, *Ill. Fl. N. U.S.* 1: 393 (1952).

Maps: W.C.Muenschler, *Aquat. Pl. U.S.*, map. 231 (1944); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 230 (2000).

Perennials, heteromorphic; one form caespitose (in drier places) with one to several stems 5–15 cm tall, each with 1–4 (–8) flower heads; in wet sites and shallow water prostrate with creeping and rooting stems and leaf rosettes developing 5–10 cm apart along the stem; when floating then with remote rosettes. Rhizome sometimes present, densely branched. Stems compressed, 0.8–2.0 mm in diam., up to 50 cm long, internodes 5–10 cm long. Leaves in dense rosettes, 2–15 cm long, 1–4 mm wide, flat; blades not distinctly separated from sheaths 0.5–1.5 cm long; margins scarios; auricles rounded to acutish, to 0.5 (–0.8) mm long. Lower bract leaf-like; floral bracts broadly lanceolate, mucronate, 1–2 mm long. Inflorescence an anthela of 2–8 conical to hemispherical 2–20-flowered heads 7–13 (–20) mm in diam. Tepals unequal, green or slightly reddish; outer tepals 2.8–4.2 mm long, scarios towards margins; inner tepals longer (3.5–) 4.0–5.0 mm long, subulate; margins distinct, narrow, involute, scarios. Stamens 3; anthers 0.3–1.0 mm long, at first as long as filiform filaments, after dehiscence only  $\frac{1}{7}$  length; style c. 0.2 mm long; stigmas c. 0.4 mm long. Capsule trilobular, linear to lanceolate in outline, trigonous, truncate to retuse, 2.5–3.5 mm long, 0.7–1.1 mm wide, shorter than inner tepals; base thin-walled and hyaline; apex thicker, stramineous to golden-brown. Seeds oblique, ovoid, apiculate, c. 0.3 × 0.15 mm, finely rugose, castaneous; appendages absent.

Most common in the E USA, disjunctly in Cuba and Tabasco in Mexico. Reported from California but material not seen. 74: OKL. 77: TEX. 78: ALA, ARK, DEL, FLA, GEO, LOU, MRY, MSI, NCA, SCA, TEN, VRG. 79: SMX. 81: CUB. Margins of lakes and ponds, in swamps, open woods, stream beds, on muddy and loamy soils. Map 200.

78. ARKANSAS: Ouachita Co., Bragg Lake, *D.Demaree* 48165 (W); Bradley Co., 22 km N of Moro Bay State Park, *R.D.Thomas* & *S.Leslie* 1381 (LD). FLORIDA: Jacksonville, *A.H.Curtiss* 3721 (W). NORTH CAROLINA: Moore Co., Fort Bragg, 17 Aug 1976, *L.J.Musselman* & *T.Gwynn* (LD). SOUTH CAROLINA: Aiken, 2 Jun 1866, *H.W.Ravenel* [*G.Engelmann, Herb. Junc. Bor.-Amer. Norm.*] 29 (MO). 79. MEXICO: Tabasco, W of Huimanguillo, *B.Barlow* 30/133 (BM, MEXU, UC, WIS). 81. CUBA: Isla de Pinos, Santa Ana, Laguna Blanca, *N.L.Britton* & *P.Wilson* 15686 (CM, NY, S, US); Pinar del Río, Herradura, *E.L.Ekman* 10733 (NY, S, US).

### 23. *Juncus cyperoides* Laharpe, *Essai Monogr. Jonc.* 57 (1825)

T: L'Amérique méridionale, *L.Née s.n.*; holo: G.

*Juncus graminifolius* E.Mey., in K.B.Presl, *Reliq. Haenk.* 1: 144 (1827); *Cephaloxys graminifolia* (E.Mey.) Nees & Meyen, in F.J.F.Meyen, *Observ. Bot.* 128 (1843). T: [Peru] in montanis Peruviae Oronoccensis [Huanoccensis], *T.Haenke*; syn: HAL, PR, W.

*Juncus rivularis* Poepp. ex Steud., *Syn. Pl. Glumac.* 2: 303 (1855). T: Chile, *E.F.Poeppig* [*Coll. Pl. Chil.*] 114; syn: *n.v.*; Chile, San Vincente, *E.F.Poeppig* [*Coll. Pl. Chil.*] 2: 48; syn: W; *C.L.G.Bertero* 1061; syn: *n.v.* Illustrations: M.Barros, *Darwiniana* 10: 450, fig. 56 (1953); H.Balslev, *Fl. Neotrop. Monogr.* 68: 101, fig. 50, C, D (1996).

Map: H.Balslev, *Fl. Neotrop. Monogr.* 68: 103, fig. 51 (1996).

Perennials, 5–30 cm tall; rhizome creeping, ascending, gradually changing in stem, rooting, branched, 0.7–1.5 mm in diam.; internodes to 3 cm, with scarios scale-leaves to 1.5 cm long. Cataphylls absent or 1–3, scarios, to 2 cm long, with blade to 3 mm long; cauline leaves 5–15, ±remote, 3–12 cm long, 1–7 mm wide, gradually changing to sheaths 0.5–3 cm long, with or without scarios margins; auricles absent. Lower bract leaf-like, to 9 cm long; floral bracts scarios, to 5 mm long. Inflorescence anthelate, of (1–) 5–40, (3–) 5–10-flowered heads on thin peduncles 0.2–0.3 mm in diam., proliferation sometimes present. Tepals ±equal, 2.2–4.0 (–5.0) mm long, linear to lanceolate, acuminate, green, later castaneous to light brown; margins scarios, narrow. Stamens 6; anthers 0.5–1.0 mm long, much shorter than 2 mm filaments; style c. 0.5 mm long; stigmas 1.5–2.0 mm long. Capsule 3-septate, ellipsoid-trigonous, 2.0–3.5 mm long, 1.0–1.5 mm wide, ±equalling perianth, thin-walled. Seeds ellipsoid, apiculate, c. 0.4 × 0.2 mm, reticulate, castaneous; appendages absent. Fig. 54.

Found in the Andes from Colombia to Chile and Argentina; and reportedly disjunctly in Sierra Nevada, California [see J.Jokerst, *Fremontia* 14(2): 22–23 (1986)], but material not seen. 76: CAL(?). 83: BOL, CLM, ECU, PER. 85: AGW, CLN, CLC. Bogs, wet meadows, swamps, ditches. Map 201.

**83.** BOLIVIA: Cochabamba, Ayopayo, Independencia, 3045 m, *Baar 362* (GOET). COLOMBIA: Cauca, Mt Puracé, 3600–3700 m, *F.W.Pennell & E.P.Killip 6547* (GH, NY, PH, US). ECUADOR: Carchi, El Pun-Tulcán, 3000 m, *E.Asplund 16894* (C, G, K, LL, NY, S, UC, UPS, US). PERU: Huamachuco, Hacienda Cochabamba, 3200 m, *López Miranda 1483* (NY, UC, US). **85.** ARGENTINA NORTHWEST: Tucumán, Chicligasta, Estancia Santa Rosa, 3600 m, 11 Jan 1927, *S.Venturi 4768* (LP). ARGENTINA SOUTH: Río Negro, Bariloche, Camino al Tronador, frente al lago Mascaradi, *S.Crespo & E.R.Guaglianone 2114* (BAB); Chubut, Cushamen, Lago Esperanza, Pobl. Cárdenas, 550 m, *A.Johnson 612* (SI). CHILE CENTRAL: Maule, Talca, Vilches Alto, *Gardner & al. 4431* (K); Talcahuano, Ramuncho, *J.Hutchinson 231* (K). CHILE SOUTH: Valdivia, *O.Buchtien 253* (W).

#### 24. *Juncus filipendulus* Buckley, *Proc. Acad. Nat. Sci. Philadelphia* 1862: 8 (1862)

*Juncus buckleyi* Engelm., *Trans. Acad. Sci. St. Louis* 2: 435 (1866), *nom. illeg.*; *Juncus leptocaulis* Torr. & A.Gray ex Engelm., *Trans. Acad. Sci. St. Louis* 2: 454 (1866), *nom. illeg.* T: Western Texas, *S.B.Buckley*; *syn: n. v.*

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 229 (2000).

Perennials, 15–30 (–35) cm tall, densely to loosely caespitose; rhizome short, ±vertical to ascending; stem ±compressed, often with bulbous swollen base. Cataphyll 0–1, brownish; basal leaves 1–4; cauline leaves 1–3, flat, c. 3–12 cm long, 1.0–2.5 mm wide; auricles obtuse, scarious, rarely brownish at base, c. 0.3–0.8 mm long. Lower bract narrow, to 2.5 cm long, shorter than inflorescence; margins ±smooth. Inflorescence decomposed, usually umbelloid, of (1–) 2–5 (7–10) globose to hemispherical (3–) 6–10 (–15)-flowered heads 7–10 mm wide. Tepals lanceolate to ovate-lanceolate, subequal, c. 3.8–4.8 mm long, acuminate, with central band ±smooth, green to greenish-stramineous, with a prominent mid-vein (carinate) in outer ones; margins membranous to stramineous, broad. Stamens 3; anthers 0.4–0.7 mm long; filaments to c. 1.5 mm long; style c. 0.4–0.5 mm long including young capsule mucro; stigmas 0.8–1 mm long. Capsule trilocular, oblong-obovoid, obtuse to truncate, c. 2.8–3.3 mm long, with a mucro 0.3–0.4 mm long, pale (tan) brown to slightly reddish-brown, ±shorter than perianth. Seeds ±ellipsoid, apiculate, 0.4–0.6 × c. 0.2 mm, light brown, distinctly reticulate; appendages absent. 2n = 40, *fide* N.A.Harriman, *Taxon* 28: 406 (1979).

Restricted to the southeastern part of USA. 74: OKL. 77: TEX. 78: ALA, ARK, GEO, KTY, LOU, MSI, TEN. Moist, usually calcareous soils of swales and glades, along streams. Map 202.

77. TEXAS: Blanco Co., c. 50 km W of Austin, *B.J.Ertter 4894* (AAU, TEX); Kendall Co., Highway 46 SW of Boerne, *B.J.Ertter 5341* (AAU, TEX); Kerr Co., Kerrville, *A.A.Heller 1852* (UC); Kerr Co., Kerrville, Big Foot Wallace Ck, 28 Apr 1946, *V.L.Cory 51810* (UC). 78. TENNESSEE: Wilson Co., Vesta, 12 Jul 1935, *H.K.Svenson 7156* (UC).

#### 25. *Juncus marginatus* Rostk., *De Junco* 38 (1801)

*Juncus marginatus* var. *vulgaris* Engelm., *Trans. Acad. Sci. St. Louis* 2: 455 (1866). T: [USA] Pennsylvania, *Muehlenberg*; lecto: B-W6861, sheet 1, *fide* H.Balslev, *Fl. Neotrop. Monogr.* 68: 100 (1996).

*Juncus aristulatus* Michx., *Fl. Bor.-Amer.* 1: 192 (1803); *Juncus marginatus* var. *aristulatus* (Michx.) Coville, *Proc. Biol. Soc. Wash.* 8: 123 (1893). T: [USA] Georgia, Carolina, [*collector not given*]; holo: P [wrongly spelled as *J. aristatus* by some older authors].

*Juncus longii* Fernald, *Rhodora* 39: 397 (1937). T: USA, Virginia, Sussex Co, Coddysore, 20 Jul 1936, *M.L.Fernald & B.Long 6144*; holo: GH; iso: NY, PH, US.

*Luzula juncooides* Poir., *Encycl., Suppl.* 3: 535 (1813). T: Carolina, *L.A.G.Bosc*; holo: P.

*Luzula angustifolia* Poir., *Encycl., Suppl.* 3: 530 (1813). T: Carolina, *L.A.G.Bosc*; holo: P.

*Juncus biflorus* Elliott, *Sketch Bot. S. Carolina* 1: 407 (1817); *Juncus marginatus* var. *biflorus* (Elliott) Chapm., *Fl. S. U.S.* 495 (1860). T: USA, Georgia, Savannah, on the road to Augusta, *G.Elliott s.n.*; holo: NY.

JUNCACEAE (*Juncus*)



**Figure 54.** *Juncus marginatus*. **A**, habit; **B**, flower. *Juncus cyperoides*. **C**, habit; **D**, flower. (C, D, L.Holm-Nielsen & al. 4697, AAU). Scale bars: **A**, **C** = 5 cm; **B**, **D** = 4 mm. Drawn by K.Tind. C, D originally published in G.Harling & B.Sparre (eds), *Fl. Ecuador* 11: 41, fig. 10 (1979), all reproduced with permission, from H.Balslev, *Fl. Neotrop. Monogr.* 68: 66, fig. 34 (1996), © Lunds Botaniska Förening, © 1996, The New York Botanical Garden.

*Juncus marginatus* var. *odoratus* Torr., *Fl. N. Middle U.S.* 1: 362 (1824); *Juncus odoratus* (Torr.) Steud., *Syn. Pl. Glumac.* 2: 304 (1855). T: USA, New York, Bloomingdales Woods, *J. Torrey*; syn: NY.

*Juncus heteranthos* Nutt., *Trans. Amer. Phil. Soc.*, n.s., 5: 153 (1837). T: USA, Arkansas, *T. Nuttall*; holo: lost.

*Juncus cylindricus* M.A. Curtis, *Amer. J. Sci.* 44: 83 (1843). T: USA, N Carolina, Lincolnton, *M.A. Curtis*; syn: NY.

*Juncus canaliculatus* Liebm., *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 1850: 43 (1850). T: Mexico, Veracruz, S. Antonio Huatusco, Aug 1841, *F. Liebmann 726*; lecto: C, *fide* H. Balslev, *Fl. Neotrop. Monogr.* 68: 102 (1996); iso: C, W.

*Juncus marginatus* var. *paucicapitatus* Engelm., *Trans. Acad. Sci. St. Louis* 2: 455 (1866). T: New Jersey, Long Branch, *C.W. Short*; syn: *n.v.*

*Juncus marginatus* var. *setosus* Coville, *Proc. Biol. Soc. Wash.* 8: 124 (1893); *Juncus setosus* (Coville) Small, *Fl. S.E. U.S.* 248 (1903). T: USA, Arizona, Santa Catalina Mtns, 4 Jun 1882, *C.G. Pringle s.n.*; holo: US; iso: NY, P.

*Juncus buchenau* Sved., *Juncac. Regn. Exp. (Bih. Kongl. Svenska Vetensk.-Akad. Handl.)* 23(3), no 6: 9 (1897). T: Brazil, Rio Grande do Sul, Quinta prope opp. Rio Grande, 7 Dec 1892, *C.A.M. Lindman A857*; holo: S; iso: GH, W [cf. *Juncus* × *buchenau* Dörfl. 1897 – an prius?].

*Juncus marginatus* var. *paucicapitatus* Engelm., *Trans. Acad. Sci. St. Louis* 2: 455 (1866). T: New Jersey, Long Branch, *C.W. Short*; syn: *n.v.*

*Juncus biflorus* f. *adinus* Fernald & Griseb., *Rhodora* 37: 157 (1935). T: USA, Massachusetts, Brewster, Saul's Pond, 7 Sep 1919, *M.L. Fernald [Pl. Exs. Gray.] 350*; syn: GH29614, GH29615, GH32001.

*Juncus longii* Fernald, *Rhodora* 39: 397 (1937). T: USA, Virginia, Sussex Co, Coddysore, 20 Jul 1936, *M.L. Fernald & B. Long 6144*; holo: GH; iso: NY, PH, US.

Illustrations: M. Barros, *Darwiniana* 10: 453, fig. 57 (1953); H. Balslev, *Fl. Neotrop. Monogr.* 68: 101, fig. 50A, B (1996).

Maps: W.L.L. Muenscher, *Aquat. Pl. U.S.*, map. 227 (1944); H. Balslev, *Fl. Neotrop. Monogr.* 68: 103, fig. 51 (1996); R.E. Brooks & C.E. Clemants, *Fl. N. Amer.* 22: 229 (2000).

Perennials, 40–100 (–130) cm tall, caespitose; rhizome short, rarely to 5–6 cm, densely branched, 2–4 mm diam.; stolons absent. Stems sometimes bulbous-based, slightly compressed, 0.5–3.0 mm diam., smooth. Cataphylls absent; basal leaves 2–5 per stem; sheaths to 9 cm long; blade 10–30 (–45) cm long, 1–5 mm wide, flat, usually with prominent abaxial midrib and two distinct adaxial veins; cauline leaves similar to basal ones, distally shorter; auricles 0.5–1.0 (–3.0) mm long, rounded. Lower bract leaf-like, as long as or shorter than inflorescence; floral bracts lanceolate, acute, scarious, ±as long as tepals or shorter. Inflorescence compound, anthelate, 4–15 × 2–10 cm; main branches to 10 cm long, to 1 mm diam., of (5–) 10–40 (–200) ±hemispherical (1–) 3–9 (–20)-flowered heads 5–7 mm wide, stramineous to dark brown. Tepals unequal, ±brown with green midstripe; outer tepals lanceolate, obtuse to acute, (1.8–) 2.0–2.8 (–3.2) mm long, with margins scarious; inner tepals longer, lanceolate, 2.4–3.0 (–3.5) mm long, obtuse to acute, with margins scarious, inflexed and forming a little cap when young. Stamens 3, sometimes slightly exserted; anthers 0.3–1.0 (–1.2) mm long, shorter than to rarely ±equalling 1.0–1.5 (–2.5) mm filaments; style c. 0.1 (–0.3) mm long; stigmas 0.5–1.0 mm long. Capsule broadly ellipsoid, ±equalling perianth, apiculate, round in T.S., 2.0–2.5 mm long, 1.8–2.0 mm wide, 3-septate, dehiscing apically, dark brown, glossy. Seeds narrowly and obliquely ellipsoid, apiculate, 0.5–0.6 × 0.15–0.2 mm, reticulate, yellow-brown; appendages absent. 2n = 40, *fide* N.A. Harriman, in Å. Löve, *Taxon* 28: 406 (1979); 2n = 38, *fide* S. Snogerup, *Bot. Not.* 116: 150 (1963). Fig. 54.

Disjunctly in E part of North America, from SE Canada to the S USA; in Central America from Mexico to Costa Rica; in Cuba and Bermuda in the Caribbean; in S America Venezuela, widespread from SE Brazil to Paraguay, Uruguay and Argentina. 72: NSC, ONT, QUE. 73: COL, ÖRE. 74: ILL, IOW, KAN, MIN, MSO, NEB, OKL, SDA, WIS. 75: CNT, INI, MAI, MAS, MIC, NWH, NWJ, NWY, OHI, PEN, RHO, VER, WVA. 76: ARI, CAL. 77: NWM, TEX. 78: ALA, ARK, DEL, FLA, GEO, KTY, LOU, MRY, MSI, NCA, SCA, TEN, VRG, WDC. 79: MXC, MXE, MXG, MXS, MXT. 80: BLZ, COS, GUA, HUA, HON, NIC. 81: BER, CUB. 82: VEN. 84: BZL, BZS. 85: AGE, AGS, AGW, PAR, URU. Moist to wet sandy, peaty, or clayey soils, usually in open areas including bogs, shores, marshes, and ditches. Map 203.



## JUNCACEAE (*Juncus*)

**79.** MEXICO: Chiapas, Tenejapa, *D.E.Breedlove 14803* (AAU, NY); Veracruz, Jalapa, 1200 m, *C.G.Pringle 8123* (AAU, BR, F, MEXU, MO, NY, PH, S, UC, US, Z). **80.** GUATEMALA: San Juan Chamelco, 1350 m, *P.C.Standley 92445* (F, NY). HONDURAS: La Paz, Marcala, Quebrada El Cerron, *R.Molina & R.Molina 24247* (DS, F, MO, NY). **81.** CUBA: Mateo Sancher, *E.L.Ekman 17931* (NY, S, US). **85.** ARGENTINA NORTHEAST: Misiones, Candelaria, Bonpland, *P.Jörgensen 526* (BAB); Córdoba, Punilla, Sierra Grande, Cavalango, *L.J.Novara 59* (CORD); San Luis, El Trapiche, 1150 m, *F.Roig 1303* (SI). ARGENTINA NORTHWEST: Salta, Orán, Puente internacional, Finca Jacúlica, 400 m, *L.Giusti, P.R.Legname & A.Cuezzo 12050C* (CTES). PARAGUAY: Caaguazu, Arroyo Yhú, *E.M.Zardini & Velasquez 23726* (AAU, MO).

A variable species. Several taxa have often been recognized within *J. marginatus*, mostly on the basis of rhizome length and the presence of stolons, number of heads per inflorescence and tepal shape. The evaluation of the variation in the whole range of the species shows that it is difficult to accord a higher taxonomic rank to any of the variants.

### **26. *Juncus falcatus* E.Mey., *Syn. Luzul.* 34 (1823)**

T: Mont-Real [Monterey, California], *T.Haenke*; holo: PR; iso: LD.

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 228 (2000).

Perennials, 8–18 (–29) cm tall; rhizome long, creeping; stoloniform, c. 1.0–1.7 mm thick, with remote scarios-stramineous scales. Stem slightly compressed, ±rigid, minutely papillose distally. Cataphylls 0–2, greenish to brown; basal leaves 2–5, c. 6–13 (–20) cm long; cauline leaves 1–3, shorter, margins papillose at least distally; sheath margins scarios; auricles usually ±absent, less often developed, scarios, to 1 mm long. Lower bract leaf-like or pale brownish, 1–5 cm long, equalling or exceeding inflorescence. Inflorescence usually a single, semiglobose–globose c. 2–8-many-flowered dark castaneous terminal head, or composed of 2 (–4) shortly pedunculate clusters of 2–15 flowers. Tepals ±equal or outer ones slightly longer, ovate-lanceolate, finely papillose; outer tepals with narrow scarios to membranous margins, ±acute, deep to dark castaneous brown to dark brown, with central band green to paler brown, ; inner tepals ±obtuse to subacute, with broader scarios margins. Stamens 6. Capsule trilocular, ±broadly obovoid, ±truncate to retuse at apex, 3.5–4.5 mm long, shorter than or ±equalling perianth, dark castaneous-brown. Seeds ±obliquely ovoid, apiculate, c. 0.5–0.7 × c. 0.3 mm; outer seed-coat not tight, usually shining, slightly reticulate; appendages absent.  $2n = 38$ , *vide* R.L.Taylor & G.A.Mulligan, *Fl. Queen Charlotte Isl.* 2: 44 (1968).

Widely distributed in W North America, Australia and Tasmania. Reports of the occurrence in Japan probably refer to *J. prominens*. Two subspecies are recognized, with intermediates rarely observed (e.g., *W.S.Cooper 28-11, 2875*).

Anthers much longer than filaments; style c. 0.8–1.0 mm long

**26a.** subsp. **falcatus**

Anthers ±as long as filaments; style c. 0.5 mm long

**26b.** subsp. **sitchensis**

### **26a. *Juncus falcatus* E.Mey. subsp. *falcatus***

*Juncus menziesii* R.Br. ex Hook., *Fl. Bor. Amer.* 2: 192 (1838). T: ‘N.W. coast of America’[probably near Monterey, California], *A.Menzies*; syn: K, n.v.

*Juncus tasmanicus* Engelm., *Trans. Acad. Sci. St. Louis* 2: 453 (1866). T: Tasmania, *R.C.Gunn*; holo: GH [uncertain validity].

*Juncus agrostophyllus* F.Muell., *Linnaea* 26: 245 (1853), *nom. inval.*

Illustrations: W.L.Jepson, *Fl. Calif.* 1: pl. 41 (1921); C.L.Hitchcock & al., *Vasc. Pl. Pacif. Northw.* 1: 196 (1969).

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 228 (2000).

Leaves c. 1.5–3.0 mm wide. Tepals (3.5–) 4.3–5.5 (–6.0) mm long. Anthers 1.0–1.3 mm long, much longer than 0.4–0.7 mm long filaments; style c. 0.8–1.0 mm long; stigmas c. 1.5–2.0 mm long. Fig. 51.

Disjunctly in California and in Australia (New South Wales, Victoria and Tasmania). 50: NSW, TAS, VIC. 76: CAL. Mostly coastal, in wet depressions among dunes, wet flats. Reports from Japan refer to the closely related *J. prominens*. Map 204.

**50.** NEW SOUTH WALES: Australian Capital Territory, Mt Gingera, 1750 m, 14 Feb 1950, *E.Gauba* (W); Bombala River, 17 km NW of Bibbenluke, at confluence with Back Ck, 23 Mar 1988, *Crawford 896* (CBG, MEL, NSW); Mungyang River at Whites River Hut, S side of Schlink Pass, Kosciusko National Park, 14 Feb 1985, *K.L.Wilson 6144* (MEL, NSW). TASMANIA: Between Lake Sorell & Lagoon of Islands, c. 18 km W of Interlaken, 6 Feb 1960, *H.Eichler 16932* (NSW). VICTORIA: Dinner Plain, 11 km SE of Mt Hotham, 5 Feb 1979, *K.L.Wilson 2082* (CHR, MEL, NSW). **76.** CALIFORNIA: Humboldt Co., Eureka, Samoa, *J.P.Tracy 1273* (AAU, UC); Monterey Peninsula, Point Pinos, *L.R.Abrams 10948* (LD); Monterey Co., Pacific Grove, 24 May 1941, *R.F.Hoover 5210* (UC).

**26b. *Juncus falcatus* subsp. *sitchensis*** (Buchenau) Hultén, *Acta Univ. Lund*, n.s., sect. 2, 39(2): 427 (1943)

*Juncus falcatus* var. *sitchensis* Buchenau, *Bot. Jahrb. Syst.* 12: 428 (1890). T: Unalaska [Unalaska], *L.K.A.Chamisso*; syn: K, P.

*Juncus falcatus* var. *alaskensis* Coville, *Contr. U. S. Natl. Herb.* 3: 347 (1896). T: Ocean Cape, Yakutat Bay, Alaska, 18 Jul 1892, *F.Funston 67*; holo: US, n.v.

Illustration: E.Hultén, *Fl. Alaska* 288, fig. 9 (1968).

Maps: E.Hultén, *Fl. Alaska* 288, fig. 9 (1968); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 228 (2000).

Leaves c. 1.0–2.5 mm wide. Tepals 4.0–5.2 mm long. Anthers 0.8–1.3 mm long, about as long as 0.7–1.1 mm long filaments; style c. 0.5 mm long; stigmas c. 1.0 mm long.

Distributed from Aleutian Is. and Alaska to Washington and Oregon. 70: ALU, ASK. 71: BRC. 73: ORE, WAS. Coastal swamps, tidal flats, depressions in dune areas. Map 205.

**70.** ALEUTIAN IS.: Unalaska, Huntsville Trail, *W.L.Jepson 226* (UC); Unalaska, *E.Hultén 7658* (S). **71.** BRITISH COLUMBIA: Queen Charlotte Is., Graham Is., Tow Hill, *J.A.Calder & D.B.O.Savile 22731* (W); Vancouver Is., Echo Lake, Campbell R., *A.Ceska & O.Ceska 0492* (PRA); Banks Is., Larson Harbor, *T.T.McCabe 7270* (UC). **73.** OREGON: Newport, *B.Briggs* (NSW 72287); Coos Bay, 9 Jul 1928, *W.S.Cooper 28-11* (UC); Coos Bay, 17 Jul 1928, *W.S.Cooper 28-75* (UC) [the latter two specimens somewhat intermediate between the two varieties].

**27. *Juncus covillei*** Piper, *Contr. U. S. Natl. Herb.* 11: 182 (1906)

*Juncus falcatus* var. *paniculatus* Engelm., *Trans. Acad. Sci. St. Louis* 2: 495 (1868); *Juncus latifolius* var. *paniculatus* (Engelm.) Buchenau, *Bot. Jahrb. Syst.* 12: 426 (1890) [the latter combination was misapplied to another taxon by Buchenau]. T: California, Mendocino, 12 May 1866, *H.N.Bolander [G.Engelmann, Herb. Junc. Bor.-Amer. Norm.] 41*; syn: AAU, MO, PR.

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 228 (2000).

Perennials, c. 10–25 cm tall, very loosely caespitose; rhizome long, creeping; stolons 1.2–1.5 mm in diam. Cataphylls 0–2, brown to pale brownish; basal leaves 2–5, 8–13 (–20) cm long, 1.2–2.5 mm wide; sheaths loose; auricles absent or scarious, subacute, 0.3–0.8 mm long; cauline leaves 2–4, with margins papillose. Lower bract narrow, leaf-like, to c. 5 cm long, shorter than or exceeding inflorescence. Inflorescence usually umbelloid, of (1–) 2–4 (–6) obconical to semiglobose 3–7-flowered clusters; peduncles to c. 3 cm long, distinctly papillose, sometimes abbreviated. Tepals ±broadly lanceolate, subequal; outer tepals slightly longer, 3.0–4.2 mm long, papillose. Stamens 6. Capsule trilocular, oblong-ovoid, c. 3.5–4.5 mm long, usually truncate to retuse, distinctly exceeding perianth. Seeds obliquely ovoid, apiculate, c. 0.4 × 0.2–0.25 mm, brown; outer seed-coat tight, distinctly reticulate; appendages absent. 2n = 38, *vide* S.Snogerup, *Bot. Not.* 116: 150 (1963).

Pacific coast of North America and adjacent area, from British Columbia to California. Two varieties are recognized. The differences between the two varieties usually are rather weakly correlated, and they may not deserve recognition at the varietal rank.

Perianth and capsule dark brown; capsule much exceeding perianth

**27a. var. *covillei***

Perianth pale brown, capsule brown to pale brown; capsule slightly exceeding perianth

**27b. var. *obtusatus***

## JUNCACEAE (*Juncus*)

### 27a. *Juncus covillei* Piper var. *covillei*

Illustrations: W.L.Jepson, *Fl. Calif.* 1: pl. 42 (1921); C.L.Hitchcock & al., *Vasc. Pl. Pacif. Northw.* 1: 192 (1969).

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 229 (2000).

Outer tepals acute to mucronate; inner tepals rounded; tepal central band greenish to brown, bordered dark castaneous-brown; tepal margins membranous to translucent-brownish. Anthers 0.9–1.4 mm long; filaments 0.5–0.8 (–1.0) mm long; style 0.8–1.0 mm long; stigmas c. 1.5 mm long. Capsule dark brown, truncate, mucronate, much exceeding perianth.  $2n = 36$ , *vide* R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 229 (2000). Fig. 55.

Coastal and low montane areas from S British Columbia to California. 71: BRC. 73: IDA, MNT, ORE, WAS. 76: CAL. Coastal habitats and wet sites around lakes. Map 206.

71. BRITISH COLUMBIA: Port Renfrew, R. San Juan at Fairy Lake, 26 Aug 1970, *T.C.Brayshaw* (PRA); Vancouver Is., Nanaimo, Nanaimo R. below Cedar, 21 Jul 1970, *T.C.Brayshaw* (PRA); Vancouver Is., Cameron Lake, *J.W.Eastham 9451* (UC). 73. WASHINGTON: Clallam Co., Lake Ozette, *J.W.Thompson 9431* (PR); Whatcom Co., Lake Whatcom, 17 Jul 1937, *W.J.Eyerdam* (UC).

Frequently and erroneously reported from Japan, due to a misidentification of *J. covillei* with *J. prominens*.

### 27b. *Juncus covillei* var. *obtusatus* [Engelm.] C.L.Hitchc., in C.L.Hitchcock & al., *Vasc. Pl. Pacif. Northw.* 1: 193 (1969)

*Juncus obtusatus* Engelm., *Trans. Acad. Sci. St. Louis* 2: 495 (1868), *nom. illeg., non* Schult. (1814). T: California, Mariposa, Big Tree Grove, *H.N.Bolander [G.Engelmann, Herb. Junc. Bor.-Amer. Norm.] 42*; syn: AAU, MO, PR; *H.N.Bolander 6028*; syn: MO.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 246, fig. 115 (1906); C.L.Hitchcock & al., *Vasc. Pl. Pacif. Northw.* 1: 192 (1969).

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 229 (2000).

Outer tepals acute to mucronate; inner tepals obtuse to subacute; tepal central band greenish to straw-brown, bordered pale brown; tepal margins membranous to scarious-brownish, broad. Anthers 0.9–1.2 mm long; filaments c. 0.5 mm long; style (including the base of young capsule mucro) c. 1.0 mm long; stigmas c. 1.5 mm long. Capsule truncate to retuse, exceeding perianth, light brown to brown. Fig. 55.

Occupying a similar range as that of the type variety but extending to higher altitudes. 71: BRC. 73: IDA, MNT, ORE, WAS. 76: CAL. Along streams, lake shores, wet sites. Map 207.

76. CALIFORNIA: Sierra Nevada, Fresno Co., North Fork Kings R., Balch Camp, c. 400 m, *Taylor 9196* (UC); San Bernardino Co., Lake Arrowhead, 1500 m, *I.W.Clokey 5140* (UC); Trinity Co., Trinity Center, 28 Aug 1936, *J.T.Howell 12770* (UC); Eel R., *Thorne 35098 & Everett* (NSW, RSA).

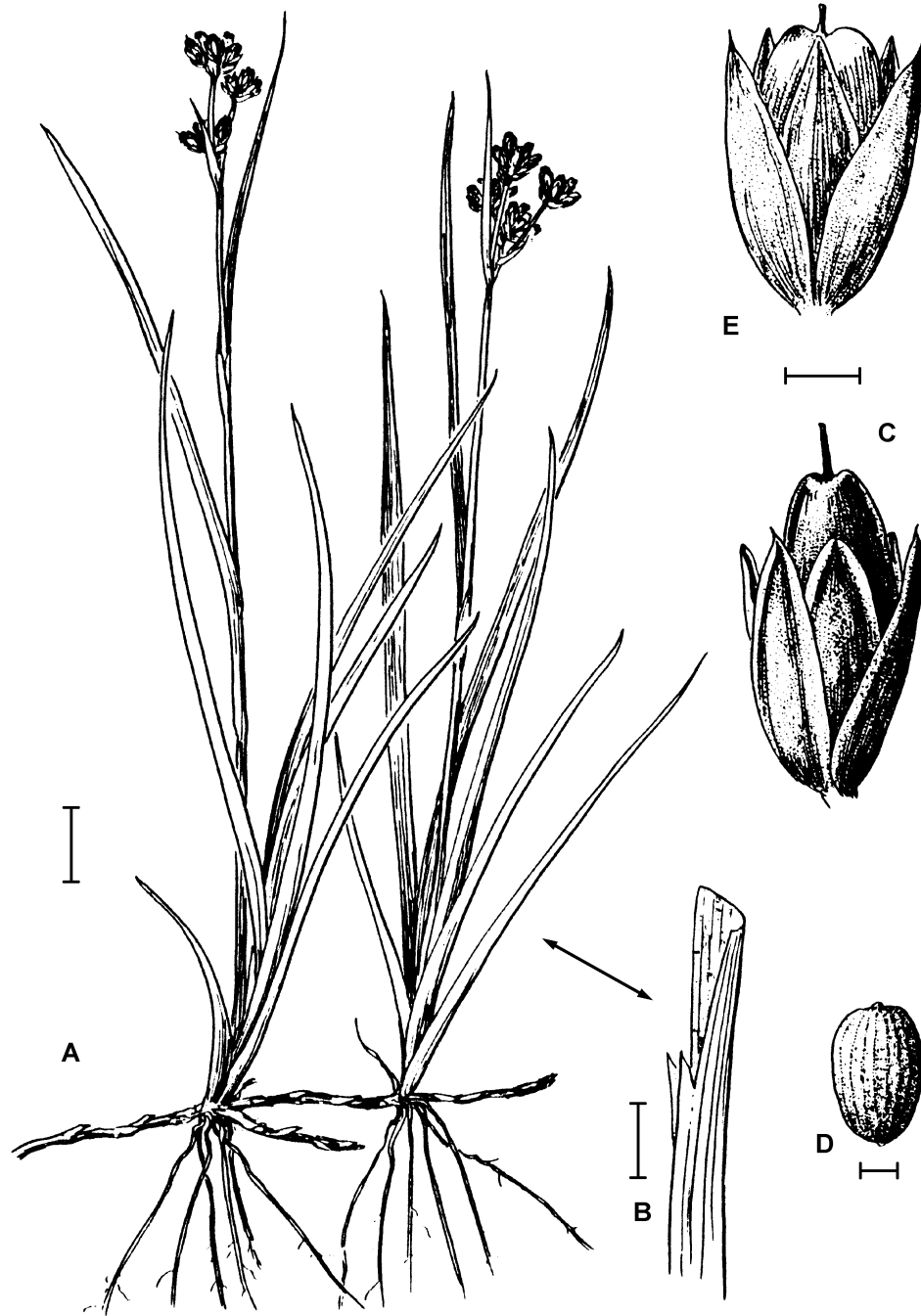
### 28. *Juncus prominens* (Buchenau) Miyabe & Kudo, *Trans. Sapp. Nat. Hist. Soc.* 5: 40 (1913)

*Juncus falcatus* var. *prominens* Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 247 (1906). T: citation: 'aus dem Staate Washington und aus Japan bekannt'; T: Japan, Yezo, Iburi, Tomakomai, 1899, *J.Matsumura*; syn: SAP.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 247, fig. 116 (1906); Y.Satake, in T.Nakai & M.Honda, *Nov. Fl. Jap.* 1: 65, fig. 16 (1938); V.S.Novikov, in S.S.Kharkevich, *Sosud. Rast. Soviet. Dal'rego Vost.* 1: 71, pl. v (1985).

Map: V.S.Novikov, in S.S.Kharkevich, *Sosud. Rast. Soviet. Dal'rego Vost.* 1: 69, fig. 18B (1985).

Perennials, c. 20–35 (–50) cm tall, loosely caespitose; rhizome long, creeping to ascending, c. 1.5 mm diam. Cataphylls 0–2, brown; basal leaves 2–4, to 20–35 cm long, to 2.0–2.5 mm wide; cauline leaves 2–4, with margins papillose; sheaths loose; auricles usually present, scarious, subacute, to c. 1 mm long. Lower bract short, leaf-like, to c. 3 cm long, usually shorter than inflorescence. Inflorescence umbelloid, of (1–) 2–4 (–5) ±semiglobose dark 3–8-flowered heads; peduncles to c. 4 cm long, papillose, rarely abbreviated. Tepals subequal, papillose, 3.5–4.5 mm long; outer tepals slightly longer, ±acute to mucronate; inner tepals obtuse to rounded; central band greenish to pale brown, bordered deep castaneous; margins translucent-brownish, rarely scarious. Stamens 6; anthers c. 1.0–1.4 mm long; filaments



**Figure 55.** *Juncus covillei* var. *covillei*. **A**, habit; **B**, auricles; **C**, flower with capsule; **D**, seed. *Juncus covillei* var. *obtusatus*. **E**, flower with capsule. Scale bars: **A**, **B**, = 1 cm; **C**–**E** = 1 mm. Drawn by J.R.Janish. Reproduced with permission, from C.L.Hitchcock, A.Cronquist, M.Ownbey & J.W.Thompson, *Vasc. Pl. Pacif. Northw.* 1: 192 (1969). © University of Washington Press.

## JUNCACEAE (*Juncus*)

0.6–0.9 mm long; style to c. 0.8 mm long; stigmas c. 1.5 mm long. Capsule trilocular, broadly oblong-ovoid, 3.6–4.4 mm long, obtuse to truncate, mucronate, dark castaneous-brown, exceeding perianth or slightly so. Seeds obliquely narrowly ovoid, c.  $0.7 \times 0.35$  mm; outer seed-coat not tight, shining, faintly reticulate, pale brown; appendages absent.

Confined to Kuril Is., Komandor Is. and Japan. 31: KAM, KUR. 38: JAP. Wet grassy slopes, margins of woods, along streams. Erroneously reported from Washington, a record which is actually *J. covillei*. Map 208.

31. KURIL IS.: Kunashir, between Alekhino and Golovkina Volcano, 24 Sep 1968, *V.Vašák, J.M.Yegorova & L.A.Alexeeva* (PR307352–307361). 38. JAPAN: Hokkaido, Hidakas, Shizunai, 2 Jul 1974, *M.Furuse 6078* (K); Hokkaido, Mt Tokachi, *U.Faurie 7208* (BM); Hokkaido, Hidaka, Shoya, 3 Sep 1933, *H.Hara* (S).

*Juncus prominens* approaches *J. falcatus* in seed characters but its capsules are longer than the perianth, and tepals are up to c. 4 mm long. Together with *J. falcatus* and *J. covillei*, it forms a complex group.

### 29. *Juncus orthophyllus* Coville, *Contr. U. S. Natl. Herb.* 4: 207 (1893)

*Juncus longistylis* var. *latifolius* Engelm., *Trans. Acad. Sci. St. Louis* 2: 496 (1868); *Juncus latifolius* (Engelm.) Buchenau, *Bot. Jahrb. Syst.* 12: 425 (1890), *nom. illeg., non* Wulf. (1789). T: California, Yosemite Valley, *H.N.Bolander [G.Engelmann, Herb. Junc. Bor.-Amer. Norm.] 46*; syn: AAU, MO, PR; California, upper Tuolumne, 10,000 ft, *H.N.Bolander*; syn: MO.

*Juncus orthophyllus* var. *congestus* Suksd., *Werdenda* 1: 6 (1923); *Juncus orthophyllus* f. *congestus* (Suksd.) H.St.John, in C.V.Piper & R.K.Beattie, *Fl. S.E. Washington* 82 (1936). T: USA, Washington, Klickitat Co., Falcon Valley, *W.Suksdorf 6301*; syn: US.

Illustrations: H.L.Mason, *Fl. Marshes Calif.* 374, fig. 184 (1957); C.L.Hitchcock & al., *Vasc. Pl. Pacif. NorthW.* 1: 204 (1969).

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 226 (2000).

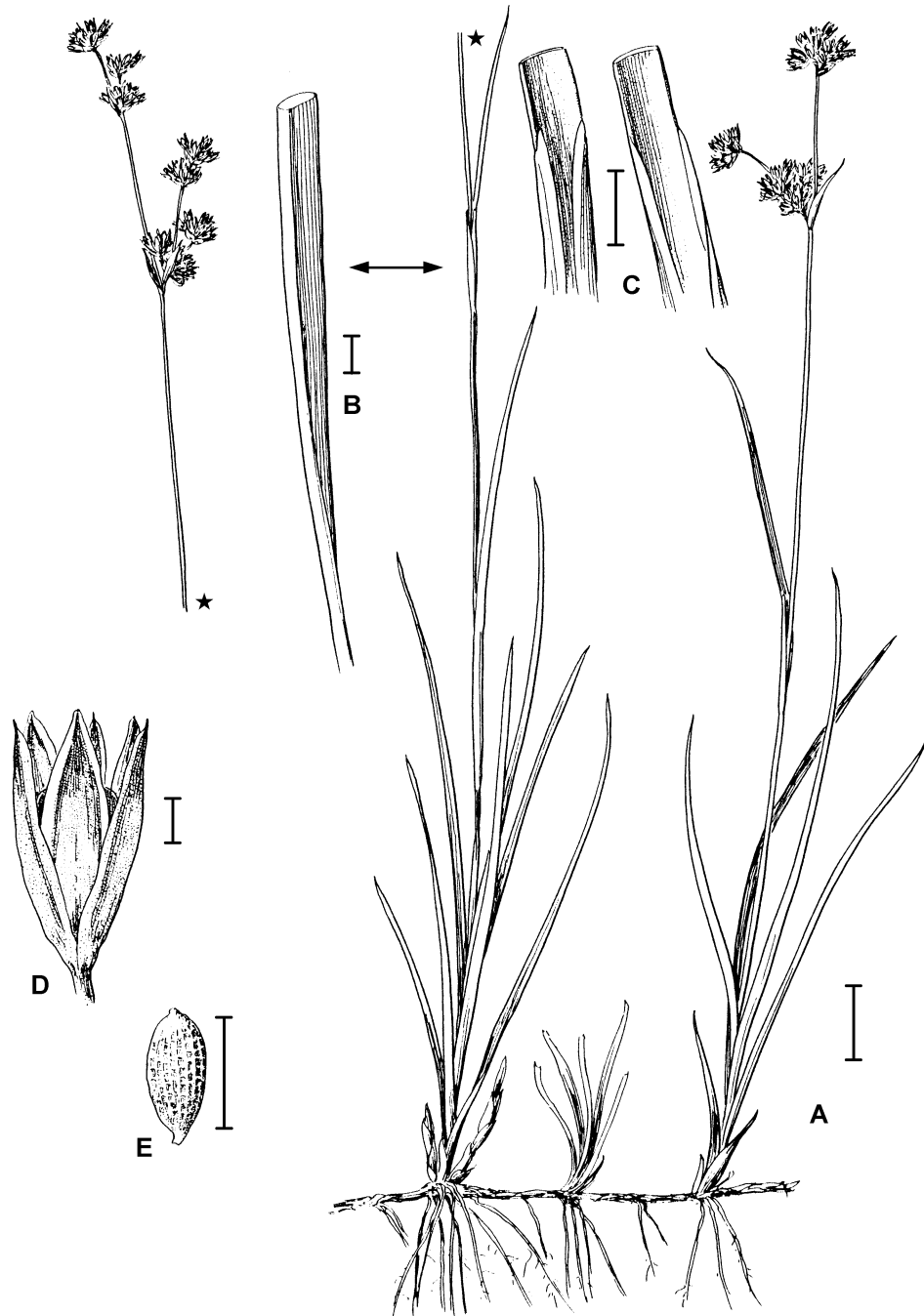
Perennials, c. 20–45 cm tall, loosely caespitose; rhizome horizontal, creeping, to c. 2 mm diam., with internodes 0.5–5 cm long; stolons present. Stem erect, slightly compressed, ±papillose. Cataphylls 1–3, brownish, usually 1.5–4 cm long. Basal and sub-basal leaves several, c. 5–25 (–30) cm long, (1–) 3–5 (–6) mm wide, flat; cauline leaves 1–3, shorter and narrower; margins papillose-serrulate; apex subulate; sheaths with narrow scarious or membranous margins; auricles absent or up to 0.5–0.8 mm long, subacute, scarious. Lower bract leaf-like or reduced, brownish, 1–4 cm long, much shorter than inflorescence. Inflorescence usually 3–10 cm long, decompound, of (2–) 3–8 (–12) cup-shaped to hemispherical, (4–) 5–8 (–10)-flowered heads on peduncles usually 2–8.5 cm long. Capitulum bracts pale castaneous, to 6 mm long. Tepals subequal, deep castaneous to ±brown; outer tepals often slightly shorter, lanceolate, acute; inner tepals subobtusate, mucronate, 5–6 mm long, with central band green becoming pale brown, narrow, slightly papillose; margins brownish and narrowly membranous. Stamens 6; anthers 1.6–2.8 mm long; filaments 0.4–0.6 (–0.8) mm long; style (including young mucro) 1.3–1.9 mm long; stigmas to 3.5 mm long. Capsule trilocular, elongated-ovoid, ±truncate, c. 3.5–4.5 mm long including 0.4 mm mucro, pale castaneous, shorter than perianth. Seeds narrowly ovoid, c.  $0.5\text{--}0.6 \times 0.25$  mm, apiculate, brown, distinctly reticulate; appendages absent.  $2n = 40$ , *vide* R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 226 (2000). Fig. 56.

Pacific North America, from British Columbia to California and Nevada. 71: BRC. 73: IDA, MNT, ORE, WAS. 76: CAL, NEV. Wet ground in mountain meadows, to 3300 m. Map 209.

76. CALIFORNIA: San Luis Obispo Co., Price Canyon, *R.F.Hoover 9172* (UC); Siskiyou Co., 1879, *C.B.Bradley* (UC); Inyo Co., Rock Ck Lake basin, c. 3300 m, 6 Aug 1940, *F.W.Peirson* (UC); Nevada Co., Trout Laboratory, Sage Hen bog, 2100 m, *J.Langenheim 4419* (UC). NEVADA: Esmeralda Co., the White Mtns, Chiatovitch Ck, 2300 m, *V.Duran 2765* (UC).

### 30. *Juncus longistylis* Torr., in W.H.Emory, *Rep. U.S. Mex. Bound. [Botany of the Boundary]* 223 (1859)

T: New Mexico, near the Copper Mines, *Bigelow*.



**Figure 56.** *Juncus orthophyllus*. A, habit; B, cauline leaf sheath; C, auricles; D, perianth; E, seed. Scale bars: A = 2 cm; B = 2 mm; C, D = 1 mm; E = 0.5 mm. Drawn by J.R.Janish. Reproduced with permission, from C.L.Hitchcock, A.Cronquist, M.Ownbey & J.W.Thompson, *Vasc. Pl. Pacif. Northw.* 1: 204 (1969). © University of Washington Press.

## JUNCACEAE (*Juncus*)

*Juncus menziesii* var. *californicus* Hook. & Arn., *Bot. Beechey Voy.* 402 (1840). T: [California], Lay & A. Collie; syn: K, n.v.

Illustration: C.L. Hitchcock & al., *Vasc. Pl. Pacif. NorthW.* 1: 200 (1969).

Map: R.E. Brooks & C.E. Clemants, *Fl. N. Amer.* 22: 226 (2000).

Perennials, c. 20–35 (–55) cm tall, loosely caespitose; rhizome long, creeping, to 1.5 mm in diam., with internodes long; stolons ascending. Stem subterete to slightly compressed, usually ±papillose. Cataphylls 1–2, dull brownish, to c. 5 cm long; basal leaves few; cauline leaves 2–3, blades flat, c. 3–14 cm long (upper shorter), 1.5–2.5 mm wide; margins often papillose; apex subulate; sheaths narrow, with broad membranous margins; auricles distinct, 1.0–2.0 mm long, broadly obtuse or truncate. Lower bract reduced, pale brownish-subherbaceous, c. 1–2 cm long, shorter than inflorescence. Inflorescence of (1–) 2–4 (–7) subcongested or variably pedunculate cup-shaped to ±hemispherical (2–) 4–7-flowered heads (if heads congested then compound heads to 15-flowered); peduncles to 5–6 cm long, usually shorter. Upper bracts ovate, acuminate, to 6 mm long, ±scarious. Tepals subequal, ovate-lanceolate, conspicuously broadly membranous-bordered; outer tepals subacute; inner tepals subobtusate and often mucronate, c. 4.5–6.0 mm long, with central band green becoming pale brownish, distinctly narrowly bordered castaneous. Stamens 6; anthers 1.1–1.7 mm long; filaments 0.6–1.0 mm long; style 0.7–0.9 mm long; stigmas 1.5–2.5 mm long. Capsule trilobular, narrowly ovoid-trigonous, ±equalling perianth, c. 3.5–4.8 mm long, castaneous-brown above, obtuse to subtruncate; mucro to 0.3 (–0.5) mm long. Seeds obliquely narrowly ovoid, pale brown, apiculate, c. 0.50–0.65 × c. 0.25 mm, indistinctly reticulate; appendages ±absent or inconspicuous. 2n = 40, *vide* Á.Löve & D.Löve, *Taxon* 30: 849 (1981). Fig. 57.

Widely distributed in W North America, in the north reaching E Canada, North-Central USA and Michigan in the east. 71: ABT, BRC, MAN, SAS. 72: NFL, ONT, QUE. 73: COL, IDA, MNT, ORE, WAS, WYO. 74: MIN, NDA, NEB, SDA. 75: MICH. 76: ARI, CAL, UTA. 77: NWM. Mountain meadows, along streams, usually above 1000 m. Map 210.

71. ALBERTA: Craigmyle, *A.H. Brinkman* 765 (W); Edmonton, White Mud Ck, *G.H. Turner* 1492 (W). BRITISH COLUMBIA: Ta Ta Lake, *R.L. Taylor & D.H. Ferguson* 3957 (W). SASKATCHEWAN: Kindersley District., Hoosier, *L. Jenkins* 1048 (W). 73. COLORADO: El Paso Co., Pikes Peak, Grandview Rock, c. 2900 m, *J. Ewan* 15205 (W); Moffat Co., The Pines, Cold Spring Mtn, *W.A. Weber* 14384 (W). 74. NORTH DAKOTA: Dawson, Buffalo Lake, *O.A. Stevens* 109 (W). 76. ARIZONA: Coconino Co., San Francisco Peaks, *D.J. Pinkava* 6236 (W). UTAH: Kane Co., Cottonwood Wash Canyon, *J.L. Reveal* 817, *J.L. Gentry jr. & G. Davidse* (W).

### 31. *Juncus macrophyllus* Coville, *Univ. Calif. Publ. Bot.* 1: 65 (1902)

*Juncus canaliculatus* Engelm., *Bot. Gaz.* 7: 6 (1882). T: [California] Mill Ck Canyon, San Bernardino Mtns, 4000 ft, *S.B. Parish & W.F. Parish* 1095; holo: n.v.

*Juncus longistylis* var. *scabratus* F.J. Herm., *J. Wash. Acad. Sci.* 30: 218 (1940). T: USA, Arizona, Yavapai Co., Prescott, 8 Aug 1926, *R. Peebles & al.* 2712; syn: US.

Illustrations: L. Abrams, *Ill. Fl. Pacific States* 1: 360, fig. 26 (1923); R.E. Brooks & C.E. Clemants, *Fl. N. Amer.* 22: 227 (2000).

Map: R.E. Brooks & C.E. Clemants, *Fl. N. Amer.* 22: 228 (2000).

Perennials, c. 20–90 cm tall, densely caespitose; rhizome short; stolons absent. Stem ±terete, smooth, erect. Cataphylls 0–2, to c. 5–10 cm long, loose, pale greyish-brownish, often with pinkish tinge; margins membranous, broad, scarious, auriculate; blade reduced to mucro. Basal leaves 2–5, light brown, up to 45 cm long, c. 1–3 mm wide, flat. Cauline leaves 1–3, c. 8–15 cm long, to 2 mm wide; margins papillose-serrulate; sheaths with narrow scarious margins; auricles oblong, obtuse to truncate, c. 1.2–2.5 mm long, scarious. Lower bract ±stramineous to greenish, to c. 4 cm long, with a filiform apex, much shorter than inflorescence. Inflorescence ±loose, usually 7–20 cm long, of paniculate appearance, of c. 5–25 obconical 2–5 (–7)-flowered pale heads on usually branched peduncles of variable length. Capitulum bracts scarious, to c. 4 mm long. Tepals ±equal or inner slightly longer, lanceolate, 4.2–5.5 mm long; outer tepals acute; inner tepals subacute or subobtusate and mucronate; central band smooth, distinctly veined, pale green, becoming pale castaneous or ±stramineous; margins very broad, scarious. Stamens 6; anthers 1.7–2.6 mm long; filaments



**Figure 57.** *Juncus longistylis*. **A**, habit; **B**, auricles; **C**, perianth and stamen; **D**, capsule; **E**, seed. Scale bars: **A** = 2 cm; **B**, **D** = 2 mm; **C** = 5 mm; **E** = 0.5 mm. Drawn by J.R.Janish. Reproduced with permission, from C.L.Hitchcock, A.Cronquist, M.Ownbey & J.W.Thompson, *Vasc. Pl. Pacif. Northw.* 1: 200 (1969). © University of Washington Press.



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0.5–0.9 mm long; style 0.8–1.5 mm long; stigmas to 3.0–3.5 mm long. Capsule trilocular, narrowly obovoid, c. 3.4–4.5 mm long including a mucro 0.4–0.7 mm long on a truncate top, pale brownish, shorter than or  $\pm$ equalling perianth. Seeds  $\pm$ ovoid, c. 0.4–0.6  $\times$  0.2–0.3 mm, brown, distinctly regularly reticulate; appendages absent.

Confined to SW United States (Arizona, Nevada and California). 76: ARI, CAL, NEV. Wet sandy or gravelly sites along streams, marshy ground, up to c. 2500 m. Occurrence in NW Mexico is possible. Map 211.

76. CALIFORNIA: E Mohave Desert, New York Mtns, Keystone Spring, *P.A.Munz 13864* (UC); Los Angeles Co., San Gabriel Mtns, Chilao Flat, *T.Ross 5852* (UC); Los Angeles Co., San Gabriel Mtns, Chilao Flat, *T.Ross 5775* (UC); Los Angeles Co., Arroyo Secco, Switzer's Camp, 1000 m, 4 Jul 1929, *Bryan* (UC).

### Doubtful taxa

*Juncus singularis* Steud., *Syn. Pl. Glumac.* 2: 302 (1855).

T: Cape, between Vanstadensberg and Betheldorp, 1830, *J.F.Drège 1604b p.p.* [some gatherings with *Juncus dregeanus*]; holotype: P; isotype: B [destroyed, but picture deposited at W], G, S, W.

*Juncus singularis* Steud., treated as the only member of subg. *Singulares* by Buchenau, remains unclear. The absolute match in all floral and fruit characters between the original material of *J. singularis* and *J. capensis* strongly supports the conclusion of A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 83–84 (1985) that *J. singularis* should be included in the widespread and variable *J. capensis*. The exceptional leaf characters (a distichous arrangement of leaves and the round T.S.), however, are unknown in other groups of the sect. *Graminifolii*. The fact that plants with the latter characters have been collected only once, by J.F.Drège in 1830, in a few specimens, suggests that these plants may be accounted for as a rare mutation of *J. capensis*.

*Juncus dregeanus* var. *longistylus* Adamson, *J. Linn. Soc., Bot.* 50: 21 (1935).

T: not designated [no specimen quoted in the protologue, S Africa].

R.S.Adamson, in R.S.Adamson & T.M.Salter, *Fl. Cape Pen.* 165 (1950), wrote: 'Recorded once 30 years ago at Kirstenbosch'. According to the description, the plant might represent a form of *J. sonderianus*.

### Sect. 3. CAESPITOSI

*Juncus* sect. *Caespitosi* Cout., *Bol. Soc. Brot.* 8: 90 & 104 (1890)

T: *Juncus capitatus* Weigel; lecto, *fide* J.Kirschner & al., *Folia Geobot. Phytotax.* 34: 385 (1999).

*Juncus* subg. *Juncinella* [Fourr. ex] V.I.Krecz. & Gontsch., in V.L.Komarov, *Fl. URSS* 3: 514 (1935); *Juncus* sect. *Juncinella* (V.I.Krecz. & Gontsch.) Weim., *Svensk. Bot. Tidskr.* 40: 161 (1946); *Juncus* subsect. *Juncinella* (V.I.Krecz. & Gontsch.) Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95(5): 120 (1990).

T: *Juncus capitatus* Weigel

Annuals, dwarf to small, 1–15 (–30) cm tall. Leaves basal, canaliculate or rarely  $\pm$ flat or  $\pm$ terete, non-septate, acute; auricles absent, marginal; sclerenchyma absent. Lower bract inconspicuous or leaf-like. Inflorescence terminal, usually of 1–7 subsessile to pedunculate 1–12 (–20)-flowered heads; floral bracteoles absent; peduncles not incrassate. Seeds subglobose to oblong-ellipsoid, minutely apiculate, reticulate to  $\pm$ smooth; appendages absent.

A section of 16 usually delicate annual species centred in Southern Africa and W North America; only a single species, *J. capitatus*, is not confined to either of the two areas. The evolution towards annuality might have taken place in two (or maybe three) areas independently but the section *Caespitosi* represents a very pragmatic solution (see also B.J.Ertter, *Mem. New York Bot. Gard.* 39: 34–39 (1986).

- 1 Stamens 6
- 2 Tepals usually longer than 6 mm, yellowish stramineous **42. *J. scabriusculus***
- 2: Tepals usually shorter than 6 mm, usually at least partly (distally) with darker coloration
- 3 Outer tepals longer than the inner but of  $\pm$ equal shape, narrowly linear-triangular to linear-lanceolate, elongated-acuminate, usually slightly recurved; flower heads globose, of echinate appearance **44. *J. stenopetalus***
- 3: Outer tepals  $\pm$ shorter than the inner or subequal, with inner usually broader and more obtuse,  $\pm$ lanceolate to ovate-lanceolate, not distinctly acuminate nor recurved; flower heads cup-shaped, hemispheric or globose
- 4 Anthers shorter than filaments; style shorter than 0.2 mm; longer tepals shorter than 3 mm **45. *J. rupestris***
- 4: Anthers longer than filaments; style longer than 1 mm; longer tepals longer than 3 mm
- 5 Stem and central band of tepals very densely covered with distinctly elevated papillae; plants glaucous-green to pale green; inflorescence of 1–2 (–3) flower heads **46. *J. pictus***
- 5: Stem and central band of tepals with  $\pm$ evenly scattered to subdense lower papillae; plants  $\pm$ mid-green to deep green; inflorescence of 1–6 (–10) flower heads **47. *J. cephalotes***
- 1: Stamens 2 or 3
- 6 Lowermost bract herbaceous, usually longer than inflorescence, 8–12 (–20) mm long; outer tepals conspicuously longer (by 1 mm or more) than the inner **32. *J. capitatus***
- 6: Lowermost bract membranous to tepaloid, shorter than inflorescence, to 2.5 mm long; outer tepals not longer than the inner or slightly so
- 7 Anthers longer than filaments; style 0.9–4.0 mm long
- 8 Seeds smooth to faintly reticulate, with longitudinal and transversal ridges equally faint; capsule  $\pm$ equalling perianth **34. *J. leiospermus***
- 8: Seeds  $\pm$ distinctly ridged, longitudinal ridges clearly more distinct than transversal ones; capsule usually shorter than perianth **33. *J. triformis***
- 7: Anthers shorter than, or  $\pm$ equalling filaments; style to 0.5 mm long
- 9 Capsule usually longer (to 1.5 times) than perianth **41. *J. hemiendytus***
- 9: Capsule shorter to slightly longer than perianth
- 10 Seeds 0.5–0.8 mm long **38. *J. capillaris***
- 10: Seeds 0.3–0.5 mm long
- 11 Bract single **40. *J. uncialis***
- 11: Bracts 2–10
- 12 Inner tepals distinctly longer than the outer [South Africa] **43. *J. obliquus***
- 12 Inner tepals  $\pm$ equalling the outer [W North America]
- 13 Style reduced, less than 0.1 mm long; anthers to 0.3 mm long; flowers single per stem; seeds smooth to faintly reticulate **39. *J. bryoides***
- 13: Style 0.1–0.5 mm; anthers longer than 0.3 mm; flowers 1–8; seeds distinctly reticulate
- 14 Capsule (at least the distal part) dark reddish (to blackish) when ripe; flowers almost always trimerous **35. *J. kelloggii***
- 14: Capsule pale, pale greenish to light reddish or pinkish; flowers dimerous or trimerous

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- |   |                         |
|---|-------------------------|
| 15 Flowers 1 (–2), usually trimerous; stigmas 0.6–1.1 mm long   | 36. <b>J. luciensis</b> |
| 15: Flowers 1–4 (–7), usually dimerous; stigmas 0.2–0.7 mm long | 37. <b>J. tiehmii</b>   |

### 32. *Juncus capitatus* Weigel, *Observ. Bot.* 28 (1772)

*Juncus tenellus* S.Geuns, *Pl. Belg. Spic.* 25 (1788), *nom. illeg.* T: Pomerania [N Poland, Pomorze], *Wilke*; lecto: C.E.Weigel, *Observ. Bot.*, pl. 2, fig. 5 (1772), *vide* K.A.Lye, in S.Edwards & al., *Fl. Ethiopia* 6: 387 (1997); original material: JE, *vide* S.Snoogerup, in P.H.Davis, *Fl. Turkey* 9: 18 (1986).

*Juncus ericetorum* Pollich, *Hist. Pl. Palat.* 1: 351 (1776). T: Germany, ‘circa Lauteren prope dem Thierhäusgen; inter Dürkheim & dem Holzhof: in virgulto Worms’; *syn: n.v.*

*Juncus gracilis* Roth, *Bot. Abh. Beobacht.* 46 (1787), *n.v.*; *Tent. Fl. Germ.* 1: 155 (1788). T: Germany, ‘habitat in agris humidis arenosis Ducatus Bremensis, prope Barbi, Berolinum’; *syn: n.v.*

*Juncus gracilis* var. *capitatus* Roth, *Tent. Fl. Germ.* 1: 155 (1788). T: [Germany] ‘habitat in agris humidis arenosis Ducatus Bremensis, prope Barbi, Berolinum’; *syn: n.v.*

*Juncus mutabilis* Lam., *Encycl.* 3: 270 (1789), *nom. rejic. propos.*; *Juncus triandrus* Gouan, *Herbor. Montpellier* 25 (1796), *nom. illeg.*; *Juncus capitatus* var. *triandrus* [Gouan] Asch., in W.Barbey, *Fl. Sard. Comp.* 188 (1885); *Juncus capitatus* A.I.b. [unranked] *triandrus* [Gouan] Asch. & Graebn., *Syn. Mitteleur. Fl.* 2(2): 489 (1904). T: France [The description of the first, unnamed, type variety corresponds better to what we call *J. capitatus*; the authentic material in P-LAM is a mixture of *J. capitatus* and *J. pygmaeus*. Lamarck mentioned explicitly only plants from Auvergne; these have not been found in his herbarium.]

*Schoenus minimus* T.F.Forster, in J.Symons, *Syn. Pl. Insul. Brit.* 197 (1798). T: [Channel Is.] in insula Sarnia, ... infra pagum Bovet dictum inter Fort George et Fernain Bay; *syn: n.v.*

*Juncus capitatus* var. *physcomitrioides* Baen., *Prosp. Herb. Eur.* 4 (1873); *Schriften Königl. Phys.-Ökon. Ges. Königsberg* 14: 16 (1873), *n.v.*; *Juncus capitatus* f. *physcomitrioides* (Baen.) Neuman, *Sveriges Fl.* 659 (1901). T: Danzig, Strand bei Zoppot [Poland, Gdańsk, Sopoty], 8 Jul 1872, K.G.Baenitz; *syn: L*; additional authentic material from the same site: 5 Jul 1876, K.G.Baenitz [*Herb. Eur.*] 1506 (LD, W).

*Juncus capitatus* var. *congestus* Ten., *Fl. Napol.* 4: 53 (1830), *n.v.*; *Juncus capitatus* subsp. *setaceus* [Ten. ex] K.Richt., *Pl. Eur.* 1: 182 (1890). T: [Italy] *n.v.*

*Juncus capitatus* A.I.a.2. [unranked] *versicolor* Asch. & Graebn., *Syn. Mitteleur. Fl.* 2(2): 489 (1904). T: [Italy, Sicily] Palermo [without further details]; *syn: n.v.*

*Juncus capitatus* A.I.a.2. [unranked] *virescens* Asch. & Graebn., *Syn. Mitteleur. Fl.* 2(2): 489 (1904). T: not designated.

*Juncus capitatus* f. *umbelliformis* Merino, *Fl. Galic.* 3: 52 (1909). T: Spain, Galicia, Fonsagrada (Lugo); *syn: n.v.*

*Juncus globiceps* Bajtenov, *Vestn. Akad. Nauk Kazakhsk. S.S.R.* 9: 78 (1955). T: Kazakhstan, Karkaralinsk, Kysil-ray [Mtns], 28 Jul 1938, I.Andrejev; *holo: AA*.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 27, fig. 24 (1906); T.Szynal & J.Ładalski, *Atlas Fl. Pol.* 2(2): 123 (1931); H.E.Hess, E.Landolt & R.Hirzel, *Fl. Schweiz* 1: 508 (1967).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 162, fig. 9 (1946); H.Meusel, E.Jäger & E.Weinert, *Vergl. Chorol. Zentraleur. Fl.* 1: 83 (1965); E.Hultén & M.Fries, *Atlas N.Eur. Vasc. Pl.* 1: map 184 (1986).

Annuals, (2–) 3–9 (–15) cm tall, caespitose; rhizome absent. Cataphylls few, ±membranous. Leaves basal, usually 3–4 (–6) cm long, linear, ±canaliculate, c. 0.5 mm wide; sheaths with broad membranous margins; apex acute; auricles absent. Lower bracts 1–2, herbaceous, with the longer usually 0.8–1.2 (–4.0) cm long, overtopping inflorescence; middle bracts ±membranous, ±as long as the respective heads. Inflorescence composed of 1–2 (–4) usually 3–7 (–12)-flowered ±hemispherical heads, with one sessile, and the others on subequal peduncles c. 1–1.5 cm long. Flowers cleistogamous, rarely chasmogamous, usually trimerous. Tepals unequal; outer tepals longer, 3.0–4.5 (–6.0) mm long, oblong-ovate, keeled, long-acuminate, with midrib greenish to pale brown and broad membranous margins; inner tepals usually 2.2–3.6 (–4.0) mm long, ±subacute, mucronate, membranous. Stamens 3,  $\frac{1}{2}$ – $\frac{2}{3}$  as long as tepals; anthers c. 0.2–0.5 (–0.6) mm long; filaments (0.6–) 0.8–1.3 mm long; style 0.3–0.5 mm (rarely to 1 mm) long; stigmas c. 1 mm long. Capsule broadly ovoid to ±ellipsoid, c. 1.7–2.2 mm long, much shorter than perianth, subobtuse, ±mucronulate, trilocular, ±castaneous-brown. Seeds ±obliquely ovoid, 0.25–0.35 mm long, c. 0.2 mm wide, pale brown, apiculate; appendages absent, transverse reticulation slight, ±rectangular. 2n = 18, *vide* S.Snoogerup, *Bot. Not.* 116: 149 (1963). Fig. 58.

Europe, SW Asia, the easternmost collections in Kazakhstan, NE Africa, E Africa, Cameroon, South Africa, introduced in North and South America, Australia and New Zealand. 10: DEN, fin, GRB, SWE. 11: AUT, BGM, CZE, GER, HUN, NET, POL, SWI. 12: COR, FRA, POR, SAR, SPA. 13: ALB, BUL, GRC, ITA, KRI, ROM, SIC, TUE, YUC. 14: BLR, BLT, RUC, run, RUS, RUW, UKR. 20: ALG, LBY, MOR, TUN. 21: AZO, CNY, MDR. 23: CMN. 24: ETH. 25: KEN. 27: CPP, LES, OFS, TVL. 32: KAZ. 34: CYP, TUR. 50: nsw, soa, tas, vic, wau. 51: nzn. 74: okl. 76: cal. 77: tex. 78: lou. 84: bzs. 85: elc, uru. Moist or wet areas, usually wet sands, shores of ponds or lakes, vernal pools, open moist disturbed soil along roadsides and paths, sometimes ruderal sites, from sea level to foothills, rarely to 3500 m in the tropics (Kenya). Map 212.

11. GERMANY: Mecklenburg, Parchim, Oct 1927, *Dahnke* (PR). 13. MONTENEGRO: Danilovgrad, Jun 1900, *J.Rohlena* (PR). 14. UKRAINE: Czernigov, 28 Jul 1900, *Rakocsi* [*Herb. Fl. Ross.*] 1193 (LE, WU). 24. ETHIOPIA: Shewa, 26 km N of Gedo, 2900 m, *O.Hedberg* 9024 (UPS). 25. KENYA: Mt Kenya, Gorges Valley, c. 3500 m, *Coe & Karika* 403 (UPS). 27. CAPE PROVINCE: Rondebosch, *E.Esterhuysen* 32932 (BOL). 34. CYPRUS: Dhiorios, *R.D.Meikle* 2342 (K). 50. SOUTH AUSTRALIA: Kuitpo, *D.Symon* 13491 (NSW, AD, B, BH, F, L, LG, MO, US). 84. BRAZIL SOUTH: Rio Grande do Sul, Rio Grande, 1 Nov 1901, *G.Malme* 127 (LD). 85. CHILE CENTRAL: Aconcagua, Los Vilos, *E.Barros* 9633 (SI). URUGUAY: Tacuarembó, between Paso de los Toros and Tacuarembó, *B.Rosengurt* B-6592 (SI).

### 33. *Juncus triformis* Engelm., *Trans. Acad. Sci. St. Louis* 2: 492 (1868)

*Juncus triformis* var. *stylosus* Engelm., *Trans. Acad. Sci. St. Louis* 2: 492 (1868). T: California, Yosemite Valley, DeLong's Ranch, 4000 ft. [c. 1280 m], 10 Jun 1866, *H.N.Bolander* 4864 [*G.Engelmann, Herb. Junc. Bor.-Amer. Norm.* 30]; lecto: MO, *fide* F.J.Hermann, *Leafl. W. Bot.* 5: 114 (1948); isolecto: CAS, MICH, NY, US.

*Juncus megaspermus* F.J.Herm., *Leafl. W. Bot.* 5: 114 (1948). T: California, Fresno Co., Sierra Nevada, King's River, 6200 ft., Jun 1900, *H.M.Hall & H.P.Chandler* 558; holo: US; iso: DS, MICH, MO, PR.

Illustrations: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 42, fig. 11 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 230 (2000).

Maps: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 43, fig. 12 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 230 (2000).

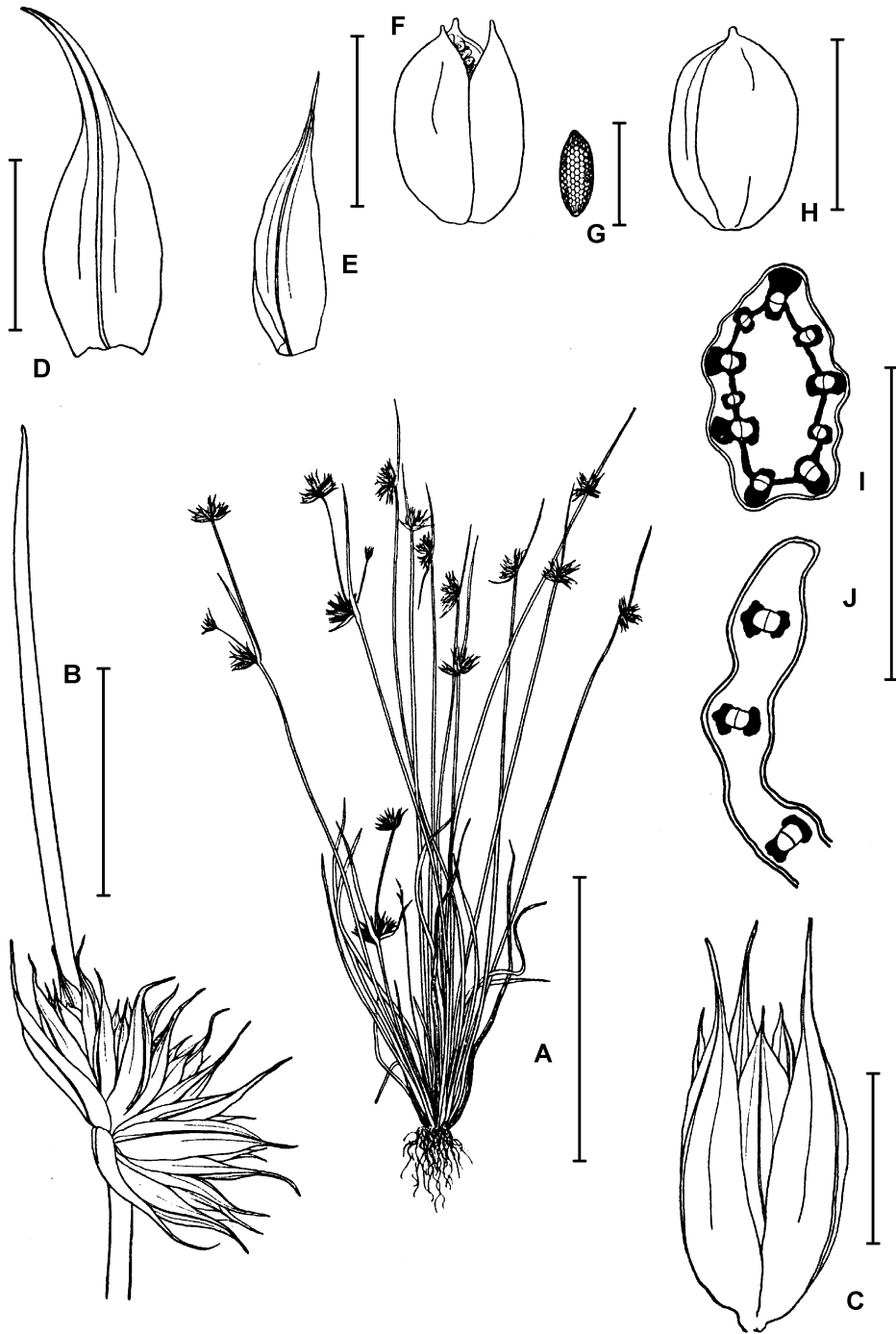
Annuals, (2-) 5-12 (-17) cm tall, caespitose. Stem erect, leafless; basal leaves to 5 cm long. Flowers (1-) 2-8, usually trimerous, occasionally dimerous; bracts 2-10, ovate to broadly lanceolate, acute, unpigmented or castaneous, 0.7-2.4 mm long. Tepals linear to lanceolate, (1-) 1.9-4.5 mm long, (0.3-) 0.5-1.1 mm wide; inner tepals usually 0.2-0.8 mm longer (rarely subequal or shorter) than the outer, (acute-) acuminate to attenuate, erect to recurved, with central band remaining green or turning pale to dark reddish. Stamens (2-) 3, 1.5-3.1 mm long; anthers often somewhat sagittate-based, (0.6-) 1-2.2 mm long, c. 1.25-3 times filament length; style (0.5-) 0.9-3.2 mm long; stigmas 0.5-2.5 mm long, often reddish. Capsule (globose-) ovoid to ellipsoid or oblong, (1.1-) 1.6-2.5 (-2.9) mm long, 0.5 times tepal length or sometimes subequal or rarely longer, usually pale to dark reddish. Seeds to 6 (-8) per row and c. 35 (-50) per capsule, variable in size and shape even in the same capsule, subglobose to ellipsoid, 0.3-0.8 mm long, usually apiculate and umbonulate, distinctly ridged or lightly ridged (but then seeds at least 0.5 mm long).  $2n = c.36$ , *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 59.

Endemic to the Sierra Nevada and foothills, and San Diego Co., California, United States. 76: CAL. On shallow soil and seepage at the edges of granite outcrops, sandy stream beds, 50-2500 m. Map 213.

76. CALIFORNIA: Fresno Co., Lake Edison, Warm Ck, *B.J.Ertter & J.L.Strachan* 3060 (CAS, DAV, FSC, GH, MICH, MO, NY, PH, RM, RSA, TEX, UC, UTC, WTU); Kern Co., Greenhorn Mtns, Waggy Fire Road, *C.B.Hardham* 3680A (CAS); San Diego Co., Highland Valley Road SE of Escondido, *B.J.Ertter & J.L.Strachan* 3538 (ASU, CAS, FSC, GH, LA, MEXU, NY, OBI, RSA, SBBG, SD, TEX, US, UTC, WTU); Tuolumne Co., Tuolumne Meadows, *F.J.Smiley* 739 (GH).

A variable species with the extremes sometimes recognized as separate species (*J. megaspermus* is based on high altitude samples). A complete intergradation between the extremes was observed by B.J.Ertter, *Mem. New York Bot. Gard.* 39: 45 (1986).

JUNCACEAE (*Juncus*)



**Figure 58.** *Juncus capitatus*. **A**, habit; **B**, inflorescence; **C**, flower; **D**, outer tepal; **E**, inner tepal; **F**, **H**, capsule; **G**, seed; **I**, stem T.S.; **J**, leaf T.S. (**A–I**, *Fleischer*, 12 Aug 1875, KRA). Scale bars: **A** = 5 cm; **B** = 5 mm; **C–F**, **H** = 2 mm; **G** = 0.5 mm; **I**, **J** = 1 mm. Drawn by T.Szynal. Reproduced with permission, from T.Szynal & J.Mądalski, *Atlas Fl. Polsk.* 2/2: 123 (1931).



**Figure 59.** *Juncus triformis*. **A**, habit; **B**, head of flowers (in fruit). *Juncus leiospermus* var. *leiospermus*. **C**, habit; **D**, head of flowers (in fruit, with pollen grains remaining on shriveled stigmas). *Juncus leiospermus* var. *ahartii*. **E**, flower (in fruit). Scale bars: **A**, **C** = 1 cm; **B**, **D**, **E** = 2 mm. Drawn by B. Angell. Reproduced with permission, from B. J. Ertter, *Mem. New York Bot. Gard.* 39: 42, fig. 11 (1986), © 1986, The New York Botanical Garden.

## JUNCACEAE (*Juncus*)

### 34. *Juncus leiospermus* F.J.Herm., *Leafl. W. Bot.* 5: 113 (1948)

T: California, Tehama Co., 2 mi [3 km] S of Red Bluff, 20 Apr 1916, *A.A.Heller 12326*; holo: US; iso: CAS, NZ etc.

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 231 (2000).

Annuals, 2–12.5 cm tall. Stem erect, leafless, (0.1–) 0.2–0.7 (–0.8) mm thick; basal leaves to 4 cm long. Flowers 1–7, commonly trimerous; bracts 2–8, round to acutely ovate, unpigmented or castaneous-brown at centre, 0.7–2.4 mm long; pedicels 0.4–2.2 (–2.5) mm long. Tepals narrowly lanceolate to ovate or oblong, (1.5–) 2.2–4.6 mm long, 0.5–1.4 mm wide, subequal or the inner longer, (rounded–) obtuse to acuminate, ±erect, straight, with central band remaining green or turning reddish. Stamens 3 (–5), 1.7–3.7 mm long; anthers 0.9–3.2 mm long, 1–4 times filament length; style (0.9–) 1.4–4.0 mm long; stigmas 1.3–4.0 mm long, white. Capsule globose to ellipsoid or oblong, (1.5–) 2–4.5 mm long, 0.5 mm longer or shorter than tepals, light to dark reddish or maroon, not contrasting strongly with tepals. Seeds to 12 per row and c. 150 per capsule, ovoid, 0.35–0.45 mm long, usually umbonulate, sometimes apiculate as well, smooth or faintly reticulate.

Endemic in California, United States. A rare plant almost confined to Sacramento Valley and adjacent foothills. Edges of temporary pools. Two varieties are recognized.

Flowers (1–) 2–7; bracts usually castaneous-brown at centre

**34a. var. *leiospermus***

Flowers usually solitary, rarely 2; bracts usually unpigmented

**34b. var. *ahartii***

### 34a. *Juncus leiospermus* F.J.Herm. var. *leiospermus*

Illustrations: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 42, fig. 11 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 230 (2000).

Map: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 43, fig. 12 (1986).

Flowers (1–) 2–7; bracts 2–8, round to acutely ovate, usually castaneous-brown at centre, 1–2.4 mm long; pedicels 0.5–2.2 (–2.5) mm long. Tepals narrowly to broadly lanceolate, with inner usually longer than the outer by up to 0.7 mm, acute to acuminate, rarely obtuse; central band usually turning reddish with darker red or brown or black at the sides and apex. Capsule ovoid to ellipsoid or oblong, to 0.5 mm shorter (less often to 0.3 mm longer) than tepals, (1.6–) 2–3.8 mm long.  $2n = 32$ , *vide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 59.

Rare plant in the northern Sacramento Valley, California, United States. 76: CAL. Edges of temporary vernal pools and swales, 180–960 m. Map 214.

76. CALIFORNIA: Butte Co., Oroville, Table Mtn, *L.Ahart 1703* (CAS, CDA, K, UC); *B.J.Ertter & al. 3309* (DAV, F, GH, MICH, MO, NY, OBI, PH, PRE, RM, RSA, SACT, SD, TEX, UCBS, US, UTC, WTU); Shasta Co., E of Redding, *R.F.Hoover 2270* (LL, OBI, UC).

### 34b. *Juncus leiospermus* var. *ahartii* Ertter, *Mem. New York Bot. Gard.* 39: 49 (1986)

T: California, Butte Co., Honcut, 1 May 1982, *L.Ahart 3402*; holo: NY; iso: CAS, MO etc.

Illustration: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 42, fig. 11 (1986).

Map: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 43, fig. 12 (1986).

Flowers 1 (–2); bracts 2 (–3), rounded to obtusely ovate, usually unpigmented, sometimes brown at base, 0.7–1.3 mm long; pedicels 0.4–0.9 mm long. Tepals lanceolate to ovate or oblong, subequal, with inner to 0.3 mm longer than the rounded outer ones, obtuse to acuminate; central band remaining green with a black apex or turning reddish. Capsule globose to ovoid to ellipsoid, (1.5–) 2.5–4.5 mm long, subequal to (sometimes to 0.5 mm longer than, rarely to 0.5 mm shorter than) tepals. Fig. 59.

Only known from Butte Co., California. 76: CAL. Edges of vernal pools, 50–100 m. Map 215.

76. CALIFORNIA: Butte Co., Honcut, Peter Ahart Ranch, *L.Ahart 1692* (B, CAS, CDA, CHSC, K, UC); Butte Co., Honcut, Peter Ahart Ranch, *L.Ahart 2238* (CAS, F, MICH, NY, PH, SACT, TEX, UTC).

**35. *Juncus kelloggii* Engelm., *Trans. Acad. Sci. St. Louis* 2: 494 (1868)**

T: USA, California, San Francisco, Turk Station, 22 Apr 1866, *A.Kellogg s.n.*; holotype: MO; isotype: GH, US.

*Juncus triflorus* Engelm. var. *brachystylus* Engelm., *Trans. Acad. Sci. St. Louis* 2: 492 (1868); *Juncus brachystylus* (Engelm.) Piper, *Contrib. U. S. Natl. Herb.* 11: 181 (1906). T: USA, California, Mendocino Co., Ukiah, May 1866, *H.N.Bolander 4646* [*G.Engelmann, Herb. Junc. Bor.-Amer. Norm.*]; holotype: MO; isotype: CAS, NY, PR, US.

Illustrations: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 51, fig. 13 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 231 (2000).

Maps: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 53, fig. 14 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 231 (2000).

Annuals, 1–5.5 (–6.5) cm tall. Stem erect, leafless, 0.1–0.3 mm thick; basal leaves to 2.5 cm long. Flowers 1–4, almost always trimerous; bracts 2–5, ovate to lanceolate, obtuse to more frequently acute, reddish-brown at least below, occasionally with a herbaceous midrib, 1–2.5 mm long, rarely tepaloid and to 4 mm long; pedicels 0.3–0.6 mm long. Tepals acute to acuminate, (1.5–) 2.0–3.2 mm long, 0.4–1.0 mm wide, with inner to 0.2 mm longer or 0.4 mm shorter than outer; central band soon turning dark reddish-brown to black at least distally. Stamens (2–) 3, 1.2–1.8 mm long; anthers 0.3–0.5 mm long,  $\frac{1}{3}$ – $\frac{1}{2}$  filament length; style 0.2–0.5 mm long; stigmas 0.4–1.3 mm long, pinkish. Capsule obovoid to elliptic, (1.5) 1.8–2.9 mm long, subequalling the tepals, differing by up to 0.3 mm, usually soon turning dark reddish, similar in color to the tepals. Seeds to 7 per row and c. 50 per capsule, ovoid, 0.4–0.55 mm long, apiculate, distinctly ridged.  $2n = c.34$ , *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 60.

Widely distributed along the Pacific coast of North America, from British Columbia, Canada, to California, United States. 71: BRC. 73: ORE, WAS. 76: CAL. Sandy to clayey soil in a variety of habitats, such as vernal pools, seepage areas, depressions in fields and meadows, from near sea level to 800 m. Map 216.

71. BRITISH COLUMBIA: Vancouver Is., Oak Bay, 18 Jun 1902, *Diehl* (POM). 73. OREGON: Columbia Co., St. Helens, May 1887, *T.Howell s.n.* (F, MO, NA, NY, ORE, UC, US). WASHINGTON: Klickitat Co., Columbia R., *W.Suksdorf 427* (F, MICH, NY, PH, UC, WS). 76. CALIFORNIA: Humboldt Co., Fort Seward, *J.P.Tracy 4431* (JEPS, UC, WTU); Lake Co., S of Kelseyville, *J.T.Howell 18033* (CAS, GH, MICH, MO); Santa Cruz Co., NW of Boulder Ck, *B.J.Ertter & J.L.Strachan 3333* (CAS, CHR, CHSC, GH, MO, NY, ORE, PRE, RM, SFSU, TEX, UTC, WTU).

**36. *Juncus luciensis* Ertter, *Mem. New York Bot. Gard.* 39: 58 (1986)**

T: USA, California, Monterey Co., between The Indians turnoff and N Fork San Antonio River, 12 May 1980, *B.J.Ertter & J.L.Strachan 3366*; holotype: NY; isotype: CAS, CPH, DAV, F, GH, ISC, K, LA, LE, MICH, MO, NY, OBI, P, PH, RM, RSA, SBBG, SD, TEX, UC, UTC, WTU.

Illustration: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 51, fig. 13 (1986).

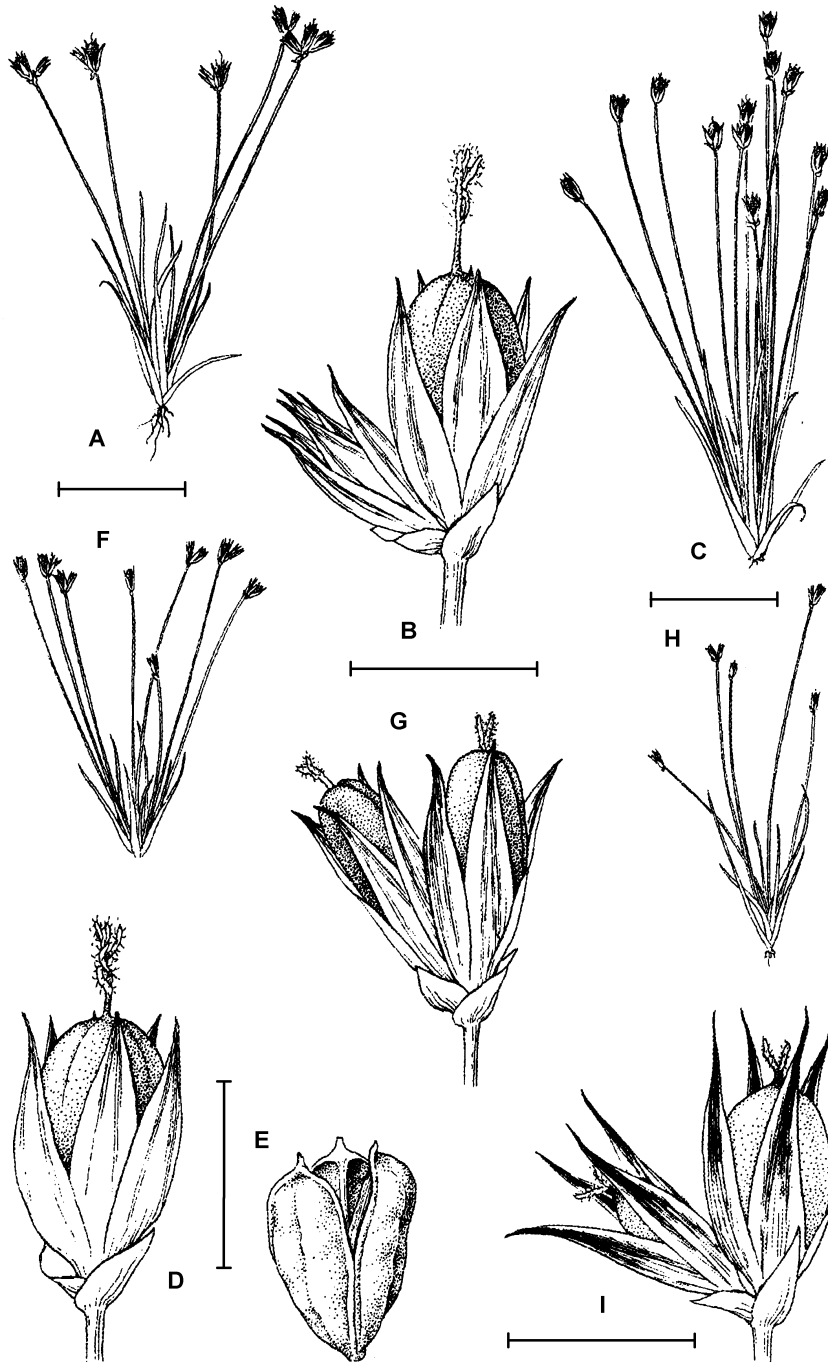
Maps: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 53, fig. 14 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 231 (2000).

Annuals, 0.7–5.5 (–6.5) cm tall. Stem erect, leafless, 0.1–0.3 mm thick; basal leaves to 1.5 cm long. Flowers 1 (–2), usually trimerous; bracts two, rounded to acutely ovate, usually unpigmented, sometimes brown-flecked or reddish at the base, 0.4–1.6 mm long; pedicels 0.3–0.6 mm long. Tepals  $\pm$ broadly lanceolate, acute to acuminate, 1.6–3 (–4.2) mm long, 0.4–0.6 mm wide, subequal or differing by up to 0.2 mm (in some populations the long-acuminate outer tepals up to 1 mm longer than the inner); central band dark-tipped but otherwise remaining pale yellow-green and only slowly turning reddish. Stamens 2–3, 0.9–1.4 mm long; anthers 0.3–0.5 mm long,  $\frac{1}{3}$ – $\frac{1}{2}$  filament length; style 0.2–0.4 mm long; stigmas 0.6–1.1 mm long, white. Capsule obovoid to elliptic, subequal to the tepals, differing by up to 0.3 mm, 1.3–2.9 mm long, remaining pale greenish or turning light reddish above as the seeds ripen. Seeds to 8 per row and c. 40 per capsule, globose-ovoid, 0.3–0.4 mm long, sometimes apiculate, distinctly ridged.  $2n = 32$ , *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 60.

Endemic in California, United States. 76: CAL. Wet sandy soils of seepage areas on sandstones, temporarily wet depressions, vernal pools, 300–1600 m. Map 217.



JUNCACEAE (*Juncus*)



**Figure 60.** *Juncus kelloggii*. A, habit; B, head of flowers (one in fruit). *Juncus luciensis*. C, habit; D, flower (in fruit); E, opened capsule. *Juncus tiehmii*. F, habit; G, head of flowers (in fruit). *Juncus capillaris*. H, habit; I, head of flowers (one in fruit). Scale bars: A, C, F, H = 1 cm; B, D, E, G, I = 2 mm. Drawn by B. Angell. Reproduced with permission, from B. J. Ertter, *Mem. New York Bot. Gard.* 39: 51, fig. 13 (1986), © 1986, The New York Botanical Garden.

76. CALIFORNIA: Monterey Co., Del Venturi Road 6.5 km S of San Antonio R., *B.J.Ertter & J.L.Strachan 3365* (ASU, BRY, CAS, ISC, MICH, NY, PH); Monterey Co., Los Burros Ck near Nacimiento, *C.B.Hardham 5896A* (CAS, RSA, UCSB); Plumas Co., Red Clover Valley, *A.A.Heller & P.B.Kennedy 8695* (DAV, DS, F, GH, ISC, MO, NESH, NY, PH, US, WTU); Santa Barbara Co., W of San Marcos Pass, Camino Cielo, 22 Jun 1956, *H.M.Pollard* (CAS, RSA, US).

**37. *Juncus tiehmii* Ertter, *Mem. New York Bot. Gard.* 39: 60 (1986)**

T: USA, California, Riverside Co., Kenworthy Forest Station, 26 Jun 1979, *B.J.Ertter & J.L.Strachan 2971*; holotype: NY; isotype: CAS, F, GH, K, MICH, MO, OSC, PH, RSA, SD, TEX, UC, US, UTC, WTU.

Illustrations: *B.J.Ertter, Mem. New York Bot. Gard.* 39: 51, fig. 13 (1986); *R.E.Brooks & C.E.Clemants, Fl. N. Amer.* 22: 230 (2000).

Maps: *B.J.Ertter, Mem. New York Bot. Gard.* 39: 53, fig. 14 (1986); *R.E.Brooks & C.E.Clemants, Fl. N. Amer.* 22: 231 (2000).

Annuals, 0.8–5 (–6.3) cm tall. Stem erect, leafless, 0.1–0.2 mm thick; basal leaves to 2.2 (–2.5) cm long. Flowers 1–4 (–7), usually dimerous; bracts 2–4 (–8), ovate, acute, usually unpigmented, sometimes reddish-brown at base, 0.6–1.5 mm long, rarely tepaloid to 2 mm long; pedicels 0.1–0.5 mm. Tepals ±broadly lanceolate, acute or acuminate, (1–) 1.9–2.9 mm long, 0.4–0.6 mm wide, subequal, rarely differing by 0.1 mm; central band pale green with pinkish edges and dark tip, sometimes darker reddish throughout. Stamens 2 (–3), 0.8–1.2 mm long; anthers 0.3–0.4 mm long, c. 1/2 filament length; style to 0.3 mm long; stigmas 0.2–0.7 mm long, white. Capsule (obovoid) elliptic to narrowly oblong, (1.5–) 1.9–2.9 mm long, usually equalling or exceeding tepals by up to 0.9 mm, rarely to 0.3 mm shorter, usually pink-tinged. Seeds to 7 per row and c. 30 per dimerous capsule, oblong to ovoid, (0.3–) 0.35–0.55 mm long, often both apiculate and umbonulate, distinctly ridged.  $2n = 34$ , *vide B.J.Ertter, Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 60.

Along the Pacific coast of North America from Oregon and Idaho, United States, to N Baja California, Mexico. 73: IDA, ORE. 76: CAL, NEV. 79: MXN. Seepage areas at the edge of outcrops, depressions in meadows, usually on bare moist granitic sand, 300–3090 m. Map 218.

73. IDAHO: Boise Co., Idaho City, Grayback Gulch, *B.J.Ertter & J.L.Strachan 3786* (CAS, CIC, ID, NY, UTC, WS, WTU). OREGON: Harney Co., Steins Mtns, Devine Ranch, *J.B.Leiberg 2525 p.p.* (MICH, ORE, US).

76. CALIFORNIA: Modoc Co., Surprise, *A.Eastwood & J.T.Howell 8111* (CAS, MICH); San Bernardino Co., Holcomb Valley N of Big Bear Lake, *B.J.Ertter & J.L.Strachan* (ASU, BRY, CAS, GH, LA, MICH, NY, PRE, RSA, SACT, SBBG, SD). NEVADA: Elko Co., Independence Mtns, NNW of Saval Ranch, *A.Tiehm 5392* (NY); Humboldt Co., Santa Rosa Mtns, SE of Canyon Ck Summit, *B.J.Ertter 4322* (CAS, CIC, NY, UTC).

79. MEXICO NW: Baja California Norte, Sierra San Pedro Mártir, between San Felipe Desert and Los Emes, *I.L.Wiggins 9884* (DS, MICH, UC, US).

**38. *Juncus capillaris* F.J.Herm., *Leafl. W. Bot.* 5: 116 (1948)**

T: USA, California, Mariposa Co., Yosemite Falls, Jun 1881, *C.C.Parry*; holotype: US; isotype: DS, F, ISC, MO, NY.

Illustration: *B.J.Ertter, Mem. New York Bot. Gard.* 39: 51, fig. 13 (1986).

Maps: *B.J.Ertter, Mem. New York Bot. Gard.* 39: 53, fig. 14 (1986); *R.E.Brooks & C.E.Clemants, Fl. N. Amer.* 22: 232 (2000).

Annuals, 0.9–5.5 (–6) cm tall. Stem erect, leafless, 0.1–0.3 mm thick; basal leaves to 2.2 cm long. Flowers 1–2 (–3), dimerous or trimerous; bracts 2–4, ovate, acute, usually reddish-brown below, (0.4–) 0.8–1.5 mm long, rarely tepaloid to 2.5 mm long; pedicels 0.3–0.6 mm long. Tepals acuminate to attenuate, (1.3–) 1.8–2.8 mm long, 0.4–0.6 mm wide, with inner to 0.5 mm longer than outer especially at anthesis; central band dark reddish to black at least at the top and sides, sometimes almost throughout. Stamens 2–3, 0.9–1.5 mm long; anthers 0.3–0.4 mm long, c. 1/2 filament length; style 0.1–0.3 mm long; stigmas 0.4–0.6 mm long. Capsule globose to obovoid (–ellipsoid), (1–) 1.2–2 (–2.2) mm long, usually 1/2–3/4 tepal length (sometimes equal, rarely slightly longer by 0.2 mm), most often remaining pale greenish with a dark red or black apex, sometimes gradually turning dark red throughout. Seeds 2–3 per row and 4–9 per capsule, elliptic-ovoid, 0.5–0.8 mm long, often both slightly apiculate and umbonulate, faintly ridged.  $2n = 36$ , *vide B.J.Ertter, Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 60.

## JUNCACEAE (*Juncus*)

Known only from W United States, from the Sierra Nevada, California, and Steins Mtns, Oregon. 73: ORE. 76: CAL. Moist bare flats, short turf, mossy patches in meadows, seepage areas on rock outcrops, stream banks, 1200–3200 m. Map 219.

73. OREGON: Harney Co., Steins Mtns, Devine Ranch, *J.B.Leiberg* 2525 *p.p.* (MICH, ORE, US). 76. CALIFORNIA: Calaveras Co., Big Trees, *Hillebrand* 2333 (MO, US); Mariposa Co., Yosemite Valley, *H.N.Bolander* 6034 (GH, JEPS, MICH, MO, UC); Mariposa Co., Tioga Road, W of Olmstead Point, *B.J.Ertter* & *J.L.Strachan* 3076 (CAS, CHR, NY, TEX, UCBS); Mono Co., Rock Ck, *J.T.Howell* 25682 (CAS, NA, NY, RSA, UC, US, UTC, WS, WTU).

### 39. *Juncus bryoides* F.J.Herm., *Leaflet. W. Bot.* 5: 117 (1948)

T: USA., California, San Bernardino Co., Bear Valley, 6000 ft., Jun 1866, *S.B.Parish* 1859; holo: US; iso: DS, F, GH, JEPS, MICH, MO, NY.

Illustrations: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 65, fig. 16 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 230 (2000).

Maps: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 66, fig. 17 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 232 (2000).

Annuals, 0.3–2 (–2.5) cm tall. Stem erect, leafless, 0.1–0.2 mm thick; basal leaves to 0.9 cm long. Flower 1, mainly trimerous; bracts (1–) 2, ovate (–lanceolate), ±acute, usually unpigmented, sometimes brownish at base, 0.3–0.9 mm long; pedicels to 0.2 mm long. Tepals lanceolate to acutely oblong, (1–) 1.2–2.3 (–2.8) mm long, 0.4–0.6 mm wide, subequal or inner to 0.2 mm longer, acute to acuminate, incurved over the capsule; central band narrowly tapering, not reaching the apex. Stamens (2–) 3 (–4), 0.5–0.9 mm long; anthers 0.15–0.25 mm long, c.  $\frac{1}{3}$ – $\frac{1}{2}$  filament length; style lacking or at most 0.1 mm long; stigmas 0.2–0.3 mm long. Capsule ovoid to ellipsoid, (0.7–) 1.0–1.9 mm long, shorter than the tepals by 0.1–0.7 mm, pale reddish. Seeds to 8 per row and c. 40 per capsule, ovoid to globose, somewhat apiculate or umbonulate, 0.3–0.5 mm long, smooth or faintly reticulate.  $2n = c. 38$ , *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 61.

W United States and NW Mexico, from Oregon, Idaho and Colorado to Baja California Norte. 73: COL, IDA, ORE. 76: CAL, NEV, UTA. 79: MXN. Damp usually sandy habitats, such as seepage areas near rock outcrops, swales in meadows, 650–3600 m. Map 220.

73. COLORADO: Moffatt Co., c. 6 km above Greystone on Zenobia Peak Road, *Weber & MacLeod* 12561 (CAS, DS, MICH, NCU, NY, RM, TEX, UC, WS). IDAHO: Boise Co., SW of Centerville, *B.J.Ertter* & *J.L.Strachan* 3797 (CAS, CIC, NY, RM, WS). OREGON: Harney Co., Steins Mtn SE of Fish Lake, *B.J.Ertter* & *J.L.Strachan* 3107 (CAS, CIC, NY, ORE, UTC). 76. CALIFORNIA: Fresno Co., Fourth Recess, *J.T.Howell* 22682 (CAS, F, GH, NY, POM, UC, US, UTC, WS); Riverside Co., Kenworthy Ranger Station, Hemet Valley, *B.J.Ertter* & *J.L.Strachan* 2972 (CHR, CPH, NA, NY, RSA, UC, UTC). NEVADA: Elko Co., Poorman Ck N of Wildhorse Reservoir, *A.Tiehm & Read* 6084 (NY). UTAH: Washington Co., Clear Ck Canyon, Zion Park, *A.Eastwood & J.T.Howell* 9212 (CAS, MICH). 79. MEXICO NW: Baja California Norte, Sierra San Pedro Mártir, Oak Pasture turnoff, *Moran* 23340 (DAV, MICH, NCU, SD).

### 40. *Juncus uncialis* Greene, *Pittonia* 2: 105 (1890)

T: USA, California, Solano Co., Suisun, 5 May 1890, *E.L.Greene s.n.*; lecto: NDG, *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 70 (1986); iso: DS, F, NA, NDG, UC, US [Material from the same date in LD].

Illustration: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 65, fig. 16 (1986).

Maps: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 71, fig. 18 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 232 (2000).

Annuals, 0.8–3.2 (–4) cm tall. Stem erect, leafless, (0.1–) 0.2–0.4 (–0.5) mm thick; culms not dilated just below flower; basal leaves to 2.2 cm long. Flowers single, mostly trimerous; bract solitary, broadly truncate, completely enwrapping culm, unpigmented, 0.25–0.9 mm long; pedicels to 0.5 mm long. Tepals ±lanceolate, (1.7–) 2.1–3.8 (–5.3) mm long, 0.6–0.9 mm wide, subequal or inner to 0.3 (–0.7) mm shorter or rarely to 0.3 mm longer than outer, usually ±acute, erect to recurved, sometimes slightly incurved; central band usually remaining green, occasionally turning reddish. Stamens 2–3, 1.2–2 (–3) mm long; anthers 0.3–0.5 (–0.8) mm long, c.  $\frac{1}{3}$  filament length; style 0.1–0.3 mm long; stigmas 0.4–1.3 mm long, white. Capsule ovoid to ellipsoid, subequalling the tepals or shorter by up to 0.5 mm,

(1.2–) 1.8–3.2 (–4) mm long, remaining greenish or more commonly turning reddish to deep maroon and then strongly contrasting with tepals. Seeds to 12 per row and c. 140 per capsule, ±ovoid, 0.3–0.4 mm long, sometimes apiculate or umbonulate, smooth or faintly reticulate.  $2n = 32$ , *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 61.

Endemic to W United States; it is centred in California and Oregon, marginally reaching Nevada. 73: ORE. 76: CAL, NEV. Muddy edges of vernal pools, 45–1700 m. Map 221.

73. OREGON: Harney Co., 6.5 km S of Steens Mtn Loop Road, *B.J.Ertter 4430* (BRY, CAS, CIC, CHR, GH, MO, NSW, NY, ORE, RENO, RM, RSA, TEX, UTC, WTU). 76. CALIFORNIA: Butte Co., Honcut, Ahart Ranch, *L.Ahart 3428* (B, CAS, CDA, K, MICH, NY, PH, SBBG, UC, US); Fresno Co., S of Friant, *R.J.Ferris & R.C.Bacigalupi 12389* (DS, UC); San Luis Obispo Co., near Estrella, *A.Eastwood & J.T.Howell 4197* (CAS, GH, MICH, NY, US). NEVADA: Washoe Co., Virginia Range E of Little Washoe Lake, *A.Tiehm & L.Williams 7140* (NY).

#### 41. *Juncus hemiendytus* F.J.Herm., *Leafl. W. Bot.* 5: 118 (1948)

T: USA, California, Trinity Co., NE side of the Trinity Alps, Big Flat, 21 Jul 1937, *J.T.Howell 13213*; holo: CAS; iso: DS, GH, MICH, NY, RSA, UC, US.

Map: R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 232 (2000)

Annuals, (0.2–) 0.3–3.6 cm tall. Stem erect, leafless, 0.1–0.5 mm thick; basal leaves to 1.8 cm long. Flowers 1, usually dimerous. Tepals ±lanceolate, (0.8–) 1.9–3 (–3.5) mm long, 0.5–1.2 mm wide, all equal or inner shorter, rounded to acute, usually recurved or erect; central band usually turning reddish. Stamens 2 (–3), (0.7–) 1–1.8 mm long; anthers (0.2–) 0.3–0.7 mm long,  $\frac{1}{3}$  filament length to almost equal; style 0.1–0.4 mm long; stigmas 0.3–1 mm long, white. Capsule obovoid to ellipsoid or oblong, (1–) 1.9–3.5 mm long, slightly less than to 1.5 times tepal length, usually turning reddish at maturity, not contrasting strongly with the tepals. Seeds to 12 per row and c. 70 per dimerous capsule, ovoid to oblong, 0.3–0.55 mm long, often apiculate, sometimes umbonulate as well, smooth or faintly reticulate.

Along the Pacific coast of the United States, from southernmost Washington, Oregon, Idaho and Utah to S California. Vernal moist depressions, streambeds and swales, usually on clayey soils. Two varieties are recognized.

Bracts 1–2; stem 0.1–0.3 mm in diam., not dilated below flower; capsule often exceeding perianth

41a. var. *hemiendytus*

Bracts absent; stem 0.2–0.5 mm in diam., dilated below flower; capsule usually not exceeding perianth

41b. var. *abjectus*

#### 41a. *Juncus hemiendytus* F.J.Herm. var. *hemiendytus*

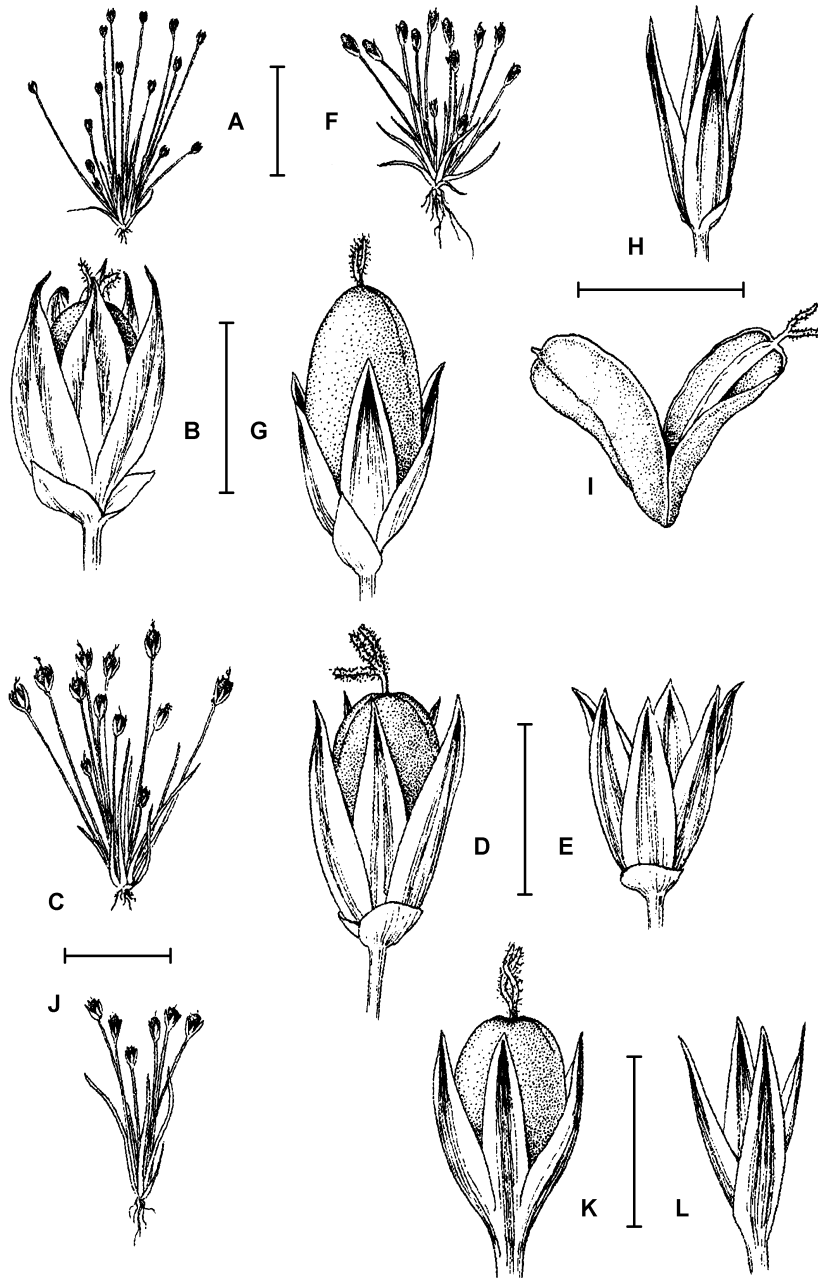
*Juncus triformis* Engelm. var. *uniflorus* Engelm., *Trans. Acad. Sci. St. Louis.* 2: 493 (1868); *Juncus saginoides* Engelm., *Trans. Acad. Sci. St. Louis* 2: 436 (1866), *nom. inval.*; *Juncus brachystylus* (Engelm.) Piper var. *uniflorus* (Engelm.) M.Peck, *Man. Pl. Oregon* 183 (1941). T: USA, California, Mendocino Co., Long Valley, 6 May 1866, *H.N.Bolander 4691b* [*G.Engelmann, Herb. Junc. Bor.-Amer. Norm.*]; lecto: MO, *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 73 (1986); isolecto: CAS, GH, ISC, MICH, MO, NY, PR, RSA, US. Illustrations: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 65, fig. 16 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 230 (2000).

Maps: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 71, fig. 18 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 233 (2000).

Culms not dilated below the flower. Bracts 1–2, rounded to obtusely ovate (–acute), not completely sheathing culm, unpigmented, seldom brownish near the base, to 2 mm long (occasionally greatly reduced or lacking), rarely tepaloid to 5 mm long; pedicels to 0.3 mm long. Capsule usually 1–1.5 times tepal length, usually turning reddish at maturity. Seeds to 12 per row, 0.3–0.5 mm long, smooth or faintly reticulate.  $2n = 32$ , *fide* B.J.Ertter, *Mem. New York Bot. Gard.* 39: 27 (1986). Fig. 61.

Throughout the range of the species, from Washington to California. 73: IDA, ORE, WAS. 76: CAL, NEV, UTA. Usually on damp clay, 400–300 m. Map 222.

JUNCACEAE (*Juncus*)



**Figure 61.** *Juncus bryoides*. **A**, habit; **B**, flower (in fruit). *Juncus uncialis*. **C**, habit; **D**, flower (in fruit); **E**, flower (capsule removed, from different angle). *Juncus hemiendytus* var. *hemiendytus*. **F**, habit; **G**, flower (in fruit); **H**, flower (side view, capsule removed); **I**, open capsule. *Juncus hemiendytus* var. *abjectus*. **J**, habit; **K**, flower (in fruit); **L**, flower (side view, capsule removed). Scale bars: **A**, **C**, **F**, **J** = 1 cm; **B** = 2 mm; **D**, **E**, **G**–**I**, **K**, **L** = 2 mm. Drawn by B. Angell. Reproduced with permission, from B. J. Ertter, *Mem. New York Bot. Gard.* 39: 65, fig. 16 (1986), © 1986, The New York Botanical Garden.

73. IDAHO: Elmore Co., Hill City, Mt Bennett Hills, Walker Gulch, *B.J.Ertter 4179* (CAS, CIC, ID, NY, OSC, US, UTC, WTU). OREGON: Jackson Co., Medford, Lower Table Rock, *K.L.Chambers 2453 p.p.* (DS, NY, OSC); Marion Co., Salem to Silverton, *E.Hall 543* (BKL, F, GH, LA, MICH, MO, NY, RM, UC, US). WASHINGTON: Klickitat Co., Falcon Valley, *W.Suksdorf 6987* (CAS, DS, MO, NA, NY, PH, UC, WS). 76. CALIFORNIA: Plumas Co., Milford – Beckwourth Road, *B.J.Ertter & J.L.Strachan 3880* (CAS, NY, RSA); Tulare Co., Chagoopa Plateau, Sky Parlor Meadow, *J.T.Howell 17522* (CAS, F, GH, MICH, NY, SFSU). NEVADA: Elko Co., Independence Mtns, Jack Ck Road, *B.J.Ertter & J.L.Strachan 3770* (CAS, CIC, MICH, NY, RENO, TEX, UTC). UTAH: Daggett Co., S of Carter Ck, *B.Maguire 12397* (NY, UTC).

**41b. *Juncus hemiendytus* var. *abjectus* (Herm.) Ertter, *Mem. New York Bot. Gard.* 39: 76 (1986)**

*Juncus abjectus* F.J.Herm., *Leafl. W. Bot.* 5: 120 (1948). T: USA, Oregon, Harney Co., 7 mi [11 km] W of Riley, 22 Jun 1925, *M.E.Peck 13893 p.p.*; holotype: F; isotype: CAS, DS, MICH.

Illustration: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 65, fig. 16 (1986).

Maps: B.J.Ertter, *Mem. New York Bot. Gard.* 39: 71, fig. 18 (1986); R.E.Brooks & C.E.Clemants, *Fl. N. Amer.* 22: 233 (2000).

Culms dilated at the base of the flower. Bracts lacking. Capsule most often slightly less than but sometimes to 0.5 mm longer than tepals, often turning brick-red at maturity. Seeds to 10 per row, 0.4–0.55 mm long, faintly reticulate. Fig. 61.

From C Idaho and C Oregon to N Nevada and California, United States. 73: IDA, ORE. 76: CAL, NEV. Moist open habitats, 1450–3400 m. Map 223.

73. IDAHO: Gooding Co., N of Gooding, *B.J.Ertter 4301* (CAS, CIC, ID, NY, WTU). OREGON: Lake Co., c. 14 km W of Lakeview, *M.E.Peck 25449 p.p.* (UC, WILLU). 76. CALIFORNIA: Mono Co., Slate Ck, *P.A.Munz 20041* (CAS, NY, RSA, TEX); Tuolumne Co., Tuolumne Meadows, *B.J.Ertter & J.L.Strachan 3933a* (NY). NEVADA: Elko Co., Sunflower Flat N of Wildhorse Reservoir, *B.J.Ertter & J.L.Strachan 3782* (CAS, CHR, CIC, GH, MICH, NY, PH, PRE, RENO, RM, RSA, TEX, US, UTC, WS).

**42. *Juncus scabriusculus* Kunth, *Enum. Pl.* 3: 354 (1841)**

T: South Africa, Cape, Piketberg Range, Groene Vallei, *J.F.Drège 8795* (see also the next name); synonym: G, K, L, S. [The collection number was mistakenly interpreted as Sternbergsspruit by F.G.P.Buchenau, 1875.]

*Juncus subglandulosus* Steud., *Syn. Pl. Glumac.* 2: 303 (1855); *Juncus scabriusculus* var. *subglandulosus* (Steud.) Buchenau, *Bot. Jahrb. Syst.* 12: 458 (1890). T: Cape Provinces, Piketberg Range, Groene Vallei, *J.F.Drège 8795*; synonym: P, S. [The locality associated with the collection number was mistakenly interpreted as Witbergen by F.G.P.Buchenau, 1875.]

Illustration: F.G.P.Buchenau, *Monogr. Junc. Cap.*, pl. 6, fig. 2, 3 (1875).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 164, fig. 12 (1946); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 87, map 69 (1985).

Annuals c. 5–25 (–35) cm tall, slender to robust, single-stemmed to caespitose. Leaves only basal, flat to ±folded, c. (4–) 8–14 (–21) cm long, (0.3–) 0.8–1.8 (–2.4) mm wide; base dilated; margins hyaline; apex acute; auricles absent. Lower bracts few, straw-membranous (rarely distally subherbaceous), with midrib distinct, ovate-lanceolate, (3.5–) 4.5–6.0 (–7.0) mm long, shorter than flower clusters. Inflorescence of usually 1–2 (–5) cup-shaped (1–) 2–7 (–10)-flowered pale stramineous clusters, with one sessile, and the others on erect, ±smooth peduncles to 3.5 cm long. Tepals subequal or inner longer, c. (5.5–) 6.0–8.0 mm long; inner tepals ±subobtusate; outer tepals ±acute to ±mucronate; central band thicker, stramineous, scabrid to ±smooth; margins broad, yellowish membranous. Stamens 6, shorter than perianth; anthers c. (0.8–) 1.5–4.1 mm long, longer than 0.5–1.0 (–1.5) mm filaments; style 2.3–2.8 mm long; stigmas 0.8–2.0 mm long. Capsule narrowly oblong-trigonous, trilobular, ±obtusate above, submucronate, c. 3.5–4.5 mm long, ±castaneous-brown, shining, shorter than perianth. Seeds ±oblong-ovoid, apiculate, c. 0.4–0.5 mm long, c. 0.2–0.25 mm wide, pale brown to brown, with distinct transverse reticulation; appendages absent.

Restricted to a small area in southwestern Cape, South Africa. 27: CPP. Open, damp sandy areas at low altitudes. Map 224.

27. CAPE PROVINCE: SW Cape, Malmesbury, Rondevlei, W of Preekstoel, *E.Esterhuysen 34715* (BOL, K, S); Witels Kloof, Sandberg, *L.Hugo 672* (K, NBG); Cape Flats, *R.S.Adamson 213* (NBG); *R.S.Adamson*

## JUNCACEAE (*Juncus*)

4 (BOL); Cape Town, *H.Bolus 4812* (BOL); NW of Fisch Hoek, *N.S.Pillans 4106* (BOL); Bredasdorp, Poort, *M.R.Levyns 4451* (BOL); Paarl, Goostenberg, *E.Esterhuysen 16027* (BOL); Kenilworth, 14 Oct 1892, [*anonymous*] (LD); Simonstown, Isoetes Vlei, *A.A.Gubb 75* (NBG).

### 43. *Juncus obliquus* Adamson, *J. S. African Bot.* 3: 165 (1937)

T: South Africa, Cape, Ceres, Cold Bokkeveld Mtns, Ebenezer, *R.S.Adamson 1139* (BOL).

Illustration: R.S.Adamson, *J. S. African Bot.* 3: 166, fig. 1 (1937).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 164, fig. 11 (1946); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 88, map 70 (1985).

Annuals, 2–4 (–6) cm tall, dwarf, slender. Leaves basal, filiform, usually 1–2 cm long, canaliculate; base ±dilated with broad membranous margins, ±purplish; inner leaves with sheath-like base; margins membranous; apex acuminate; auricles absent. Stem filiform, smooth, 0.1–0.2 mm in diam. Lower bracts ovate to narrowly lanceolate, brownish membranous to brown, 1.5–2.5 (–3.2) mm long, shorter than inflorescence; lowermost bract often ±erect. Inflorescence a single (very rarely 2) pseudolateral or terminal 1–5-flowered head to 6 mm diam. Tepals unequal; outer tepals subacute to mucronate; inner tepals longer, 2.2–2.6 mm long, ovate, obtuse, usually ±involute above, pale castaneous brown; central band and/or margins darker; midrib smooth to ±scabrid. Stamens 3, much shorter than perianth; anthers 0.3–0.4 (–0.6) mm long; filaments (0.4–) 0.5–0.7 mm long; style 0.2–0.3 mm long; stigmas c. 0.5 mm long, patent-recurved, not exserted. Capsule oblong-obovoid, subtrigonus, subobtuse, ±mucronate, c. 1.5 mm long, shorter than perianth, pale brown to brown. Seeds ovoid, c. 0.3 × 0.2 mm, pale brown, inconspicuously reticulate; appendages absent.

A rare endemic of the Cold Bokkeveld Mtns, Cape, South Africa. 27: CPP. Wet sands. Map 225.

27. CAPE PROVINCE: Ceres Division, 14 km N of Elands Kloof, *R.S.Adamson 2998* (BOL, NBG [a slightly different locality under the same number]); Elands Kloof, *M.R.Levyns 5791* (BOL).

### 44. *Juncus stenopetalus* Adamson, *J. S. African Bot.* 8: 273 (1942)

*Juncus sprengelii* Nees [*Linnaea* 20: 244 (1847), *nom. inval.*] ex Buchenau, *Monogr. Junc. Cap* 449 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 449 (1875)], *nom. illeg., non Willd.* (1787); *Juncus sprengelii* Nees ex Buchenau var. *gracilior* Buchenau, *Monogr. Junc. Cap* 449 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 449 (1875)]. T: South Africa, Cape, Tulbagh Waterfall, *C.F.Ecklon & C.Zeyher 11*; lecto: BOL, *vide* A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 88 (1985); isolecto: LD, S, W.

*Juncus sprengelii* Nees ex Buchenau var. *robustior* Buchenau, *Monogr. Junc. Cap* 449 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 449 (1875)]. T: South Africa, Cape, Tulbagh Waterfall, *C.F.Ecklon & C.Zeyher 11*; isosyn: L; Kampsbay, *C.F.Ecklon & C.Zeyher s.n.*; syn: herb. O.W.Sonder, *n.v.*; isosyn: S [the latter locality may be a mistake, and the plant may belong to the collection no. 11 from the Waterfall].

Illustration: F.G.P.Buchenau, *Monogr. Junc. Cap*, pl. 10 (1875).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 164, fig. 11 (1946); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 85, map 68 (1985)

Annuals, usually 7–11 (–17) cm tall, caespitose, yellowish green. Leaves basal, c. 3–9 cm long, ±flat, 0.5–2.5 mm wide; apex ±rugose and acute; base with membranous margins and often purplish central part; auricles absent. Stems ±smooth to scabrid. Lower (inflorescence) bract ±herbaceous, c. 1–3 cm long, ±equalling inflorescence or shorter; capitulum bracts linear-lanceolate, acute, ±equalling capitulum. Inflorescence of 1 sessile and 0–5 pedunculate heads; heads globose, echinate, usually 3–8 (–12)-flowered, 0.9–1.5 cm in diam. Peduncles scabrid, flowers on pedicels to 1 mm long. Tepals unequal to subequal, with outer longer, rigid, narrowly linear-triangular to linear-lanceolate, elongated-acuminate, carinate, slightly recurved near apex, 4.2–6.0 (–6.5) mm long, usually pale straw-brown with castaneous-brown tip and margins distally; margins ±translucent to stramineous; midrib pale straw-brown, scabrid. Stamens 6, much shorter than perianth; anthers (0.9–) 1.5–2.0 mm long; filaments (0.2–) 0.3–0.6 mm long; style (1.0–) 1.5–2.0 mm long; stigmas ±erect, (0.7–) 1.5–2.0 mm long. Capsule trigonous-ovoid, c. 2.5–3.0 mm long, including a beak to 0.5 mm long, subacute, straw-brown to castaneous-brown, much shorter than perianth. Seeds

±ovoid, c. 0.6–0.7 × 0.30–0.35 mm, apiculate at both ends, ±brown, distinctly transversely reticulate; appendages absent.

A rare endemic of Worcester district, Cape, South Africa. 27: CPP. Wet sandy patches, to 650 m. Map 226.

27. CAPE PROVINCE: Bains Kloof, *R.H.Compton 18645* (NBG-SAM); Bains Kloof, *F.R.Schlechter 9129* (L, NSW, S).

#### 45. *Juncus rupestris* Kunth, *Enum. Pl.* 3: 344 (1841)

*Juncus rupestris* f. *robusta* Buchenau, *Monogr. Junc. Cap* 442 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 442 (1875)]. T: South Africa, Cape, Kamiesberge, Eselsfontein, *J.F.Drège 2471a*; syn: BOL, G, K, LD, PR, S.

*Juncus rupestris* f. *gracilis* Buchenau, *Monogr. Junc. Cap* 442 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 442 (1875)]. T: South Africa, Cape, Kamiesberge, Giftberg, *J.F.Drège 2471b*; syn: B, destroyed; herb. O.W.Sonder, *n.v.*; South Africa, Cape, Kamiesberge, Ezelsbank, *J.F.Drège 2471c*; syn: B, destroyed; herb. O.W.Sonder, *n.v.*

Illustration: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 262, fig. 121 (1906).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 163, fig. 10 (1946); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 87, map 69 (1985).

Annuals, usually 5–15 cm tall, delicate, caespitose. Leaves basal, filiform, canaliculate, to c. 3–5 cm long; base with dilated membranous margins, often purplish; apex acute, often scabrid; auricles absent. Stem and peduncles distinctly scabrid (with elevated papillae), to c. 0.3 mm in diam. Inflorescence bract short, membranous or leaf-like, usually 2–6 mm long; middle bracts brownish membranous, c. 1.5–2.0 mm long. Inflorescence terminal, usually of umbellate appearance, composed of 1 basal and (0–) 1–7 (–10) pedunculate heads; heads 1–4-flowered cup-shaped; peduncles usually 1.0–3.5 cm long, some with a single secondary branchlet. Tepals ±equal or inner longer and outer narrower and acute; inner tepals subobtusate with involute membranous margins, c. 2.2–2.7 mm long, castaneous-brown with a greenish midrib; central band rigid, scabrid. Stamens 6; anthers c. 0.3–0.4 mm long; filaments 0.5–0.6 mm long; style very short, to 0.2 mm long; stigmas 0.4–0.5 mm long, recurved-patent (often contorted and head-like), reddish, with very long papillae. Capsule subglobular to ±ovoid, trilocular, subobtusate, ±mucronate, slightly shorter than perianth, c. 1.4–1.8 mm long, ±castaneous, shining. Seeds subglobular-ovoid, apiculate, c. 0.35 × 0.25 mm, pale brown to brown, finely reticulate; appendages absent.

Endemic to the Cape, South Africa. 27: CPP. Damp sands, seepage areas, to c. 1300 m. Map 227.

27. CAPE PROVINCE: Clanwilliam district, Biedouw Valley, *C.Reid 1350* (BOL, PRE); Clanwilliam, Cederberg Tafelberg, 1280 m, *E.Esterhuysen 18140* (BOL); S Cederberg, Krom R Kloof, *E.Esterhuysen 34158* (BOL); Calvinia, Lokenburg, Themeda Valley, 1100 m, *J.P.H.Acocks 17421* (K); Nieuwoudtville, Papkuilsfontein Farm, *D.Snijman 897* (NBG); Simonstown, Redhill, *R.S.Adamson 347* (NBG); Fisch Hoek Valley, *Wolley Dod 3400* (BOL, K); Noordhoek Vlei, *M.R.Levyns 641* (NBG); Fremt Hoek, *F.R.Schlechter 9224* (K, NSW); Stellenbosch, *R.H.Compton 15313* (NBG).

A distinct species showing limited variation. Plants with long stigmas and anthers longer than filaments, described as *J. schlechteri* and sometimes understood as an aberrant *J. rupestris*, are better classified as a part of the wide variation range of *J. cephalotes* Thunb.

#### 46. *Juncus pictus* Steud., *Syn. Pl. Glumac.* 2: 305 (1855)

T: South Africa, Cape, Namaqualand, Kamiesberg, Leliefontein, *J.F.Drège 2472a*; syn: BOL, G, K, L, P, PR, S.

Illustration: F.G.P.Buchenau, *Monogr. Junc. Cap & Abh. Naturwiss. Ver. Bremen* 4: pl. 6 (1875).

Map: H.Weimarck, *Svensk Bot. Tidskr.* 40: 163, fig. 10 (1946).

Annuals, c. 8–16 cm tall, pale caespitose. Leaves basal, to c. 7 cm long, ±filiform, ±flat, c. 0.5–1.2 mm wide; base usually pale purplish, with dilated membranous margins; surface finely verruculose to ±smooth; apex acute. Stem deeply grooved, very densely covered by elevated papillae. Inflorescence terminal, usually of a single sessile hemispheric to turbinate head and 1–2 heads on papillose peduncles to 1.5 cm long; each head usually 2–5 (–8)-



## JUNCACEAE (*Juncus*)

flowered. Tepals unequal; outer tepals ovate-lanceolate, c. 2.4–2.9 mm long, ±acute to mucronate; inner tepals longer, ovate, obtuse, c. 3.5–4.7 mm long; margins membranous, often involute; central band distally ±pinkish, often blackish-purple near tip; base whitish pale straw-brown; central part densely covered with elevated papillae. Stamens 6; anthers c. 1.4–1.7 mm long; filaments 0.4–0.6 mm long; style c. 1.5 mm long; stigmas 0.5–1.2 mm long, colourless to reddish, ±exserted. Capsule narrowly oblong-ovoid, subtrigonal, trilocular, c. 2.5 mm long including mucro c. 0.2 mm long, acuminate to acute, shorter than perianth, pale straw-brown. Seeds ovoid, apiculate, c. 0.6 × 0.3 mm, brown, with distinct longitudinal ridges and fine dense transversal reticulation.

Restricted to a small area in Northern Cape, South Africa. 27: CPP. Wet sandy areas, seepage places near rocks, along streams, to c. 1600 m. Map 228.

27. CAPE PROVINCE: the Kamiesberg, Leliefontein, 18 Dec 1936, R.S.Adamson 1488 (BOL).

A taxon closely related to *Juncus cephalotes*. Although recently included in the latter [A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2] its specific status is retained here. It is characterized by an extremely dense, distinctly elevated papillosity of stems and central part of the tepals, and pale colour. Plants with this character combination are confined to Northern Cape; the rich material of *J. cephalotes*, in spite of great variation, does not exhibit the dense papillosity (stems of the latter are only scabrid with papillae lower, irregularly scattered to subdense). There are two gatherings from Northern Cape [Namaqualand, farm Kliphoeck, C.Reid 1317 (BOL); Calvinia district, farm Vondelingfontein, C.Reid 1344 (BOL)] that differ from the typical *Juncus pictus* by plant colour and (partly) their general habit. They may represent a variation limit of *Juncus pictus*, a limit otherwise difficult to characterize due to ±scanty material.

### 47. *Juncus cephalotes* Thunb., *Prodr. Pl. Cap.* 66 (1794)

T: Cap[ut] b[onae] sp[eci] [South Africa, Cape Prov.], C.P.Thunberg; lecto: UPS-THUNB8708, fide A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 85 (1985).

*Juncus capensis* var. *minimus* Laharpe, *Essai Monogr. Junc.* 55 (1825). T: [South Africa, Cape Provinces, Cape of Good Hope] cap de Bonne-Espérance [otherwise not indicated, identity not certain], n.v.

*Juncus cephalotes* var. *minimus* Hochst., *Flora* 28: 342 (1845), p.p. T: [South Africa, Cape] 'in arenosis planitiei capensis', Nov 1828, C.Krauss; syn: W, K [both mixed collections].

*Juncus parvulus* E.Mey. ex Buchenau, *Monogr. Junc. Cap* 447 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 447 (1875)]. T: South Africa, Cape, Namaqualand, Modderfontein, 5 Nov 1830, J.F.Drège 2472b; syn: BOL, K, L, PR, S.

*Juncus polytrichos* E.Mey. & Buchenau, in F.G.P.Buchenau, *Monogr. Junc. Cap* 448 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 448 (1875)]. T: South Africa, Cape, Leliefontein, Ezelkop, J.F.Drège 2472aa; syn: G, K, L, PR.

*Juncus cephalotes* var. *ustulatus* Buchenau, *Monogr. Junc. Cap* 451 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 451 (1875)]. T: South Africa, Cape, Tafelberg, Oct 1827, C.F.Ecklon 13; lecto: BOL, fide R.S.Adamson, *J. Linn. Soc., Bot.* 50: 32 (1935).

*Juncus cephalotes* var. *varius* Buchenau, *Monogr. Junc. Cap* 451 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 451 (1875)]. T: [South Africa, Cape] Camps Bay, C.F.Ecklon s.n. (BOL).

*Juncus inaequalis* Buchenau, *Monogr. Junc. Cap* 455 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 455 (1875)]; *Juncus inaequalis* var. *genuinus* Buchenau, *Monogr. Junc. Cap* 455 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 455 (1875)], *nom. inval.* T: South Africa, Cape Town, Camps Bay, C.F.Ecklon 24; syn: BOL; C.F.Ecklon 12; syn: BOL.

*Juncus inaequalis* var. *viridescens* Buchenau, *Monogr. Junc. Cap* 455 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 455 (1875)]. T: South Africa, Cape, Swellendam, C.Zeyher 4319; syn: BOL, W [p.p., ut *Juncus isolepoides* Nees, *nom. inval.*]; Hottentotts-Holland, C.Zeyher 46; syn: BOL, W; C.F.Ecklon 14; syn: n.v.

*Juncus altus* Buchenau, *Monogr. Junc. Cap* 457 (1875) [*Abh. Naturwiss. Ver. Bremen* 4: 457 (1875)]; *Juncus inaequalis* var. *altus* (Buchenau) Adamson, *J. Linn. Soc., Bot.* 50: 34 (1935). T: [South Africa, Cape, Kogman's Kloof] Zwillingdam, zwischen Puspasvalei und Kochmanskloof, C.F.Ecklon & C.Zeyher 96 [= C.Zeyher 15]; syn: S.

*Juncus schlechteri* Buchenau, *Bot. Jahrb. Syst.* 24: 459 (1898); *Juncus rupestris* var. *schlechteri* (Buchenau) Adamson, *J. Linn. Soc., Bot.* 50: 38 (1935). T: South Africa, Cape, Bain's Kloof, F.R.Schlechter 9154; syn: BOL, L, LD, PR, PRE, S.

*Juncus filifolius* Adamson, *J. Linn. Soc., Bot.* 50: 36 (1935). T: South Africa, Cape, Cape Flats, temporary vleis, *R.S.Adamson 212*; holo: BOL.

*Juncus inaequalis* var. *squarrosus* Adamson, *J. Linn. Soc., Bot.* 50: 36 (1935). T: South Africa, Cape Province, Malmesbury, Saron, *F.R.Schlechter 10608*; holo: n.v.; iso: PRE.

Illustrations: F.G.P.Buchenau, *Monogr. Junc. Cap.*, pl. 6, 7 (1875); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 86, fig. 25, 3 (1985).

Maps: H.Weimarck, *Svensk Bot. Tidskr.* 40: 163, fig. 10 (1946); A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 85, map 68 (1985).

Annuals (2–) 8–13 (–30) cm tall, caespitose, scabrid. Leaves basal, c. 1.5–8 cm long, filiform to flat, usually 0.8–2.0 mm wide; base often purplish with margins dilated, membranous; apex acute. Stem ±grooved, scabrid with ±evenly scattered to dense low papillae. Lower bract usually membranous, rarely partially herbaceous, usually to 1 (–4) cm long, shorter than inflorescence; capitulum bracts membranous, to c. 3 mm long. Inflorescence of 1 sessile and (0–) 1–6 (–10) hemispheric to ±globose usually (1–) 3–8 (–15)-flowered heads; peduncles to 3.5 (–4.5) cm long, scabrid. Tepals ±equal to unequal, outer ±lanceolate; inner tepals usually longer, ovate-lanceolate, subacute to mucronate, c. 3.5–4.5 mm long; margins ±membranous; median part pale greenish to straw-brown, scabrid, with most of the area between margins and centre usually blackish purple to dark castaneous-brown. Stamens 6; anthers 1.2–1.7 mm long; filaments 0.4–0.6 mm long; style 1.0–2.3 mm long; stigmas (1.5–) 2.5–4.5 mm long, red, exserted. Capsule oblong-ovoid, subacute to subacuminate, c. 2.3–2.8 mm long including mucro 0.2–0.4 mm long, shorter than perianth, usually pale brown. Seeds ±ovoid, apiculate, c. 0.3–0.4 × 0.2 mm, pale brown to brown, distinctly reticulate. Fig. 49.

Endemic to SW Cape, South Africa. 27: CPP. Wet sands, flat sandy or clayey shores of temporary pools, seepage areas, usually near sea level. Map 229.

27. CAPE PROVINCE: Cape Town, Table Mtn, *C.F.Ecklon 901* (K, S); Bredasdorp, Appelskraal, *J.P.Stokoe 9395* (BOL, NBG); Cape Flats, *R.S.Adamson 219* (K); Cape Flats, Crawford, *R.S.Adamson 332* (BOL); Cape Peninsula, Olifantabosch, *G.Lewis 1762* (NBG); Kenilworth race course, *E.Esterhuysen 34116* (BOL); Stellenbosch, Gordons Bay, 22 Oct 1948, *Parker 4366* (BOL); Paarl, *E.Esterhuysen 6123* (BOL); Maitland Station, *M.R.Levyns s.n.* (BOL); Kommetje, *M.R.Levyns [as R.S.Adamson 227]* (BOL).

Extremely variable in size, from juvenile forms with single-flowered heads to tall plants. It also varies in the inner/outer tepal length ratio; in many cases inner tepals elongate with age but sometimes young plants also have unequal tepals. In general, characters previously used to distinguish numerous taxa in the material of *J. cephalotes* are the most variable ones (size, number of flowers and capitula etc.).

### Doubtful species

*Juncus dinteri* Poelln., *Feddes Repert. Spec. Nov. Regni Veg.* 48: 173 (1940).

T: Namibia, Garies, *M.K.Dinter 4254*; holo: B, probably destroyed; the plant not located in SAM, herbarium Dinter.

Equated with *J. bufonius* by A.A.Obermeyer, in A.A.Obermeyer, J.Lewis & R.B.Faden, *Fl. S. Afr.* 4/2: 76 (1985), although the type was not seen by her. The description does not exclude *J. bufonius* but the latter was a species surely known to Poellnitz.

### Sect. 4. STYGIOPSIS

*Juncus* sect. *Stygiopsis* [Gand. ex] Kuntze, in G.E.Post & O.Kuntze, *Lex. Gen. Phan.* 303 (1903)

*Juncus* [unranked, 'Abtheilung'] *Terminiflora* Peterm., *Deutschl. Fl.* 592 (1849) [lecto, see below, *fide* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 117 (1990)]; *Juncus* [unranked] *Alpini* Engelm., *Trans. Acad. Sci. St. Louis* 2: 434 (1866); *Juncus* subg. *Alpini* (Engelm.) Buchenau, *Bot. Jahrb. Syst.* 1: 118 (1880); *Juncus* sect. *Alpini* (Engelm.) Vierh., in H.G.A.Engler & K.Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a: 218

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(1930); *Juncus* subg. *Stygiopsis* (Kuntze) V.I.Krecz. & Gontsch., in V.L.Komarov, *Fl. URSS* 3: 520 (1935), *nom. illeg.*; *Juncus* sect. *Terminiflori* (Peters.) Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 117 (1990), *nom. illeg.*; *Juncus* subsect. *Thomsonii* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 117 (1990); *Juncus* sect. *Triglumes* K.F.Wu, *Acta Phytotax. Sin.* 32: 459 (1994), *nom. illeg.*; *Juncus* ser. *Triglumes* [K.F.Wu] K.F.Wu, *Acta Phytotax. Sin.* 32: 459 (1994), *nom. illeg.*. T: *Juncus triglumis* L.; lecto, *vide* J.Kirschner & al., *Folia Geobot. Phytotax.* 34: 384 (1999).

*Juncus* sect. *Stygii* [Fr. ex] Rouy, *Fl. France* 13: 232 (1912); *Juncus* subsect. *Stygii* (Rouy) Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 118 (1990). T: *Juncus stygius* L.

*Juncus* [unranked] *Castanei* Rydb., *Fl. Rocky Mts.* 150 (1917); *Juncus* sect. *Castanei* (Rydb.) Satake, in T.Nakai & M.Honda, *Nov. Fl. Jap.* 1: 67 (1938); *Juncus* subsect. *Castanei* [Rydb.] Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 118 (1990). T: *Juncus castaneus* Sm.

*Juncus* ser. *Filiformes* Satake, in T.Nakai & M.Honda, *Nov. Fl. Jap.* 1: 72 (1938). T: *Juncus potaninii* Buchenau; lecto, *vide* J.Kirschner & al., *Folia Geobot. Phytotax.* 34: 386 (1999).

*Juncus* subsect. *Bracteati* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 119 (1990). T: *Juncus bracteatus* Buchenau.

*Juncus* subsect. *Grisebachii* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 119 (1990). T: *Juncus grisebachii* Buchenau.

*Juncus* subsect. *Luzuliformes* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 118 (1990). T: *Juncus luzuliformis* Franch.

*Juncus* subsect. *Membranacei* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 118 (1990). T: *Juncus membranaceus* Royle.

*Juncus* sect. *Ochracei* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 121 (1990). T: *Juncus ochraceus* Buchenau.

*Juncus* subsect. *Uniflori* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.*, 95: 119 (1990). T: *Juncus uniflorus* W.W.Sm.

*Juncus* sect. *Sikkimensis* K.F.Wu, *Acta Phytotax. Sin.* 32: 461 (1994). T: *Juncus sikkimensis* Hook.f.

*Juncus* sect. *Sphacelati* K.F.Wu, *Acta Phytotax. Sin.* 32: 465 (1994). T: *Juncus sphacelatus* Decne.

*Juncus* sect. *Minimi* K.F.Wu, *Acta Phytotax. Sin.* 32: 461 (1994). T: *Juncus minimus* Buchenau.

*Juncus* ser. *Benghalenses* K.F.Wu, *Acta Phytotax. Sin.* 32: 460 (1994). T: *Juncus benghalensis* Kunth.

*Juncus* sect. *Allioides* K.F.Wu, *Acta Phytotax. Sin.* 32: 452 (1994). T: *Juncus allioides* Franch.

*Juncus* sect. *Concinni* K.F.Wu, *Acta Phytotax. Sin.* 32: 462 (1994). T: *Juncus concinnus* D.Don.

*Juncus* sect. *Nigroviolacei* K.F.Wu, *Acta Phytotax. Sin.* 32: 448 (1994). T: *Juncus nigroviolaceus* K.F.Wu.

Perennials, rhizomatous or densely caespitose; leaf blade flat, canaliculate, subterete to terete, uni-, bi- or pluritubular, imperfectly or perfectly septate. Inflorescence reduced to a single flower or a single terminal head, or anthelate of several to many heads; floral bracteoles absent. Tepals often white or whitish, or dark castaneous-brown. Stamens frequently exerted. Capsule unilocular, rarely  $\pm$ triseptate, not trilocular. Seeds usually with two distinct appendages.

A section of 59 species in high mountains of N hemisphere and subarctic regions, centred in the Sino-Himalaya. The section is obviously heterogenous, perhaps polyphyletic, but further research is needed to find a more satisfactory subdivision. The sect. *Stygiopsis* occupies a variety of alpine and subalpine habitats, from montane forests to subnival regions up to c. 5500 m.

1 Majority of partial inflorescences completely sterile, composed of  $\pm$ cylindrical, feather-like fascicles of bract-like structures; flower heads golden or stramineous

2 Fascicles of bracts c. 2.5–5 mm long; bracts 1.2–1.5 mm long; cauline leaf single; rhizomes short and curved

**56. *J. fimbriatoides***

2: Fascicles of bracts c. 5–8 (–10) mm long; bracts 2.7–3 mm long; cauline leaves 1–4; rhizomes very abbreviated

**57. *J. ochraceus***

1: Majority of partial inflorescences with well developed flowers (occasionally proliferation may occur or plants do not set seeds); flower heads not of golden colour

3 Flowers in a single terminal head, or head pseudolateral (overtopped by a  $\pm$ erect bract), or inflorescence with 1–2 lateral branches, each one-flowered

- 4 Flower head pseudolateral, 1–3-flowered, or terminal, 1 (–3)-flowered, sometimes with 1–2 one-flowered branches, and then whole inflorescence 2–4-flowered
- 5 Tepals brown, deep castaneous brown or dark brown
- 6 Capsule much exceeding perianth, retuse, truncate, obtuse to subacute, 4–8 mm long; seed appendages at least 0.4 mm long
- 7 Outer tepals obtuse, 2.5–3.3 mm long; anthers 0.3–0.4 (–0.6) mm long; style 0.3–0.4 (–0.7) mm long **84. J. biglumis**
- 7: Outer tepals acute to subacute, 5–6 mm long; anthers 0.6–0.9 mm long; style 0.8–1.7 mm long **85. J. longirostris**
- 6: Capsule equalling perianth, if (slightly) exceeding it, then acuminate, up to 4 (–4.5) mm long; seed appendages absent or minute, less than 0.1 mm long
- 8 Inner tepals distinctly longer than outer (to 3.5 mm long); style c. 0.5 mm long; auricles 0.5–1.2 mm long **78. J. biglumoides**
- 8: Inner and outer tepals of ±equal length (if inner longer, then longer than 4 mm); style longer than 0.8 mm, or if style c. 0.5 mm long, then auricles minute
- 9 Leaves filiform, non-septate, bitubular; inflorescence 1-flowered
- 10 Anthers longer than filaments; flower shortly pedicellate; lower bract ±equalling flower; style 1.0–1.7 mm long **82. J. uniflorus**
- 10: Anthers shorter than filaments; flower sessile; lower bract exceeding flower; style 0.5–0.7 mm long **83. J. bryophilus**
- 9: Leaves subterete, septate, unitubular; flowers usually 2–3, or if flower single, then sessile and tepals longer than 4 mm
- 11 Anthers shorter than filaments **79. J. duthiei**
- 11: Anthers longer than filaments
- 12 Stigmas pale yellow; anthers twice as long as filaments; flowers often proliferating **80. J. harae**
- 12: Stigmas reddish; anthers 3–4 times as long as filaments; flowers not proliferating **81. J. rhotangensis**
- 5: Tepals whitish or stramineous-whitish or stramineous, sometimes pale greenish or suffused purplish
- 13 Stamens not exerted; capsule much exceeding perianth (by 1.5 mm or more) **101. J. stygius**
- 13: Stamens conspicuously to slightly exerted; capsule ±equalling or slightly exceeding perianth
- 14 Rostrum c. 2 mm long; inflorescence of one sessile flower and 1–2 lateral one-flowered branches, with a secondary branchlet often present **103. J. luzuliformis**
- 14: Rostrum up to 0.8 mm long; inflorescence of a single terminal flower or 2–3-flowered terminal head, sometimes with a single lateral one-flowered branch present, with secondary branch absent
- 15 Tepals 4.5–6.0 mm long; style 1.5–2.5 mm long; anthers 2.5–3.5 mm long **104. J. longistamineus**
- 15: Tepals to 3.8 mm long; style to 1.8 mm long; anthers to 1.5 mm long
- 16 Cauline leaves bract-like, with sheaths enclosing bulbils (later proliferating) **66. J. trichophyllus**
- 16: Cauline leaves not bract-like; sheaths not enclosing bulbils, later not proliferating
- 17 Anthers 0.8–1.3 mm long; inflorescence usually 2–3-flowered; lateral branches absent; capsule 4–6 mm long **105. J. maximowiczii**

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- 17: Anthers 0.5–0.8 mm long; inflorescence usually 1-flowered; lateral branches sometimes present; capsule 3.0–4.5 mm long **102. *J. potaninii***
- 4: Flower head terminal, usually (2–) 3–10 (–25)-flowered
- 18: Tepals brown, dark brown or purplish castaneous-brown
- 19: Leaves unitubular, indistinctly septate; stamens long exserted; anthers 1.3–2.6 mm long; style 1.5–2.5 mm long; bracts (4–) 6–8 (–10) mm long **73. *J. przewalskii***
- 19: Leaves bitubular, not septate; stamens  $\pm$ equalling tepals; anthers 0.5–1.0 mm long; style c. 0.3–0.5 mm long; bracts 3.5–4.5 mm long **68. *J. triglumis***
- 18: Tepals white, yellowish white or whitish-stramineous
- 20: Bract-like leaves on upper part of stem 2–4; their sheaths enclosing bulbils, later proliferating, plantlet-bearing; inflorescence usually (1–) 3-flowered **66. *J. trichophyllus***
- 20: Bract-like leaves on upper part of stem 0–1; sheaths not enclosing bulbils, not proliferating; inflorescence usually more than 4-flowered
- 21: Stigma capitate, pin-like, lobes not developed or very short, to 0.2–0.4 mm long
- 22: Lower bract castaneous-membranous, similar to other bracts, not exceeding inflorescence; stem not grooved; bract-like leaf present on upper part of stem **63. *J. cephalostigma***
- 22: Lower bract with a leaf-like tip exceeding inflorescence, stem deeply grooved; upper cauline leaf absent **64. *J. brachystigma***
- 21: Stigma with three distinct spreading or erect lobes at least 0.5 mm long
- 23: Leaves (when dry) with transverse septa visible externally
- 24: Lower bract leaf-like, much exceeding inflorescence; uppermost leaf exceeding inflorescence; plants slender; tepals stramineous **52. *J. chrysocarpus***
- 24: Lower bract not leaf-like, nor exceeding inflorescence; uppermost leaf not reaching inflorescence; plants robust; tepals white **58. *J. allioides***
- 23: Leaves not septate, or septa weak, not visible externally even when leaves dry
- 25: Lower bract with leaf-like or acicular tip overtopping inflorescence
- 26: Leaves X- or Y-shaped in T.S. (plants with one flower head usually rare in populations of plants with two heads) **49. *J. khasiensis***
- 26: Leaves terete (sometimes grooved) or V-shaped in T.S.
- 27: Leaves unitubular
- 28: Auricles distinct, to 1.7 mm long; plants loosely caespitose; rhizomes slender, creeping; seed appendages 0.7–1.2 mm long **59. *J. membranaceus***
- 28: Auricles absent; plants densely caespitose; rhizome short; seed appendages 0.1–0.4 mm long **69. *J. leucomelas***
- 27: Leaves bitubular or pluritubular
- 29: Loosely caespitose; stems borne singly or in loose groups, not in dense clumps
- 30: Leaves pluritubular **62. *J. spectabilis***
- 30: Leaves bitubular
- 31: Auricles membranous; rhizomes stout; upper cauline leaf absent **65. *J. kingii***
- 31: Auricles brown; rhizomes filiform; upper cauline leaf present in some plants **70. *J. benghalensis***

- 29: Densely caespitose; stems in dense clumps or groups
- 32 Capitulum bracts whitish to scarious (one-headed inflorescence rarely found in populations of plants with several flower heads) **48. J. concinnus**
- 32: Capitulum bracts pale brown to brown
- 33 Capsule (including rostrum) 4.4–4.8 mm long; upper cauline leaf present **76. J. trachyphyllus**
- 33: Capsule (including rostrum or mucro) less than 4 mm long; upper cauline leaf absent or present
- 34 Style 0.4–0.8 mm long; anthers 1.1–1.3 mm long **75. J. gonggae**
- 34: Style usually longer than 0.8 mm; anthers 1.5–2.5 mm long
- 35 Auricles reddish-brown; style usually 0.8–1.2 mm long; plants to 8 cm tall **71. J. perpusillus**
- 35: Auricles scarious; style usually 1.3–1.8 mm long; plants 6–19 cm tall **74. J. sherei**
- 25: Bracts all similar, not leaf-like, all  $\pm$ shorter than inflorescence
- 36 Leaves bitubular to pluritubular
- 37 Bracts scarious to stramineous **77. J. modicus**
- 37: Bracts dark brown to pale brown
- 38 Style 2.0–2.5 mm long; stigmas 0.6–0.8 mm long; upper cauline leaf usually 1 **76. J. trachyphyllus**
- 38: Style 0.5–0.8 mm long; stigmas 0.8–2.0 mm long; upper cauline leaf absent **67. J. thomsonii**
- 36: Leaves unitubular
- 39 Auricles brown, conspicuous; stigmas stout, 0.3–0.6 mm long **61. J. leucanthus**
- 39: Auricles scarious, conspicuous or minute; stigmas thin, 0.6–2.0 mm long
- 40 Densely caespitose; rhizomes creeping; leaves glaucous-green **60. J. glaucoturpidus**
- 40: Loosely caespitose; rhizome short; leaves  $\pm$ mid-green
- 41 Basal leaves 1–2; cauline leaves 2–3; auricles 1.2–1.7 mm long; anthers 1.2–2.2 mm long **59. J. membranaceus**
- 41: Basal leaves absent; cauline leaf single; auricles minute; anthers 2.5–2.8 mm long **72. J. concolor**
- 3: Flower heads two to many, each with more than 3 flowers
- 42 Leaves septate, tubular or pluritubular
- 43 Tepals white, cream, stramineous or green
- 44 Tepals  $\pm$ green; proliferating flowers mixed with normal ones in flower heads; normal flowers do not set seeds **106. J. dongchuanensis**
- 44: Tepals white, cream or stramineous; flowers normally developed; seed set normal
- 45 Heads usually 2–3-flowered [N America, Europe, S Siberia and Russian Far East] **101. J. stygius**
- 45: Heads usually 4–12-flowered [Sino-Himalaya]
- 46 Inflorescence usually of 3 or more heads; leaves stout **51. J. grisebachii**
- 46: Inflorescence usually of 1–2 heads; leaves filiform **52. J. chrysocarpus**
- 43: Tepals brown to deep castaneous-brown

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- 47 Plants densely caespitose, with short rhizomes; style 3–4 mm long **100. J. longiflorus**
- 47: Plants loosely caespitose, usually with creeping rhizomes; style up to 3 mm long
- 48 Anthers longer than filaments
- 49 Inflorescence usually of 7–9 flower heads **97. J. macrantherus**
- 49: Inflorescence of 1–3 (–4) heads
- 50 Inflorescence usually of two unequally peduncled heads; tepals 5–9 mm long **99. J. sikkimensis**
- 50: Inflorescence of 1–3 congested heads; tepals to 5.5 mm long **94. J. deosaiicus**
- 48: Anthers shorter than or equalling filaments
- 51 Cauline leaves (4) 5–8 mm wide (usually flat, sometimes V-shaped) **91. J. giganteus**
- 51: Cauline leaves 1–4, rarely to 5 mm wide, usually subterete or V-shaped
- 52 Auricles elongated, oblong, (1–) 2–3 mm long; lower bract base spathe-like, inflated; tepals 6.5–13 mm long **96. J. sphacelatus**
- 52: Auricles absent to short, obtuse, to 1 mm long; lower bract base narrow, not inflated; tepals usually 4.5–6.5 mm long
- 53 Capsule to 5 mm long, shorter than perianth **98. J. ganeshii**
- 53: Capsule 6 mm or longer, exceeding perianth
- 54 Anthers ±equalling filaments **93. J. elbrusicus**
- 54: Anthers distinctly shorter than filaments
- 55 Cauline leaves 2–4, inserted evenly along stem; auricles distinct, broad, to 1 mm long **95. J. himalensis**
- 55: Cauline leaves 0–2 (–3), only sub-basal or in lower half of stem, rarely one higher; auricles ±absent **92. J. castaneus**
- 42: Leaves not septate, flat and grass-like or 1–4-channelled (V-, Y- or X-shaped in T.S.)
- 56 Flowers white, yellowish or ±stramineous
- 57 Leaf blade flat, grass-like
- 58 At least some leaves 10–15 mm wide; anthers equalling or slightly longer than filaments **55. J. crassistylus**
- 58: Leaves up to 5 mm wide; anthers conspicuously shorter than filaments
- 59 Auricles developed, c. 0.5 mm long, obtuse, stramineous to brownish **50. J. gracilicaulis**
- 59: Auricles absent
- 60 Inflorescence of 6–21 flower heads; tepals whitish, suffused pink, to 3.5 mm long **90. J. spumosus**
- 60: Inflorescence of 1–5 flower heads; tepals cream or stramineous-white, not pinkish, 3.5–5.3 mm long
- 61 Inflorescence apparently lateral; flower heads dense; leaf margin proximally papillose **53. J. clarkei**
- 61: Inflorescence appearing terminal; flower heads loose, divaricate; leaf margin smooth **54. J. hydrophilus**
- 57: Leaf blade canaliculate or deeply 3–4-grooved (V-, Y- or X-shaped in T.S.)
- 62 Leaves robust, canaliculate above (V-shaped in T.S.); flower heads usually 3 or more; capsule to 4.7 mm long; seeds (including appendages) to 1.2 mm long **48. J. concinnus**

- 62: Leaves filiform, deeply 3–4-grooved (Y- or X-shaped in T.S.); flower heads usually 2; capsule 4.9 mm or more; seeds (including appendages) over 1.7 mm long **49. J. khasiensis**
- 56: Flowers brown, castaneous brown or light brown
- 63 Plants (40–) 60–100 cm tall; inflorescence of 4–18 flower heads **91. J. giganteus**
- 63: Plants 1–30 (–50) cm tall; inflorescence of 1–3 (–5) heads
- 64 Anthers c. twice as long as filaments **87. J. milashanensis**
- 64: Anthers shorter than or subequalling filaments
- 65 Flower heads usually 2–3 (–5); anthers 1.5–2.4 mm long; rhizome creeping; plants loosely caespitose **86. J. amplifolius**
- 65: Flower head usually single, rarely 2; anthers to 1.3 mm long; rhizome short or ±ascending; plants densely or ±loosely caespitose
- 66 Style short, 0.5–1.0 (–1.5) mm long; stigmas to 2.5 mm long; plants usually 3–8 cm tall **89. J. minimus**
- 66: Style 1.5–2.5 mm long; stigmas 3–4 mm long; plants usually 10–15 cm tall **88. J. nepalicus**

**48. *Juncus concinnus* D.Don, *Prodr. Fl. Nepal.* 44 (1825)**

T: Nepal, 'in regione alpina Gosaingsthan'[Gosainkund], Jul 1818, *N.Wallich*; lecto: BM, left-hand plant with roots, *designated here*.

*Juncus concinnus* D.Don var. *turbidus* Buchenau, *Nachr. Königl. Ges. Wiss. Göttingen Geschäfl. Mitt.* 13: 252 (1869). T: Tibet, Tsanskar, Sulle to Padum, 22–24 Jun 1856, *A. & H. Schlagintweit 6700*; syn: B, destroyed.

*Juncus elegans* Royle ex Sam., in H.R.E.Handel-Mazzetti, *Symb. Sin.* 7: 1232 (1936). T: India, Uttar Pradesh, Mussoorie ['Mussoree'], *J.F.Royle*; lecto: LIV, *designated here*.

*Juncus albescens* Satake, in H.Hara, *Fl. E. Himalaya* 2: 161 (1971), *nom. illeg., non* (Lange) Fernald. (1924); *Juncus yokisukei* Goel, *J. Econ. Taxon Bot., Addit. Ser.* 7: 208 (1985), *nom. nov.* T: Bhutan, Laya to Laum Thang, 3850–4100 m, 18 May 1967, *H.Kanai & al. 11847*; holotype: TI; iso: BM.

*Juncus luteocarpus* Satake, *J. Jap. Bot.* 43: 384 (1968). T: Bhutan, Chendebi to Rukubi, 2300–2600 m, 21 Apr 1967, *H.Kanai & al. 8478*; holotype: TI.

*Juncus glomeratus* K.F.Wu, *Acta Phytotax. Sin.* 32: 462 (1994), *nom. illeg., non* Thunb. (1794); *Juncus lanpinguensis* Novikov, *Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol.* 103(4): 71 (1998), *nom. nov.* T: Yunnan, Lan-Ping [Lajing], 3000 m, 17 Aug 1933, *Hse-tao Tsai 53760*; holotype: IBSC.

Illustration: H.J.Noltie, *Fl. Bhutan* 3(1): pl. 11 (1994).

Perennials, 11–35 cm tall, caespitose; rhizomes very short, usually not creeping. Cataphylls usually 1–3, pale, chaffy. Cauline leaves up to 3, evenly spaced, 3.5–21 cm long, 0.8–2.5 (–3.2) mm wide; blade pluritubular, canaliculate above, V-shaped in T.S., not septate; tip obtuse; auricles conspicuous, with free parts 0.5–1 mm long, transparent or whitish-membranous. Lower bract leaf-like, equalling longest peduncle or sometimes exceeding inflorescence; capitulum bracts membranous, whitish-pinkish, usually 5–8 mm long. Inflorescence of (1–) 3–9 (–18) unequally peduncled 6–14 (–17)-flowered capitula 0.7–1.3 in diam. Tepals lanceolate, acute, unequal; outer tepals keeled below, 2.1–4 mm long; inner tepals longer, usually 3.5–5.2 mm long, shining, whitish or pale stramineous. Stamens 6; anthers 1–1.5 mm long, usually completely exerted at maturity; filaments 2.8–5.7 mm long; ovary 1.1–2.6 mm long; style 1.1–1.8 mm long; stigmas 0.7–1.1 mm long. Capsule narrowly ovoid-trigonous, 2.6–3.0 (–3.5) mm long, contracted into short beak 0.6–0.9 (–1.5) mm long, whitish. Seeds 0.6–0.7 mm long, or 0.7–1.2 mm long with two ±unequal appendages.

W, C, & E Himalaya, from Himachal Pradesh, Garhwal and Kumaon to Bhutan, Arunachal Pradesh and adjacent regions of SW China (Sichuan, Yunnan, Tibet). 36: CHC, CHT. 40: EHM, NEP, WHM. In a variety of habitats, from open woodlands, damp rocky slopes to road banks and drier subalpine slopes, 1980–4720 m. Map 230.



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**36.** CHINA: Sichuan, Tahsiangling, 2600 m, *H.Smith 10207* (BM, S, UPS); Yunnan, E of Likiang, above Duinaoke [Duinaoko], 2900–3100 m, *H.Handel-Mazzetti 3470* (E, S, WU). TIBET: Kongbo, Mira La, Nyang Chu, 3500–3900 m, *F.Ludlow, G.Sherriff & G.Taylor 6031* (BM); Tongkyuk, Tsangpo Valley, 2900 m, *F.Kingdon-Ward 12105* (BM). **40.** EAST HIMALAYA: Bhutan, Upper Mo Chu, Gasa Dzong, 2800 m, *J.Sinclair & D.G.Long 5023* (K). NEPAL: Chomro to Gandrung, 2250 m, *Barclay & Synge 2411* (K); Marsiandi Valley, 2600 m, *D.G.Lowndes 1407* (BM). WEST HIMALAYA: Himachal Pradesh, Chamba, Kulel, 1000 m, *G.A.Gammie 18174* (K); Uttar Pradesh, Mussorie, 2250 m, *R.R.Stewart 12846* (S); Deoban, Jaunsar, 2700 m, *C.E.Parkinson 7141* (S).

Very variable, but usually easily recognized by its inflorescence of several to many small white heads. Forms with a single head can be distinguished from small forms of *J. membranaceus* by the non-tubular leaves and lack of slender, elongate rhizomes.

### **49. *Juncus khasiensis* Buchenau, *Bot. Jahrb. Syst.* 12: 407 (1890)**

T: India, Khasia, *J.D.Hooker & J.J.Thomson*; syn: BM, K, W; Khasia, Lailankote, 5000 ft., 22 Oct 1886, *C.B.Clarke*; syn: W.

*Juncus nematocaulon* Hook.f., *Fl. Brit. Ind.* 6: 400 (1892) & *Icon. Pl.* 23: tab. 2234 (1892). T: [India, Assam] Jakpho, Naga Hills, 9900 ft., 25 Oct 1885, *C.B.Clarke 41274*; holo: K.

Illustration: *J.D.Hooker, Icon. Pl.* 23: tab. 2234 (1892) [holotype specimen].

Perennials, 6–12 (–28) cm tall, slender caespitose; rhizome short; stolons absent. Cataphylls 1 or 2, pale, chaffy. Cauline leaf single, sub-basal; blade filiform with 3 or 4 deep grooves, to 10 cm long, 0.4–0.7 mm wide, Y- or X-shaped in T.S.; pith solid, not septate; auricles very short, 0.1(–0.6) mm long. Lower bract leaf-like, half length to equalling inflorescence. Inflorescence of (1–) 2 (–5) unequally peduncled 3 (–6)-flowered capitula 0.8–1.1 cm in diam.; secondary peduncle stiffly erect so capitula superposed. Tepals narrowly lanceolate, acute, subequal or with outer ones shorter (3.5–4.5 mm long) than inner ones (4–4.9 mm long), pale stramineous. Stamens 6; anthers (1.3–)1.7 mm long, exserted from tepals; filaments 4.0–4.5 mm long; stigmas 1–1.7 mm long. Capsule narrowly ellipsoid, tapered into persistent style, exceeding tepals, total length 4.9–5.7 mm, golden brown. Seeds 0.8–0.9 mm long, or 1.7 (–2.4) mm long including two unequal appendages.

Confined to E Himalaya and adjacent territories: E Nepal, Bhutan, Sikkim, Assam. **40:** ASS, EHM, NEP. Wet rocks and cliffs in open woodlands, 2290–3510 m. Map 231.

**40.** EAST HIMALAYA: Sikkim, below Kyangnosla, 3120 m, *D.G.Long & H.J.Noltie 77* (E); Bhutan, above Gortsam, 3510 m, *H.J.Noltie 136* (E). ASSAM: Khasi Hills, 1600–1900 m, *C.B.Clarke 45656 a, b* (BM, K, S). NEPAL: Ghunsa, 3570 m, [anonymous: *KEKE*] 429 (E); above Door Pani, 2900 m, [anonymous: *KEKE*] 1247 (E); Dobato, 3200 m, *T. de Haas 2148* (BM).

Similar to *J. concinnus*, but differs in its filiform, deeply grooved leaves, and commonly bears two flower heads.

### **50. *Juncus gracilicaulis* A.Camus, *Notul. Syst. (Paris)* 1(10): 279 (1910)**

T: China, Yunnan, Santcha-ho [?Sanchahe], 4 & 10 Aug 1889, *P.J.M.Delavay 3943 p.p.*; syn: P; Tsé-kou, mont de Tsen-tchrou, 20 Sep 1895, *J.A.Soulié 1112*; syn: P.

Illustrations: A.Camus, *Notul. Syst. (Paris)* 1: 282, fig. 19, 17–22 (1910); Wu Kuofang, *Fl. R.P. Sinicae* 13(3): 227, pl. 54 (1997).

Perennials, 12–20 cm tall, loosely caespitose; rhizome short-noded, horizontal; sterile shoots present. Stem erect, terete, 0.4–0.8 mm in diam. Cataphylls 1–2, green to brownish, to c. 2.5 cm long; leaves flat, grass-like. Sub-basal and basal leaves 1–3, 5–15 cm long, c. 1.5–3.5 mm wide; sheath 2–4 cm long. Cauline leaves 1–2, 5–12 cm long, 1.4–3 (–5) mm wide; auricles obtuse, c. 0.5 mm long, scarious to brownish. Lower bract leaf-like, flat, 3–10 cm long, exceeding inflorescence; capitulum bracts white, ovate-lanceolate, 2.5–4.5 mm long. Inflorescence anthelate, decomposed, with 1–4 main branches and frequent secondary ones, of 2–10 (–12) white hemispherical 3–8-flowered heads 5–9 mm wide. Pedicels 0.5–1.0 mm long. Tepals  $\pm$ equal or inner ones slightly longer, lanceolate, subacute, (1.8–) 2.0–2.8 mm long, 0.6–0.8 mm wide, white. Stamens 6, long-exserted; anthers elliptic, yellowish white, 0.8–1.2 mm long; filaments to 4–8 mm long; style 1.0–1.5 mm long; stigmas 0.5–1.0 mm

long, whitish. Capsule ellipsoid-ovoid, acuminate, rostrate, 3.5–5.5 mm long; rostrum exceeding perianth. Seeds ellipsoid, 0.6–0.7 × c. 0.2 mm, or c. 1.1–1.6 mm long including two appendages 0.3–0.5 mm long.

Sikkim and south-central regions of China. 36: CHC. 40: EHM. On mossy rocks in moist woodlands, above 2500 m. Map 232.

**36.** CHINA SOUTH-CENTRAL: Sichuan, Tahsingling, 2700 m, *H.Smith 10208* (UPS); Yunnan, Deqin Xian, Meili Xueshan, Suola, 3700 m, *S.K.Wu & al. 193125* (KUN, TI); Yunnan, Zhongdian, Haba Shan, 3717 m, [*anonymous: ACE*] 329 (E); Yunnan, S of Zhongdian, 3215 m, [*anonymous: ACE*] 1603 (E). **40.** EAST HIMALAYA: Sikkim Lachen, *J.D.Hooker* (K); Bhutan, Thimphu, Ragyo, N of Paro, 3450 m, *H.J.Noltie 89* (E).

Closely related to *J. concinnus* but leaves flat.

**51. *Juncus grisebachii* Buchenau, *Abh. Naturwiss. Vereine Bremen* 3: 295 (1873)**

T: Sikkim, 3200–4500 m, *J.D.Hooker & J.J.Thomson Juncus 11*; syn: K, LD, S, W.

*Juncus phaeocarpus* A.M.Lu & Z.Y.Zhang, *Acta Phytotax. Sin.* 17: 126 (1979). T: Ne La Mu, Chang Mu, 3550 m, 11 May 1966, *Chang & Ling 3285*; holotype: PE.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 237, fig. 111 (1906); Lu An-min & Zhang Zhi-yun, *Acta Phytotax. Sin.* 17: 126, fig. 2, 1–5 (1979); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 178, pl. 41 (1997) as *J. phaeocarpus*.

Perennials, with stout creeping rhizomes. Stems stiffly erect, 20–73 cm tall. Basal leaves 1–2 (–4), to 30 cm long. Cauline leaves up to 3 near base and sometimes 1 on upper part; blade to 32 cm long, 0.8–2.2 mm wide, semi- to subcylindrical, ±canaliculate above, unitubular, septate; septa nearly always visible externally; auricles conspicuous, obtuse, with free part c. 3 mm long, pale brown, membranous. Lower bract erect, leaf-like, usually exceeding inflorescence. Inflorescence terminal, branched, of 2–7 (–13) hemispheric 7–12 (–16)-flowered capitula 1.2–1.8 cm diameter; capitula 1–2 subsessile, others on thick stiff peduncles up to 3 (–5) cm long. Tepals lanceolate, acute; outer tepals 4.8–6.5 mm long, usually shorter than inner ones (5.3–6.7 mm long), whitish or pale stramineous. Stamens 6, partly to completely exerted; anthers linear, 2.4–3.5 mm long, cream; filaments 4–6 mm long; ovary ellipsoid, 2.1–3.6 mm long, gradually tapered into style 2.1–3.6 mm long; stigmas stout, twisted, 1.0–1.6 mm long. Capsule broadly ellipsoid-trigonous, sometimes slightly curved, orange-brown, (4.0–) 4.4–6.2 mm long; mucro 0.3–1.8 mm long. Seeds 0.5–0.7 mm long, or 2.0–2.5 mm long including two subequal appendages.

Confined to E Himalayan region, from Nepal to Bhutan and SE Tibet. 36: CHT. 40: EHM, NEP. Alpine grasslands, wet ravines, open subalpine scrub, 2300–4300 m. Map 233.

**36.** TIBET: Shoka, Tsangpo Valley, 3200 m, *F.Ludlow, G.Sherriff & G.Taylor 7151* (BM, E, UPS). **40.** EAST HIMALAYA: Sikkim, Domang, 3250 m, 10 Aug 1943, *J.Pradham* (K); Sikkim, Dzongri, 4200 m, *C.B.Clarke 26008* (K); Sikkim, Lachen, 4500 m, *J.D.Hooker & J.J.Thomson* (K); Sikkim, Tongla, 3200 m, *J.S.Gamble 8427* (K); Sikkim, Yakla, 3200 m, *C.B.Clarke 9878* (UPS); Bhutan, Dochong La, 3080 m, *J.Sinclair & D.G.Long 4771* (E). NEPAL: Ghunsa, 3500 m, [*anonymous: KEKE*] 619 (E, KATH); Khokim, 3100 m, *J.F.Dobremez 1583* (BM); Daman, 2400 m, *J.F.Dobremez 809* (BM).

Reported from Kumaon, India, but material not located, and the occurrence unlikely. In its inflorescence like a very robust *J. concinnus*, but easily distinguished by its septate, unitubular leaves.

**52. *Juncus chrysocarpus* Buchenau, *Bot. Jahrb. Syst.* 6: 201 (1885)**

T: Sikkim, Islumbo, *C.B.Clarke*; syn: S; Sikkim, Jongri, 15 Oct 1875, *C.B.Clarke 25963*; syn: UPS; Sikkim, Jongri, 15 Oct 1875, *C.B.Clarke 25748*; syn: BM; Sikkim, Yakla, *C.B.Clarke*; syn: K, W.

Perennials, loosely caespitose; stems distant, 10–26 cm tall; rhizome slender, creeping. Cauline leaves usually 2, inserted  $\frac{1}{3}$  and  $\frac{1}{2}$  way along stem, with up to 2 basal leaves (to 25 cm long) sometimes also present; blades filiform, evenly tapered to acute apex, deeply ridged, canaliculate, unitubular (±bitubular near apex), closely and regularly septate; septa usually visible at least when dry; upper leaf usually overtopping inflorescence, to 14 cm long, under 1 mm wide; auricles conspicuous, with free part 0.5–1.0 × 0.5 mm. Lowest bract

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ridged, extended into leaf-like erecto-patent point 1–2× length of capitulum. Inflorescence a single (occasionally 2 or 3) 3–15-flowered capitulum. Tepals ±unequal; outer tepals 4.2–6.4 mm long; inner tepals 4.7–7 mm long, narrowly lanceolate, acute, ridged, stramineous. Stamens 6; anthers partly exerted at anthesis, 1.9–3.5 mm long; filaments 2.9–6 mm long; ovary ellipsoid, 2.5–3.5 mm long, gradually tapered into style 1.8–3 mm long; stigmas erect, 1.0–1.5 mm long. Capsule widely ovoid- to ellipsoid-trigonous, golden-brown, shining, 4.9–5.8 × 3–3.5 mm, abruptly contracted; mucro 0.5–2.0 mm long. Seeds c. 0.8 mm long, or c. 2.2 mm long including two subequal appendages.

Confined to the East Himalaya, from E Nepal to Bhutan and adjacent Tibet. 36: CHT. 40: EHM, NEP. Moist open patches, especially on rocks and trees in *Rhododendron* woodlands; along streams, 2400–4420 m. Map 234.

**40.** EAST HIMALAYA: Sikkim, Mom Lapcha to Phedang, 3800 m, 26 Jul 1992, [*anonymous: ESIK*] 747 (E); Bhutan, below Darkey Sang Tso, 3690 m, 3960 m, *H.J.Noltie 105B* (E); above Gortsam, 3350 m, 10 Aug 1991, *H.J.Noltie 134* (E). NEPAL: Chitre, between Basantpur and Door Pani, 2720 m, [*anonymous: KEKE*] 51 (E, K, KATH); E Nepal, between Baroya Khimty and Thakma Khola, 2500–3000 m, *H.Hara, H.Kurosawa & T.Tuyama 193* (BM, TI).

Related to *J. grisebachii* but more slender; leaves filiform, and usually bearing only a single head.

### **53. *Juncus clarkei* Buchenau, *Bot. Jahrb. Syst.* 6: 210 (1885)**

T: Sikkim Himalaya, 11–14000 ft, *J.D.Hooker Juncus 14 p.p.*; syn: W; Tonglo, Darjeeling, 12 Sep 1875, *C.B.Clarke 27604B*; syn: W; Sikkim, Islumbo, 12000 ft, 24 Oct 1875, *C.B.Clarke 25565*; syn: K, S [fragment], W; Yakla, 10–13000 ft, Oct 1869; *C.B.Clarke 9621, 9854, 9994bis, 10222*; syn: BM, K, W; Sikkim, Jongri, 12000 ft, 15 Oct 1869; *C.B.Clarke 25886, 25959*; syn: W; India, Singale-la, 11000 ft, 8 Oct 1870, *C.B.Clarke 12711*; syn: W.

*Juncus clarkei* Buchenau var. *marginatus* A.Camus, *Notul. Syst. (Paris)* 1(10): 278 (1910). T: Yunnan, Tsang-chan, 3500 m, 20 Aug 1887, *P.J.M.Delavay 2656*; holo: P.

Perennials, 15–33 cm tall, loosely caespitose; rhizomes slender, creeping. Cataphylls 1–2; cauline leaves 2–3 (–4), flat, grass-like, to 23 cm long, (1.8–) 3.0–4.5 (–5.2) mm wide, gradually tapered to acute apex, with upper one usually overtopping inflorescence; margins sometimes narrowly membranous, usually distinctly papillose in proximal part; papillae patent; veins conspicuous beneath; sheaths often reddish, without auricles. Lower bract erect, leaf-like, greatly exceeding inflorescence; middle bracts pale stramineous, equalling capitulum. Inflorescence apparently lateral of 1–4 unequally peduncled (2–) 4–12-flowered hemispheric capitula 0.9–2 cm in diam.; flowers ±erect, shortly pedicelled. Tepals lanceolate; outer tepals acute, 4.1–7.5 mm long with midrib usually greenish; inner tepals broader, usually longer, sometimes blunt, 4.9–7.5 mm long, pale stramineous. Stamens 6; anthers 1.8–2.5 mm long, usually at least partly exerted; filaments (3.4–) 4–6 mm long; ovary narrowly ovoid, inflated, gradually tapered into a 1.5–2 mm long style; ovary including style 6.5–9.5 mm long, stramineous; stigmas 0.3–1.5 mm long. Capsule usually sterile, narrowly ovoid, tapered into persistent style, long-exserted from tepals, total length to 1.2 cm, pale stramineous. Ripe seeds not seen; appendages present.

In the broader E Himalayan region, from E Nepal to upper Burma, SW China (Sichuan, Yunnan, Tibet). 36: CHC, CHT. 40: EHM, NEP. 41: BMA. Rocky slopes, stony pastures, margins of open woodlands, 1830–4000 m. Map 235.

**36.** CHINA SOUTH-CENTRAL: Yunnan, Mekong/Nu Jiang [Salween] divide, Shidsaru [Schidsaru] Tibet valley, *H.Handel-Mazzetti 9705* (S, W); Yunnan, Lichiang Range, 3850–4150 m, *G.Forrest 6380* (BM, E). TIBET: Doshing La, 3850 m, *F.Kingdon-Ward 13970* (BM). **40.** EAST HIMALAYA: Sikkim, Chooabanja, *King's collector s.n.* (K); Darjeeling, below Kalapokri, 7 Oct 1876, *J.S.Gamble s.n.* (K). NEPAL: Simbua Khola, below Tseram, 3400 m, *S.Crawford & al. [KEKE] 820* (K); Gopte Ural, 3500 m, *J.F.Dobremez 1621* (BM); Nepal, Lamjoora, 5500 m, *Lall Dhwoj 0251A* (BM). **41.** BURMA: NE Upper Burma, 3500 m, *G.Forrest 24877* (K); North Triangle, Tama Bum, 2900 m, *F.Kingdon-Ward 21441* (BM).

Similar to *J. crassistylus*, but much smaller, more slender. For differences from *J. hydrophilus* see below.

**54. *Juncus hydrophilus*** Noltie, *Edinburgh J. Bot.* 51: 138 (1994)

T: Sikkim, Prek Chhu Bridge below Bakhim, 2300 m, 27 Jul 1992, [anonymous: *ESIK*] 771; holo: E; iso: K.

Illustration: H.J.Noltie, *Edinburgh J. Bot.* 51: 140, fig. 2 (1994).

Perennials, 32–40 cm tall, loosely caespitose; stoloniferous; stolons short, slender (under 1 mm diam.), dark brown, covered with remains of old cataphylls. Cataphyll single, 0.7–4 cm long; basal leaves lacking; cauline leaves 3–4, evenly spaced, flat, grass-like, longest 14–17 cm long, 2–3 mm wide; sheaths 2.5–4.0 cm, reddish-brown, lacking auricles. Non-flowering shoots 3-leaved; blades shorter than stems, grass-like, tapering gradually to acute apex; margins extremely narrowly hyaline, smooth; midrib prominent beneath. Lower bract shorter than inflorescence; blade bristle-like; sheathing base narrowly membranous. Inflorescence usually of a single anthela with 3 (–5) heads, appearing terminal; heads loose, 4–9-flowered, c. 1.5 cm in diam.. Tepals unequal; outer tepals 3.5–5.0 × 0.8–1.4 mm, narrowly lanceolate, acute, keeled, cream; inner tepals 4.0–5.3 × 0.9–1.0 mm, similar in shape, cream. Stamens 6; anthers exserted, 1.4–2.5 mm long, pale yellow, narrowly oblong; filaments exceeding tepals; ovary 5.0–6.5 mm long including style, 1.0–1.5 mm wide, stramineous, very narrowly ovoid, gradually tapered into beak-like style to 1.5 mm long; stigmas 0.5–1.0 mm long, ±spreading. Capsule c. 6.0 × 1.8 mm, very narrowly ovoid, stramineous, shining. Ripe seeds unknown; appendages present. Fig. 62.

Endemic to the E Himalaya, extending from E Nepal to C Bhutan. 40: EHM. On wet cliffs with running water in oak-blue pine forest zone, 2300–3510 m. Map 236.

40. EAST HIMALAYA: Dotena, 2730 m, 20 Jul 1991, *H.J.Noltie* 13 (E); Bumthang, above Gortsam, 3510 m, 10 Aug 1991, *H.J.Noltie* 137 (E). NEPAL: NW of Saltie, along trail to Pangsing Bhanjyang, 2760 m, 25 Aug 1974, *T. de Haas* 2547 (BM).

Similar and related to *J. clarkei* but more slender, with lower bract and cauline leaves shorter, not exceeding inflorescence; anthers distinctly exserted. Also characterized by earlier flowering time (July to early August).

**55. *Juncus crassistylus*** A.Camus, *Notul. Syst. (Paris)* 1(10): 278 (1910)

T: China, Yunnan, Tsang-chan, 3500 m, 20 Aug 1887, *P.J.M.Delavay* 2656; holo: P; iso: TI.

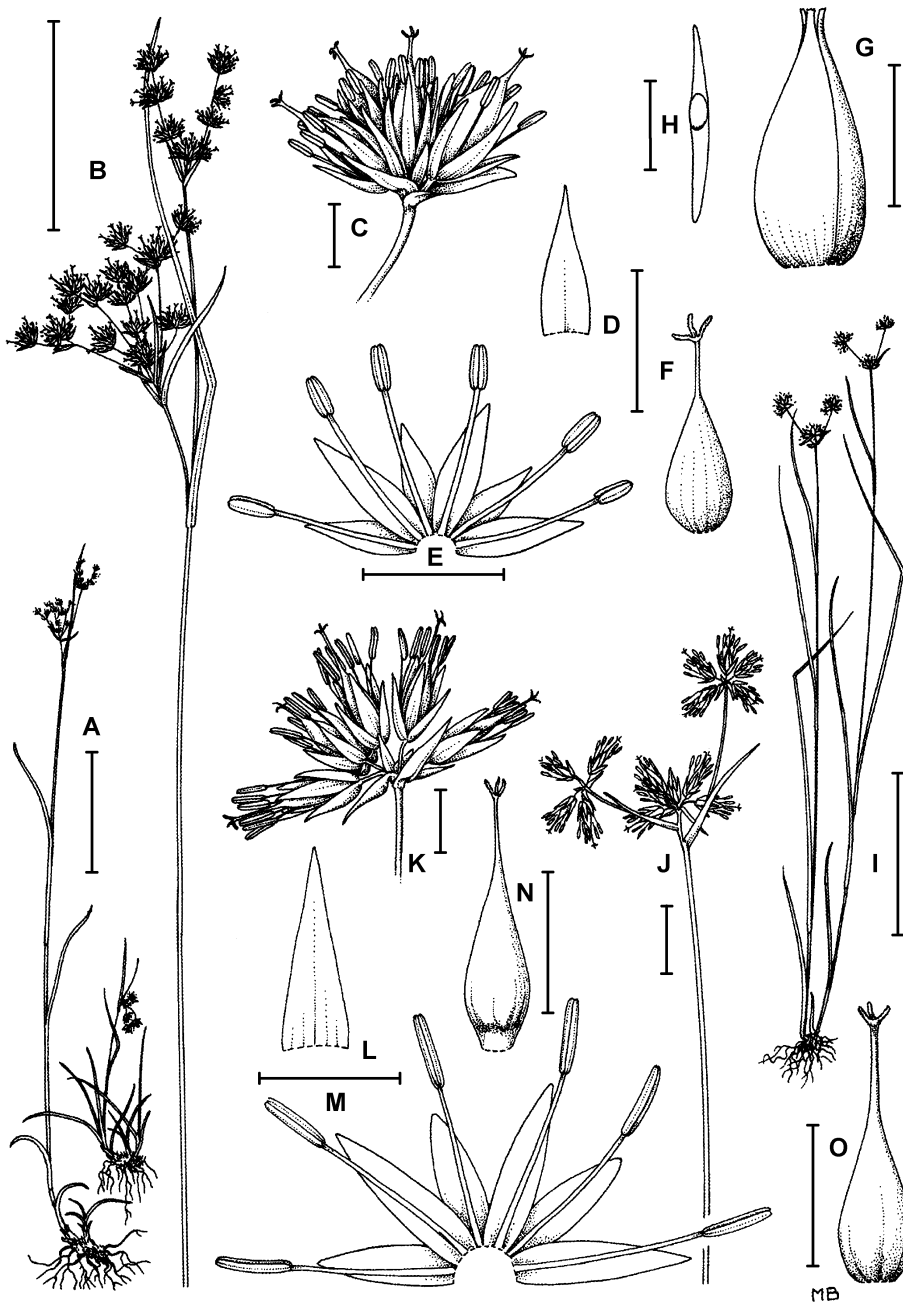
Illustration: A.Camus, *Notul. Syst. (Paris)* 1(10): 282, fig. 19 (1910) as *J. crassifolius* [sphalm.].

Perennials, 30–60 cm tall, robust, loosely caespitose; rhizomes long, creeping, covered with brownish scales, stout, 2–3 mm thick; stolons present. Stem erect, terete, 2–5 mm thick. Cataphylls 1–2, purplish-brown; leaves flat, grass-like; basal leaves 1–2, shorter than upper cauline leaves, 3–10 cm long including sheath, 1–1.5 cm wide; sheath 2–5 cm long; cauline leaves 2–4, 10–30 cm long, 1–2 cm wide; leaf margin broad-membranous, often ±serrulate; auricles obliquely ±absent. Lower bract leaf-like, exceeding inflorescence, 10–15 cm long, 3–6 mm wide, flat, grass-green. Inflorescence anthelate, 3–10 cm long, with 2–4 main branches and 1 to several secondary ones, of 3–8 subglobose 5–20-flowered heads 1–2 cm wide, subtended by several bracts, yellowish white; bracts of heads lanceolate to ovate-lanceolate, 3–15 mm long, 1.5–4 mm wide; sheath-like bract on peduncle membranous, lanceolate, 0.5–0.8 cm long. Flowers 6–8 mm long, 2–3 mm wide; pedicels 1.5–6.0 mm long. Tepals lanceolate; inner tepals 3.5–5.0 mm long, 0.8–2.5 mm wide; outer tepals 3.0–4.0 mm long, 0.8–2.4 mm wide, yellowish white. Stamens 6, ±not exserted, 2.6–3.3 mm long; anthers slightly longer than filaments, linear-elliptic, 1.4–1.8 mm long; filaments 1.2–1.5 mm long; style 1.3–1.5 mm long; stigmas 0.5–0.7 mm long; ovary ovoid-trigonous, 1.6–1.9 mm long, 0.8–1.0 mm wide. Capsule unilocular, oblong-ovoid, subtrigonous, acute, subabruptly contracted in a short mucro, 4.2–6.5 (–8) mm long, pale castaneous-brown, usually exceeding perianth. Seeds ovoid, 0.6–0.8 × 0.3–0.4 mm, 2.4–3.0 mm long including two appendages c. 0.8–1.1 mm long; outer seed-coat very loose.

Confined to Yunnan, SW China. 36: CHC. Banks of streams, grasslands, thickets and slopes in *Abies* forests, above 2000 m. Map 237.

36. CHINA: Yunnan, Dali Shi, Diancang Shan, Zhonghe Temple – Ximatang, 3200 m, *S.K.Wu & al.* 103138 (KUN, TI); Yunnan, Lushui Xian, Pianma – Pianma Pass – Lushui, 3200 m, *S.K.Wu & al.* 103173 (KUN, TI);

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**Figure 62.** *Juncus spumosus*. A, habit; B, inflorescence; C, partial inflorescence; D, bract; E, flower; F, ovary; G, fruit; H, immature seed. *Juncus hydrophilus*. I, habit; J, inflorescence; K, partial inflorescence; L, bract; M, flower; N, ovary; O, fruit. (A–H, *H.Noltie 122*, E; I–O, *ESIK 771*, E). Scale bars: A = 10 cm; B = 4 cm; C, K = 2 mm; D–G, L–N = 3 mm; H = 1 mm; I = 10 cm; J = 1 cm; O = 2 mm. Drawn by M.Bates. Reproduced by kind permission of the Trustees of the Royal Botanic Garden Edinburgh, from Noltie, *Edinburgh J. Bot.* 51: 140, fig. 2 (1998).

Dali, Tsang Shan, Longquan Peak, 3460 m, 15 Oct 1990, [anonymous: CLD-90] 1343 (K); Shweli Salwin divide, *G.Forrest* 9026 (K, S); W Yunnan, Yü Hsien, Kung Hsien, *McLaren's collectors* L90A (K); Yunnan, *H.T.Tsai* 58016 (K); Yunnan, Tali Range, 2250 m, *G.Forrest* 28009 (S).

Recently, a new species of the group of *J. crassistylus* and *J. amplifolius* was discovered in the Xiaojin region, Sichuan, China. F.Miyamoto and H.Ohba call it *Juncus hamulus* (the description submitted to *J. Jap. Bot.*); it is characterized by brown tepals with a hook-like appendage near the tip, long stigmas, long-creeping rhizomes, and leaves 1.5–7 mm wide.

**56. *Juncus fimbristyloides* Noltie, *Edinburgh J. Bot.* 55: 39 (1998)**

T: China, Yunnan, Lijiang Prefecture, Yulong Shan, N of Camellia Temple, 3040 m, 11 Oct 1990; [anonymous: CLDJ] 1122; holotype: E; isotype: GH, PE, TI.

Illustration: H.J.Noltie, *Edinburgh J. Bot.* 55: 40, fig. 1B, 42, fig. 2E–J (1998).

Perennials, 9.5–15 cm tall, caespitose; rhizomes short, curved. Cataphylls shining, to 3.5–5 cm long, striate, dull, brown, dark brown at base; apex truncate, mucronate. Vegetative shoots bearing a single erect leaf, usually to 15 cm long. Cauline leaf single; sheath short; auricles truncate, very short (c. 0.2 mm); blade exceeding inflorescence, c. 0.9 mm wide, canaliculate, bitubular, weakly septate, with septa not visible externally. Lower bract with filiform blade shorter than inflorescence. Inflorescence 4–8 cm long, anthelate, branched to 4 orders; branches slender, ascending; flowers replaced by 3.5–6 mm long cylindrical heads of spirally inserted bracts, with each bract subtending a plantlet; bracts 1.2–1.4 mm long, narrowly ovate, acute, keeled, chaffy, stramineous; plantlets composed of several scales with dark brown bases; upper scales bearing small green filiform blades. Fertile flower (only one developed in the material) with unequal tepals; outer tepals 4 × 1.4 mm, lanceolate, acute, concave, stramineous, with margins whitish-hyaline and midrib 3-veined; inner tepals 5 × 1.5 mm. Stamens 6; filaments c. 3.4 mm long; anthers not seen. Capsule 3.5 × 1.8 mm, narrowly ellipsoid, gradually tapered into beak c. 0.7 mm long, stramineous shining. Fig. 63, 64.

Only known from Yunnan, China. 36: CHC. The only population grows in damp slopes in an open oak/pine woodland. The species is known from the type collection only. Map 238.

Related to *J. ochraceus* but cauline leaf single, inflorescence 'heads' smaller, with fewer, smaller and acute (not acuminate) bract-like structures.

**57. *Juncus ochraceus* Buchenau, *Abh. Naturwiss. Vereine Bremen* 3: 292 (1873)**

T: Sikkim, 3800 m, *J.D.Hooker* *Juncus* 9; holotype: K; isotype: S, UPS.

*Juncus tratangensis* Satake, in H.Hara, *Fl. E. Himalaya* 2: 164 (1971). T: Bhutan, Tongsa to Uto La Road, 2000–2500 m, 17 Apr 1967, *H.Kanai* & *T.Yamazaki* 5952; holotype: TI.

Illustrations: H.J.Noltie, *Fl. Bhutan* 3(1): 241, fig. 24 (1994); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 230, pl. 56 (1997).

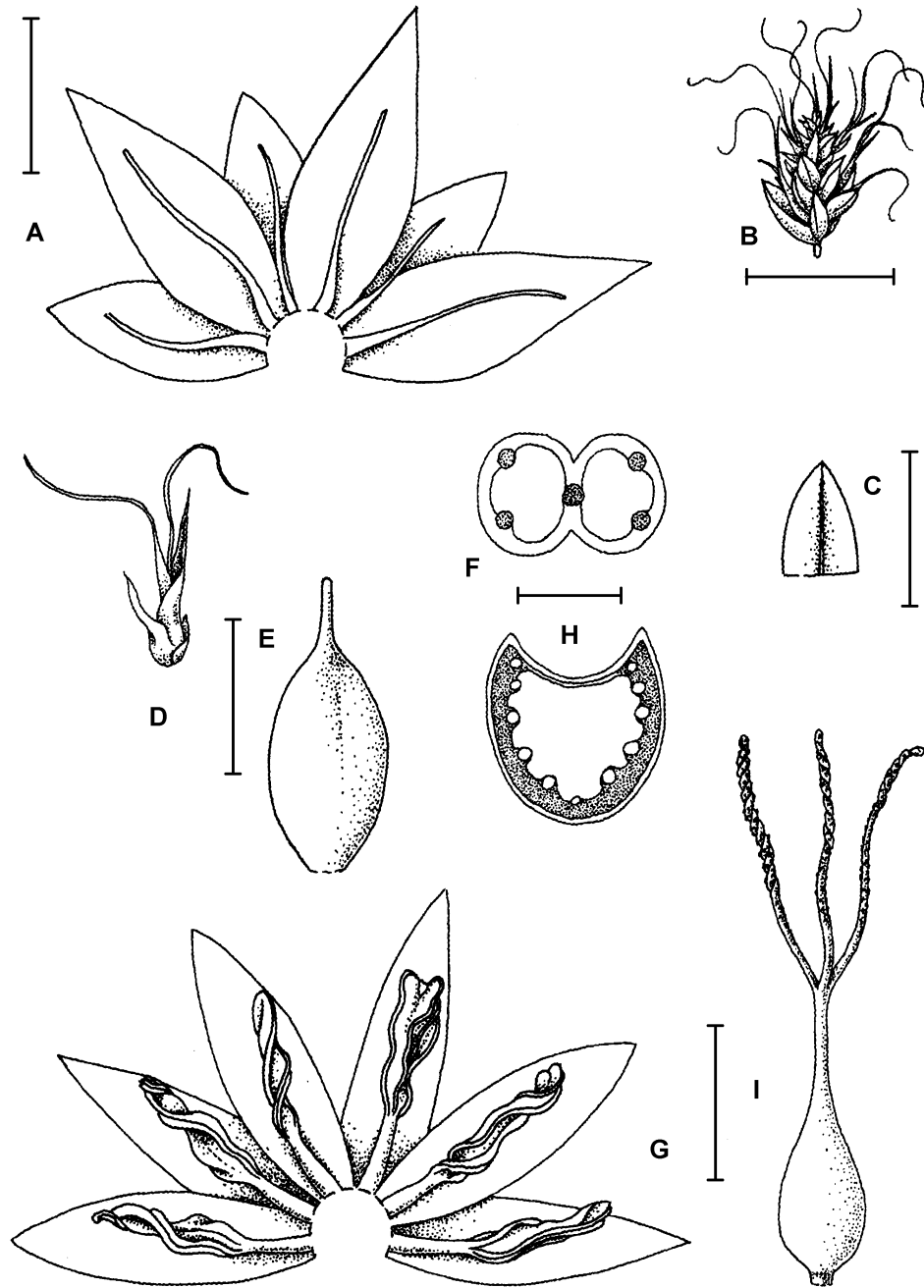
Perennials, 8–28 cm tall, caespitose; rhizomes short. Cataphylls short, pale brown; leaves mostly basal and sub-basal, filiform, usually to 20–23 cm long, grooved, canaliculate, bitubular, septate; septa not visible externally; auricles obtuse, membranous, pale brown, c. 0.3 mm long. Lower bract filiform, usually to 2–3 cm long, shorter than inflorescence. Inflorescence branched, dense, to 12 cm long, with majority of partial inflorescences non-fertile and composed of pedicellate feather-like fascicles of narrowly lanceolate aristate, golden-brown sterile bracts. Fertile flowers usually inconspicuous, situated at base of partial inflorescences, occasionally predominating. Tepals lanceolate, acute or mucronate, equal, 3.3–4.2 mm long, stramineous. Stamens 6, shorter than tepals; filaments 1.2–1.5 mm long; anthers 1.3–2 mm long, often twisted; ovary widely ellipsoid, 1.4–2.7 mm long, abruptly contracted into style 1.8–2 mm long; stigmas erect, twisted, 1.4–2.7 mm long. Capsule widely ovoid-trigonous, c. 2.4 × 1.5 mm, abruptly contracted; mucro c. 1.8 mm. Seeds not developed even in almost ripe capsules.

Restricted to the E Himalaya from C Nepal and Bhutan to Darjeeling and adjacent regions of China. 36: CHC, CHT. 40: IND, EHM, NEP. Moist open ground and shingle along streams and roadbanks, 1220–3660 m. Map 239.

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**Figure 63.** *Juncus fimbristyloides*. **A**, habit. *Juncus deosaicus*. **B**, habit. (**A**, CLD 1122, E; **B**, Hussain & al. 940659, E). Scale bar: **A**, **B** = 4 cm. Drawn by L.Olley. Reproduced by kind permission of the Trustees of the Royal Botanic Garden Edinburgh, from Noltie, *Edinburgh J. Bot.* 55: 40, fig. 1 (1998).



**Figure 64.** *Juncus fimbriatylodes*. **A**, flower opened out; **B**, sterile head; **C**, bract of sterile head; **D**, plantlet; **E**, capsule; **F**, leaf T.S. *Juncus deosaicus*. **G**, flower opened out; **H**, leaf T.S.; **I**, ovary. (**A–F**, *CLD 1122*, **E**; **G–I**, *Hussain & al. 940659*, **E**). Scale bars: **A**, **C–E**, **G**, **I** = 1.7 mm; **B** = 3 mm; **F**, **H** = 0.5 mm. Drawn by L.Olley. Reproduced by kind permission of the Trustees of the Royal Botanic Garden Edinburgh, from Noltie, *Edinburgh J. Bot.* 55: 42, fig. 2 (1998).



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**36.** CHINA SOUTH-CENTRAL: Yunnan, Tsang Shan, Dali, Longquan Peak, 2520 m, [*anonymus: CLD*] 1289 (E, K). TIBET: Di Chu Gorge, 2600 m, *F.Kingdon-Ward 19466* (BM, E). **40.** INDIA: Darjeeling, 2250 m, *C.B.Clarke 26277* (K, UPS). EAST HIMALAYA: Bhutan, 1 km S of Tongsa, 2250 m, *A.J.C.Grierson & D.G.Long 1097* (K); Bhutan, Thimphu, 2250 m, *H.Hara & al. 10369* (BM, TI); Bhutan, Chompa, near Kori La, 2356 m, *R.Pradhan & T.Wangdi 6962* (E); Sikkim, Keydangthan, 1220 m, *R.Pradhan, Norbu & Naku 170* (E). NEPAL: Ghunsa Khola, Kyapra to Pheri, 3330 m, [*anonymus: KEKE*] 351 (E, K); Dhawalagiri Zone, Myagdi, 2190 m, *Mikage & al. 9552228* (E).

*Juncus tratangensis* represents a form with perfect flowers, occasionally occurring in the populations of *J. ochraceus*. Not even the developed flowers, however, yield any seed, and the reproduction of the species seems to be exclusively vegetative. Both the morphology of the bract-like structures and the nature of reproduction require further study.

### **58. *Juncus allioides* Franch., *Nouv. Arch. Mus. Hist. Nat.*, ser. 2, 10: 99 (1887)**

T: Tibet Oriental, Province de Moupine [Baoting], *A.David s.n.*; holo: P; iso: W.

*Juncus macranthus* Buchenau, *Bot. Jahrb. Syst.* 12: 398 (1890). T: China, Prov. Kansu [Gansu], 11 Jul 1885, *G.N.Potanin s.n.*; syn: LE, W; Kansu [Gansu], Tschagola Mtn, 11 Jul 1885, *G.N.Potanin*; syn: W; Kansu or. [E Gansu], inter. Mör-pin et U-pin, 4 Jul 1885, *G.N.Potanin*; syn: W; Kansu or. [E Gansu], fl. Lumbu, 11 Jul 1885; *G.N.Potanin*; syn: W [the most typical plant among syntypes].

*Juncus yunnanensis* A.Camus, *Notul. Syst. (Paris)* 1(10): 275, (1910). T: China, Yunnan, Tsang-chan, Tali, 2200 m, 20 Apr 1886, *P.J.M.Delavay 2046*; syn: P; Tsang-chan, 4 Jul 1882, *P.J.M.Delavay 364bis*, p.p.; syn: P.

*Rhynchospora mairei* H.Lév., *Cat. Pl. Yunnan* 80 (1916), n.v. T: China, Yunnan, 1910, [*collector not given*]; holo: E.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 229, fig. 106 (1906); H.J.Noltie, *Fl. Bhutan* 3(1): 263, fig. 25 (1994); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 178, pl. 41 (1997).

Perennials, 5–60 cm tall, densely caespitose; rhizome short. Stems erect, terete, 0.5–1.2 mm thick. Cataphylls 2–3, loose, brown to castaneous, shining. Basal leaves 1–2, terete, unitubular, septate; septa usually visible externally, 2–20 cm long; apex obtuse; cauline leaf single, rarely absent, inserted about the middle of stem, with conspicuous sheath; blade 0.5–1.5 (–4) cm long; sheaths 0.8–3 cm long; auricles large, brownish, obtuse, 0.7–1.4 mm long. Bracts lanceolate to ovate lanceolate, 0.5–1.3 cm long, 1.5–5 mm wide, ribbed and shortly aristate; lower bract as long as flowers or slightly longer, stramineous or brown. Inflorescence a terminal dense subglobose 10–25-flowered head. Flowers 0.8–1.3 cm long, with pedicels 0.5–5 mm long. Tepals equal, lanceolate, 4.7–6 (–7.6) mm long, 1–1.5 mm wide, subacute, ivory white or sometimes with brownish apex. Stamens 6, exserted, 6–8 mm long; anthers linear elliptic, white, 2–2.5 (–3.0) mm long, shorter than 4–5.5 mm long filaments; style 1.5–2.5 mm long; stigmas (0.5–) 0.8–1.1 mm long, with lobes stout; ovary 2.5–3 mm long, 0.5–0.8 mm wide, ivory white. Capsules ellipsoid-trigonal, 4.0–5.3 (–6.9) mm long, incl. a c. 1 mm long exserted rostrum, 1.4–1.8 mm wide, pale. Seeds brown, 0.8–1.0 mm long, 0.25–0.3 mm wide, c. 1.7–2.2 mm long including c. 0.4–0.5 mm long appendages. Fig. 65.

India (Kumaon, Punjab), Nepal, Sikkim, Bhutan and China (Tibet, Sichuan, Yunnan, Hubei, Shaanxi). 36: CHC, CHT. 40: EHM, NEP, IND, WHM. On scree slopes and along streams, bogs, damp turf, above 2500 m. Map 240.

**36.** CHINA SOUTH-CENTRAL: Hubei, *E.H.Wilson 2347* (K); Sichuan, Tatsienlu [Kangding], *J.A.Soulié 827* (K, P); Yunnan, Yangtze watershed, Likiang, E slopes of Likiang Snow Range, *J.F.Rock 4765* (S). CHINA NORTH-CENTRAL: Shaanxi, Mt Thae-pei-san, *G.Giraldi 2055* (B). TIBET: Tongolo [Tungo La], *J.A.Soulié 720* (K, P); Tibet, Ronaphar Valley, *Hingston* (K). **40.** EAST HIMALAYA: Bhutan, Dotena Limpa, 10000 ft., *R.E.Cooper & al. 2481* (BM); Tsomgo Lake, 12000 ft., *Cutting & Vernay 22* (K). NEPAL: Tangsing, 14000 ft., *Dhwoj 113* (BM); Bhurchula Lekh, near Jumla, *O.Polunin & al. 4505a* (BM). WEST HIMALAYA: Punjab, Kunawar, *J.R.Drummond 22433* (K)

### **59. *Juncus membranaceus* Royle, in D.Don, *Proc. Linn. Soc. London* 1: 10 (1839), & *Trans. Linn. Soc. London* 18(3): 320 (1840)**

T: [in 1839 not indicated, reference given to the 1840 publication] In Emodi montibus ad Punjee, *J.F.Royle*; holo: LIV.

*Juncus hoffmeisteri* Klotzsch, in J.F.Klotzsch & C.A.F.Garcke, *Bot. Ergebn. Reise Waldemar* 60 (1862). T: [Himalaya, probably Garhwal, Kedarnath] *Hoffmeister*; syn: B, destroyed; syn: Klotzsch & Garcke, *Bot. Ergebn. Reise Waldemar*, pl. 98 (1862).

*Juncus concinnus* var. *turbidus* Buchenau, *Nachr. Königl. Ges. Wiss. Göttingen Geschäftl. Mitt.* 13: 252 (1869). T: [Kashmir] "Tibet", Tsanskar, Sulle to Padum, 22–24 Jun 1856, A. & H. Schlagintweit 6700; syn: B, destroyed; W.

Illustration: S.M.H.Jafri, *Fl. Pakistan* 138: 24, fig. 6 (1981).

Perennials, usually (8–) 12–30 (–42) cm tall, loosely caespitose; rhizome slender, ±creeping. Cataphylls 0–1, pale brownish-membranous to purplish; basal leaves 1–2 (–4), usually to 10 cm long (sterile shoots with longer leaves, to 25 cm). Cauline leaves 2–3, length variable, with upper ones usually to 6–10 cm including sheath, ±canaliculate at base, unitubular, remotely septate; septa ±not visible externally; tip ±acute to subobtusate; auricles 1.2–1.7 mm long, obtuse. Lower bract entirely scarious or base herbaceous, stramineous to suffused pale brownish, ovate-acuminate, c. 1.0–1.5 cm long, equalling, or sometimes exceeding inflorescence; other bracts scarious-stramineous, ±ovate-lanceolate, with distinct veins, ±equalling inflorescence. Inflorescence a single (5–) 8–15 (–25)-flowered head usually 1.0–1.8 cm in diam.; pedicels c. 1–2 mm long. Tepals ±equal, 4.0–5.3 mm long, ±whitish to pale stramineous, obtuse to acute. Stamens 6, ±exserted; anthers 1.2–2.0 (–2.2) mm long; filaments 3–5 mm long; style 0.7–1.7 mm long; stigmas 1.5–2.0 mm long. Capsule oblong-ovoid to ellipsoid, acuminate, mucronate, 5.5–6.5 mm long including c. 0.5–1.5 mm mucro, brown to castaneous-brown, shining. Seeds c. 0.6 × 0.2–0.3 mm, or 2.5–3.0 mm including seed-coat; appendages subequal, 0.7–1.0 and 0.8–1.2 mm long. n = 60, P.N.Mehra & S.K.Sachdeva, *Cytologia* 41: 31–53 (1976), n.v.

From E Afghanistan to Himalayan parts of Himachal Pradesh and Uttar Pradesh, India, and SW Tibet. 32: TAD. 34: AFG. 36: CHT. 40: PAK, WHM. Reported from Nepal, Sikkim and Yunnan but material not seen. Damp rocky habitats, alpine valleys above 2700 m. Map 241.

34. AFGHANISTAN: Konar, Barg-i-Matal, 2160 m, *T.F.Hewer 1406* (K); Nuristan, Rangul Valley, 2600 m, *W.Thesiger 1432* (BM). 36. TIBET: Kullu, *Jäschke* (WU). 40. PAKISTAN: Swat State, Swat R., Kalam, *R.J.Rodin 5614* (K); Chitral, Laspur (Harchin), *Bowes Lyon 30* (BM). WEST HIMALAYA: Garhwal, Jelandu Ko Gadh, *J.F.Duthie 151* (K); Baltistan, Shagarthang Valley, *J.F.Duthie 12110* (WU); Kashmir, Musjid Valley, 4200–4400 m, *J.F.Duthie 13281* (WU); Himachal Pradesh, Lahul, Udaipur, 2850 m, *R.McBeath 2267* (E); Kumaon, Kutti Valley, in Byans, 4600 m, *J.F.Duthie 612* (E).

Closely allied to *J. allioides* but anthers shorter; cauline leaves acute to subobtusate, septa externally ±not visible, and rhizomes slender, creeping, so plant not tufted.

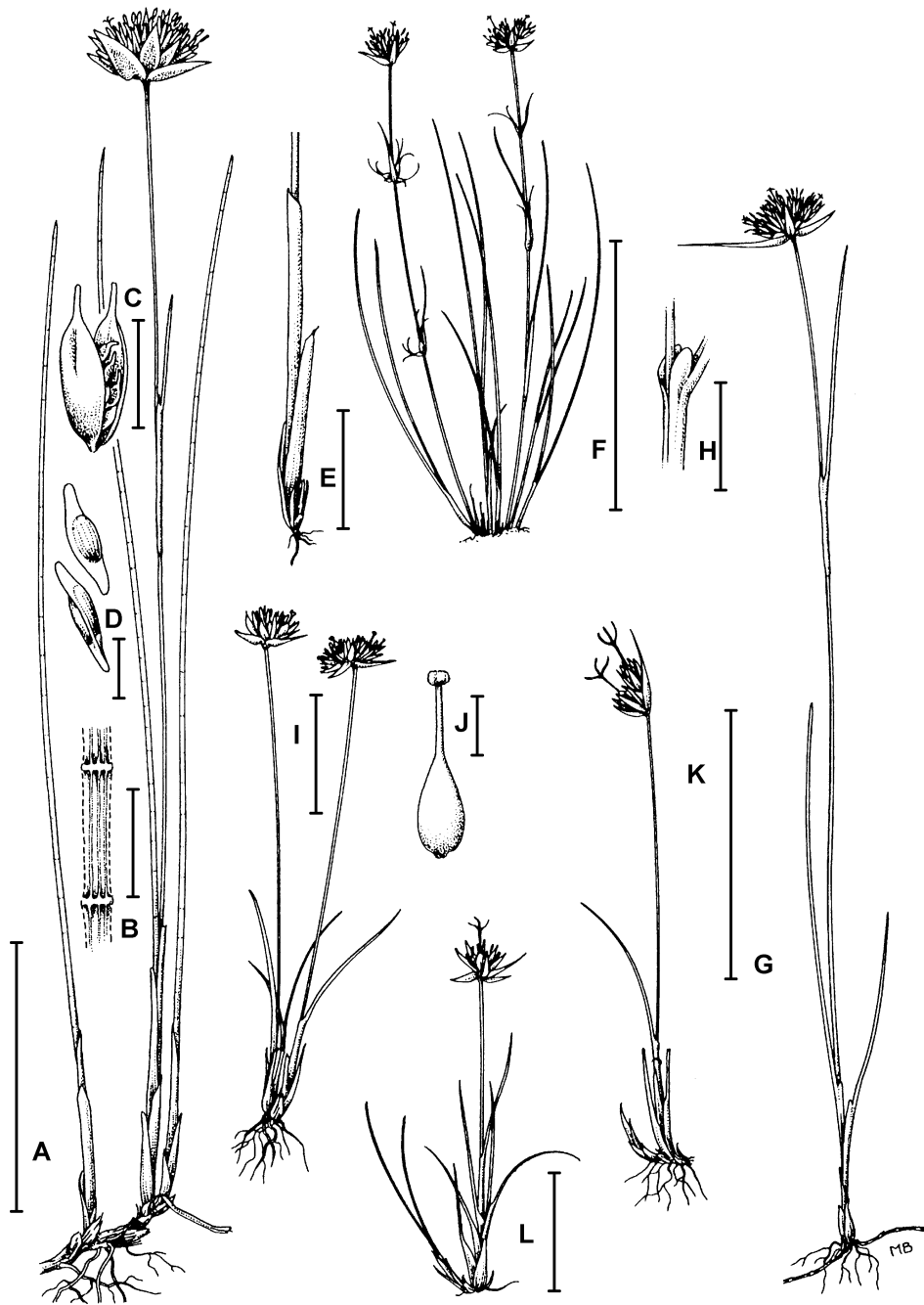
#### 60. *Juncus glaucoturgidus* Noltie, *Edinburgh J. Bot.* 51: 132 (1994)

T: Sikkim, Samiti Lake (Bungmoteng Chho), 4300 m, 21 Jul 1992, [*Anonymous: ESJK*] 572; holo: E; iso: K.

Illustration: H.J.Noltie, *Edinburgh J. Bot.* 51: 133, fig. 1A–E (1994).

Perennials, 10–25 cm tall, densely caespitose; rhizome short-noded. Cataphylls numerous, dull, stramineous, darker at centre, paler at margins, minutely apiculate. Cauline leaf single, sub-basal, 5.5–12.5 cm long, shorter than stem, 2–3.5 mm in diam., suberect, glaucous, terete, hollow, constricted below the blunt apex, with few distant weak transverse septa not visible externally even when dry; sheath short, with minute auricles (less than 1 mm). Leaf-like bract on upper stem; sheath 3.5–5 cm long, tubular; apex with membranous subacute auricles to 2.2 mm long; blade bristle-like to 6.5 mm long. Non-flowering shoots with 1 leaf usually equalling stems and similar to stem leaf. Inflorescence a terminal c. (8–) 12–14-flowered capitulum to 2 cm in diam.; bracts forming an involucre-like structure, subequal, longest 15–22 × 7–8 mm, oblong-ovate, acute, dark reddish-brown, paler at margins. Flowers shortly (to 3 mm) pedicelled. Tepals subequal, cream; outer tepals 6.0–6.5 × 1.4–1.7 mm, oblong-lanceolate, subacute, keeled; inner tepals not keeled; anthers 2–3.4 mm long, narrowly oblong, pale yellow, exserted; filaments to c. 5–6 mm long, slightly shorter than tepals; ovary 2.5–3.0 × 1.2–1.9 mm, ellipsoid, abruptly contracted into 2.0–2.7 mm style; stigmas 1–1.5 mm long, stout, cream, erect. Capsule 4–4.5 × 2.5 mm, ellipsoid, golden brown; beak 1–1.5 mm long. Fig. 66.

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**Figure 65.** *Juncus allioides*. A, habit; B, leaf L.S. showing transverse septa; C, capsule; D, seeds. *Juncus leucanthus*. E, stem base showing sheathing scale leaves. *Juncus trichophyllus*. F, habit. *Juncus benghalensis*. G, habit showing slender stolons; H, leaf-sheath auricles of stem leaf. *Juncus brachystigma*. I, habit; J, capitate stigma. *Juncus duthiei*. K, habit. *Juncus uniflorus*. L, habit. Scale bars: A, F, G, K = 5 cm; B, H = 5 mm; C = 3 mm; D, J = 1 mm; E, I, L = 1 cm. Drawn by M.Bates. Reproduced by kind permission of the Trustees of the Royal Botanic Garden Edinburgh, from Noltie, *Fl. Bhutan* 3/1: 263, fig. 25 (1994).

Known from the E Himalayan region: Nepal, Bhutan, Sikkim. 40: EHM, NEP. Open subalpine meadow slopes, 3960–4300 m. Map 242.

40. EAST HIMALAYA: Bhutan, Kantanang, Tsampa, 4200 m, 3 Jun 1949, *F.Ludlow & G.Sheriff 19042* (BM). NEPAL: Kyangin Kharka, 3850–4500 m, 18 Jul 1967, *S.B.Malla 9197* (K).

Similar to *J. allioides*, but stems and leaves stouter; leaves glaucous, septa not visible externally; bracts broader.

**61. *Juncus leucanthus*** Royle ex D.Don, *Proc. Linn. Soc. London* 1: 10 (1839); & *Trans. Linn. Soc. London* 18: 318 (1840)

T: [not indicated in 1839; in 1840 given as] in Emodi montibus ad Shalma, *J.F.Royle*; lecto: LIV, designated here; isolecto: K, LE, W.

*Juncus leucanthus* Royle ex D.Don var. *alpinus* Buchenau, *Bot. Jahrb. Syst.* 12: 396 (1890). T: Sikkim Himalaya, 4200–5150 m, *C.B.Clarke*; holo: K.

*Juncus tanguticus* Sam., in H.Handel-Mazzetti, *Symb. Sin.* 7: 1233 (1936). T: China, Hwangtoushan, 10 Jul 1900, *G.Giraldi 7242*; holo: B, destroyed; iso: S.

Illustrations: H.J.Noltie, *Fl. Bhutan* 3(1): 263, fig. 25 (1994); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 210, pl. 50 (1997).

Perennials, 8–32 cm tall, densely to loosely caespitose; rhizomes short-noded or ascending. Cataphylls up to 4, sometimes aristate, to 3 cm long, tightly encircling stem, castaneous, shining; sterile shoots with single leaf to 15 (–18) cm long; cauline leaves usually 2, stiffly erect, usually inserted  $\frac{1}{2}$  and  $\frac{2}{3}$  way along stem; lower leaf blade cylindrical, sometimes flattened, to 10 cm long, to 1.4 mm wide, slightly grooved to deeply canaliculate, not septate, reaching at least base of upper leaf, sometimes exceeding inflorescence, gradually tapered to subacute apex; upper leaf with long slightly inflated sheath and short bristle-like blade to 2 cm long; auricles conspicuous, oblong, blunt, free part to 0.9–1.3 mm long, often brown. Lower 2 bracts subequal, equalling capitulum, lanceolate, dark castaneous, shining. Inflorescence hemispheric, 4–11-flowered, to 1.7 cm in diam.; pedicels of lower flowers to 3 mm long. Tepals lanceolate, subacute or inner blunt,  $\pm$ equal, 4.5–5.6 mm long,  $\pm$ white or reddish-brown. Stamens 6; anthers 2.0–2.9 mm long, usually completely exerted; filaments (2.2–) 4.2–5.2 mm long; ovary (1.5–) 2.2–2.5 mm long, abruptly contracted into 2.0–2.5 mm style; stigmas stout, short, erect, c. 0.3–0.6 mm long. Capsule ellipsoid-trigonous, 3.0–3.3 mm long, dark brown, shining; mucro 0.7–1.1 mm long (style with mucro c. 3 mm). Seeds pale brown, 0.7–0.8  $\times$  0.3–0.4 mm; appendages  $\pm$ unequal, 0.2–0.3 mm and c. 0.1–0.2 mm long. Fig. 65.

Garhwal, Nepal, East Himalaya, N Burma and SW China. 36: CHC, CHT. 40: EHM, NEP, WHM. 41: BMA. Scree and rocky slopes, open alpine heathland, damp flushes and *Rhododendron* scrub, usually between 3100 and 4600 m. Reported from North-Central China and Qinghai, but material not seen during this study. Map 243.

36. CHINA: Tibet, N of Pagri [Phari], Kang Me, 8 Aug 1882, *King's collector s.n.* (BM); Sichuan, Ta-tsien-lu [Kangding], Yülingkong, Gomba La, 3700 m, *H.Smith 10724* (S, UPS); Yunnan, Zhongdian, Wengsui to Xiang Chen, W side of Da Xue Shan pass, [*Anonymous: ACE*] 1851 (E); Yunnan, Zhongdian, Napa Hai, 3966 m, [*Anonymous: ACE*] 188 (E). 40. WEST HIMALAYA: India, Uttar Pradesh, Mussorie, Kidar Kantha, 3850 m, *J.R.Drummond 22795* (K). NEPAL: between Tamo La and Sinion La, 4025 m, [*Anonymous: KEKE*] 677 (E, K, KATH); Rambrong, Lamjung, 4150 m, *J.D.A.Stainton, W.R.Sykes & R.H.J.Williams 6124* (UPS). SIKKIM: Jongri, 4150 m, *C.B.Clarke 26146* (K); Sikkim, Lachen, 3850 m, 20 Jun 1849, *J.D.Hooker* (K, LD). BHUTAN: Upper Mo Chu, Timuzam, W of Laya, 4150 m, *J.Sinclair & D.G.Long 5254* (K). 41. BURMA: Kachin State, North Triangle (Tama Bum), 3500 m, *F.Kingdon-Ward 21018* (BM, p.p.).

Superficially similar to slender forms of *J. allioides* or *J. membranaceus* but differs in non-septate leaves and tightly sheathing castaneous cataphylls. Very similar to *J. cephalostigma* from which it differs in being more robust, with longer stigmas.

The isotype of *J. tanguticus* (*G.Giraldi 7242*) represents a plant very close to *J. leucanthus*. The main differences found between the typical *J. leucanthus* and the original material (incl. four paratypes) of *J. tanguticus* are: the lower cauline leaf almost sub-basal, straw-brown cataphylls  $\pm$ castaneous at base in the latter, the lower cauline leaf inserted in, or just below, the middle of stem; cataphylls dark castaneous in the former. The differences may be accounted for as extremes of the variation range of *J. leucanthus*, which we adopted above,

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**Figure 66.** *Juncus glaucoturgidus*. A, habit; B, flower; C, ovary; D, stigma; E, capsule. *Juncus bryophilus*. F, habit; G, flower; H, ovary; I, stigma; J, capsule; K, seeds. (A–E, *ESIK* 572, E; F, *ESIK* 698, E; G–K, *J.Sinclair & D.G.Long* 5217b, E). Scale bars: A = 3 cm; B, C, E = 5 mm; F = 1 cm; G, H, J = 1.7 mm; D, K = 1 mm; I = 1.5 mm. Drawn by M.Bates. Reproduced by kind permission of the Trustees of the Royal Botanic Garden Edinburgh, from Noltie, *Edinburgh J. Bot.* 51: 133, fig. 1 (1998).

or as a result of hybridization between *J. leucanthus* and *J. przewalskii*. Both these species, moreover, have white-flowered and reddish-brown-flowered forms. A part of the original material of *J. tanguticus* undoubtedly represents *J. przewalskii*. Further study is needed.

**62. *Juncus spectabilis* Rendle, *J. Bot.* 44: 46 (1906)**

T: Tibet, Gyantse, 1904, *H.J. Walton 69*; holo: BM; iso: K, photo E.

Perennials, 17–26 cm tall, loosely caespitose; rhizome creeping, thin; stems terete, c. 0.8–1.2 mm in diam. Cataphylls 1–2, brownish; margins distinct, castaneous-translucent; blade short, acicular. Basal leaves 1–2. Cauline leaf single, sub-basal, inserted in lower 1/4 of stem, 2–5 cm long, to 0.8 mm wide, subterete, striate, pluritubular (up to three longitudinal septa), imperfectly septate; apex obtuse; sheaths 2–3 cm long, dilated above, with distinct castaneous-membranous margins; auricles distinct, ±obtuse to truncate, c. 1 mm long, castaneous. Inflorescence bracts several, ovate-lanceolate, acute, castaneous-brownish, 0.7–1.0 cm long, one of them often leaf-like, with a dilated brownish sheath and short to c. 1 cm long blade slightly overtopping inflorescence, erecto-patent. Inflorescence a single c. 10–13-flowered terminal head; pedicels to 1.5–2 mm long. Tepals ±equal, oblong-ovate, ±cucullate at apex, c. 5.7–6.5 mm long, cream-white, keeled or 3-veined. Stamens 6, exserted; anthers 2.2–2.8 mm long; filaments to c. 8 mm long; style 1.0–1.5 mm long; stigmas 2–3 mm long; ovary c. 2.5 mm long. Young capsule distinctly mucronate, shorter than perianth, unilocular. Seeds not seen.

Known only from Tibet. 36: CHT. Ecology unknown. Map 244.

An imperfectly explored species, even missing from the recently published Flora of China [Wu Kuofang, *Fl. China* 13(3): 147–232 (1997)]. Up to now, the only gathering of *J. spectabilis* known is the type collection. The plants are somewhat intermediate between *J. triglumis* and *J. allioides*, and H.J. Noltie, *Edinburgh J. Bot.* 51: 131–132 (1994) considers a possibility of hybridization between the latter two species. From the closest species, *J. allioides*, it differs in lacking the middle cauline leaf and its leaf septa are not visible externally.

**63. *Juncus cephalostigma* Sam., in H. Handel-Mazzetti, *Symb. Sin.* 7: 1233 (1936)**

T: China, Yunnan, Tseku on Mekong, *Monbeig 43*; syn: S.

*Juncus leucanthus* Royle ex D. Don var. *alpinus* Buchenau, *Bot. Jahrb. Syst.* 12: 396 (1890). T: Sikkim Himalaya, 4200–5150 m, *C.B. Clarke*; holo: K.

*Juncus cephalostigma* Sam. var. *dingjieensis* K.F. Wu, *Acta Phytotax. Sin.* 32: 460 (1994). T: Tibet, Dinggye [Gyangkar], 3650 m, 4 Jun 1975, [*Exped. Qinghai-Xizang*] 5484; holo: PE.

Illustration: Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 210, pl. 50 (1997).

Perennials, 6–20 cm tall, densely caespitose; rhizomes short. Cataphylls 1 or more, shortly aristate, tightly encircling stem, pale- to orange-brown; basal leaves 1 (–3). Cauline leaves usually 2, with lower one sub-basal and upper one 2/3 way along stem. Lower leaf blade linear, to 8 cm long, 0.6–1.0 mm wide, cylindric, grooved above, sometimes also beneath, non-septate; apex ±acute. Upper leaf with conspicuous, slightly inflated, often brownish sheath and short bristle-like blade to 0.8 cm long; auricles obtuse, free part c. 0.2 mm long, transparent, membranous, sometimes not visible. Lower 2 bracts subequal, lanceolate, ribbed when dry, scarcely exceeding capitulum, usually pale brown. Inflorescence hemispheric, 5–9-flowered, to 1.2 cm diameter, with flowers shortly pedicellate. Tepals narrowly lanceolate, ±equal, 4.4–5 mm long, ±white. Stamens 6; anthers 1.8–2.5 mm long, at least partly exserted; filaments 4–5.4 mm long; ovary ellipsoid, 2.3–2.8 mm long, abruptly contracted into 2.5–2.7 mm style; stigma capitate, pin-like, with exceedingly short lobes. Capsule broadly ellipsoid-trigonous, stramineous to brown, 2.3–2.8 mm long; mucro 0.9–1.2 mm long. Seeds c. 0.8 mm long; appendages short, c. 0.1–0.3 mm long.

East Himalaya, C and E Nepal, Sikkim, Bhutan, N Burma, China (Tibet, Yunnan). 36: CHC, CHT. 40: EHM, NEP. 41: BMA. Wet rocks, rocky meadows, 3350–4540 m. Map 245.

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**36.** CHINA: Yunnan, Mekong–Salwin divide, 28°12' N, 3840 m, *G.Forrest 14252* (E *p.p.*); Yunnan, Zhongdian, Deqen, Beima Shan, 4675 m, [*Anonymous: ACE*] 1277 (E). **40.** NEPAL: Arun Valley, Kasuwa Khola, 3850 m, *J.D.A.Stainton 523* (E, UPS). SIKKIM: upper Sikkim, 3850–4800 m, *J.D.Hooker* (BM, S); Changu, 3850 m, *R.E.Cooper 38* (BM, E). BHUTAN: Thrumse La, W of Sengor, 3640 m, *A.J.C.Grierson & D.G.Long 2572* (E, K). **41.** BURMA: Kachin State, North Triangle (Tama Bum), 3500 m, *F.Kingdon-Ward 21018* (BM *p.p.*).

Very close to *J. leucanthus*, but more slender and with capitate stigma.

### **64. *Juncus brachystigma* Sam., in H.Handel-Mazzetti, *Symb. Sin.* 7: 1236 (1936)**

T: China, Yunnan, Ngulukö [Nguluke], Ndwolo, 20 Jul 1914, *H.Handel-Mazzetti 4259*; lecto: WU, designated here; isolecto: W.

Illustrations: H.J.Noltie, *Fl. Bhutan* 3(1): 263, fig. 25 (1994); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 200, pl. 47 (1997).

Perennials, 2–17 cm tall, densely caespitose; rhizomes very short. Cataphylls 1 or more, apiculate, brown. Cauline leaf usually 1 (–3), sub-basal, with upper  $\frac{2}{3}$  of stem leafless; blade 0.2–5.0 cm long, to 0.8 mm wide, obtuse, canaliculate above and beneath, with up to 4 other shallower grooves, sometimes appearing bitubular in T.S.; auricles very short, with free part absent or c. 0.1 mm long. Lower bract  $\pm$ equalling capitulum, or extended into aristate point to 3 cm long. Inflorescence 4–13-flowered, 0.7–1.0 (–1.4) cm diam.; pedicels short. Tepals narrowly lanceolate,  $\pm$ equal, (3.0–) 3.5–3.9 (–4.5) mm long,  $\pm$ white. Stamens 6; anthers finally completely exerted, 0.8–1.6 mm long; filaments elongating, c. 3–4 mm long; ovary ellipsoid, (0.9–) 2.2–2.8 mm long, abruptly contracted into exerted (0.9–) 1.3–1.8 (–2.8) mm style; stigmas up to 0.4 mm long, spreading or almost indistinct. Capsule castaneous, very shortly stipitate, narrowly ellipsoid, c. 3 mm long; mucro exerted, c. 0.8 mm long. Seeds brown, c. 0.3 mm wide, 0.5–0.7 mm long, or c. 0.9–1.1 mm including two appendages 0.1–0.2 mm long. Fig. 65.

In C Nepal, Sikkim, Bhutan, N Burma and China (Tibet, Yunnan). 36: CHC, CHT. 40: EHM, NEP. 41: BMA. Wet, usually calcareous rocks, damp patches amongst scrub, stony slopes, usually between 3050 and 5000 m. Map 246.

**36.** CHINA SOUTH-CENTRAL: Yunnan, Mekong–Salwin divide, 28°12' N, 3840 m, *G.Forrest 14252* (E *p.p.*); Yunnan, Yulong Shan [Yülong Schan] near Likiang, Luoqu [Lokü], 3625 m, *H.Handel-Mazzetti 6815* (S, WU); Yunnan, Likiang, Mt Ünlüpe, 4000–4200 m, *H.Handel-Mazzetti 6706* (S, W, WU); Yunnan, Likiang Snow Range, 5150 m, *J.F.Rock 5247* (S, W); Yunnan, Zhongdian, Wengsui to Xang Chen, W side of Da Xue Shan pass, [*Anonymous: ACE*] 1852 (E). TIBET: Kongbo Province, Molo, Nepal, 4000 m, *F.Ludlow, G.Sheriff & G.Taylor 6266* (BM). **40.** EAST HIMALAYA: Sikkim, Na-tut, 26 Aug 1882, *King's collector s.n.* (K); Rookah, 3200 m, *King's collector s.n.* (K). NEPAL: Sabze Khola, 4300 m, *D.G.Lowndes 1208* (BM); Rambong, Lamjung, 4150 m, *J.D.A.Stainton, W.R.Sykes & R.H.J.Williams 6160* (BM, E). **41.** BURMA, Imaw Bum, 3850–4150 m, *F.Kingdon-Ward 3612* (E).

Similar to *J. cephalostigma* in its capitate stigma, but differs in lacking cauline leaf, and in lower bract extended into a leaf-like point.

### **65. *Juncus kingii* Rendle, *J. Bot.* 44: 45 (1906)**

T: Tibet, N of Pagri [Phari], Kang-me, 3 Aug 1882, *King's collector s.n.*; lecto: BM, designated here; isolecto: K.

*Juncus longibracteatus* A.M.Lu & Z.Y.Zhang, *Acta Phytotax. Sin.* 17: 126 (1979). T: Tibet, Gyi-Lung, 4152 m, *Qing-Zang Exped. Group Q131-1*; holotype: PE.

Illustrations: Lu An-min & Zhang Zhi-yun, *Acta Phytotax. Sin.* 17: 125, fig. 1, 5–8 (1979); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 200, pl. 47 (1997).

Perennials, (6–) 13.5–35 cm tall, with stems single, distant, stiffly erect; rhizomes stout, creeping, long-noded. Cataphylls sheathing, with upper ones with setaceous points, whitish-brown, dull. Cauline leaf single, stiff, erect, linear; tip obtuse, usually  $\frac{1}{2}$  of stem length, semicircular to cylindrical in T.S., canaliculate, bitubular, with thin membranous longitudinal septum and weak transverse septa (septa not visible externally), to 1.7 mm wide; auricles rounded, with free part 0.8 × 0.9 mm, stramineous, membranous. Lower bract extended into leafy point at least twice capitulum length. Inflorescence 8–13 (–24)-flowered, 1.4–2.0 cm diam. Tepals narrowly lanceolate, acute,  $\pm$ equal, 4.7–6.7 mm long, creamy white. Stamens 6; anthers completely exerted at maturity, 1.7–2.5 mm long; filaments elongating, to c. 5–6 mm

long; ovary ellipsoid, 2.0–4.2 mm long; style 1.3–2.7 mm long; stigmas 1.0–2.2 mm long. Capsule ellipsoid-trigonous, 3.0–4.1 mm long, abruptly contracted into partly exerted 1.5–2 mm mucro. Seeds orange-brown, to 0.3 mm wide, 0.6–0.8 mm long, or c. 0.9–1.0 mm including two subequal appendages c. 0.1–0.2 mm long.

From W Nepal to Sikkim, Bhutan, China (Tibet, Yunnan, Sichuan, Qinghai). 36: CHC, CHQ, CHT. 40: EHM, NEP. Wet meadows, along streams, stony slopes amongst scrub, 3600–4750 m. Map 247.

**36.** CHINA SOUTH-CENTRAL: Sichuan, Zado Valley W of Kanding, 3800 m, *Dickoré 8200* (E); Yunnan, Zhongdian, Haba, E flank of Habashan, 4200 m, [*Anonymous: ACE*] 2120 (E). TIBET: Subamsir tributary, W of Xezar, 4160 m, *Dickoré 10131* (E). QINGHAI: Nangqen Xian, 3600 m, *Ito, B.Bartholomew, Watson & M.Gilbert 2977* (E). **40.** EAST HIMALAYA: Bhutan, Upper Mo Chu, E bank of Tharizam Chu, 4120 m, *J.Sinclair & D.G.Long 5294* (K). NEPAL: Khahtang, Augu Khola, 4800 m, *O.Polunin, W.R.Sykes & R.H.J.Williams 5385* (BM); Balangra Pass, 4100 m, *O.Polunin, W.R.Sykes & R.H.J.Williams 2542* (UPS); W side of Khunng Khola, Dolpo, 5000 m, *C.Grey-Wilson & Phillips 674* (K); Lapsang, Simbua Khola, 4330 m, [*Anonymous: KEKE*] 764 (E, K, KATH).

Superficially similar to *J. allioides*, but distinguished by the elongate lower bract, creeping rhizomes, and lack of upper stem leaf.

**66. *Juncus trichophyllus* W.W.Sm., *Rec. Bot. Surv. India* 6: 103 (1914)**

T: Sikkim, Changu, 13,000 ft., 16 Jul 1910, *W.W.Smith 3502*; syn: CAL, K.

Illustration: H.J.Noltie, *Fl. Bhutan* 3(1): 263, fig. 25 (1994).

Perennials, 3–14 cm tall, caespitose; rhizome short, branched, clump-forming. Stems erect, terete, slender. Cataphylls stramineous to pale castaneous, later fibrous; basal leaves 0–2, filiform, bitubular, 0.5–1 cm long, c. 0.2–0.5 mm in diam. Cauline leaves 2–3, some inserted in upper part of stem, filiform, bract-like, 0.2–1.5 cm long; sheaths brown, enclosing small dark bulbils developing into plantlets; auricles oblique truncate, to c. 0.2 mm long, membranous or brownish. Bracts 2, navicular-lanceolate, 3–4 mm long, 1–1.5 mm wide, reddish-brown, shorter than perianth. Inflorescence reduced to a single terminal head with 1–3 (–5) flowers, yellowish white; bract lanceolate, pale brown; lowest bracts shorter than flower. Flowers 4–6 mm long, 0.7–0.9 mm wide; pedicels 0.8–1.3 mm long. Tepals narrowly ovate-lanceolate, acute, unequal; outer tepals shorter, 2.5–3.2 mm long, 0.7–0.9 mm wide; inner tepals to 3.3–3.7 mm long, ivory white. Stamens 6, exerted, 2.2–3.2 mm long; anthers linear elliptic, white, 0.8–1.5 mm long, shorter than 1.7–2.2 mm filaments; style 0.8–1.8 mm long; stigmas ±capitate, 0.2–0.3 mm long; ovary ellipsoid, 2.5–3.0 mm long, 0.8–1 mm wide, white. Capsule ellipsoid-trigonous, 2.6–3.1 mm long, 1.3–1.5 mm wide, with mucro to 0.5 mm long, brown, exceeding perianth, usually sterile. Seeds unknown. Fig. 65.

Confined to Nepal, Sikkim and Bhutan. 40: EHM, NEP. Wet flushes, boggy pool margins, mossy rocks, above 3500 m. Map 248.

**40.** EAST HIMALAYA: Sikkim [precise locality unknown], *King's collector* (K); Bhutan, Wangdi Phordrang District, Tintatso, 4300 m, *F.Miyamoto 9361739b* (TI). NEPAL: Koshi Zone, Sankhuwa Sabha District, Cha Ding Kharka–Khongma, 3900 m, *M.Minaki & al. 9020862a* (TI); Bagmati Zone, Rasuwa District, Kharka–Pati Kharka, 3650 m, *F.Miyamoto & al. 9410194* (TI); Sagarmatha zone, Solukhumbu District, Pike, 3820 m, *F.Miyamoto & al. 950059* (TI); Kauma, 3540 m, [*Anonymous: EMAK*] 294 (E); Sankhuwa Sabha District, opposite Shipton La, N side of Barum Khola, 4200 m, [*Anonymous: EMAK*] 653 (E).

A peculiar species notable for having dark bulbils in the axils of bract-like cauline leaves. According to the material available, it has ±sterile capsules.

**67. *Juncus thomsonii* Buchenau, *Bot. Zeitung (Berlin)* 25: 148 (1867)**

*Juncus leucomelas* var. *thomsonii* (Buchenau) Buchenau, *Nachr. Königl. Ges. Wiss. Göttingen Geschäfil. Mitt.* 13: 250 (1869). T: Himalaya, 10,000–15,000 ft., *J.J.Thomson*; syn: W.

*Juncus thomsonii* var. *fulvus* K.F.Wu, *Acta Phytotax. Sin.* 32: 459 (1994). T: Tibet, Tumengla col mine, 5000 m, 8 Jul 1963, *J.Yang 1917*; holo: KUN.

Illustrations: S.M.H.Jafri, *Fl. Pakistan* 138: 5, fig. 1E–G (1981); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 197, pl. 46 (1997).



## JUNCACEAE (*Juncus*)

Perennials, 5–16 (–30) cm tall, densely caespitose; rhizome short. Stems erect, terete with several shallow grooves. Cataphylls 1–2, apiculate, reddish-brown. Leaves 2–3, basal and sub-basal, pluritubular at base, bitubular near apex, linear, 1–5 cm long; apex obtuse, reaching c.  $\frac{1}{3}$  of stem; sheaths 1–4 cm long, often castaneous; auricles curved, acute, to c. 0.9 mm long. Lower bracts lanceolate to ovate, subequal, castaneous, not exceeding capitulum, usually 4–6 mm long. Inflorescence a single hemispherical 3–10-flowered head. Pedicels 0.5–2 mm long. Tepals  $\pm$  lanceolate, subequal, 3–5 mm long, 0.7–0.9 mm wide, ivory-white. Stamens 6, exserted, 4–6 mm long; anthers linear elliptic, white, 1.2–2.0 mm long; filaments 2.5–4.2 mm long; style 0.5–0.8 mm long; stigmas 0.8–2.0 mm long; ovary 2–4 mm long, white. Capsules narrowly ellipsoid-trigonous, 3.8–5.0 mm long, 2–2.5 mm wide, with rostrum 0.6–1.0 mm long, castaneous-brown. Seeds oblong-ovoid, ochraceous, 0.6–0.8  $\times$  0.2–0.3 mm, or c. 2.0–2.4 mm long including two appendages 0.6–1.1 mm long.

Pamir and W Himalaya to S China. 32: TZK. 36: CHC, CHT. 40: EHM, NEP, WHM. Marshy places, streamsides, above 3000 m. Map 249.

**36.** CHINA: Sichuan, Kangding, Tapaoshan, 4200 m, *H. Smith 11311* (KYO, S, UPS); Yunnan, Linchiang Valley, *G. Forrest 2148* (P). TIBET: Kiala, *J.A. Soulié 960* (P). **40.** EAST HIMALAYA: Bhutan, Byakar, Bumtang Chu, 2750 m, *A.J.C. Grierson & D.G. Long 1762* (K); Wangdi Phodrang District, Tintaso, 4000 m, *F. Miyamoto 9361583* (TI). NEPAL: Near Balangra Pass, *O. Polunin & al., 2574* (L, P, UPS); Tilicho, *Barclay & Syngé 2610* (K). WEST HIMALAYA: Punjab, Lahul, Serchu, 14000 ft., *W.N. Koelz 2100* (S); Kumaon, Marto li, *R. Chand 711* (L); Kashmir, Deosai, *C.B. Clarke 29824* (K).

### **68. *Juncus triglumis* L., *Sp. Pl.* 328 (1753)**

*Juncus triglumis* var. *typicus* Buchenau, in H.G.A. Engler, *Pflanzenr.* (iv.36) 25: 224 (1906), *nom. inval.* T: 'in Alpihus Lapponicis [Sweden, Lappland], Tauro Rastadiensis [Austria, Radstädter Tauern]'; syn: LINN-LAPP 115.

*Juncus schischkinii* Kryl. & Sumn., *Sist. Zametki Mater. Gerb. Krylova Tomsk. Gosud. Univ. Kujbysheva* 7: 1 (1928); *Juncus triglumis* var. *schischkinii* (Kryl. & Sumn.) Novikov, *Novosti Sist. Vyssh. Rast.* 19: 58 (1982). T: Russia, Altai, inter Kavuri & Mokor-Aczik, 5 Aug 1927, *I. Schischkin*; syn: TK; Altai, prope ostium rivi Kurai, 18 Jun 1907, *Veresczagin*; syn: TK; Altai, inter pagos Schebalina & Topuczaja, 17 Jun 1909, *V.V. Saposhnikov*; syn: TK.

Illustrations: H.E. Hess, E. Landolt & R. Hirzel, *Fl. Schweiz* 1: 509 (1967); S. Snogerup, in K.H. Rechinger, *Fl. Iranica* 75: pl. 4, 2 (1971); N.K. Kovtonyuk, in L.I. Malyshev & G.A. Peshkova, *Fl. Sibiri* 4 (*Araceae–Orchidaceae*): 24, pl. 3, 1 (1987).

Maps: E. Hultén, *Kongl. Svenska Vetenskapsakad. Handl.*, ser. 5, 8(5): map 42 (1962); N.K. Kovtonyuk, in L.I. Malyshev & G.A. Peshkova, *Fl. Sibiri* 4 (*Araceae–Orchidaceae*): map 31 (1987) [Siberia].

Perennials, 3–20 (–30) cm tall, loosely to densely caespitose, with short-noded rhizome and long thin subterranean stolons. Leaves basal, c. 2–8 cm long, or sub-basal with blade to c. 3–4 cm long, with uppermost leaf in lower  $\frac{1}{3}$ – $\frac{1}{5}$  of stem, canaliculate at base, otherwise  $\pm$ terete, c. 0.3–1.0 mm in diam., bitubular, not septate; apex subacute; sheath dilated with broad membranous to brownish or purplish margins; auricles to 1 mm long, obtuse,  $\pm$ brownish. Lower bract blackish brown, brown or pale stramineous, oblong-ovate, obtuse to  $\pm$ acute; apex scarious, usually shorter than perianth, c. 3.5–4.5 mm long. Inflorescence a single terminal cup-shaped (1–) 3–4 (–5)-flowered head; flowers arranged at the same level, or sometimes lower floret slightly remote. Tepals subequal; outer tepals often slightly longer, (3.5–) 4.0–5.0 (–5.5) mm long, acute to subacute; inner tepals subobtuse, blackish brown to brown, pale brown or stramineous. Stamens 6,  $\pm$ equalling tepals; anthers 0.5–0.8 (–1.0) mm long; filaments c. 2.0–3.0 mm long; style 0.3–0.5 mm long; stigmas c. 0.5–1.0 mm long,  $\pm$ patent. Capsule  $\pm$ ellipsoid, subtrigonous above, subobtuse, usually (4.0–) 4.5–6.0 mm long, with c. 0.1–0.3 (–1.4) mm mucro, dark brown to stramineous, exceeding perianth. Seeds narrowly ellipsoid, to 1.0  $\times$  0.3 mm, or to 2.8 mm long including two distinct appendages.

Subarctic to arctic regions and mountains of Europe, the Caucasus, Siberia, Mongolia, N China, the Far East and Korea, Greenland, North America. An extremely variable species with very variable chromosome numbers reported and many local variants, particularly in marginal or isolated parts of the range. The most conspicuous and most widely distributed race is recognized as a separate subspecies but numerous intermediates exist. Plants from the southern part of the Russian Far East, SE Siberia and North America are difficult to assign to

a subspecies [e.g., South Siberia, Chita, Darasun R., 7 Jun 1920, *G.Stukov* (BM, LE)]. The complex is in need of a revision.

Tepals blackish brown to pale brown; bracts usually brown; capsule usually longer than 4.5 mm, usually distinctly exceeding perianth; plants most often 7–15 cm tall; lower flower not or slightly remote

**68a.** subsp. **triglumis**

Tepals pale straw-brown to stramineous; capsule usually c. 4.0–4.5 mm long, scarcely exceeding perianth; plants taller, to 30 cm; lower flower often slightly remote

**68b.** subsp. **albescens**

### **68a. *Juncus triglumis* L. subsp. *triglumis***

*Juncus hancockii* Hance, *J. Bot.* 16: 111 (1878). T: China, Shanxi, Siao Wu-tai-shan [Wu-t'ai-hsien], *W.Hancock 20118*; holotype: BM, figure S.

*Juncus pyrenaicus* Cadevall & Pau, in C.Pau, *Acta Soc. Esp. Hist. Nat.* 25: 129 (1896). T: Spain, Gerona, Nuria, Salt del Aigua, 12 Aug 1896, *J.Cadevall*; syn: MA19507.

*Juncus triglumis* var. *copelandii* Buchenau, *Zweite Deutsche Nordpolarfahrt* 2: 51 (1874), *n.v.* T: Östliches Grönland, Abhänge u. Gletscherwälle am Kaiser Franz-Josephs-Fjord, *coll. not given*; syn: W.

*Juncus triglumis* var. *nigricans* Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 7: 555 (1880). T: Inter Sumba et Kassan, 7–8000', 22 Jun 1878, *A.Regel [It. Turkest.] s.n.*; syn: W.

*Juncus triglumis* var. *fuscatus* [Turcz. ex] Regel, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 7: 555 (1880). T: [Kirgizstan] angustura Duwara in itinere ad lacum Issyk-kul, *A.Regel*; holotype: LE, *n.v.*

*Juncus triglumis* var. *acutiusculus* Norman, *Forh. Vidensk.-Selsk. Kristiania* 16: 41 (1893); *Juncus triglumis* f. *acutiusculus* (Norman) Neuman, *Sveriges Fl.* 660 (1901). T: Norway. [*n.v.*]

*Juncus gontscharovii* Schischk., *Bot. Mater. Gerb. Inst. Bot. Zool. Akad. Nauk Uzbeksk. S.S.R.* 9: 23 (1947), *n.v.* T: Uzbekistan, Turkestanskiy Khrebet, Guralasch; holotype: TAK, *n.v.*

*Juncus triglumis* subsp. *wakhaniensis* Snogerup, in K.H.Rechinger, *Fl. Iranica* 75: 26 (1971). T: Pakistan, Wakhan, in valle Quazi Deh, 3100 m, Jul 1964, *Roemer 156*; holotype: M.

Illustrations: T.Szynal & J.Mądalski, *Atlas Fl. Pol.* 2(2): 135 (1931); E.Hultén, *Fl. Alaska* 293 (1968).

Maps: E.Hultén, *Kongl. Svenska Vetenskapsakad. Handl.*, ser. 5, 8(5): map 42 (1962); E.Hultén, *Fl. Alaska* 293 (1968).

Plants most often 7–15 cm tall. Bracts usually brown to dark brownish, rarely pale brownish, oblong-ovate, ±obtusate, 3.5–4.5 mm long; apex scarious, ±equalling perianth. Lower flower not or slightly remote. Tepals blackish brown to pale brown, (3.5–) 4.0–5.0 (–5.5) mm long; style c. 0.4–0.5 mm long; stigma c. 0.8 mm long. Capsule c. 4.5–6.0 mm long, usually distinctly exceeding perianth. Seeds 0.8–0.9 × c. 0.25 mm, with two subequal appendages c. 0.7–1.0 mm long each.  $2n = c.120, c.130$ , *fide* K.Mičieta, *Folia Geobot. Phytotax. Phytotax.* 18: 196 (1983) [with a brief discussion of the karyological variation]. Figs 37, 67.

N Europe and mountains of C and S Europe, the Caucasus, Middle Asia, the Himalayas, Arctic and mountainous Siberia, Mongolia, N China, Tibet, Japan, Russian Far East, Greenland, Alaska and N Canada; disjunctly in the more southerly regions of United States. 10: FIN, FOR, GRB, ICE, NOR, SVA, SWE. 11: AUT, CZE, GER, POL, SWI. 12: FRA, SPA. 13: BUL, ITA, ROM. 14: RUN, UKR. 30: ALT, BRY, CTA, IRK, KRA, TVA, WSB, YAK. 31: KAM, KHA, KUR, MAG. 32: KGZ, TZK, UZB. 33: NCS, TCS. 36: CHC, CHN, CHQ, CHT, CHX. 37: MON. 38: JAP, KOR. 40: EHM, NEP, PAK, WHM. 70: ASK, GNL, NWT, YUK. 71: BRC. 73: COL, WYO. Wet, boggy areas, margins of shallow alpine pools, on shallow peaty soils, often on calcareous soils with moving water, to 4570 m. Map 250.

A very variable taxon. Plants from the Far East and SE Siberia often show some features of subsp. *albescens*; similar plants are found as far to the west as in the Altai. The most striking variation is found in the Himalayas [Snogerup, in K.H.Rechinger, *Fl. Iranica* 75: 26 (1971); H.J.Noltie, *Fl. Bhutan* 3/1: 269 (1994)].

10. GREAT BRITAIN: Scotland, Aberdeen, 3 km NNW of Glas Maol, *S.Snogerup & B.Snogerup 10745* (LD). NORWAY: Dovrefjeld, Kongsvold, Jul 1885, *S.J.Nilsson* (PR, S). 11. AUSTRIA: Hohe Tauern, Heiligenblut, Pasterze, *D.H.Hoppe* (PR). GERMANY: Bavaria, Oberstdorf, Rappensee, 2100 m, *J.F.N.Bornmüller [Fl. Exs. Austro-Hung.] 3912* (LD, PR, WU). SWITZERLAND: Valais, Zermatt, Riffelberg, 2400–2500 m, *F.O.Wolf [A.Kneucker, Cyper. Junc. Exs.] 88* (PR, WU). 14. RUSSIA NORTH: N Urals, R. Lyapina, 8 Jul 1927, *V.B.Sochava* (K). UKRAINE: the East Carpathians, Munczel, 1930 m,

## JUNCACEAE (*Juncus*)

Czyzew [Pl. Polon. Exs.] 287 (K). 30. ALTAI: Kosh-Agach, Ulandryk R, 2400 m, N.K.Kovtonyuk [Gerb. Fl. SSSR] 6615a (BM, LE). 40. EAST HIMALAYA: Sikkim, Dzongri, 4000 m, 17 Jul 1992, [Anonymus: ESIK] 434 (E).

**68b. *Juncus triglumis* subsp. *albescens* (Lange) Hultén, Kongl. Svenska Vetenskapsacad. Handl. 8(5): 241 (1962)**

*Juncus triglumis* var. *albescens* Lange, *Consp. Fl. Groenland.* 123 (1880); *Juncus albescens* (Lange) Fernald, *Rhodora* 26: 202 (1924). T: [Greenland] Fox Bay v. Igaliko, A.Kornerup; holo: C.

Illustration: E.Hultén, *Fl. Alaska* 293 (1968).

Maps: E.Hultén, *Kongl. Svenska Vetenskapsacad. Handl.*, 8(5): map 42 (1962); E.Hultén, *Fl. Alaska* 293 (1968).

Plants usually 10–30 cm tall. Bracts usually brown or pale brown at base, with margins and distal half scarious, with lower bract equalling or exceeding inflorescence, acute, often with long mucro, usually 4–13 mm long. Lower flower often ±remote. Tepals pale straw-brown to ±scarious or stramineous with pale brown centre, c. 3.5–4.5 mm long; style c. 0.3–0.4 mm long; stigmas c. 0.6–0.8 mm long. Capsule usually c. 4.0–4.5 mm long, scarcely exceeding perianth. Seeds c. 0.6–0.7 × 0.2–0.3 mm, with two subequal appendages (0.4–) 0.5–0.8 mm.  $2n = 132$ , *vide* Å.Löve & D.Löve, *Taxon* 30: 849 (1981).

Typical plants in the Russian Far East, North America and Greenland. 31: MAG, KAM. 70: ASK, GNL, NWT. 71: ABT, BRC, MAN, SAS. 72: LAB, NFL, ONT, QUE. 73: COL, IDA, MNT, WYO. 76: UTA. 77: NWM. Marshes and peat-bogs. Map 251.

71. MANITOBA: Fort Churchill, J.M.Gillett 2225 (S). 72. LABRADOR: Hopedale, H.Bishop 189 (S). NEWFOUNDLAND: Belle Isle, Rock Marsh, M.L.Fernald, L.Griscom & F.A.Gilbert jr. 27781 (K). ONTARIO: James Bay, Opinaga R, A.Dutilly & E.Lepage 31619 (S). QUEBEC: Hudson Strait, Wolstenholme, 26 Aug 1928, M.O.Malte (PR).

**69. *Juncus leucomelas* Royle ex D.Don; Proc. Linn. Soc. London 1: 10 (1839); & Trans. Linn. Soc. London 18: 319 (1840)**

T: [In 1839 not indicated, in 1840 given as:] India, Kunawur ad Soongnum, J.F.Royle; holo: LIV; iso: K, W.

*Juncus bhutanensis* Satake, *J. Jap. Bot.* 43: 382 (1968). T: Bhutan, Barshong to Nala, 3100–3500 m, 25 May 1967, H.Kanai & al. 6201; holo: TI, photo: E.

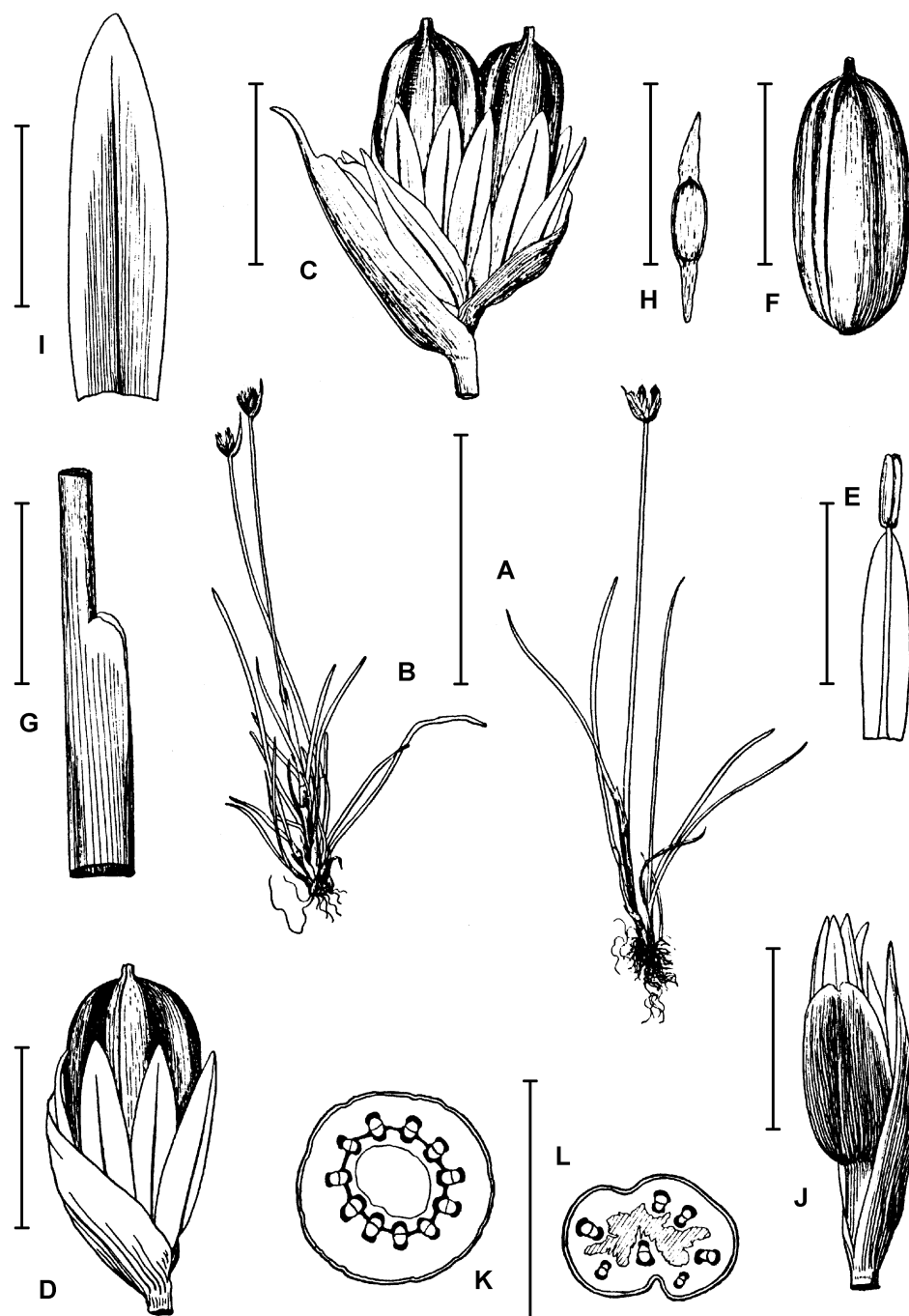
Illustrations: S.M.H.Jafri, *Fl. Pakistan* 138: 5, fig. 1D (1981); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 200, pl. 47 (1997).

Perennials, 3–15 (–19) cm tall, densely caespitose; rhizomes very short. Cataphylls reddish-brown. Cauline leaves usually 2, sub-basal, with upper part of stem leafless; blades linear, to 5.5 cm long, to c. 1 mm wide, reaching c.  $\frac{2}{3}$  way up stem, unitubular, canaliculate; apex subacute; sheaths with membranous margins gradually tapered into blade; auricles lacking. Lower bract leafy, to twice length of capitulum, 1.0–2.5 cm long. Inflorescence a single terminal capitulum, 5–10-flowered. Tepals ±white, narrowly lanceolate, subacute, equal, (4.6–) 5.2–6.4 mm. Stamens 6; anthers completely exerted at maturity, linear, (1.8–) 2.0–2.9 mm long; filaments 3.0–5.5 mm long; ovary ellipsoid-trigonous, (2.3–) 3.0–3.8 mm long; style 1.3–2.3 mm long; stigmas 0.5–1 mm long. Capsule ovoid to broadly ellipsoid, 2.6–3.0 mm long, with 0.8–1.5 mm mucro. Unripe seeds c. 0.4–0.5 mm long; appendages unequal, c. 0.1–0.2 mm and c. 0.3–0.4 mm.

Sino-Himalayan region from Kashmir and Nepal to C China. 36: CHC, CHN, CHT. 40: EHM, NEP, WHM. Damp grassy places, on sand by rivers, moraines, 3200–4880 m. Map 252.

36. CHINA SOUTH-CENTRAL: Sichuan, Ta-tsien-lu [Kangding], Tapaoshan, 4200–4400 m, H.Smith 11199 (UPS); Yunnan, Lijiang, Yulong Shan, Gangheba, 3600 m, D.Chamberlain & al. 580, 581 (E). CHINA NORTH-CENTRAL: Gansu, Lien-hoa-shan, between Xinchang [Taochow] and Taoyang [Titao], 3650 m, J.F.Rock 12715 (E, K). TIBET: Valley above Tse, Tsangpo Valley, F.Ludlow, G.Sherriff & G.Taylor 4646 (E). 40. EAST HIMALAYA: Sikkim, Chakalung La, Rohmoo 351 (E). NEPAL: Dojam Khola, Suli Gola, 4500 m, O.Polunin, W.R.Sykes & R.H.J.Williams 2276 (UPS); Kali Gandaki Valley, Hinko cave, 3200 m, Barclay & Synge 2283 (K).

Similar to *J. benghalensis* in leaf like lower bract, but differing in always having upper stem leaf, leaf sheaths lacking auricles, longer anthers and densely caespitose growth.



**Figure 67.** *Juncus triglumis* subsp. *triglumis*. **A, B**, habit; **C**, inflorescence; **D**, flower with ripe fruit; **E, I**, tepals; **F**, capsule; **G**, upper part of leaf sheath with auricles; **H**, seed; **J**, young inflorescence; **K**, stem T.S.; **L**, leaf T.S. (**A, C, D, F, H, I, K, L**, *B. Kotula*, 1895, KRA; **B, E, G, J**, *M. Raciborski*, 21 Jun 1910, KRA). Scale bars: **A, B** = 4 cm; **C–G, J** = 4 mm; **H, I** = 2 mm; **K, L** = 1 mm. Drawn by T. Szynal. Reproduced with permission, from T. Szynal & J. Mądalski, *Atlas Fl. Polsk.* 2/2: 135 (1931).

## JUNCACEAE (*Juncus*)

### 70. *Juncus benghalensis* Kunth, *Enum. Pl.* 3: 360 (1841)

T: 'Benghalia inferior' [=error], *N.Wallich 3480a*; syn: B, n.v. [photo: E], BM, K, W [fragment and a drawing].

*Juncus bracteatus* Buchenau, *Bot. Jahrb. Syst.* 6: 220 (1885). T: Sikkim, 3800 m, *J.D.Hooker*; syn: K, UPS, S.

*Juncus sphenostemon* Buchenau, *Bot. Jahrb. Syst.* 6: 220 (1885). T: India, Himachal Pradesh, Dharmsala, Laka, 3500 m, 11 Oct 1874, *C.B.Clarke 23983*; syn: K; India, Kashmir, Pahalgam [Palgam], 4150 m, 4 Sep 1875, *C.B.Clarke 31059*; syn: K.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 230, fig. 106 (1906) as *J. sphenostemon*; H.J.Noltie, *Fl. Bhutan* 3(1): 263, fig. 25 (1994); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 207, pl. 49 (1997).

Perennials, 5–24 cm tall, with single slender stems from thin creeping, long-noded rhizomes. Cataphylls 1 or more, whitish-brown. Cauline leaves usually 2 (–3); lower leaf basal, filiform, acute, canaliculate, bitubular, to 10 cm long, c. 0.7 mm wide; upper leaf usually present; blade to 8 cm, sometimes overtopping inflorescence; sheath long, sometimes slightly inflated and brown-tinged; auricles conspicuous, oblong, obtuse, with free part 0.7–1.2 mm long, usually brown. Lower bract developed into leaf-like point to 2.5 cm long. Inflorescence a single (2–) 4–11-flowered capitulum. Tepals cream-white to dirty white, narrowly lanceolate, subacute, equal, 4.0–5.8 (–6.5) mm long. Stamens 6; anthers very narrow, (1.7–) 2.2–3.3 mm long, exerted at maturity; filaments up to c. 5 mm long; ovary ellipsoid, 2.0–3.5 mm long; style 1.4–2.0 mm long; stigmas erect, (0.3–) 0.6–1.4 mm long. Capsule shortly stipitate, narrowly ellipsoid-trigonal, shorter than tepals, 2.6–4.0 mm long, tapered into 0.6–1.0 mm mucro. Seeds c. 0.6 mm long, or to 1.2 mm including two appendages. Fig. 65.

A common Sino-Himalayan species centred to the East Himalaya. It occurs from Swat, Pakistan, and Kashmir to Sichuan and Yunnan. Reported from Gansu, China, but specimens not located. 36: CHC, CHT. 40: EHM, NEP, PAK, WHM. River and stream banks, damp grasslands, damp gravelly banks and roadsides in *Abies/Rhododendron* forest, wet cliffs, sandy moraines, 2900–4570 m. Map 253.

36. CHINA SOUTH-CENTRAL: Sichuan, Ta-t sien-lu [Kangding], Tapaoshan, 4200 m, *H.Smith 11312* (S, UPS); Tibet, Kongbo, Deyang La, 4200 m, *F.Ludlow, G.Sherriff & H.H.Elliott 14325* (BM, E, UPS); Yunnan, Diqing, N of Napa Hai, 3910 m, [*Anonymous: KEG*] 1383 (E). 40. WEST HIMALAYA: Garhwal, Kamri, 3850 m, *J.F.Duthie 4464* (K); Kashmir, Gulmarg Rakh, 3200 m, *R.R.Stewart 8667* (S). NEPAL: Larjung, Kali Gandaki, 3700 m, *J.D.A.Stainton, W.R.Sykes & R.H.J.Williams 1942* (BM, UPS); Barum Khola, Ribuk, 3800 m, *H.B.Emery CH38A* (K). SIKKIM: Jelep La, 3050 m, *King's collector 4198* (K). BHUTAN: Upper Mo Chu, SW of Lingshi Dzong, 4005 m, *J.Sinclair & D.G.Long 5421* (E, K). PAKISTAN: Swat, above Bishigram, *R.R.Stewart & A.Rahman 24940* (BM).

Easily recognized by its elongate lower bract, conspicuous leaf sheath auricles and slender creeping rhizomes. Recently, a new species similar to *J. benghalensis* and *J. sherei* was detected in Dali, Yunnan, China. It is characterized by flat, grass-like leaves 0.8–1.6 mm wide, anthers 1.3–1.5 times as long as their filaments and the lower bract usually shorter than inflorescence. F.Miyamoto and H.Ohba call it *Juncus petrophilus* (the description submitted to *J. Jap. Bot.* in 2000).

### 71. *Juncus perpusillus* Sam., in H.Handel-Mazzetti, *Symb. Sin.* 7: 1237 (1936)

T: China, Sichuan, Taofu [Dawu], Haitzeshan, 4400–4600 m, 31 Aug 1934, *H.Smith 11684*; holo: UPS; iso: BM, S.

Perennials; stems 1.5–8 cm, setaceous, densely caespitose; rhizomes very short, stout, covered with dark brown scales. Leaves bitubular, filiform; leaf sheaths with conspicuous, often reddish-brown auricles; upper stem leaf present or absent; basal stem leaf with dark purplish-brown sheath. Bracts castaneous, with lowermost often with leaf-like point exceeding inflorescence. Inflorescence a single (1–) 2–4-flowered capitulum. Tepals 3.0–4.5 × 1 mm, oblong, obtuse, initially white, becoming suffused dark purplish. Stamens 6; anthers 1.5–2 mm long; filaments up to 3.5–4.5 mm long, exceeding tepals at maturity; style 0.7–1.2 mm long; stigmas c. 0.5 mm long, spreading. Capsule 2.5–3 × 1.5–2 mm, oblong-ellipsoid, abruptly contracted into 1.0–1.5 mm mucro. Seeds 0.6–0.7 mm long, with minute appendages less than 0.1 mm long.

A rare, probably overlooked, species recorded from Nepal, Sikkim, Tibet and Sichuan, China. 36: CHC, CHT. 40: EHM, NEP. Shallow, damp soils on moraines, above 4250–5020 m. Map 254.

**36.** TIBET: SW of Lhozak [Lhozag, Garbo] Valley junction, 4420 m, *Dickoré 9816* (E); Tsangpo – Subansiri Pass, 5000 m, *Dickoré 9952* (E). **40.** EAST HIMALAYA: Sikkim, Chaunrikhiang, foot of East Rathong Glacier, 4550 m, [*Anonymous: ESIK*] 375 (E); SE side of Lasha Chhu, below Sebu La, 4700 m, *D.G.Long & H.J.Noltie 383* (E). NEPAL: Gosainkund Lake, 4250 m, *T. de Haas 2252* (BM); rocks N of Gosainkund Governmental House, 4500 m, *T. de Haas 2222* (BM); Lau, 4600 m, *Yon 243* (BM).

Close to *J. benghalensis*, especially in its bitubular leaves, the usually long, leaf-like lowest bract and the conspicuous leaf-sheath auricles, but differing in its very dwarf stature (inflorescence sometimes reduced to 1 or 2 flowers) and its short, branched rhizomes giving rise to dense clumps, rather than having stems borne singly and spreading by very slender rhizomes.

**72. *Juncus concolor* Sam., in H.Handel-Mazzetti, *Symb. Sin.* 7: 1232 (1936)**

T: Yunnan, zwischen Dschaoping und Bolotin von Yungbei [Yongsheng], 2600–3000 m, 30 Jun 1914, *H.Handel-Mazzetti 3359*; holo: W.

Illustration: F.Miyamoto & H.Ohba, *J. Jap. Bot.* 74: 73, fig. 1 (1999).

Perennials, 10–38 cm tall, loosely caespitose; rhizome thin, creeping, 0.3–0.7 mm across. Stem erect, terete. Cataphylls 3–6, 1.6–4.0 cm long, stramineous, dull; basal leaves absent. Cauline leaf single, inserted in upper half of stem, terete, unitubular, usually exceeding stem, 10–21 cm long, 1.0–1.5 mm wide; sheath 1.0–3.0 cm long, grass-green; auricles very short, obtuse. Bracts 3–5, with lower one shorter than the flowers, lanceolate, 7–9 mm long, 3.4–4.3 mm wide, light brown. Inflorescence a terminal semiglobose, 5–20-flowered head 1.0–2.0 cm wide; flower bract lanceolate, 3.0–9.0 mm long, 0.7–4.3 mm wide, light brown. Flowers 6.5–9.5 mm long, 2.0–2.5 mm wide; pedicels 0.8–2.4 mm. Tepals  $\pm$ equal, lanceolate, acute, 4.8–5.5 mm long, 1.2–1.5 mm wide, ivory-white. Stamens 6, long exserted, 7.3–8.7 mm long; anthers linear-elliptic, 2.5–2.8 mm long, ivory-white; filaments 4.8–6.0 mm long; style 2.3–3.5 mm long; stigmas 0.6–0.9 mm long; ovary obovoid-trigonal, 2.5–4.0 mm long, 1.0–1.4 mm wide. Seed unknown. Fig. 68.

Only known from Yunnan, China. 36: CHC. On grassland slopes, above 3400 m. Map 255.

**36.** CHINA SOUTH-CENTRAL: Yunnan, Yangbi, around Cangshan, 3800 m, *S.K.Wu & al. 475* (KUN, TI); Yunnan, Y. Cheng Kang, Snow Range, 3400 m, *Yu 1961* (PE).

*Juncus concolor* is similar to *J. allioides*, *J. cephalostigma*, *J. glaucoturgidus*, *J. leucanthus* and *J. trachyphyllus*, but it apparently differs in having a stoloniferous rhizome, no basal leaf, and stramineous basal sheath.

**73. *Juncus przewalskii* Buchenau, *Bot. Jahrb. Syst.* 12: 398 (1890)**

T: China, [Gansu] Terra Tangutorum (prov. Kansu), regio alpina secus fl. Tetung (affl. Hoangho), Jul 1872, *N.M.Przewalski s.n.*; syn: W, S.

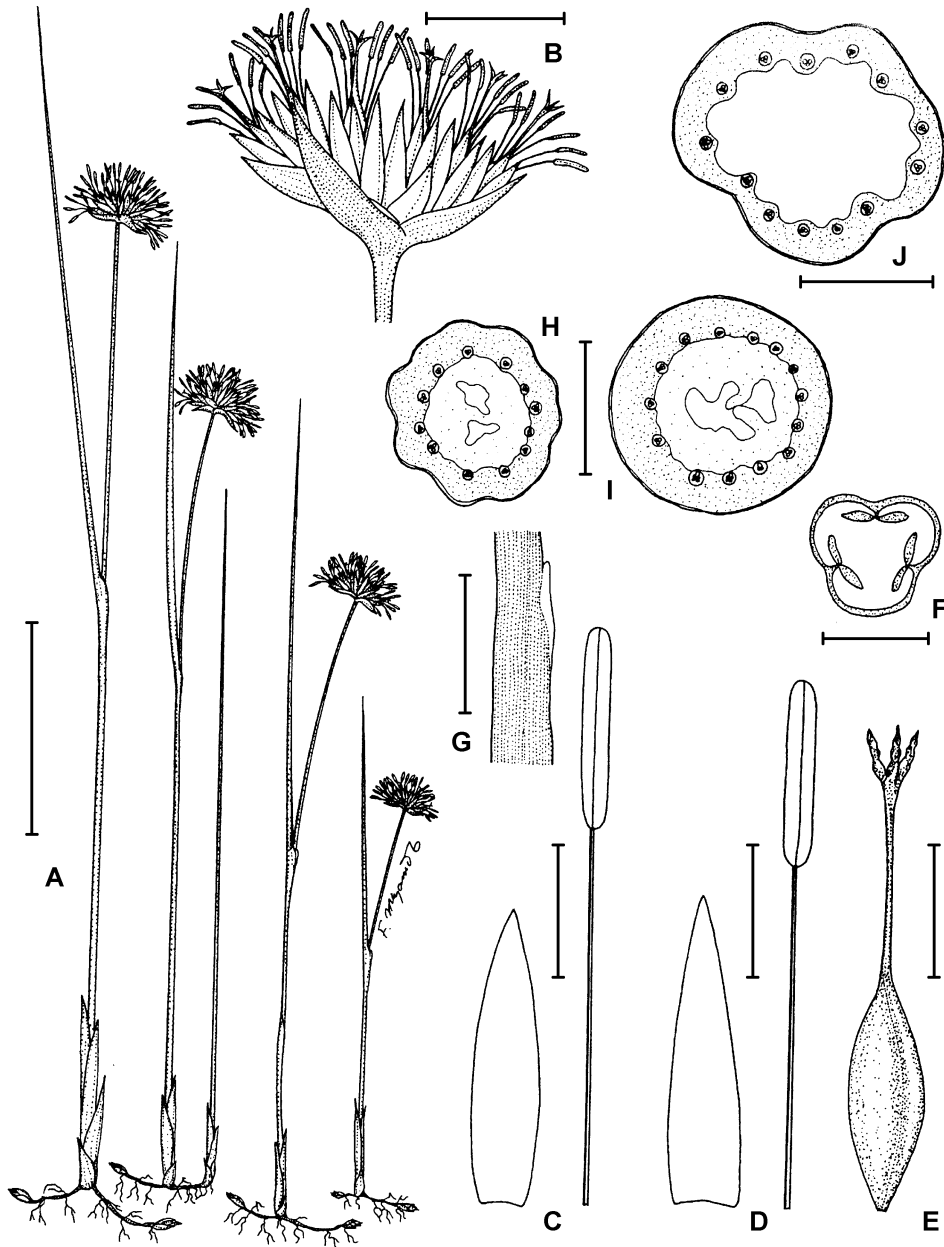
*Juncus przewalskii* var. *discolor* Sam., in H.Handel-Mazzetti, *Symb. Sin.* 7: 1234 (1936). T: China [Yunnan, Yangtze watershed], Likiang, E slopes of Likiang Snow Range, 15,000 ft., v–x.1922, *J.F.Rock 4953*; syn: B., n.v.

*Juncus kangdingensis* K.F.Wu, *Acta Phytotax. Sin.* 32: 460 (1994). T: China, Sichuan, Kangding, 3400 m, 1934, *Zhen-shu Liu 964*; holo: PE.

Illustrations: F.G.P.Buchenau, in H.G.A.Engler, *Pflanzenr.* (iv.36) 25: 231, fig. 108 (1906); Wu Kuofang, *Fl. R. P. Sinicae* 13(3): 216, pl. 51 (1997).

Perennials, 3–28 cm tall, densely caespitose; rhizome short, densely branched. Stem erect, terete, 0.2–0.5 mm thick. Cataphylls 1–3, pale castaneous, to c. 3 cm long; basal and sub-basal leaves 1–3, unitubular, indistinctly septate, 2–11 cm long, 0.6–1.0 mm in diam. Cauline leaf 1, inserted in upper  $\frac{1}{2}$ – $\frac{1}{4}$  of stem; blade reduced, 0.5–2 cm long, thin; sheaths tight, c. 1.5–2.5 cm long, with dark castaneous margins, sometimes entirely castaneous; auricles obtuse to truncate, 0.5–1.3 mm long, dark castaneous or distally scarious. Bracts ovate,  $\pm$ acute, (4–) 6–8 (–10) mm long, deep castaneous-brown, usually with paler to

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**Figure 68.** *Juncus concolor*. **A**, habit; **B**, inflorescence; **C**, outer tepal and stamen; **D**, inner tepal and stamen; **E**, ovary; **F**, ovary T.S.; **G**, auricle; **H**, lower part of stem T.S.; **I**, upper part of stem T.S.; **J**, cauline leaf T.S. (A–J, *Wu & al.* 475, T1). Scale bars: **A** = 4 cm; **B**, **G** = 5 mm; **C**, **D**, **E** = 2.5 mm; **F** = 1 mm; **H–J** = 0.6 mm. Drawn by F.Miyamoto. Reproduced with permission, from F.Miyamoto & H.Ohba, *J. Jap. Bot.* 74: 73, fig. 1 (1993).

scarios margins and distal part,  $\pm$ equalling inflorescence. Inflorescence a single terminal hemispherical (3–) 5–7 (–10)-flowered head 7–17 mm wide. Pedicels 0.5–1 mm long. Tepals ovate-lanceolate, subacute, 4.5–6.5 mm long, 1–1.5 mm wide, usually dark purplish-castaneous; margins paler to scarios, of variable width, or rarely tepals entirely ivory-white. Stamens 6, long exserted, 5–8 mm long; anthers linear-elliptic, white, 1.3–2.6 mm long; filaments 3.7–4.4 (–7) mm long; style 1.5–2.5 mm long; stigmas 0.5–0.8 mm long; ovary 2–3 mm long, 0.8–1.1 mm wide, brown or yellowish white. Capsule unilocular, rostrate, narrowly obovoid-trigonus, acuminate, c. 4.5–6.0 mm long including rostrum, 1.5–2 mm wide, castaneous-brown, shining; rostrum 1.0–1.5 mm long, exceeding perianth. Seeds ellipsoid, 0.5–0.8  $\times$  0.25–0.3 mm, brown, or c. 2.0–2.5 mm long including two subequal appendages 0.3–0.6 mm long. Fig. 69.

W and C China: Tibet, Gansu, Sichuan and Yunnan. 36: CHC, CHN, CHT. On alpine scree or grassland slopes, usually above 4000 m. Map 256.

**36.** CHINA NORTH-CENTRAL: Gansu, Lapuleng, 3800 m, *Wang 5844* (KUN). CHINA SOUTH-CENTRAL: Sichuan, Kangding, Tapaoshan, west range, 4200–4400 m, *H.Smith 11198* (S, UPS); Sichuan, Tsipula, 4200 m, *H.Smith 3051* (UPS); Sichuan, Daocheng, around Gongga Shan, Beiyu, 4200–4580 m, *S.K.Wu & al., 1546* (KUN, TI); Yunnan, Yangtze watershed, E slopes of Likiang Snow Range, *J.F.Rock 5265* (B); Likiang, N peak of Likiang Snow Range, *J.F.Rock 10376* (BM); Lichiang Range, *G.Forrest 2917* (BM); Atuntze [Deqin], Chitoyangou, 4200 m, *Yu 9743* (KUN); Zhongdian, Haba shan, 3950 m, *Zhongdian Team 1792* (KUN). TIBET: Kham, Pass Chuntschao [Bolo], *G.N.Potain* (S).

A part of the original material of *J. tanguticus* (see *J. leucanthus*) belongs to *J. przewalskii*.

#### **74. *Juncus sherei* Miyam. & H.Ohba, *J. Jap. Bot.* 72: 293 (1997)**

T: Nepal, Sagarmatha Zone, Solukhumbu District, Gnaula – Pike, 3300 m, 22 Jul 1995, *F.Miyamoto & al. 9580049*; holo: TI.

Illustration: *F.Miyamoto & H.Ohba, J. Jap. Bot.* 72: 294, fig. 1 (1997).

Perennials, 6–19 cm tall, caespitose; rhizome very short. Stem erect, terete. Cataphylls 2–3, loose, brown; basal leaves  $\pm$ bitubular, grooved on both adaxial and abaxial sides, 2–11 cm long; leaf sheath 1–4 cm long. Cauline leaves absent, sometimes single, inserted in lower or upper part of stem, linear, 1.5–3.0 cm long, not exceeding inflorescence; auricles obtuse, 0.7–1.0 mm long. Lower bract exceeding inflorescence, acicular-lanceolate, 0.5–1.5 cm long, 1–2 mm wide, brownish green. Inflorescence a single terminal hemispherical head, usually 3–7-flowered, 1.0–1.5 cm wide; flower bracts lanceolate, 2–4 mm long, 0.5–2 mm wide, brown. Flowers 4–8 mm long, 6–12 mm wide; pedicels 0.3–0.5 mm long. Tepals  $\pm$ equal, lanceolate, subacute, 3–6 mm long, 1–1.7 mm wide, white, later whitish-stramineous. Stamens 6, exserted, 5.8–8.8 mm long; anthers linear-elliptic, white, (1.2–) 1.8–2.5 mm long, twice as long as 4.0–6.1 mm filaments; style 1.3–1.8 mm long; stigmas 0.6–0.8 mm long. Capsule unilocular, narrowly obovoid-trigonus, acuminate, rostrate, 3.0–4.0 mm long incl. 0.6–1.1 mm rostrum, 1–1.5 mm wide, castaneous-brown, shining. Seeds [the Bhutan specimen] ellipsoid, 0.5–0.6  $\times$  0.2 mm, or c. 0.8 mm including two minute appendages c. 0.1 mm long.

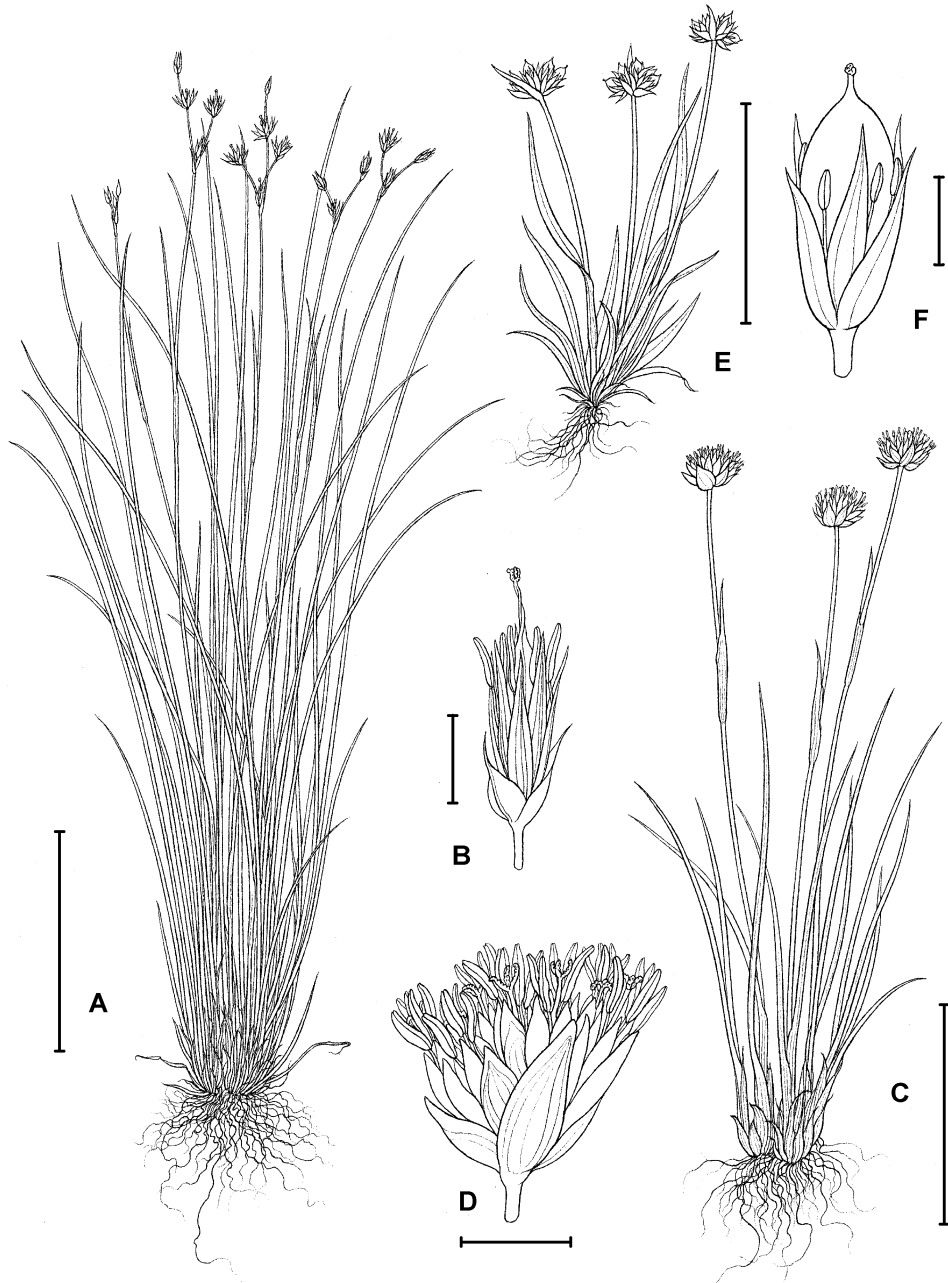
Nepal, East Himalaya (Bhutan) and Yunnan, China. 36: CHC. 40: EHM, NEP. Alpine scree slopes and banks, above 3000 m. Map 257.

**36.** CHINA SOUTH-CENTRAL: Yunnan, Zhongdian Xian, Haba Xueshan, Haba Hai, 4500 m, *S.K.Wu & al. 103080* (KUN, TI); Gongshan Xian, SW of Gongshan, Gaoligong Shan, 2600 m, *S.K.Wu & al. 103193* (KUN, TI). **40.** NEPAL: Bagmati Zone, Rasuwa District, NW of Dobato, 3400 m, *Hass 2162A* (BM); Bagmati Zone, Rasuwa District, Paldol Base Camp-a Kharka, 4300 m, *F.Miyamoto & al. 9410163* (TI); Sagarmatha Zone, Solukhumbu District, Beni Kharka–Sarkari Pati, 3970–3350 m, *H.Ohba & al. 8581282* (TI); Sagarmatha Zone, Solukhumbu District, Najing Ding–Chalem Kharka, 3100 m, *F.Miyamoto & al. 9580140* (TI); Koshi Zone, Sankhuwa Sabha District, Khongma–Sano Pokhari, 3800 m, *M.Minaki & al. 9020641* (TI). EAST HIMALAYA: Bhutan, Phajudin Limpere, 4 Nov 1914, *R.E.Cooper 3513* (BM).

The leaf anatomy and anther length distinguish *J. sherei* from similar species (*J. gonggae*, *J. benghalensis* and *J. brachystigma*).



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**Figure 69.** *Juncus luzuliformis*. **A**, habit; **B**, flower. *Juncus przewalskii*. **C**, habit; **D**, inflorescence. *Juncus minimus*. **E**, habit; **F**, flower. (**A**, *F.T.Wang* 22492, S; *J.-A.Soulié* 119, S; **B**, *H.Smith* 11075, S; **C**, *J.F.Rock* 10376, BM; **D**, *G.Forrest* 2917, BM; **E**, *ACE* 1297, E; **F**, *F.Ludlow, G.Sherriff & G.Taylor* 5252, E). Scale bars: **A**, **C**, **E** = 5 cm; **B**, **F** = 2 mm; **D** = 5 mm. Drawn by © E.Smrčínová.

**75. *Juncus gonggae*** Miyam. & H.Ohba, in F.Miyamoto & al., *J. Jap. Bot.* 72: 162 (1997)

T: China [China South-Central], Sichuan, Daocheng District, Mt Gonggashan, 4300 m, 25 Aug 1996, S.K.Wu & al. 1551; holo: KUN; iso: TI.

Illustration: F.Miyamoto & H.Ohba, *J. Jap. Bot.* 72: 163, fig. 1 (1997).

Perennials, 4–20 cm tall, densely caespitose; rhizome short. Stem  $\pm$ erect, terete, grooved. Cataphylls 1–3, brown. Leaves basal and subbasal, 1–2, bitubular, canaliculate, 1.5–10 cm long; sheaths 0.5–2 cm long, stramineous, with leaves of sterile shoots with several grooves, 1.2–15 cm long. Cauline leaf absent or single, linear, 3–5 cm long; auricles obtuse, 0.5–0.7 mm long,  $\pm$ scarious. Lower bract equalling or slightly exceeding inflorescence, linear-lanceolate, 4–10 mm long, 0.5–1.0 mm wide, light brown. Inflorescence a terminal 3–8-flowered head; flower bracts lanceolate, 1.5–2.0 mm long, 0.5–0.8 mm wide, light brown. Flowers proliferating or not so, sometimes mixed in an inflorescence; normal flowers on pedicels 0.4–0.6 mm long. Tepals  $\pm$ equal, lanceolate, subacute, 3.0–3.5 mm long, 0.8–1.1 mm wide,  $\pm$ white. Stamens 6, exserted, 4.5–5.0 mm long; anthers linear, white, 1.2–1.3 mm long; filaments 3.8–4.0 mm long; style 0.4–0.8 mm long; stigmas 0.5–0.7 mm long. Capsule unilocular,  $\pm$ ovoid-trigonous, acuminate, 2.9–3.0 mm long, 1.0–1.2 mm wide, castaneous-brown, slightly exceeding perianth. Proliferating flowers 3–5 mm long, stamens and capsules usually abortive, with inner perianth segment changed into propagules 3.0–4.5 mm long. Seeds ellipsoid, apiculate, brown, 0.5–0.6 mm long; appendages  $\pm$ absent. Fig. 70.

Known from the type locality in Sichuan, SW China. 36: CHC. On banks and scree slopes, above 3500 m. Map 258.

*Juncus gonggae* is similar to *J. modicus* but differs by short anthers and the grooved leaves. The plants often have proliferating flowers. In the section *Stygiopsis*, proliferation has been known in *J. trichophyllus*, *J. harae* and *J. dongchuanensis*. *Juncus trichophyllus* differs from *J. gonggae* in having axillary bulbils on cauline leaves.

**76. *Juncus trachyphyllus*** Miyam. & H.Ohba, in F.Miyamoto & al., *J. Jap. Bot.* 72: 164 (1997)

T: China, Sichuan, Daocheng District, Mt Gonggashan, 4300 m, 21 Aug 1996, S.K.Wu & al. 1540; holo: KUN; iso: TI.

Illustration: F.Miyamoto & H.Ohba, *J. Jap. Bot.* 72: 165, fig. 2 (1997).

Perennials, 7–20 cm tall, densely caespitose; rhizome short. Stem erect, terete, scabrous. Cataphylls 1–3, brownish; basal leaves terete, grooved, scabrous, 2–4-tubular, 4–10 cm long; sheath 1.0–3.5 cm long, stramineous. Cauline leaf 1, terete, with an adaxial groove, 1.5–7.0 cm long, not exceeding inflorescence; auricles absent. Lower bract subterete, exceeding or equalling inflorescence, 0.8–1.2 cm long, 2.0–3.5 mm wide. Inflorescence a single terminal hemispherical head, 5–15-flowered, 0.8–1.5 cm wide, or rarely heads two with lateral one on peduncle 1.0–1.5 cm long; sheath-like bract present; flower bracts membranous, lanceolate, 3–4 mm long; capitulum bracts lanceolate-ovate, 4–7 mm long, 1.5–3.0 mm wide, light brown. Flowers 0.7–1.0 cm long; pedicels 0.8–1.0 mm long. Tepals subequal; inner tepals slightly longer, 4.5–5.5 mm long, 1.0–1.4 mm wide,  $\pm$ white, lanceolate, acute to subacute; outer tepals 4–5 mm long, 0.9–1.0 mm wide. Stamens 6, exserted, 9–10 mm long; anthers linear, white, 2.5–3.8 mm long; filaments 6.5–7.2 mm long; style 2.0–2.5 mm long; stigmas 0.6–0.8 mm long. Capsule unilocular, ovoid-trigonous, acuminate, 4.4–4.8 mm long, 1.2–1.5 mm wide, with rostrum exceeding perianth. Seeds ellipsoid, apiculate, 1.5–1.8 mm long; appendages  $\pm$ absent. Fig. 71.

Known from Gonggashan, Sichuan, SW China. 36: CHC. On alpine scree slopes, above 4000 m. Map 259.

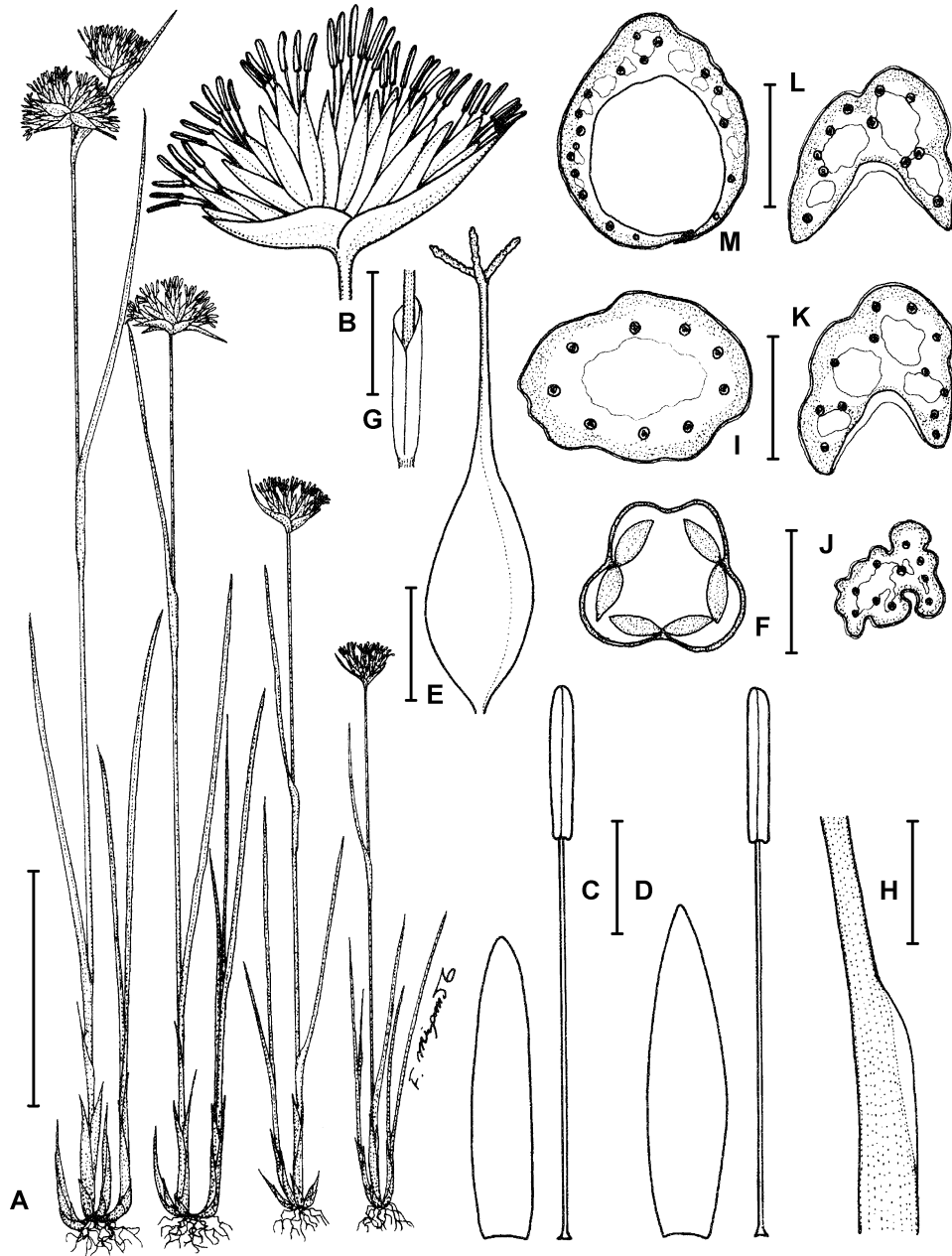
36. CHINA SOUTH-CENTRAL: Sichuan, Daocheng District, Mt Gonggashan, alt. 4000 m, S.K.Wu & al. 1579 (KUN, TI).

*Juncus trachyphyllus* is similar to *J. allioides* and *J. glaucoturgidus* but differs in having scabrid leaves and stems and adaxially grooved basal leaves. The scabrid leaves (under

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**Figure 70.** *Juncus gonggae*. **A**, habit of plants with normal inflorescence; **B**, habit of plants with proliferating inflorescence; **C**, normal inflorescence; **D**, normal and proliferating inflorescence; **E**, proliferating inflorescence; **F**, outer tepal and stamen; **G**, inner tepal and stamen; **H**, capsule; **I**, capsule T.S.; **J**, auricle; **K**, stem T.S.; **L**, sterile leaf T.S.; **M**, basal leaf T.S.; **N**, proliferating flower. (A–N, *S.Wu & al. 1551*, KUN). Scale bars: **A**, **B** = 2 cm; **C**, **D**, **E**, **N** = 5 mm; **F**, **G**, **H**, **J** = 2.5 mm; **I** = 1 mm; **K**, **L**, **M** = 0.5 mm. Drawn by F.Miyamoto. Reproduced with permission, from F.Miyamoto, H.Ohba & S.K.Wu, *J. Jap. Bot.* 72: 163, fig. 1 (1997).



**Figure 71.** *Juncus trachyphyllus*. **A**, habit; **B**, inflorescence; **C**, outer tepal and stamen; **D**, inner tepal and stamen; **E**, capsule; **F**, capsule T.S.; **G**, sheathing bract on peduncle; **H**, auricle; **I**, lower part of stem T.S.; **J**, cauline leaf T.S.; **K**, upper part of basal leaf T.S.; **L**, lower part of basal leaf T.S.; **M**, sheath T.S. (**A–M**, *S.Wu & al. 1540*, KUN). Scale bars: **A** = 4 cm; **B**, **G**, **H** = 5 mm; **C**, **D**, **E** = 2.5 mm; **F**, **I–M** = 1 mm. Drawn by F.Miyamoto. Reproduced with permission, from F.Miyamoto, H.Ohba & S.K.Wu, *J. Jap. Bot.* 72: 165, fig. 2 (1997).