JUNCACEAE¹ (C. A. Backer, Heemstede)

Perennial or annual herbs, tufted or with an erect or creeping rhizome. Stems mostly leafy only at the base but sometimes also in the higher parts. Leaves spirally arranged, cylindric to flat and grass-like, mostly linear or filiform, sheathing at the base or entirely reduced to a sheath; sheaths open or closed, sometimes ciliate at the top. Flowers mostly proterogynous and anemophilous, solitary or in anthelas, panicles, corymbs or heads, usually small, actinomorphic, ∇ or (3) (9). Tepals 6, free, in two whorls, rarely only 3, glumaceous or coriaceous, rarely white. Stamens 3-6, when 3 opposite the outer tepals; filaments thin; anthers basifixed, introrse; cells opening longitudinally; pollen in tetrads. Ovary superior, 1-celled or divided by 3 septa into 3 cells; style short to long; stigmas 3, papillose; ovules 3, inserted at the base of the ovary or numerous and biseriate on 3 parietal placentas. Fruit a dry, 1- or 3-celled capsule, loculicidally 3-valved. Seeds sometimes tailed; embryo in the middle or at the base of the endosperm, small.

Distr. Genera 8, with 250-300 species, especially in the temperate and cold regions of both hemispheres; in the tropics restricted to the mountainous districts.

Ecol. Mainly herbs of wet or moist habitats above 1000 m, sometimes gregarious.

Uses. In Malaysia unimportant. Some species used for tying parcels, some for medicinal purposes. In Europe Juncus is largely used for mats and chair-bottoms.

KEY TO THE GENERA

1. JUNCUS

2. Luzula

Linné, Sp.Pl. (1753) 325; Gen. Pl. ed. 5 (1754) no 396.

Perennial or annual herbs. Stems often tufted, or crowded on a creeping rhizome. Leaves either all radical or also higher on the stem, grass-like or terete and stem-like. Flowers small, sessile or peduncled in dense or lax cymes. Inflorescence terminal or spuriously lateral and then its bract continuous with the stem. Tepals 6, glumaceous, equal or the 3 inner smaller. Stamens 3–6, attached to the base of the tepals; filaments filiform; anthers erect, oblong or linear. Ovary sessile; placentas 3, parietal, sometimes hardly prominent, more frequently protruding and sometimes connate in the middle; ovules many in each cell; style short or longish; stigmas 3, linear, often twisted. Capsule 3-valved; valves usually bearing the placentas in their middle; rarely the 3 placentas becoming detached and remaining free or cohering into a central column. Seeds minute, ovoid or oblong, very faintly ribbed; embryo small, near the hilum.

Distr. Species \pm 200, largely spread over both hemispheres, most abundant in the cool and temperate zones, but also occurring in the mountainous districts of the tropics, usually in moist or marshy localities.

KEY TO THE SPECIES

- 1. Inflorescence on each flowering stem a solitary, pseudo-lateral, many-flowered cyme; its single bract terete, continuous with the terete or subterete stem and resembling it. Flowers with 2 minute, membranous basal bracteoles. Stems erect, close-set in a row on a creeping rhizome.
- 2. Perianth 2-23/4 mm long, pale green or yellowish. Stamens usually 3. Capsule with a rounded or truncate top, 21/2-23/4 mm long. Seeds ± 1/2 mm. Cymes 11/2-5 cm long, rarely longer (up to 10 cm), dense or rather loose. Stem in the living plant not or hardly ribbed, in dried specimens faintly and very closely ribbed; their basal sheaths dull or faintly shining 1. J. effusus
- (1) The author wishes to express his sincere thanks to Mr R. D. Hoogland for valuable help in identifying and discussing some aberrant Papuan and Philippine specimens of the very variable *J. prismatocarpus* R.Br.

- Perianth 3¹/₂-5 mm long, brown. Stamens 6. Capsule shortly mucronate on an obtuse apex, 3-3¹/₄ mm long. Cymes 4-10 cm long, often rather lax. Stem in the living plant distinctly ribbed, ribs separated by interspaces which in dried specimens are as broad as the ribs themselves or broader. Basal sheaths of stems much shining.
 2. J. inflexus
- 1. Inflorescence terminal, its bract not continuous with the stem.

- 1. Juncus effusus Linné, Sp. Pl. (1753) 326; Baker, Fl. Maur. (1877) 389; Hook. f. Fl. Br. Ind. 6 (1892) 392; Cordemoy, Fl. Réun. (1895) 146; Baker, Fl. Cap. 7 (1897) 18; Asch. & Gr. Syn. 2, 2 (1904) 442; Buch. Pfl. R. 25 (1906) 135; Hegi, Ill. Fl. Mitt. Eur. 2 (1909) 188; Koord. Exk. Fl. 1 (1911) 285; Ridl. J.F.M.S. 8⁴ (1917) 120; Merr. En. Philip. 1 (1922) 201; Back. Handb. Fl. Jav. 3 (1924) 44; Steen. Bull. J.B.B. III, 13 (1934) 220; Diels, Bot. Jahrb. 62 (1929) 461; Burk. Ec. Prod. 2 (1935) 1271; RIDL. J. Bot. 73 (1935) 342.—J. communis E. Meyer, Junc. Gen. Mon. (1819) 20; Miq. Fl. Ind. Bat. 3 (1855) 246; Bth. Fl. Austr. 7 (1878) 128; Bail. Queensl. Fl. 5 (1902) 1668.—J. sundaicus Ridl. J. Bot. 73 (1935) 342.—Fig. 1, 2b.

Erect, quite glabrous perennial herb, 0.40-1.20 m high, with a horizontal, rather short, creeping, very short-jointed sympodial rhizome. Stems tufted, terete, in the living plant not or hardly ribbed, in dried specimens with very close-set faint longitudinal ribs; pith continuous. Basal sheaths closely embracing the stem, dull light- or darkbrown, obtuse, the inner often crowned by a deciduous awn. Not-flowering stems leafless (not computing the basal sheaths). Cymes pseudolateral, solitary, sessile, mostly 11/2-5 cm long, rarely longer (up to 10 cm), dense or lax, usually many-flowered; bract of the inflorescence continuous with the stem and resembling it, very acute, 5-20 cm long. Flowers partly sessile, partly stalked, stalks up to 8 mm long. Floral bracts 2, very close together, ovate, thin, nerveless, \pm 3/4 mm long. Tepals narrowly ovate-lanceolate, very acute, firm with transparent thin margins, subequal, 2-23/4 mm long, pale green or yellowish. Stamens 3, much shorter than the tepals, rarely 4-6; filaments thin, short; anthers comparatively large, linear. Style very short; stigmas long, erect, filiform. Capsule oblong, trigonous, with a round or truncate (in Malaysian specimens not impressed) apex, brown, 21/2-23/4 mm long, 3valved; placentas rather deeply intruded. Seeds numerous, oblong, not tailed, ± 1/2 mm long, very faintly reticulate-ribbed.

Distr. World-wide in the temperate zones (specially in the N. hemisphere) and the mountainous districts of the tropics, not in Australia, in Malaysia: N. Sumatra (Atjeh), Java, Br. N. Borneo, Philippines (Luzon, Mindanao), New Guinea; undoubtedly native!

Ecol. Wet places, pools, morasses, lake-borders, river-banks, 1400 to 3000 m, locally numerous, but on the whole rare.

Uses. In the Malay Peninsula the pith is im-

ported from China and used as a drug (cf. BURKILL, Dict. 1935, 1272).

Vern. Sumpu, J, udulan, J, pit-rus, D, Philippines: badili, sudsúd (Ig.), balili, piñgot (Bon.).

2. Juncus inflexus LINNÉ, Sp. Pl. (1753) 326.—J. glaucus EHRH. Calam. no 55 et Beitr. Naturk. 6 (1791) 83; HOOK. f. Fl. Br. Ind. 6 (1892) 393; ASCH. & GR. Syn. Mitt. Eur. Fl. 2, 2 (1904) 446; BUCH., Pfl. R. 25 (1906) 132; HEGI, Ill. Fl. Mitt.-Eur. 2 (1909) 185; BACK. Handb. Fl. Jav. 3 (1924) 44; STEEN. Bull. J.B.B. III, 13 (1934) 220.

Erect, quite glabrous, more or less glaucous perennial herb, 0.50-1.20 m high, with a horizontal, short, creeping, very short-jointed, sympodial rhizome. Stems tufted, terete or slightly compressed, in the living plant rather distinctly longitudinally ribbed, in dried specimens very distinctly so, with rather close-set ribs, separated by interspaces which, at least for the greater part, are as broad as the ribs themselves or broader; pith in the typical form divided by transverse interspaces, in some forms, possibly of hybrid origin (J. effusus \times inflexus?), otherwise quite like the typical form, continuous. Basal sheaths very closely embracing the stem, shining darkbrown, acute or obtuse, 5-20 cm long. Cymes pseudolateral, solitary, sessile, 4-10 cm long, rather lax, not very many-flowered. Bract of the inflorescence continuous with the stem and resembling it, very acute, 15-20 cm long. Flowers partly sessile, partly stalked; stalks up to 10 mm long. Floral bracts 2, very close together, unequal, thinly membranous, 11/2-2 mm long. Tepals narrowly ovate-lanceolate, very acute, brown, with a firm midrib and thinly membranous margins, 31/2-5 mm long, slightly unequal. Stamens 6, often partly abortive, shorter than the tepals; filaments thin, moderately long; anthers linear. Style short, its arms rather long, erect or ascending. Capsule oblong obtuse, with a distinct, 1/4-1/3 mm long mucro (persistent style-base), 3-31/4 mm long, 3-celled, with very thin septa. Seeds numerous, oblong, very faintly longitudinally ribbed, very faintly transversally striate between the ribs, brown, 3/4-5/6 mm long.

Distr. Europe, N. and S. Africa, W. and SE. Asia, Ceylon, and introduced in New Zealand, in *Malaysia*: Java, thus far only collected in the easternmost part.

Ecol. Wet places, river-banks, 2100-2700 m, locally numerous but on the whole rare.

Vern. Mendon banyu, J, zeegroene rus, D, hard rush, E.



Fig. 1. Juncus effusus L. Tusts in a shallow pool; water covered by Lemna & Azolla. E. Java, ca 1950 m alt.

Note. I am not at all convinced that the specimens with a continuous pith but otherwise quite like the typical form are of hybrid origin. See also HEGI, *l.c.*

3. Juncus bufonius Linné, Sp. Pl. (1753) 328; Bth. Fl. Austr. 7 (1878) 127; Hook. f. Fl. Br. Ind. 6 (1892) 392; Bailey, Queensl. Fl. 5 (1902) 1667; Asch. & Gr. Syn. Mitt.-Eur. Fl. 2, 2 (1904) 420; Buch., Pfl. R. 25 (1906) 105; Hegi, Ill. Fl. Mitt.-Eur. 2 (1909) 192; Merr. En. Philip. 1 (1922) 201; Steen. Bull. J.B.B. III, 13 (1934) 220.

Very variable, pale-coloured annual, usually 10-30 cm long, rarely longer. Stems tufted, all fertile, erect, erecto-patent or decumbent, slender, terete, soft, often branched, leafy. *Leaf-sheaths* rather

long, not auricled. Leaves linear, very narrow, channelled down the face, the lowmost up to 16 cm long, the higher shorter. Inflorescence terminal, branched; branches erect or obliquely erect, rather straight. Flowers either solitary and remote or in more or less remote (sometimes almost crowded) clusters of 2-6; each flower at the base with a bract and 2 bracteoles; flowers nearly sessile, pale-coloured, very variable as to size, 3-7 mm long. Bracts and bracteoles thinly membranous, ovate, acute. Tepals narrowly ovate-lanceolate, very acute, the 3 inner often much smaller than the outer. Stamens 6, in the topmost flowers often 3. Style distinct; stigmas straight. Capsule oblong, trigonous, usually shorter than the perianth, 3-5 mm long; placentas at length often detached from



Fig. 2. a. Juncus prismatocarpus R.BR., b. Juncus effusus L., rootstock and inflorescence, \times $^{2}/_{3}$.

the valves, either free or cohering into a central column. Seeds numerous, ellipsoid, tailless, brown, extremely faintly ribbed, $^{1}/_{3}$ — $^{1}/_{2}$ mm long.

Distr. Almost cosmopolitan in the northern temperate zone, in the tropics restricted to the mountainous regions, in *Malaysia*: Philippines (Luzon), according to MERRILL *l.c.*, probably introduced.

Ecol. Permanently or temporarily humid localities, often gregarious. In Luzon along bridletrails in mossy forests at 1900 m.

Vern. Paddengras, D, toad rush, E.

4. Juncus prismatocarpus R.Br. Prod. (1810) 259; E. MEY. Syn. Junc. (1822) 38; MIQ. Fl. Ind. Bat. 3 (1855) 246; BTH. Fl. Austr. 7 (1878) 131; BAIL. Queensl. Fl. 5 (1902) 1669; BUCHENAU, Pfl. R. 25 (1906) 180, f. 89; KOORD. Exk. Fl. 1 (1912) 285; RIDL. J. Mal. Br. R. As. Soc. 87 (1923) 103; BACK. Handb. Fl. Jav. 3 (1924) 44; STEEN. Arch. Hydrob. Suppl. Bd 10 (1932) 295; Bull. J.B.B. III, 13 (1934) 221; RIDL. J. Bot. 73 (1935) 343 incl. var. leschenaultii (GAY) BUCH.—J. leschenaultii J. GAY ex LAH. Mém. Soc. Linn. Paris 3 (1827) 205; C. B. ROBINSON, Philip. J.Sc. 3 (1908) Bot. 176; MERR. En. Philip. 1 (1922) 201.—J. lamp(r)ocarpus (non Ehrh.) Ridl. Trans. Linn. Soc. Lond. Bot. II, 9 (1916) 231; GIBBS, Arfak (1917) 100.—Fig. 2a.

Perennial quite glabrous herb, (15-)30-70(-100) cm high. Stems tufted, erect, erecto-patent, ascending or floating, or some of them prostrate and then often rooting and emitting erect flowering branches, terete or compressed, with continuous pith. Leaves few, partly basal, partly cauline, on often long sheaths with 2 short, obtuse auricles at the top, linear, acute, rather thick, compressed, hollow but divided by rather remote cross-partitions into compartments which, in dried specimens, give them a jointed appearance, 5-20 cm long. Inflorescence a terminal very lax corymb made up of few to many usually 5-10-, but sometimes feweror more-flowered heads which sometimes bear in their centre a small tuft of short, very narrow leaves; the heads partly sessile at the ramifications of the inflorescence, partly on stalks of 3/4-5 cm length. Bracts in the heads ovate-lanceolate, acute, much shorter than the perianth, thinly membranous. Perianth 31/2-41/2 mm long. Tepals of about equal length, ovate-lanceolate, very acute, longitudinally nerved. Stamens 3, before the outer tepals, shorter than these, sometimes 1-3 before the inner tepals; filaments rather long; anthers linear, sometimes very short. Style very short; stigmas much longer, often recurved or sinuous. Capsule pale brown, rarely castaneous, narrowly prismatic, with prominent acute angles, rarely ovate with rounded angles, acute, varying from slightly shorter to considerably longer than the perianth; placentas not or hardly intruded, hence the fruit 1-celled. Seeds numerous, oblong, rather regularly longitudinally ribbed with faint, rather remote transverse nerves between the longitudinal ones, yellow, ca 0.5-0.8 mm long.

Distr. Ceylon, SE. to E. Asia, Australia, Tasmania and New Zealand, in *Malaysia*: N. Sumatra,

W.-Central Java, Philippines (Luzon, Mindanao), New Guinea.

Ecol. Between 1000 and 3225 m altitude in pools, marshy plains, on swampy river-banks, locally numerous.

Vern. Mèndongan, merakan, J.

Notes. By Buchenau, *l.c.*, 2 varieties are distinguished, differing mainly in habit. *Var. genuinus* Buchenau (Bot. Jahrb. 6, 1885, 204) includes the more robust specimens with many-flowered inflorescences, *var. leschenaultii* (GAY) Buchenau (Bot. Jahrb. 6, 1885, 205; *Juncus leschenaultii* GAY in Laharpe, Monogr. Jonc. 1827, 137) the smaller specimens with poorly developed inflorescences. These varieties are not sharply separated, *var.*

genuinus is found throughout Malaysia, most extreme var. leschenaultii only in the Philippines and New Guinea, though intermediates occur throughout Malaysia.

The leaves in most Malaysian specimens of var. leschenaultii are pluritubular: subvar. pluritubulosus Buchenau (Monogr. Juncac., 1890, 311; Pfl. R. 25, 1906, 181), in part of the New Guinea specimens they are unitubular: subvar. unitubulosus Buchenau (l.c., 1890, 312; l.c., 1906, 181). Part of the latter specimens have the fruit castaneous, ovate with transitions to typical prismatocarpusfruit (collections from the Wissel Lakes and Lake Habbema). This type of fruit does not seem to occur outside this limited area.

2. LUZULA

DC. Fl. Franç. ed. 3, 3 (1805) 158.

Perennial herbs, usually tufted and stoloniferous. Leaves for the greater part crowded at the base of an erect or ascending stem, grass-like, linear from a sheathing base, tapering towards the often thickened or shortly acute apex, frequently fringed with long, very fine white hairs. Flowers either solitary or subsolitary and loosely paniculate or crowded into dense clusters; the latter often forming a raceme or panicle which may be contracted into a dense spikelike inflorescence; each flower subtended by a scarious bract and enclosed at the base by 1-2 scarious short bracteoles. Tepals 6, free, glumaceous, equal or slightly unequal, ovate-lanceolate, acute or partly obtuse. Stamens 6, singly before the tepals; filaments thin; anthers erect, oblong or linear. Ovary sessile, 1-celled; ovules 3, erect from a very short basal placenta; style 1, deciduous; arms 3, usually slender. Fruit ellipsoid or obovoid, often crowned by the style-base, 3-valved. Seeds 3 or fewer, oblong, faintly reticulate-ribbed, often with a basal or apical elaiosome; embryo small, near the hilum; albumen subfarinaceous.

Distr. Species \pm 60, in both hemispheres in the frigid, temperate and torrid zones, in the latter restricted to the mountainous districts. In *Malaysia* 2 species, only high up in the mountains.

KEY TO THE SPECIES

- Flowers solitary or subsolitary, united into a very loose, rather large panicle. Elaiosome minute, at the top of seed. Tips of leaves terminated by a very short, triangular, acute point, not thickened 1. L. effusa
- 1. Flowers in dense clusters; these sometimes solitary but usually united in small numbers into short racemes or panicles, which may be contracted into a spike-like inflorescence. Elaiosome distinct, at the base of the seed. Tips of leaves rounded or very obtuse, distinctly thickened . . . 2. L. campestris

1. Luzula effusa Buchenau, Krit. Verz. Junc. (1880) 53, 88; Bot. Jahrb. 6 (1885) 196; *ibid.* 12 (1890) 106; Hook. f. Fl. Br. Ind. 6 (1892) 401; Buch., Pfl. R. 25 (1906) 61; Merr. En. Philip. 1 (1922) 202; Steen. Bull. J.B.B. III, 13 (1934) 221.

Stoloniferous erect or ascending perennial, 25–70 cm high. Lower *leaves* crowded at the base of the stem; the higher ones more remote and gradually diminishing in size; all leaves linear from a sheathing base, flat, with a much tapering apex, terminated by a very short, shortly triangular not thickened point, along the smooth margins and often also on the surfaces with a few scattered long very fine white hairs, the larger leaves 6–12 cm by 6–12 mm. *Flowers* in an elongate very lax panicle, the lower branches of which arise from the higher

leaf-axils; branches often nodding or drooping; flowers for the greater part solitary on pedicels 4-12 mm long, for the rest shortly pedicelled or subsessile. Perianth $2-2^{1/2}$ mm long. Tepals narrowly ovate-lanceolate, very acute. Stamens 6, slightly shorter than the perianth; filaments very thin, \pm 1^{1/4} mm long; anthers oblong, $^{1/2-3/4}$ mm. Capsule about as long as the perianth, broadly ellipsoid-obovoid, trigonous, crowned by the stylebase. Seeds usually 3, erect, oblong or oblong-obovoid, brown, faintly reticulate-ribbed, on the rounded top with a minute pale elaiosome, $^{1/4-11/2}$ mm long.

Distr. E. Himalaya to China, in *Malaysia*: Philippines, Br. N. Borneo (Kinabalu), S. Celebes (Bonthain, Latimodjong), New Guinea.

Ecol. In burnt forest-fringes, scattered through forests, on steep rock walls, in upper border of mossy forests, 2100-3300 m.

2. Luzula campestris (LINNÉ) DC. Fl. franç. 3 (1805) 161; R. Br. Prod. (1810) 591; Miq. Fl. Ind. Bat. 3 (1855) 245; BTH. Fl. Austr. 7 (1878) 123; BUCH. Bot. Jahrb. 12 (1890) 155; HOOK. f. Fl. Br. Ind. 6 (1892) 401; ASCH. & Gr. Syn. Mitt.-Eur. Fl. 2, 2 (1894) 521; BAIL. Queensl. Fl. 5 (1902) 1607; BUCH. Pfl. R. 25 (1906) 83; HEGI, Ill. Fl. Mitt.-Eur. 2 (1909) 230; MERR. En. Philip. 1 (1922) 201; STEEN. Bull. J.B.B. III, 13 (1934) 221.—Juncus campestris Linné, Sp. Pl. (1753) 329.

var. australasica (STEUD.) BUCHENAU, Oesterr. Bot. Z. (1898) 216; DIELS, Bot. Jahrb. 62 (1929) 461.—Luzula australasica STEUD. Syn. Pl. Glum. 2 (1855) 294.

Erect, often tufted perennial herb, 10-36 cm high. Stem glabrous, hollow. Leaves for the greater part crowded at the base of the stem, linear from a sheathing base, with a narrowed, rounded or very obtuse distinctly thickened apex, along the smooth margins fringed with rather remote long very fine white hairs, flat, firmly herbaceous, 5-10 by 3-5 mm; higher stem-leaves few, remote, gradually diminishing in size, the topmost acting as bract to the inflorescence. Spikelets in dense head-like clusters, all or for the greater part collected at the apex of the stem into a short, dense, often spiciform 11/2-3 cm long inflorescence. Floral bracts elongate-

ovate, very acute, distinctly paler than the spikelets. Tepals oblong-ovate, very acute, $\pm 2^{1/2}$ mm long, in their upper halves dark-brown, often palemargined, subequal or slightly unequal. Stamens 6, slightly shorter than the perianth; filaments rather long; anthers shortly linear-oblong; style $1-1^{1/2}$ mm. Stigmas longish. Capsule broadly obovoid, rounded at the top, distinctly shorter than the perianth, ± 2 mm long. Seeds 3 or fewer, oblong, brown, with a rather large, basal, white elaiosome, faintly reticulate-ribbed, $\pm 1^{1/4}$ mm long.

Distr. Extremely polymorphous, distributed throughout the globe, in *Malaysia*: Philippines

(Luzon) and New Guinea.

Ecol. Alpine grasslands on sandy banks of streams, in recently burnt forest-areas, on slopes in pine-forests, extending into the mossy forest along trails, locally common, 2000-3700 m.

Vern. Veldbies, D, wood rush, E.

Note. In Malaysia hitherto only the above described form has been collected.

Excluded

'Juncus communis MEY.' sec. KURZ, Natuurk. Tijd. N.I. 27 (1864) 221, 'in swampy places round the lime-kiln at Muntok', Banka Island.

I have not traced the specimen on which this record is based, but the fact that *J. communis* = *J. effusus* L. has never been found below 1400 m alt. leads to the conclusion that Kurz's identification is wrong, and that he had before him some Cyperacea.