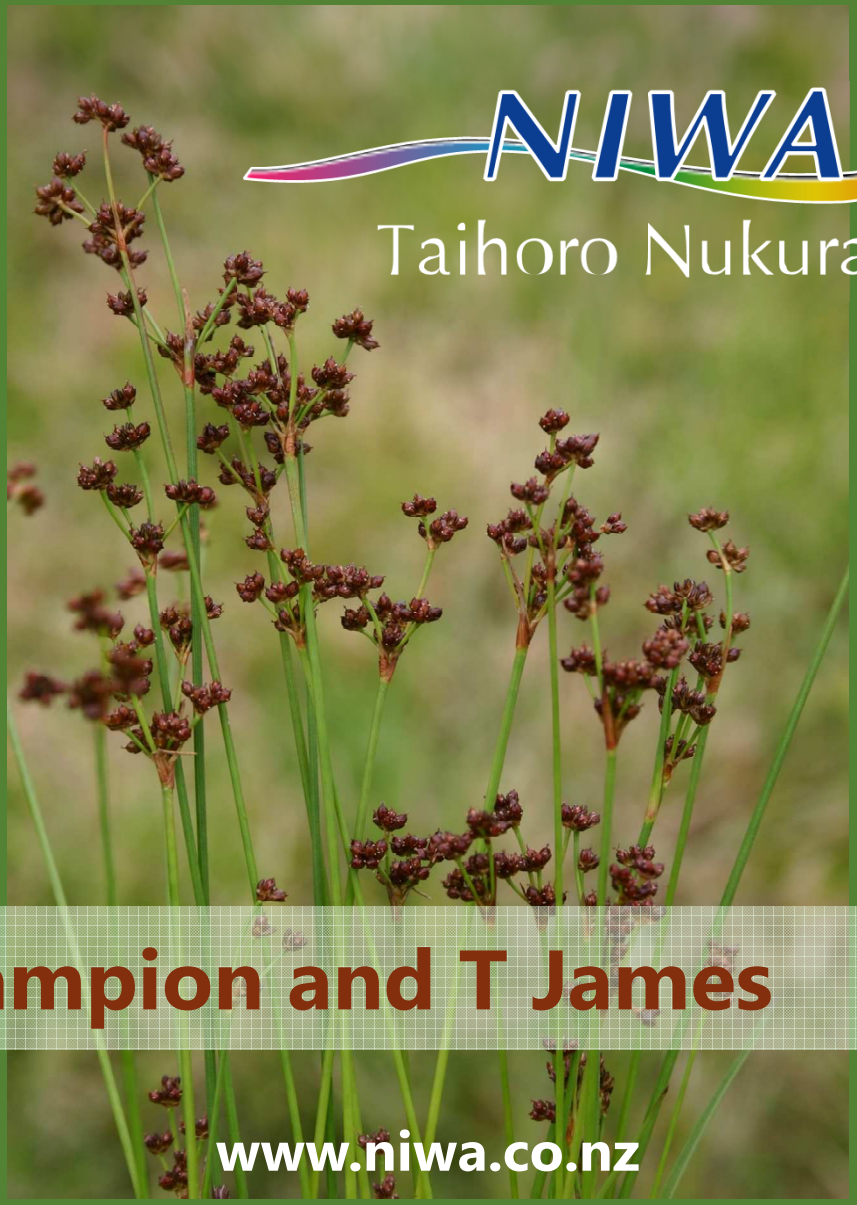
New Zealand Rushes:

field identification guide.

2nd edition



NIWA

Taihoro Nukurangi

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www.niwa.co.nz

New Zealand Rushes: field identification guide.

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Front cover photograph: *Juncus articulatus*
Back cover photograph: Kerry Bodmin (1.5 m tall) in front of *Juncus procerus*

Acknowledgements:

Our thanks to Paula Reeves who helped develop the initial paper based key, to the many participants who tested and improved the key, to DOC for assistance visiting the Subantarctic Islands, to intrepid volunteers in the field, to Nick Singers for live material, and to NIWA staff that help transform the key into an illustrated, web-based version, particularly Aarti Wadhwa (graphics), Jane Robbins and Helen Brider.

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All photographs are by Trevor James (AgResearch), Kerry A. Bodmin (NIWA) or Paul D. Champion (NIWA) unless otherwise stated. Additional images and photographs were kindly provided by Allan Herbarium; Auckland Herbarium; Ros Cole (DOC); Larry Allain (USGS, Wetland and Aquatic Research Center); Forest and Kim Starr; Tasmanian Herbarium (Threatened Species Section, Department of Primary Industries, Parks, Water and Environment, Tasmania); Arthur Haines, New England Wild Flower Society; and Bush Heritage Australia.

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Introduction

Rushes (family Juncaceae) are a common component of New Zealand wetland vegetation and species within this family appear very similar. With over 50 species, *Juncus* are the largest component of the New Zealand rushes and are notoriously difficult for amateurs and professionals alike to identify to species level.

This field identification guide and accompanying factsheets have been developed to enable users with a diverse range of botanical expertise to identify *Juncus* to species level. The best time for collection, survey or identification is usually from December to April as mature fruiting material is required to distinguish between species. Factsheets (hyperlinked and available on the NIWA website) developed for each species provide more detailed information on descriptions for both native and exotic species, distribution within New Zealand, habitat, similar species and photographs of key features.

We hope you find the key and factsheets useful and would welcome any feedback via the NIWA website, or to us directly, kerry.bodmin@niwa.co.nz or paul.champion@niwa.co.nz.

Using the field identification guide

In preparing this field identification guide and factsheets we have used everyday language and have kept botanical terms to a minimum. Any technical terms have an alternative, plain English wording and are identified on accompanying photographs or images. Each step of this key involves two choices, each described and illustrated with image(s) of the characteristic in question. It is therefore important to have mature, fruiting material to use this key.

With your specimen in hand, the first part of this key determines if your specimen is indeed a *Juncus* or one of the other three genera in the Juncaceae family present in New Zealand. The second part of the key breaks the genus *Juncus* down into five sections. The third and final part of the key determines species identification and provides a hyperlink to the species factsheet.

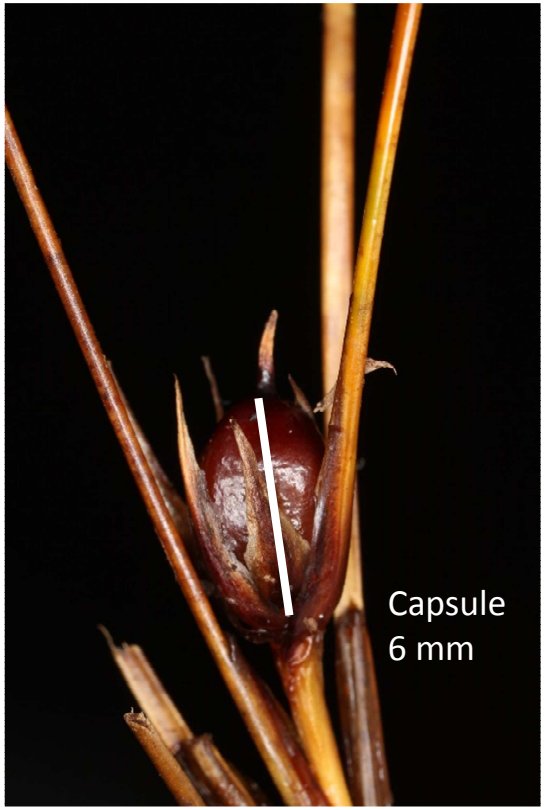
Taxonomic treatment of *Juncus* in this key generally follows the family monograph by Kirschner (2002). Species features and descriptions were taken from Kirschner (2002), as well as the New Zealand Flora volume III (Healy & Edgar, 1972).

Healy AJ, and Edgar E (1980) Flora of New Zealand Volume III: Adventive Cyperaceous, Petalous & Spathaceous Monocotyledons. Botany Division, Department of Scientific and Industrial Research, P. D. Hasselberg, Government Printer, Wellington New Zealand. 220 p.

Kirschner J (2002) *Juncaceae 3: Juncus subg. Agathryon*, *Species Plantarum: Flora of the World* Part 7 (336 p.) and Part 8 (192 p). Australian Biological Resources Study, Canberra.

Key to the genera of Juncaceae

Flowers solitary (one per flowering stem), usually > 5 mm long (pg 6)



Flowers several to many per flowering stem, usually < 5 mm long (pg 7)

Flowers solitary (one per flowering stem), usually > 5 mm long

Tepals twice the length of capsule

Marsippospermum gracile
1-3 leaves per shoot, floral bracts < tepals, seed tailed, SI in moist alpine herbfield, also on Auckland and Campbell Islands.

Tepals more or less = capsule

Rostkovia magellanica
Many leaves per shoot, floral bracts > tepals, seeds not tailed. SI local in mountainous areas of Fiordland and Otago, also on Stewart, Auckland and Campbell Islands

Flowers several to many per flowering stem, usually < 5 mm long

Leaves have no hairs (glabrous), seeds many per capsule (pg 8)

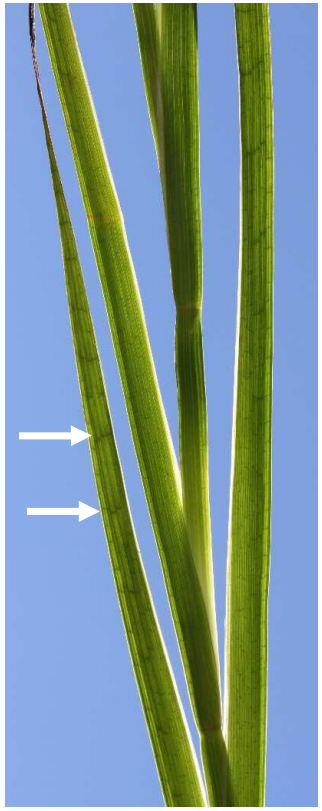
Juncus (continue using key below)

Leaves with scattered white hairs, seeds 3 per capsule

Luzula species (no key to species provided)

Key to sections of *Juncus*

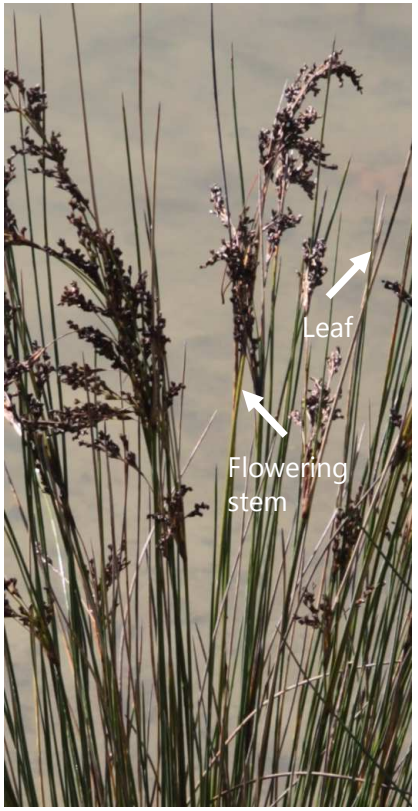
Leaves different from flowering stem (pg 9)



Leaves with cross walls

Flower stems round

Flowering stem and leaves both tall and cylindrical, or leaves reduced to a basal sheath (pg 11)



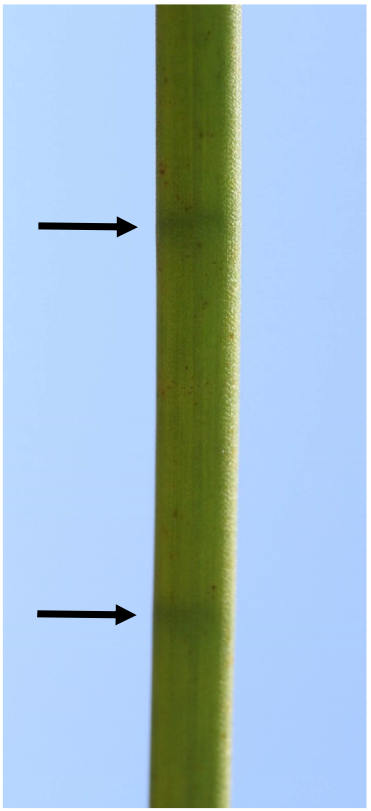
Stem and leaf tall and cylindrical

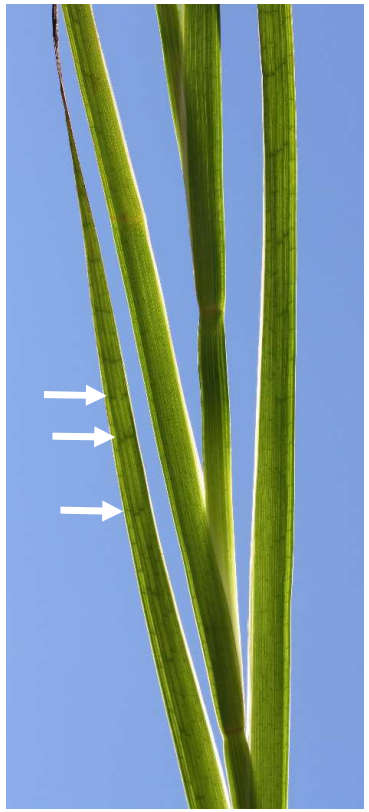
Leaves reduced to brown sheaths at base of flowering stem

Leaves different from flowering stem

Leaves without cross walls (septae) (pg 10)

Leaves with cross walls (septae), hard to see in some species (pg 12)





Ozophyllum and *Iridifolii* (*Septati*)

Leaves without cross walls (septae)

Leaves originate at the base (basal), often broad, grass-like appearance (pg 31)

Graminifolii and *Caespitosi*

Leaves originate at the base and up the stem, usually narrow, often wiry (pg 63)

Steirochloa and *Tenageia* (*Poiophylli*)

Flowering stem and leaves both tall and cylindrical, or leaves reduced to a basal sheath

Leaves tall and round, like flowering stems (pg 37)

Juncus (*Thalassii*)

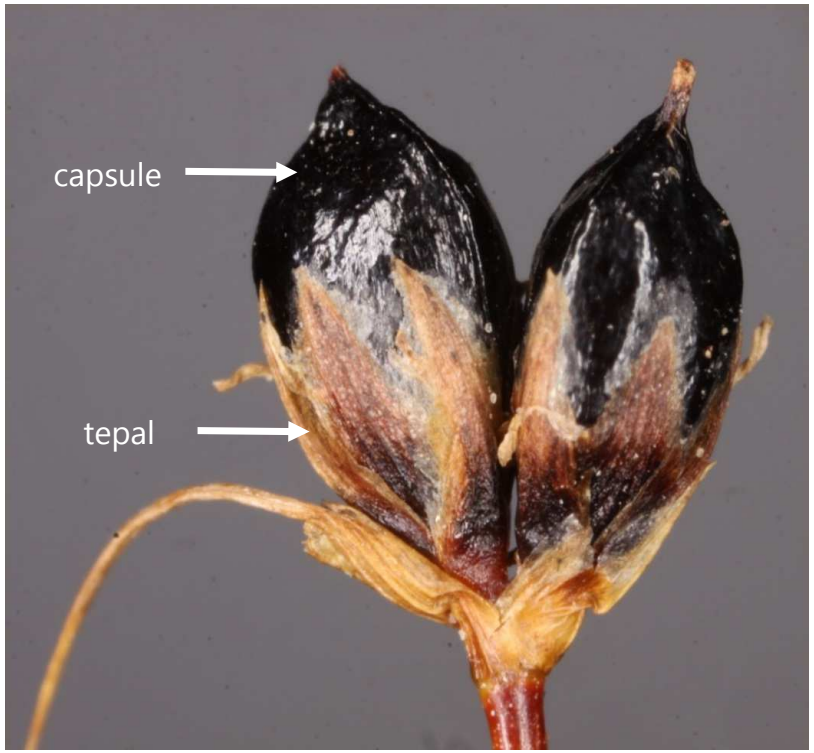
Leaves reduced to basal sheaths, only flowering stems tall (pg 38)

Juncotypus (*Genuini*)

Key to *Juncus* section *Ozophyllum* and *Iridifolii* (*Septati*)

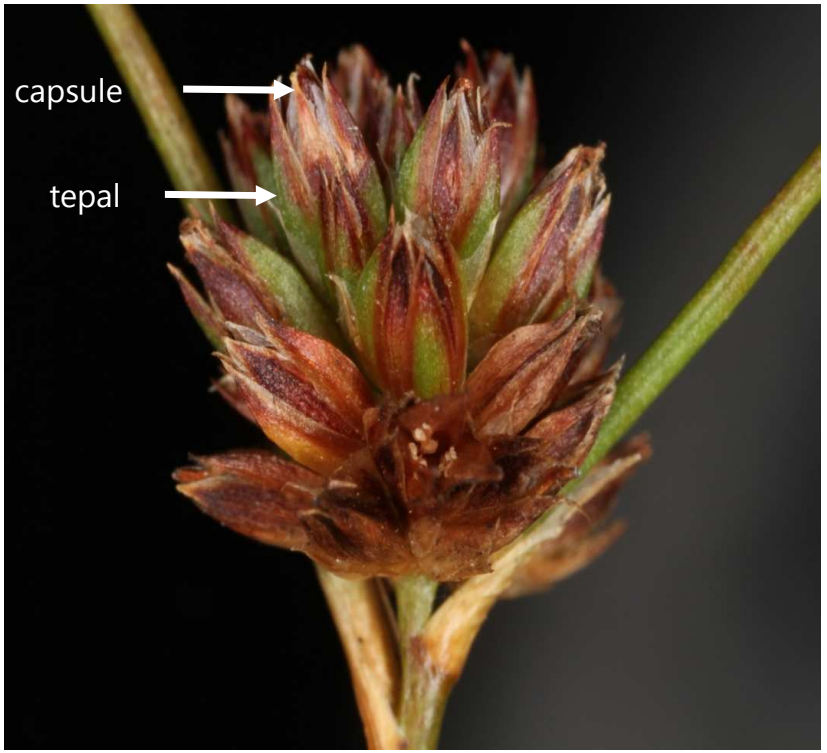
Capsule > tepals, sometimes capsule = tepals

(pg 13)



Capsule ≤ tepals

(pg 22)



Capsule > tepals, sometimes capsule = tepals

Leaves flat, sword shaped (like an iris)
(pg 14)

Leaves round and hollow or bristle-like
(pg 15)

Leaves flat, sword shaped (like an iris)

Leaves blue green, capsules in large black globose heads

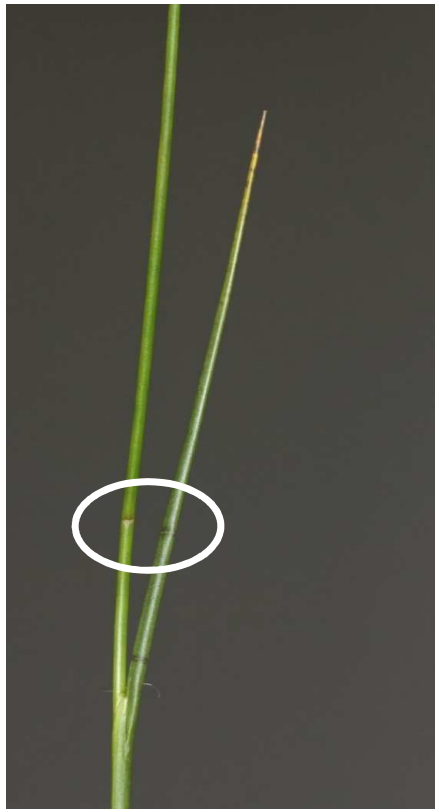
Juncus ensifolius

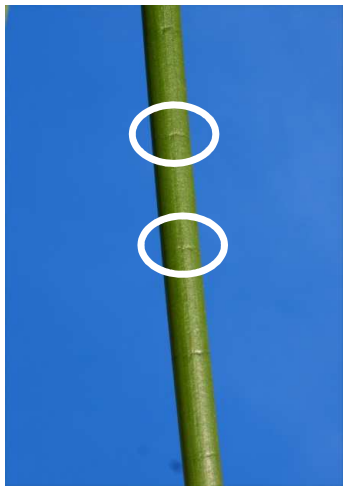
Leaves not blue-green, flower clusters reddish-green

Juncus prismatocarpus

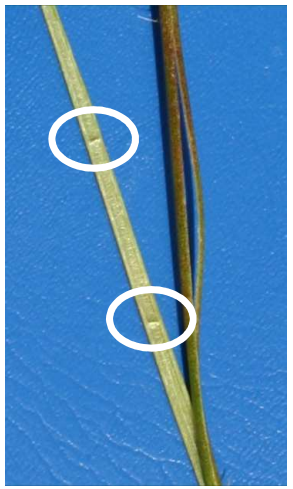
Leaves round and hollow, or bristle-like

Leaves hollow, cross walls (septae) often obvious externally (pg 16)





Leaves bristle-like, cross walls only visible internally (pg 21)



Leaves hollow, septae often obvious externally

One flower head, flowers 3 – 5 (sometimes 8). Subantarctic Islands only

Juncus scheuchzerioides
(note 1 flower head, multiple flowers, 5 flowers here)

Flower heads (clusters) many (>5) (pg 17)

This plant has 8 flower heads, 3 are circled. Each flower head has multiple flowers, indicated by arrows.

Flower heads (clusters) many (>5)

Capsule tapers to tip
(pg 18)

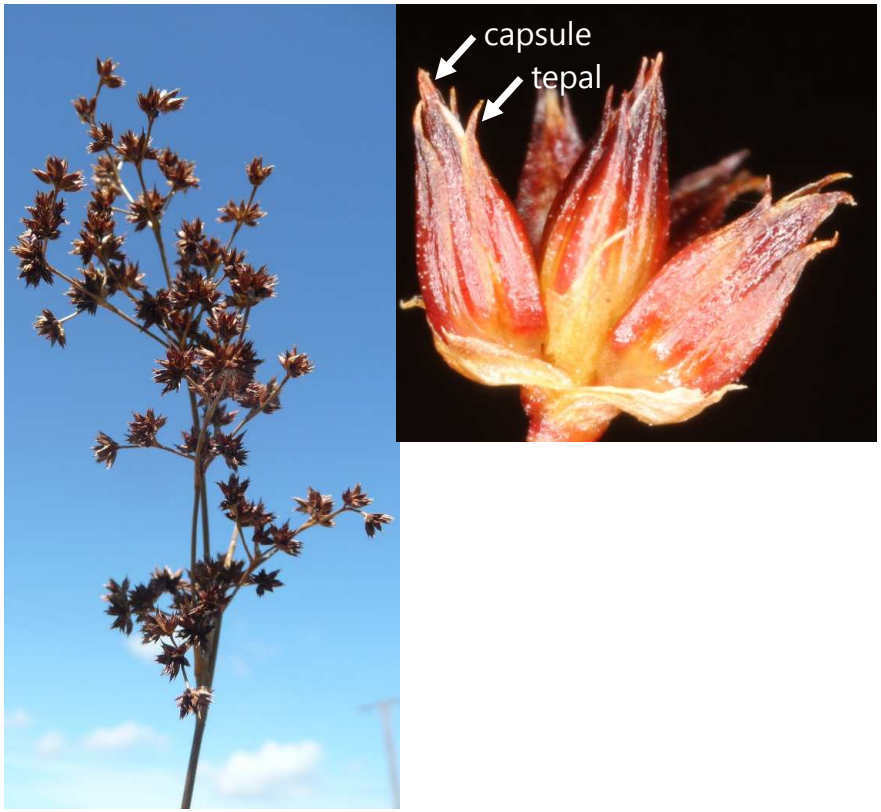
Capsules have a sharp tip (mucronate)
(pg 19)

Capsule tapers to tip

Flower heads 5-20, sparingly branched,
capsule >> tepals, capsule golden brown

Juncus fockei

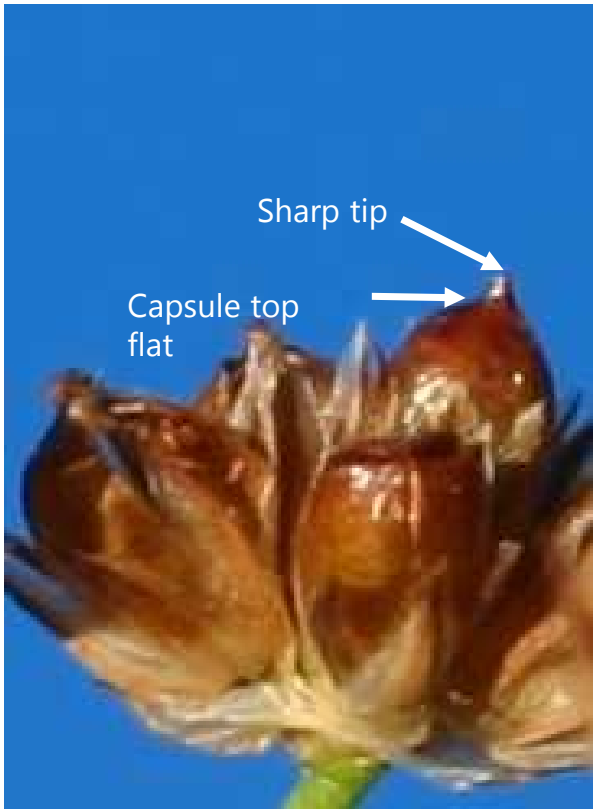
Flower heads 30 – 80, much branched,
capsule > tepals, capsule red-brown



Juncus acutiflorus

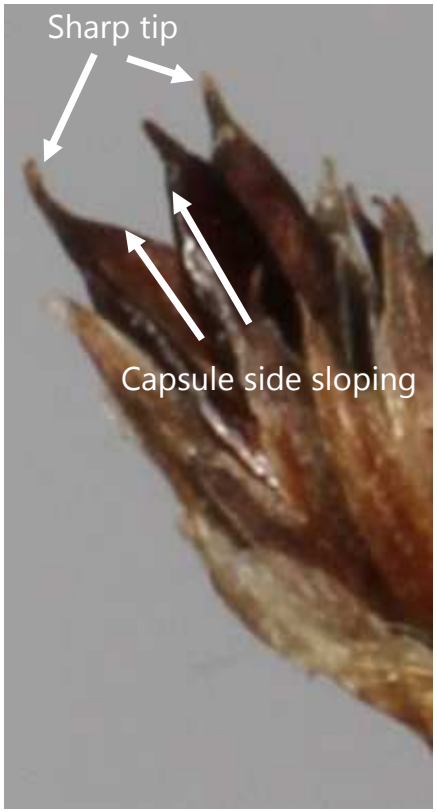
Capsules have a sharp tip (mucronate)

Capsule flat at top with sharp tip, plant very upright



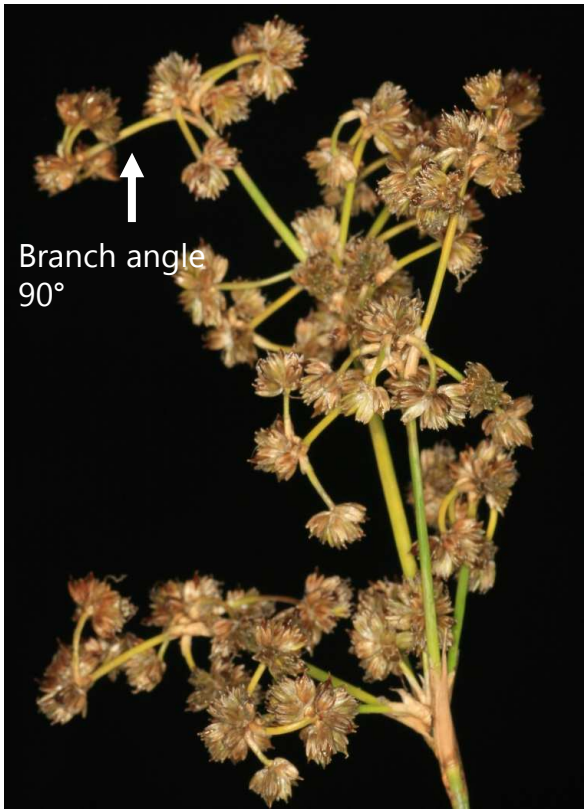
Juncus microcephalus

Capsule sloping to top with sharp tip, plant varies from lax to upright (pg 20)



Capsule sloping to top with sharp tip, plant varies from lax to upright

Flower heads on wide branching stems to 90° or bending down, tepals blunt hooded, capsule brown



Juncus subnodulosus

Flower heads on branching stems << 90°, tepals acute without hood, capsule brown to black

Juncus articulatus

Leaves bristle-like, cross walls only visible internally

Capsule black, cluster of 3-5 flowers, occasionally 2-3 branched

Juncus novae-zelandiae

Capsule yellow-brown, often many branched

Juncus bulbosus

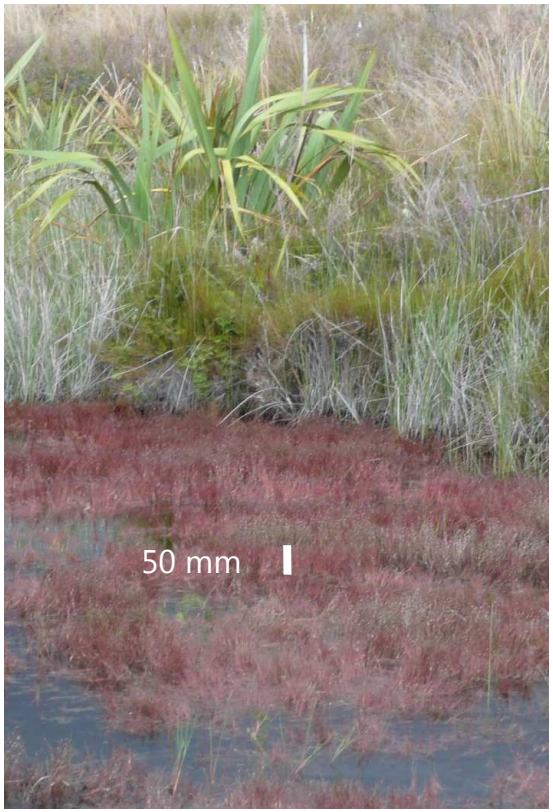
Capsule ≤ tepals

Leaves bristle-like or thread-like (filiform)
(pg 23)

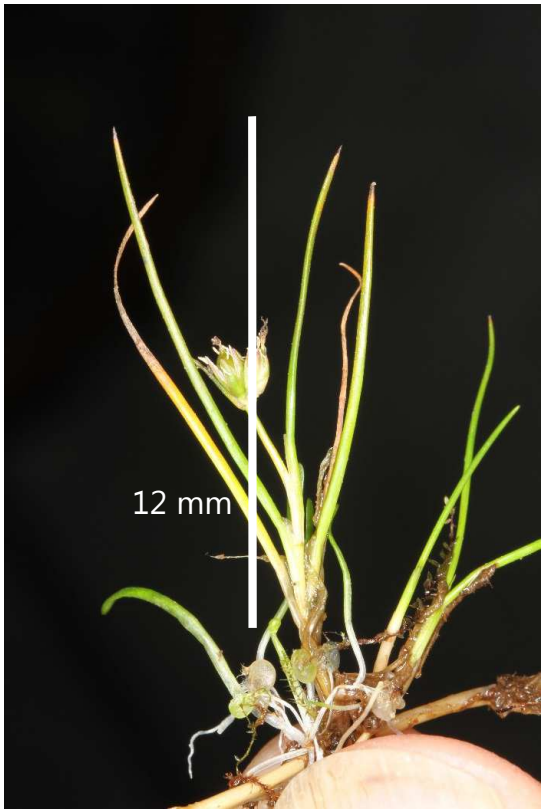
Leaves hollow
(pg 25)

Leaves bristle-like or thread-like

More than one flower head, rarely one flower head with several flowers 3 – 8, plants usually > 2 cm tall (pg 24)



Flower heads solitary, often single flowered sometimes with 2-3 flowers, plants ≤ 2 cm tall



Juncus pusillus

Leaves bristle-like, plants usually >2 cm tall

Many flower heads with 2 - 6 flowers,
plants 5 – 15 cm tall

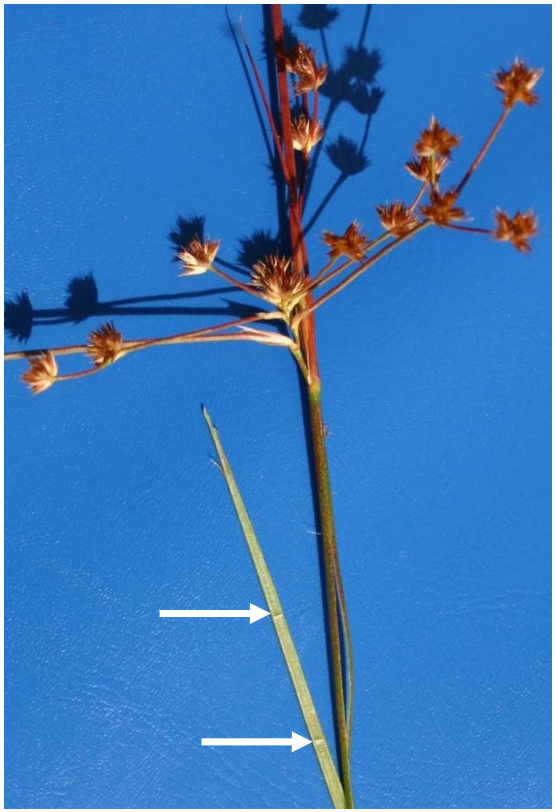
Juncus bulbosus

One flower head with 3 – 5 (sometimes 8) flowers,
plants 2 - 30 cm tall. Subantarctic Islands only

Juncus scheuchzerioides

Leaves hollow

Stem has cross walls below inflorescence
(pg 26)



Stem has no cross walls below inflorescence
(pg 28)

Stem has cross walls below inflorescence

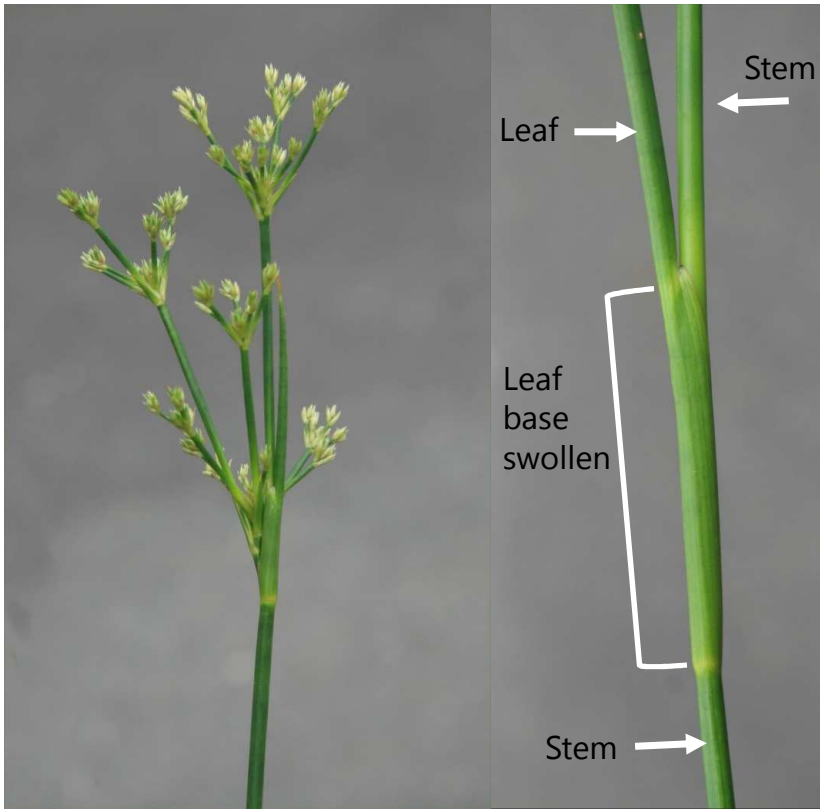
Flower heads globe shaped with > 30 flowers, leaves bristly

Juncus brachycarpus
(Photograph courtesy of Larry Allain, USGS, Wetland & Aquatic Research Center)

Flower heads with <30 flowers, leaves not bristly (pg 27)

Flower heads with <30 flowers, leaves not bristly

Plant green, stiffly erect dense clumps, base of leaf swollen, capsules and tepals 3.5 mm – 4.5 mm long



Juncus canadensis

Plant often reddish, with erect open clumps, capsules and tepals 2.5 mm – 3.5 mm long

Juncus acuminatus

Stem has no cross walls below flower head (inflorescence)

Flower heads 1 – 3

Juncus scheuchzerioides
(note 1 flower head with five flowers)

Flower heads > 5
(pg 29)

This plant has 8 flower heads, 3 are circled. Each flower head has multiple flowers, indicated by arrows.

Flower heads > 5

Capsule depressed at top with a sharp tip (mucronate)

Juncus microcephalus

Capsule tapered to tip (pg 30)

Capsule tapered to tip

Capsule 3.5 mm – 4.5 mm long

Juncus holoschoenus

Capsule < 3.5 mm long

Juncus acutiflorus

Key to *Juncus* section *Graminifolii* and *Caespitosi*

Leaves flat towards tip, flower head a cluster with each flower stalk originating from a central point (pg 32)

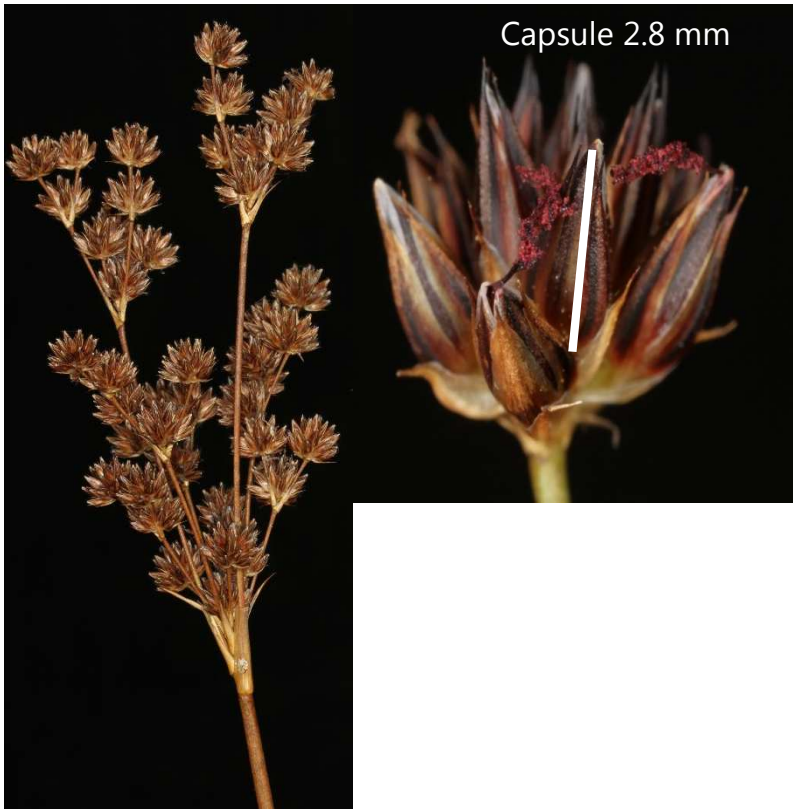
Leaves not flat, usually a single flower head, flower stalks rarely originate from a central point (pg 34)

Leaves flat towards tip, flower head a cluster with each flower stalk originating from a central point

Capsule ~2 mm long

Juncus planifolius

Capsule 2.5 mm - 3 mm long
(pg 33)

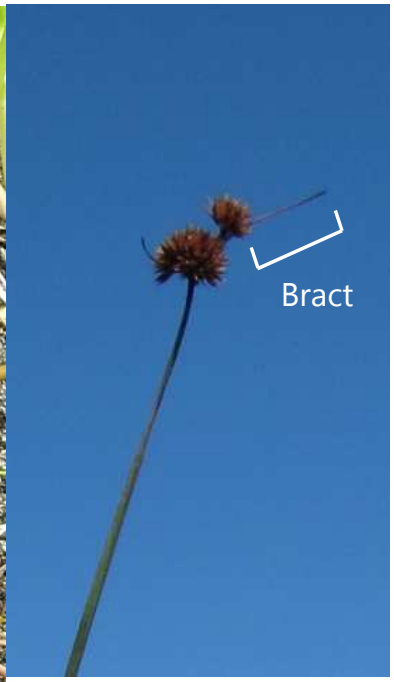


Capsule 2.5 mm - 3mm long

Leaves > 5 mm wide, modified leaf (bract) < flower head

Juncus lomatophyllus

Leaves < 5 mm wide, modified leaf (bract) > flower head



Juncus sonderianus

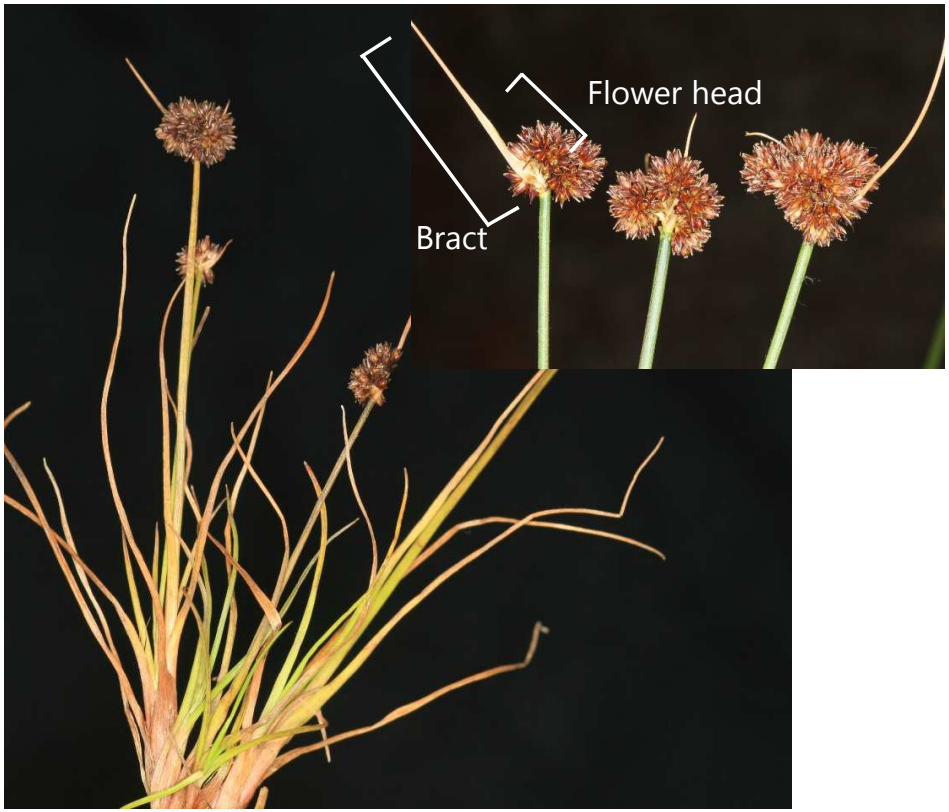
Leaves not flat, usually a single flower head, flower stalks rarely originate from a central point

Tepals ≤ 3 mm
(pg 35)

Tepals > 3 mm
(pg 36)

Tepals ≤ 3 mm

Plant usually > 10 cm tall, channelled leaves, modified leaf (bract) longer than flower head



Juncus caespiticius

Plant usually < 10 cm tall, modified leaf (bract) not conspicuous

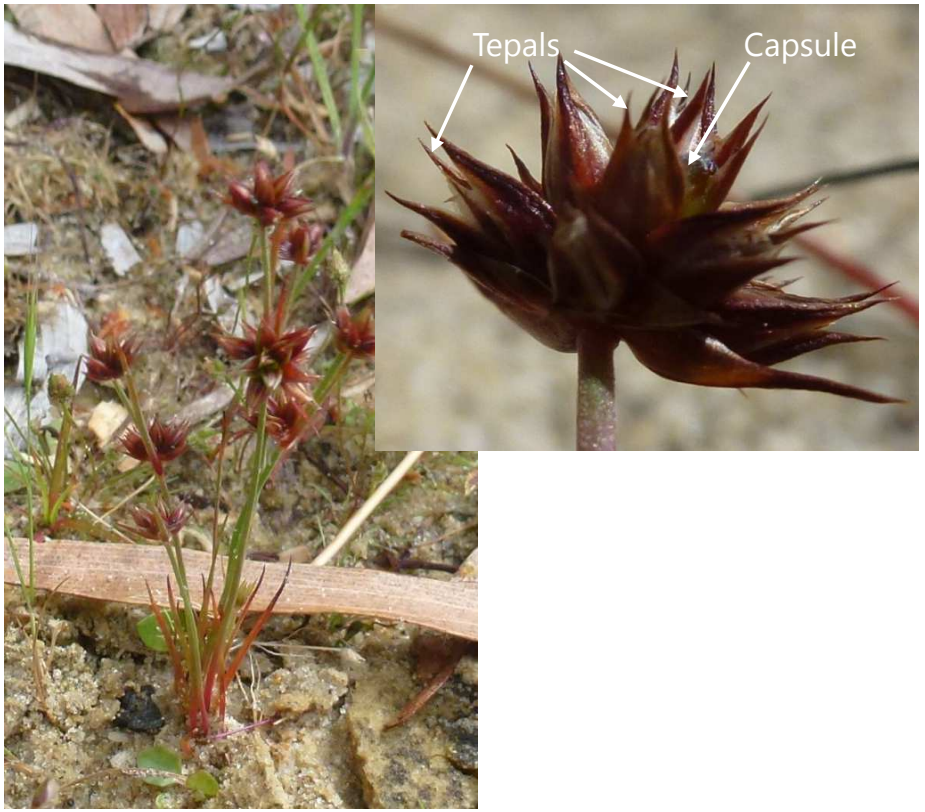
Juncus antarcticus
(photograph courtesy of R Cole, Department Of Conservation)

Tepals > 3 mm

Plant usually > 10 cm tall, channelled leaves, flower head often more than one cluster, tepals longer than capsule

Juncus sonderianus

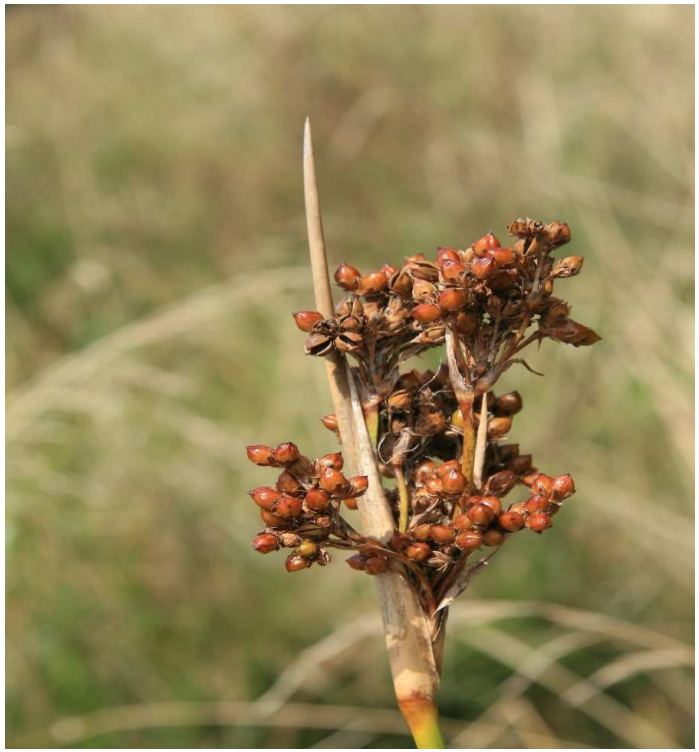
Plant usually < 10 cm tall, leaves bristle like, flower head usually a single cluster, tepals much longer than capsule



Juncus capitatus

Key to *Juncus* section *Juncus* (*Thalassii*)

Flower head one dense cluster, capsules red-brown > 4mm long



Juncus acutus

Flower head many clusters, capsules dark brown < 3.5 mm long

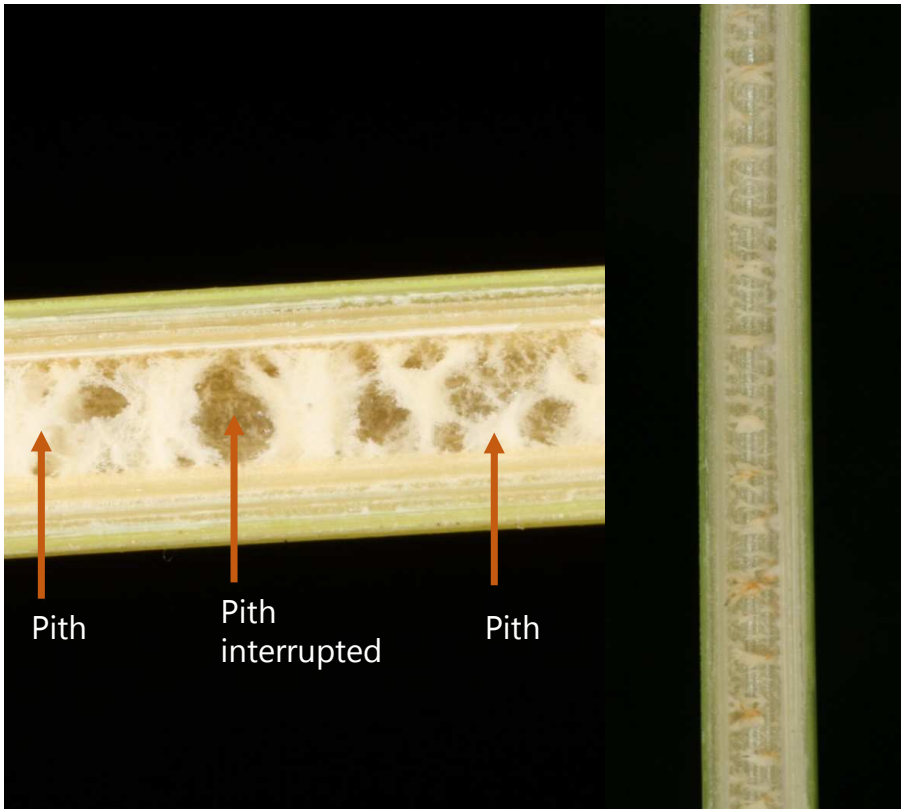
Juncus kraussii

Key to *Juncus* section *Juncotypus* (*Genuini*)

all species found in damp pasture or swamp margins

Pith in stem continuous
(pg 39)

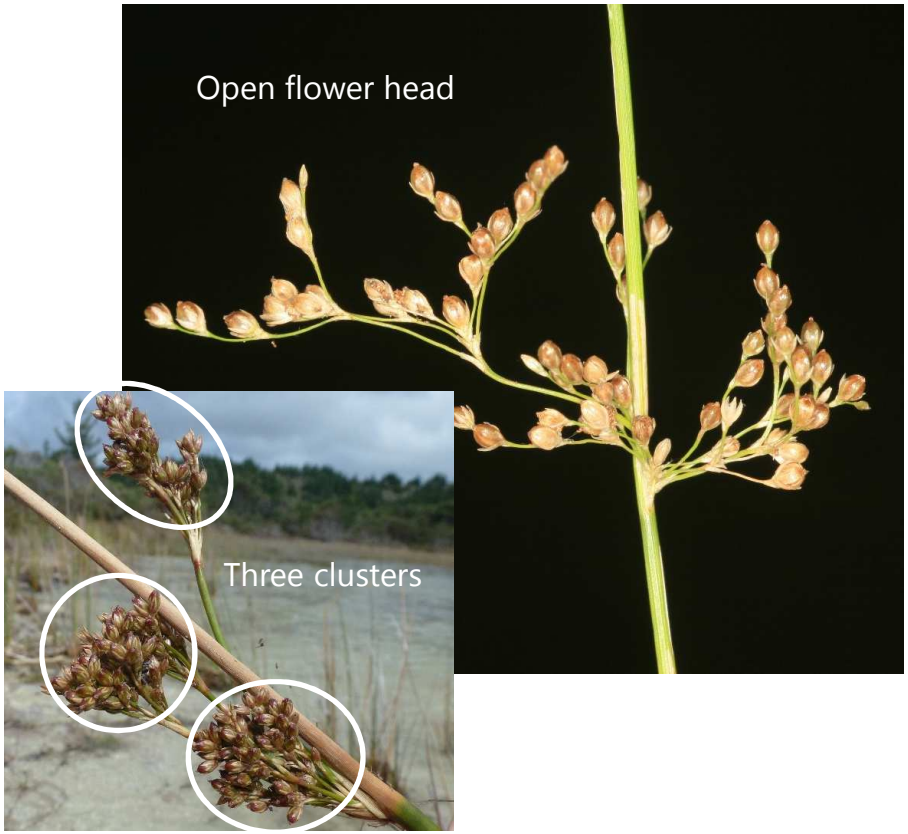
Pith in stem interrupted or lacking
(pg 49)



Pith continuous

Flower head a single dense cluster, rarely two clusters (pg 40)

Flower head open, with more than one cluster (pg 41)

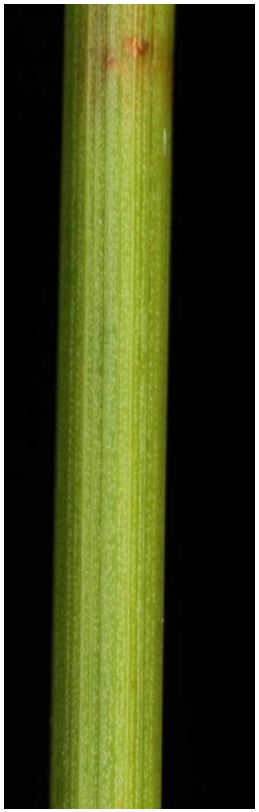


Flower head a single dense cluster, rarely two clusters

Stem shiny, modified leaf behind flower head not expanded

Juncus effusus

Stem dull, ridged, modified leaf (bract) expanded behind flower head



Juncus conglomeratus

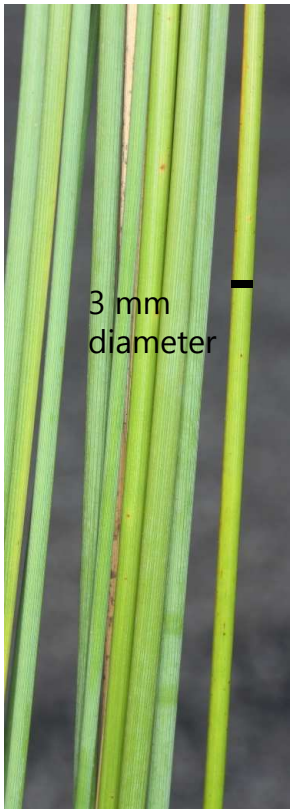
Flower head open, with more than one cluster

Stems clearly ridged
(pg 42)

Stems smooth to touch or ridges >30
(pg 45)

Stems clearly ridged

Stem hard, grey-green to blue-green, ≥ 2 mm diameter



Juncus sarophorus

Stem ≤ 2 mm, soft, green to yellow-green (pg 43)

Stem <5 mm, soft, green to yellow-green

Flowers densely clustered at branch tips

Juncus vaginatus

(Image courtesy of Tasmanian Herbarium, Threatened Species Section, Department of Primary Industries, Parks, Water and Environment, Tasmania)

Flowers loosely clustered or solitary
(pg 44)

Flowers loosely clustered or solitary

Flowers solitary in rows along slender branches, stems ≤ 2 mm wide

Juncus usitatus

Flowers loosely clustered, occasionally solitary, stems ≥ 2 mm wide

Juncus continuus

(Both images Allan Herbarium, CHR copyright, Landcare Research)

Stems smooth to touch or ridges >30

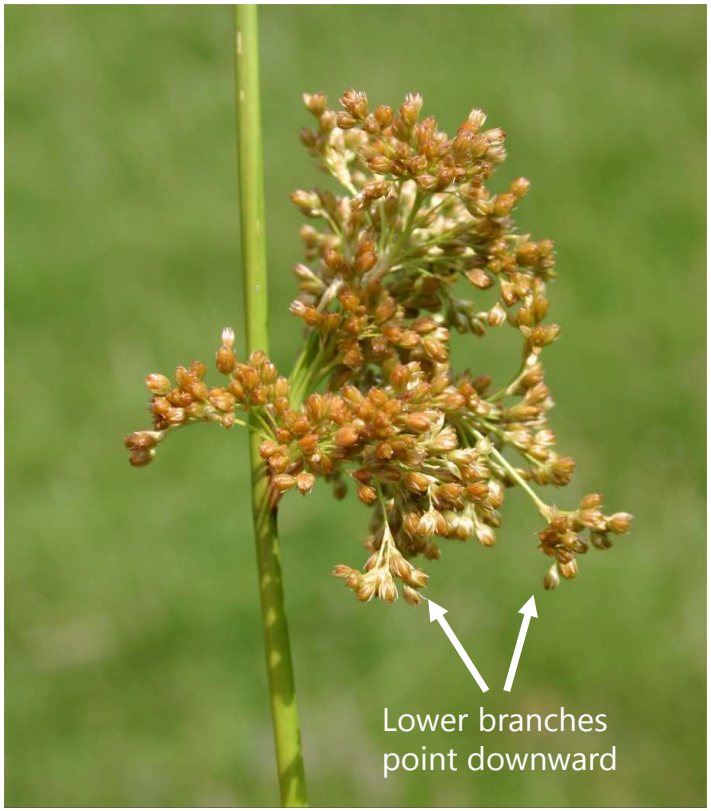
Pith cobwebby
(pg 46)

Pith not cobwebby, stems wiry
(pg 48)

Left image: Allan Herbarium, CHR copyright, Landcare Research

Pith cobwebby

Lower flower branches downward pointing



Juncus effusus

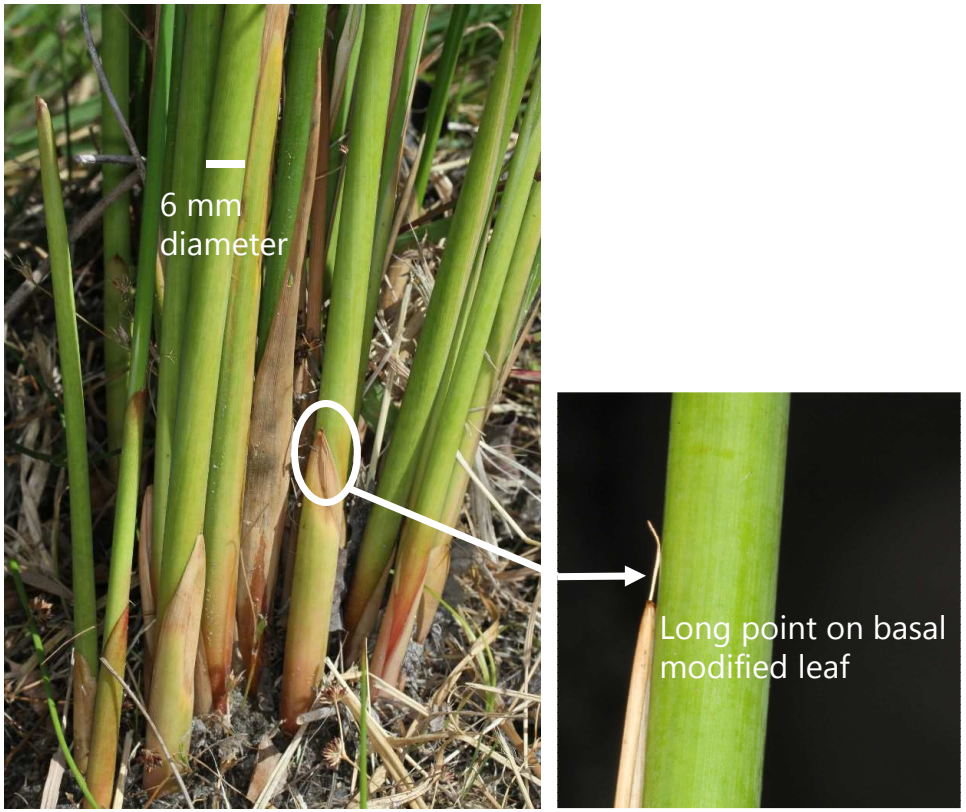
Lower flower branches upward pointing
(pg 47)

Lower flower branches upward pointing

Stem < 4 mm wide and bright green, no sharp tip on modified leaf

Juncus continuus
(Allan Herbarium, CHR copyright, Landcare Research)

Stem > 4 mm wide and pale green, long thin point on modified leaf



Juncus pallidus

Pith not cobwebby, stems wiry

Flowers clustered at branch tips

Juncus edgariae

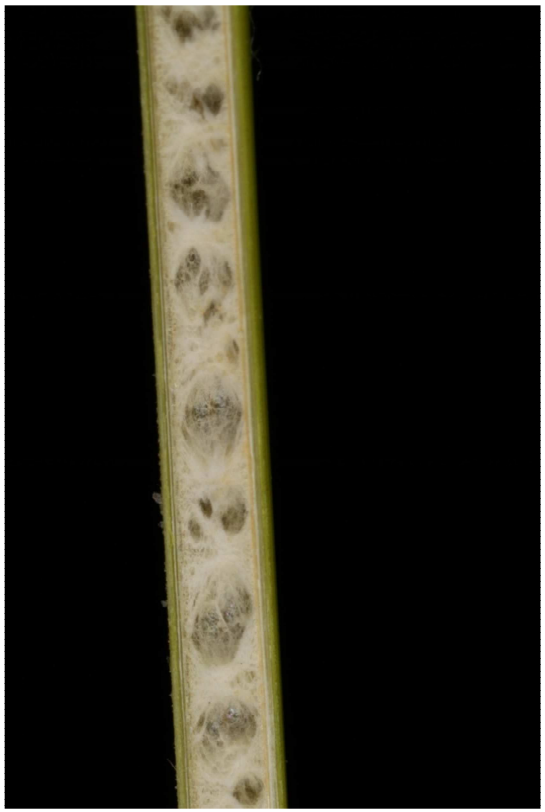
Flowers evenly distributed on branches

Juncus pauciflorus

Image left: Allan Herbarium, CHR copyright, Landcare Research;
Image right: Auckland Museum Herbarium

Pith in stem interrupted or lacking

Pith interrupted
(pg 50)



Pith lacking

Juncus australis

Pith interrupted

Flowers grouped at branch ends
(pg 51)

Flowers evenly distributed along branches
(pg 58)

Flowers grouped at branch ends

Flower head open or a cluster ≥ 10 mm across (pg 52)

Flower head a cluster ≤ 10 mm across, often with smaller clusters above (pg 56)

Flower head open or a cluster ≥ 10 mm across

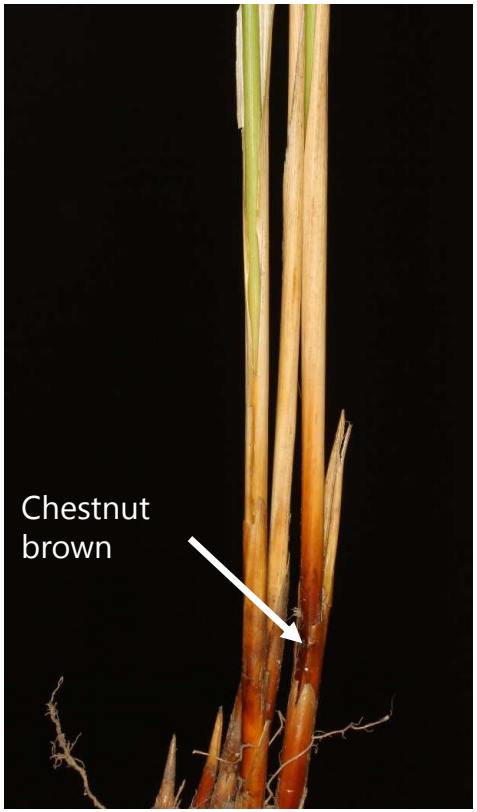
Stems bright green, capsules ≤ 2 mm long

Juncus edgariae

Stems not bright green, capsules 2-3.5 mm long (pg 53)

Stems not bright green, capsules 2-3.5 mm long

Basal sheaths shining red or chestnut brown at base (pg 54)



Basal sheaths very dark red-purple to black or dull brown at base (pg 55)

Basal sheaths shining red or chestnut brown at base

Flower head one or more clusters

Juncus australis

Flower head fan-like

Juncus flavidus

Basal sheaths very dark red-purple to black or dull brown at base

Stem > 3.5 mm across

Juncus procerus

Stem < 3.5 mm across

Juncus amabilis

Flower head a cluster ≤ 10 mm across, often with smaller clusters above

Stems > 1.5 mm

Juncus edgariae

Stems < 1.5mm
(pg 57)

Stems < 1.5mm

Flowers in 2 or more clusters, capsule ≥ tepals

Juncus distegus

Flowers in one cluster, capsule slightly < tepals

Juncus filicaulis

Flowers evenly distributed on branches

Basal sheaths dark purple or red-purple to black (pg 59)

Basal sheaths pale to dark brown, or pinkish to red-brown (pg 60)

Basal sheaths dark purple or red-purple to black

Plant < 1 m tall, stem soft, capsule ≥ 2.5 mm

Juncus inflexus

Plant 1 - 2 m tall, stem hard, capsule ≤ 2.5 mm

Juncus sarophorus

Basal sheaths pale to dark brown, or pinkish to red-brown

Stem ridges distinct, base sheaths pink or red-brown (pg 61)

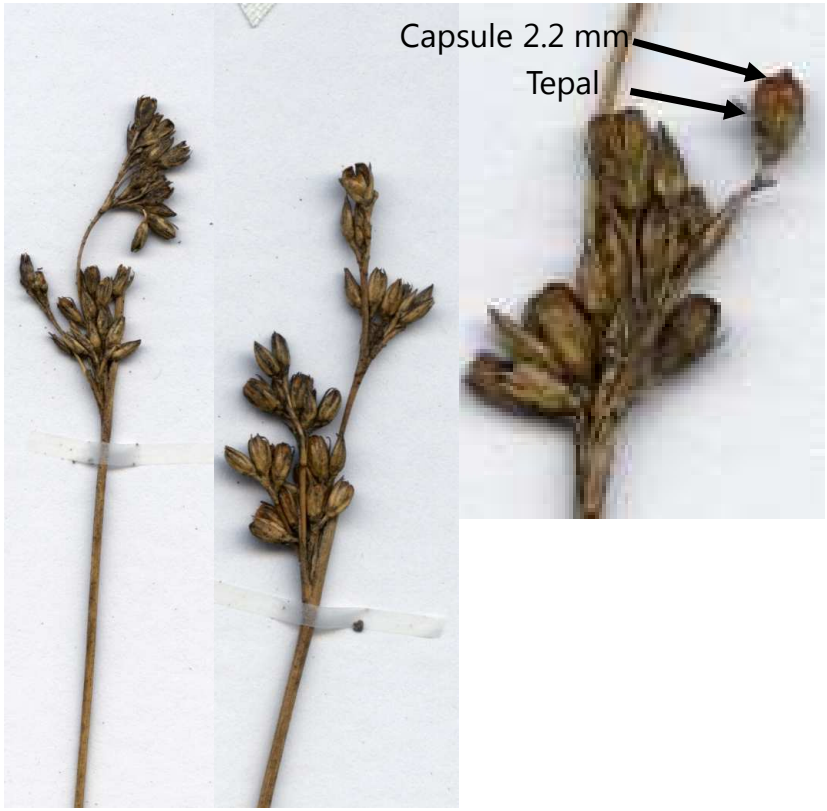
Right image: Allan Herbarium, CHR copyright, Landcare Research

Stem ridges not distinct, base sheaths golden to dark straw brown (pg 62)

Both images: Forest and Kim Starr

Stem ridges distinct, base sheaths pink or red-brown

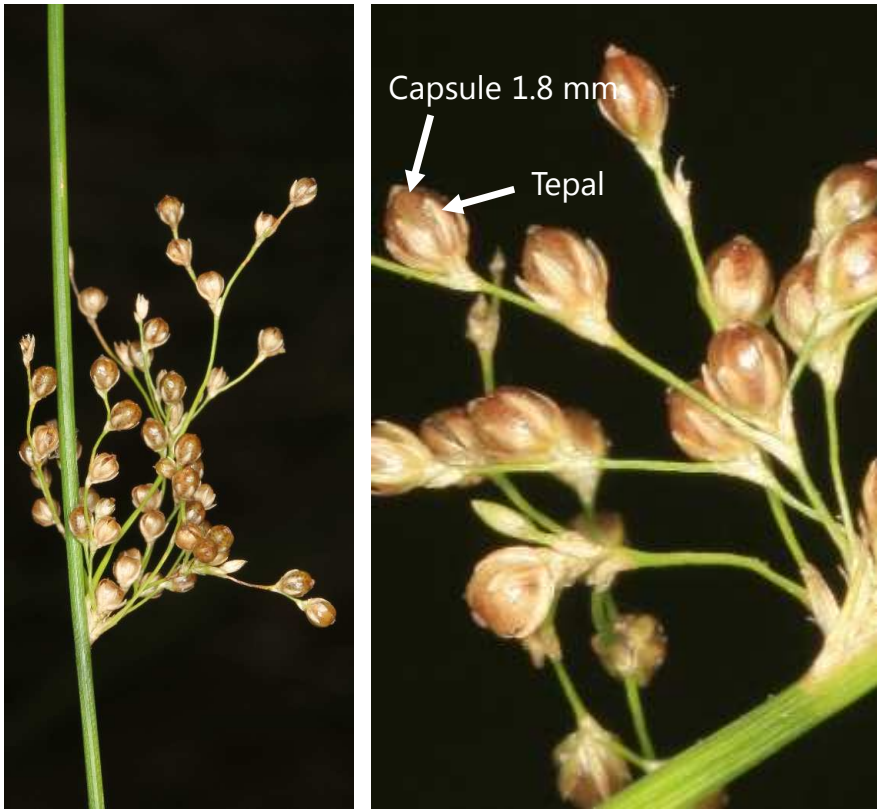
Stem hard, flowers clustered to solitary, capsule > 2 mm



Juncus subsecundus

Both images: Auckland Museum Herbarium

Stem soft, flowers solitary and evenly spaced, capsule < 2 mm



Juncus usitatus

Stem ridges not distinct, base sheaths golden to dark straw brown

Stem yellow-green, flowers solitary

Juncus ochrocoleus

Stem grey-green, flowers clustered to solitary

Juncus polyanthemus

(Left image courtesy of Bush Heritage Australia)

Key to *Juncus* sections *Steirochloa* and *Tenageia* (*Poiophylli*) also *Ozophyllum* with indistinct septae

Flowers evenly distributed on branch / branchlets (pg 64)

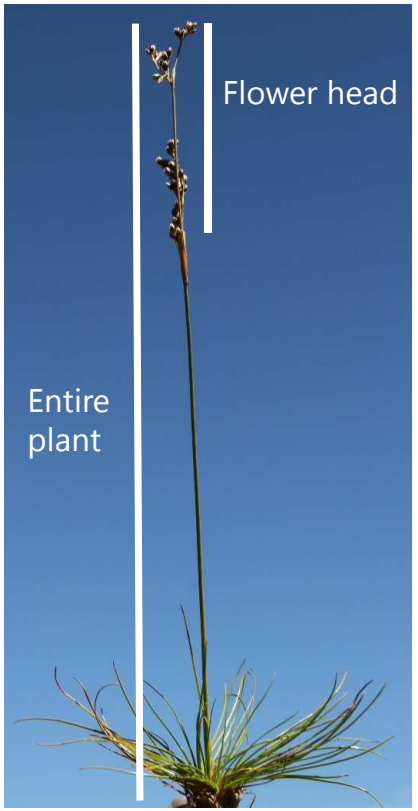
Flowers clustered into one or more heads (pg 69)

Flowers evenly distributed on branch / branchlets

Flower head 2/3 length of entire plant

Juncus bufonius

Flower heads < ½ length of entire plant (pg 65)



Flower head < ½ length of entire plant

Leaves tough, wiry, reflexed above sheath

Juncus squarrosus

Leaves not reflexed above sheath
(pg 66)

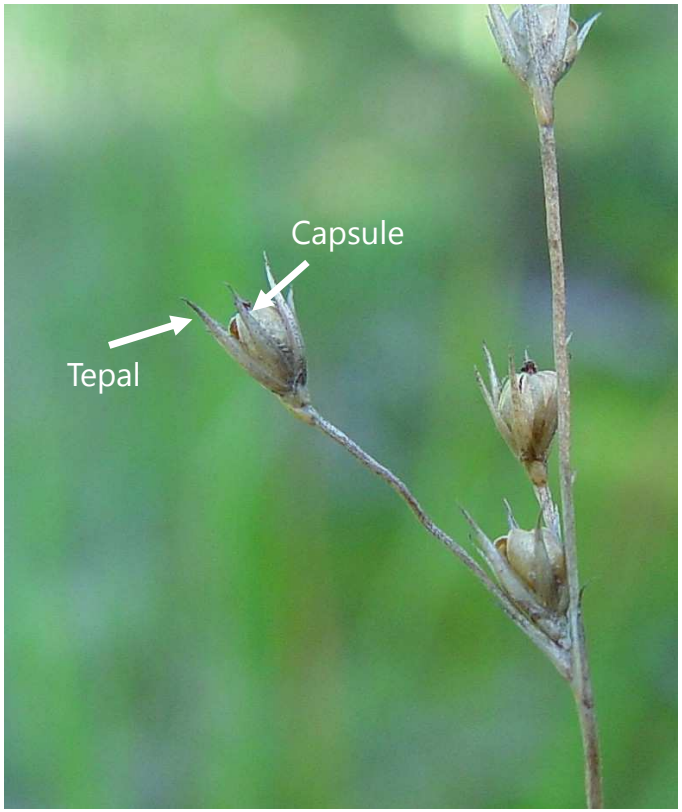
Leaves not reflexed above sheath

Leaves with prominent ear-like membranes (pg 67)

Leaves lacking prominent tongue-like auricles (pg 68)

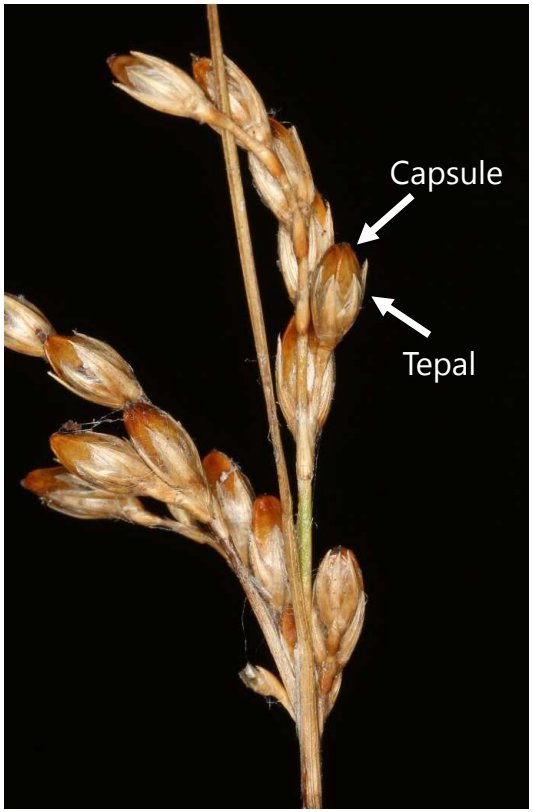
Leaves with prominent ear-like membranes (auricles)

Capsules < tepals



Juncus anthelatus

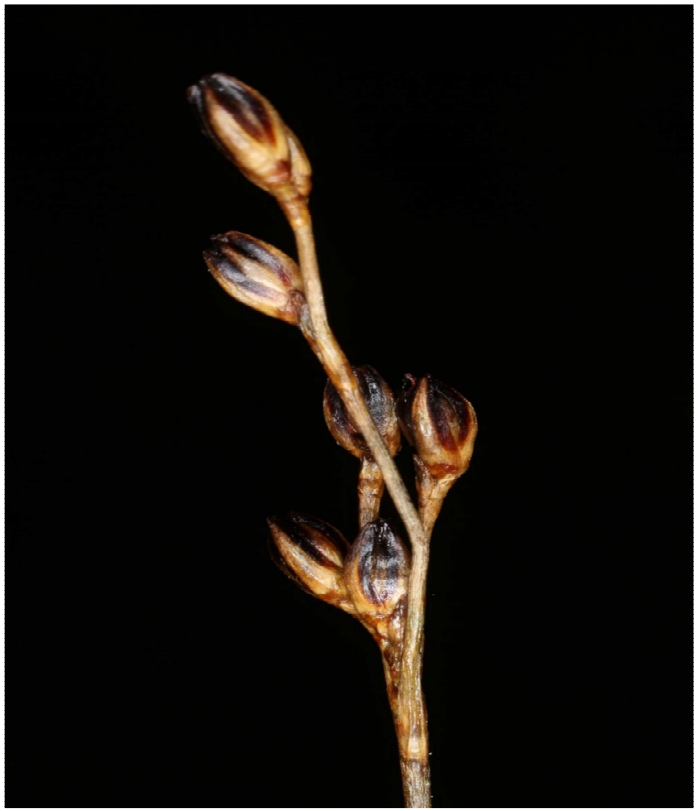
Capsules ≥ tepals



Juncus imbricatus

Leaves lacking prominent tongue-like auricles

Capsules black, tepals clasps the capsule



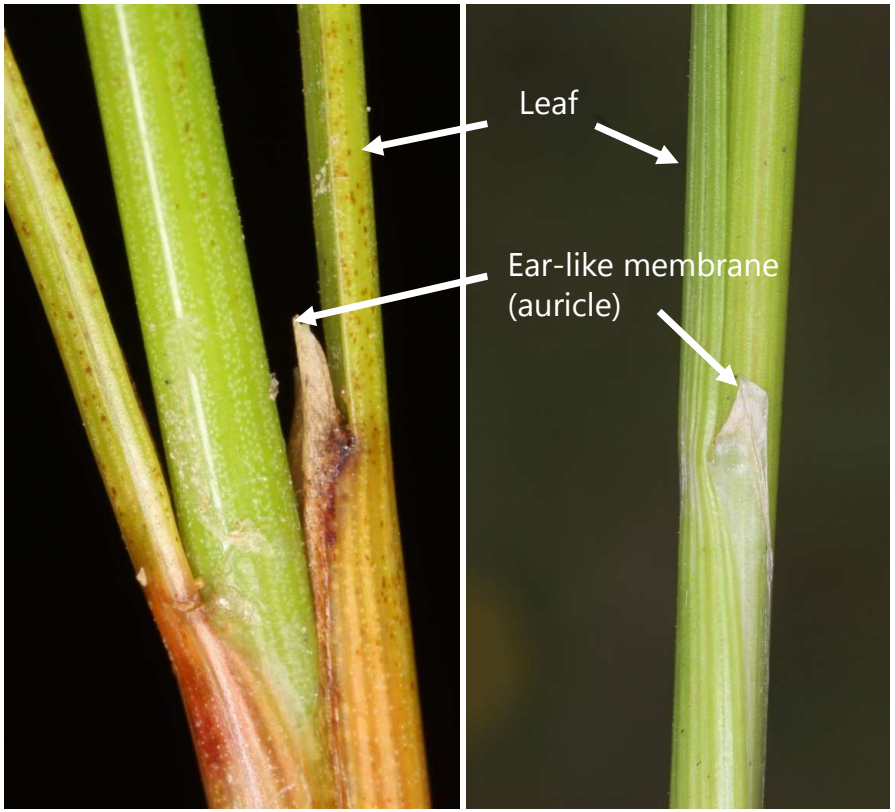
Juncus gerardii

Tepals and capsules light brown, tepals arch away from capsule

Juncus dichotomus

Flowers clustered into one or more heads

Leaves with prominent ear-like membrane



Juncus tenuis

Leaves without prominent ear-like membrane
(pg 70)

Leaves without prominent ear-like membrane

Capsules black and shiny

Juncus novae-zelandiae

Capsule brown
(pg 71)

Capsule brown

Leaves thread-like, plants ≤ 2 cm tall

Juncus pusillus

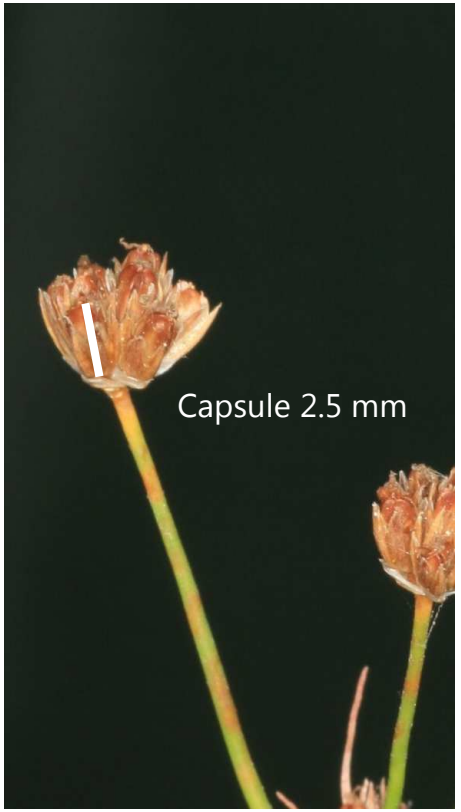
Leaves bristle-like or narrow, plants > 2 cm tall
(pg 72)

Leaves bristle-like or narrow, plants > 2 cm tall

Capsule ≥4.5 mm long, capsule < tepals

Juncus homalocaulis

Capsule 2 – 3 mm long, capsule ≥ tepals



Juncus bulbosus

Notes

Notes

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