CAMPYLOPUS

Niels Klazenga

Campylopus Brid., Muscol. Recent., Suppl. 4: 71 (1818); from the Greek kampylos (bent) and pous (a foot), in reference to the cygneous setae that characterise Campylopus and some related genera.

Type: C. flexuosus (Hedw.) Brid.

Dioicous. Plants small to robust, growing in turfs; sterile shoots uniformly foliate; fertile shoots or those with propagulous branches often distinctly comose. Stems simple to sparingly branched, sparingly to densely tomentose; central strand well-developed; rhizoids originating from the central abaxial costa at leaf bases. Leaves erect to appressed when dry, erecto-patent to curved outwards when wet, narrowly ovate-lanceolate to subulate; apex concolorous or hyaline, often with a straight to reflexed hairpoint; margin plane, entire throughout to variably ornamented above; costa very wide, occupying 25–67% of the leaf width, subpercurrent to long-excurrent, smooth to strongly ribbed abaxially, often toothed towards the leaf apex; in cross section differentiated into adaxial tissue, a central layer of guide cells, and abaxial tissue; adaxial tissue a single layer of hyalocysts or other cells with large lumina, or of 1 or more layers of stereids; abaxial tissue differentiated into bundles of stereids or substereids alternating with guide cells; epidermis directly below the guide cells, the epidermis cells alternating with guide cells; abaxial epidermis cells with or without a distinct lumen.

Perichaetial and perigonia on short innovations clustered at shoot apices; perichaetial leaves ±similar to vegetative leaves or variously different. Calyptra cucullate, with a fimbriate basal margin. Seta cygneous. Capsules long-exserted, erect to slightly cernuous, ellipsoidal, often slightly asymmetrical; exothecial cells elongate to short-linear, with strongly thickened lateral walls and thin end walls; annulus revoluble. Peristome either Campylopus-type or Thysanomitrion-type; operculum high-conical to rostrate above the conical base. Spores spherical, ±smooth to finely papillose.

Campylopus, a large cosmopolitan genus of c. 160 species, is characterised by a very broad costa and a cygneous seta. Traditionally, Campylopus has been classified in subfamily Campylopodioideae of the Dicranaceae. However, there is strong evidence from DNA sequences that Campylopus and some other genera in Campylopodioideae are more closely related to the Leucobryaceae (La Farge et al., 2000), and in the most recent classification (Goffinet et al., 2012), it has been included in that family.

Two subgenera are recognised, viz. subg. Campylopus and subg. Thysanomitrion (Frahm, 1983), based on the type of peristome. Thus, the Campylopus-type peristome is ±orange below, colourless above and with narrowly triangular teeth that are asymmetrically split in the distal half to two-thirds. The outer face is striate with cross-connections in the basal half and papillose above, and the inner face is smooth in the basal half and papillose above. In contrast, the Thysanomitrion-type peristome is colourless throughout, and the uniformly papillose teeth are split to the base into two filiform segments of almost equal width. Other characters that ±coincide with the subgeneric division, such as the basal laminal cells being

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hyaline or chlorophyllose are less reliable at this taxonomic level. As sporogones are unknown in some Australian taxa, the subgeneric division has not been adopted here.

The Australian species of Campylopus have been the subject of two relatively recent revisions (Frahm, 1987, 1994). However, the species circumscriptions in the current treatment differ markedly from those of the earlier treatments. Important diagnostic gametophore characters for the identification of Australian species include (i) the presence or absence of chlorophyllose basal laminal cells; (ii) the presence or absence of hairpoints; (iii) hairpoints being straight or reflexed; (iv) the shape and, especially, the pittedness of the upper laminal cells; (v) shape and pittedness of the transition cells between hyaline and chlorophyllose; and (vi) the presence of adaxial stereids or hyalocysts in the costa. No characters diagnostic at the species level have been found in the sporogone.

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**C. introflexus**

- Basal lamina directly above alar patches entirely occupied by thin-walled hyaline cells.
- Hairpoints reflexed.
- Chlorophyllose laminal cells not pitted.
- Upper laminal cells conspicuously pitted; costa very broad, occupying at least 65% of the leaf width.
- Costa with adaxial stereids, at least in the upper part of the leaf.
- Adaxial stereids in a single layer; at least the lower chlorophyllose laminal cells elongate and pitted.
- Leaves straight or curved, not much altered when dry, narrowly ovate-lanceolate; upper laminal cells rhomboidal to oval or rhomboidal to rectangular.
- Costa occupying c. two-thirds of the leaf width, abaxially smooth throughout or scabrous at the apex.
- Upper laminal cells rhomboidal to oval.
- Costa in upper half with adaxial stereids.
- Leaf apices obtuse, cucullate (comal leaves can have a hyaline point); costa with conspicuous side nerves.

**C. perauriculatus**

- Basal lamina directly above alar patches partly occupied by firm- to thick-walled often pitted chlorophyllose cells, often with a hyaline border.
- Hairpoints straight or lacking.
- Chlorophyllose laminal cells not pitted.
- Upper laminal cells not or inconspicuously pitted; costa occupying less than 60% (usually less than 50%) of the leaf width.
- Costa with adaxial stereids, at least in the upper part of the leaf.
- Costa abaxially with hyalocysts or cells with a large lumen throughout.
- Adaxial stereids in a single layer; at least the lower chlorophyllose laminal cells elongate and pitted.
- Leaves straight or curved, not much altered when dry, narrowly ovate-lanceolate; upper laminal cells rhomboidal to oval or rhomboidal to rectangular.
- Costa occupying c. two-thirds of the leaf width, abaxially smooth throughout or scabrous at the apex.
- Upper laminal cells rhomboidal to oval.
- Costa in upper half with adaxial stereids.
- Leaf apices obtuse, cucullate (comal leaves can have a hyaline point); costa with conspicuous side nerves.

**C. appressifolius**

- Basal lamina directly above alar patches partly occupied by firm- to thick-walled often pitted chlorophyllose cells, often with a hyaline border.
- Hairpoints reflexed.
- Chlorophyllose laminal cells not pitted.
- Upper laminal cells not or inconspicuously pitted; costa occupying less than 60% (usually less than 50%) of the leaf width.
- Costa with adaxial stereids, at least in the upper part of the leaf.
- Costa abaxially with hyalocysts or cells with a large lumen throughout.
- Adaxial stereids in a single layer; at least the lower chlorophyllose laminal cells elongate and pitted.
- Leaves straight or curved, not much altered when dry, narrowly ovate-lanceolate; upper laminal cells rhomboidal to oval or rhomboidal to rectangular.
- Costa occupying c. two-thirds of the leaf width, abaxially smooth throughout or scabrous at the apex.
- Upper laminal cells rhomboidal to oval.
- Costa in upper half with adaxial stereids.
- Leaf apices obtuse, cucullate (comal leaves can have a hyaline point); costa with conspicuous side nerves.

**C. purpureoacaulis**

- Basal lamina directly above alar patches partly occupied by firm- to thick-walled often pitted chlorophyllose cells, often with a hyaline border.
- Hairpoints straight or lacking.
- Chlorophyllose laminal cells not pitted.
- Upper laminal cells not or inconspicuously pitted; costa occupying less than 60% (usually less than 50%) of the leaf width.
- Costa with adaxial stereids, at least in the upper part of the leaf.
- Costa abaxially with hyalocysts or cells with a large lumen throughout.
- Adaxial stereids in a single layer; at least the lower chlorophyllose laminal cells elongate and pitted.
- Leaves straight or curved, not much altered when dry, narrowly ovate-lanceolate; upper laminal cells rhomboidal to oval or rhomboidal to rectangular.
- Costa occupying c. two-thirds of the leaf width, abaxially smooth throughout or scabrous at the apex.
- Upper laminal cells rhomboidal to oval.
- Costa in upper half with adaxial stereids.
- Leaf apices obtuse, cucullate (comal leaves can have a hyaline point); costa with conspicuous side nerves.
1. Campylopus appressifolius Mitt., in J.D.Hooker, Handb. New Zealand Fl. 414 (1867)

Plants to 3–7 cm tall, yellowish to olive-green or dark green, with blackish or brown lower parts; shoots uniformly foliate. Leaves appressed to erecto-patent, often slightly homomallously curved or curved back towards the stem when dry, erecto-patent to patent to slightly curved outwards when moist, narrowly ovate-lanceolate, 4.4–7.2 mm long, 0.6–1.2 mm wide, ending in a concolorous or short straight hyaline point; costa occupying c. 30% of the leaf width, abaxially ribbed at least in the upper half, toothed towards the apex, adaxially with cells with a large lumen near the leaf base, more distally with a single layer of stereids. Alar patches single-layered; cells mostly thick-walled, with yellowish brown to reddish brown or dark brown walls; basal hyaline cells restricted to the margin; basal juxtacostal cells chlorophylllose, rectangular, incrassate, mostly strongly pitted. Upper laminar cells rhomboidal with rounded corners, oblong to short lanceolate with leaf lengths in the lower end of the range, 3.7–5.5 mm long, 0.6–0.9 mm wide; apex hooded, occasionally some leaves with a narrow hyaline point; costa occupying c. two-thirds of the leaf width, abaxially smooth throughout, slantly scabrous at the extreme apex, adaxially with hyalocyts throughout. Alar cells mostly thick-walled, with yellowish brown to reddish brown walls; basal hyaline cells restricted to the margin; basal juxtacostal cells chlorophylllose, rectangular, incrassate, mostly strongly pitted. Upper laminar cells rhomboidal with rounded corners, oblong to short-linear, 20–70 × 8–13 μm, mostly conspicuously pitted; cells in the broadest part of the leaf larger and more strongly pitted. Peristome Campylopus-type.


Plants to c. 3.5 cm tall, yellowish brown; sterile shoots uniformly foliate; fertile shoots zonosemose. Leaves erect to appressed when dry, erecto-patent when moist, very narrowly ovate, 3.7–4.5 mm long, 0.6–0.9 mm wide; apex hooded, occasionally some leaves with a short hyaline point; costa occupying c. two-thirds of the leaf width, abaxially smooth throughout, slightly scabrous at the extreme apex, adaxially with hyalocyts throughout. Alar
patches weakly demarcated, single-layered; cells hyaline, thin-walled, inflated; basal hyaline cells occupying the entire laminal width directly above the alar patches. Upper laminal cells oval to rounded-rhomboidal, oblong to elongate, oblique, 17–50 × 6–12 μm, very weakly to conspicuously pitted; cells in transition longer, less oblique, thicker-walled and more strongly pitted. Peristome Campylopus-type.

Occurs in W.A., S.A., N.S.W., Vic. and Tas; also in New Zealand and South Africa. Terrestrial or on rocks in places that receive run-off or are periodically inundated in otherwise dry vegetation types, at altitudes up to 820 m.

W.A.: Hayward Peak, 22 km ESE of Mt Barker, Porongurup Natl Park, H.Streimann 54485 (CANB, MEL).
S.A.: Lofty Ra., 1848, F.Mueller (MEL).

The very broad costa and hooded leaf apices make C. bicolor is one of the most distinctive species of the genus. With changing moisture conditions, some leaves can form short hyaline points, and while this variant has been named C. bicolor var. ericeticola (Müll.Hal.) Dixon, its recognition is unwarranted. Moreover, the type of C. ericeticola Müll.Hal. was lost, so it cannot be established that C. bicolor var. ericeticola really applies to a variety of C. bicolor. Specimens in MEL, identified by Dixon as C. bicolor var. ericeticola, belong to C. appressifolius and C. insititius.


Plants to c. 3.5 cm tall, yellowish green to green; shoots uniformly foliate. Leaves appressed to erecto-patent when dry, slightly curved and homomallous when moist, narrowly ovate-lanceolate, 3.8–4.6 mm long, 0.6–0.7 mm wide, ending in a short hyaline point (this occasionally absent or slightly longer); costa occupying c. 50–75% of the leaf width, abaxially with many low ribs, toothed in the upper half, adaxially with hyalocysts throughout. Alar patches well developed in most leaves, single-layered; cells hyaline, thin-walled, inflated; basal hyaline cells occupying the entire laminal width directly above the alar patches. Upper laminal cells rounded-rhomboidal to ±quadrate, isodiametric or oblong, 12–25 × 6–18 μm, not pitted; transition cells slightly larger, many cells ±rectangular. Gametocia and sporogones unknown.

Occurs in Qld, N.S.W. and Vic.; also in southern Africa and Madagascar. Terrestrial or, more commonly, saxicolous in mainly dry woodland, especially in and around streams at elevations of 250–1300 m.


Poorly developed plants of C. catarractilis are often difficult to distinguish from equally depauperate C. introflexus, as the latter can lack the oval upper laminal cells typical of C. catarractilis. Such material with reflexed hairpoints or strongly rhomboidal to oval upper laminal cells is considered to belong to C. introflexus, while specimens with leaves having short hyaline points or concolorous tips and with weakly rhomboidal to ±rectangular upper laminal cells are referable to C. catarractilis.

T: southern Chile; n.v.  


Plants to 2–6 cm tall, yellowish green to yellowish brown, with blackish lower parts; shoots uniformly foliate. Leaves appressed to erecto-patent when dry, erecto-patent to slightly curved outwards when moist, narrowly ovate-lanceolate, 6.3–9.2 mm long, 0.8–1.2 mm wide, ending in a recurved to reflexed hairpoint; costa occupying 65–80% or more of the leaf width, abaxially smooth throughout, adaxially with hyalocysts throughout. Alar patches absent to very poorly differentiated; basal hyaline cells occupying the entire laminal width directly above the alar patches. Upper laminal cells elongate to short-linear, oblique, 28–80 × 7–10 μm, conspicuously pitted; transition cells similar, but mostly longer and broader. Gametocia and sporogones unknown.

Occurs in Tas., on peaty soil in buttongrass sedgeland or heathland, at altitudes of 140–950 m. Also in southern Chile.

Tas.: track at N side of Dove L., Cradle Mountain–Lake St. Clair Natl Park, N Klazenga 5754 (MEL); Gordon River road, I.G.Stone 3058 (MEL).

Campylopus chilensis is most similar to C. bicolor from which it can be distinguished easily by its larger size, the presence of leaf hairpoints, and the elongate, conspicuously pitted, upper laminal cells. It can also be confused with C. acuminatus and C. introflexus which occasionally exhibit reflexed hairpoints. However, C. bicolor can be distinguished from those species by the broader costa and the distinctive upper laminal cells.


T: n.v.


Plants to 2.5–6.0 cm tall, green to dark green, with dark brown lower parts; sterile shoots uniformly foliate; fertile shoots ±comose, with extensive comal innovation. Leaves appressed to erect, frequently slightly homomallously curved when dry, erecto-patent to patent and often homomallously curved when moist, narrowly ovate-lanceolate, 4.2–6.6 mm long, 0.5–0.9 mm wide; apex concolorous or ending in a straight hyaline hairpoint; costa occupying 30–50% of the leaf width, abaxially smooth throughout or weakly ribbed towards the apex, adaxially with hyalocysts throughout. Alar patches mostly well developed, single-layered; cells inflated, with thin colourless to dark reddish walls; basal hyaline cells occupying the entire laminal width directly above the alar patches. Upper laminal cells irregularly rhomboidal to oval, isodiametric to short-linear, 10–60 (~85) × 6–10 (~20) μm, not to conspicuously pitted; cells in transition elongate to short-linear or oblong-rhomboidal, frequently and deeply pitted. Peristome Thysanomitrion-type.

Occurs in N.S.W., Vic. and Tas.; also in Lord Howe Island, Norfolk Island, South Africa, New Zealand, southern Chile and the Falkland Islands. Terrestrial or, rarely, on rocks in wet-sclerophyll, montane or snowgum forest or in subalpine vegetation, often on soil banks and road cuttings, at elevations of 200–1750 m.
Campylopus clavatus has been confused previously with C. appressifolius and C. introflexus. It can be distinguished from the former by the basal hyaline cells that occupy the entire width of the lamina just above the alar patches. Unlike C. introflexus, it has elongate and strongly pitted chlorophylllose cells in the transition from hyaline to chlorophylllose cells.

Many Australian specimens have been incorrectly identified as C. clavatus because Scott & Stone (The Mosses of Southern Australia 141, 1976) suggested that fragile shoot tips were a useful diagnostic character. However, all species of Campylopus can have at least some fragile shoot tips, and most collections that were identified as C. clavatus for this reason actually belong to C. introflexus.

The elongate, strongly pitted cells can extend to the leaf apex, but more commonly they are replaced higher up in the leaf by much shorter cells that are inconspicuously pitted at best.

6. Campylopus comosus (Schwägr.) Bosch & Sande Lac., Bryol. Javan. 1: 75 (1858)


Plants to c. 2 cm tall, yellowish brown; shoots uniformly foliate. Leaves erecto-patent, curved outwards when moist, ovate-subulate to almost triangular-subulate, (4.8—) 5.3—6.0 mm long, (0.4—) 0.5—0.7 mm wide; leaf tip concolorous, rarely hyaline at the extreme apex; costa occupying c. 50—65% of the leaf width, abaxially smooth throughout or very faintly ribbed in the upper half, adaxially with a single layer of cells with large lumina near the base, with 1 layer of stereids higher up and, eventually, 2 or 3 layers towards the apex. Alar patches ±distinct, single-layered; cells firm-walled, with reddish walls; basal hyaline cells restricted to a few marginal rows; basal chlorophylllose cells short-rectangular to rectangular, thick-walled, pitted (thin-walled in youngest leaves). Upper laminar cells quadrate to rectangular with rounded ends, or rhomboidal with straight lateral and oblique end walls, oblanceolate, 15–40 (~55) × 18–30 μm, not pitted. Peristome Campylopus-type.

Occurs in north-eastern Qld at altitudes of 780–1100 m; grows on soil in rainforest. Also in continental SE Asia, Malesia and throughout Melanesia.

Qld: Barron S.F., Herberton Ra., 12 km SSW of Atherton, H.Streimann 27315 (CANB); near Mt Haig, Lamb Ra., 20 km SE of Mareeba, H.Streimann 57680 (CANB).

Campylopus comosus is characterised by its long-subulate leaves that lack a hairpoint, and by the presence of multiple layers of adaxial stereids in the upper part of the costa. The habit and cell pattern are most similar in C. flexuosus, but that species lacks the adaxial stereids. Australian specimens of C. comosus consistently differ from the type by having stereids in 2 or 3 layers.


Plants 1.0–2.5 cm tall, green, often glossy; shoots uniformly foliate. Leaves erect, occasionally ±homomallously curved when dry, erecto-patent when moist, narrowly ovate-lanceolate, 2.2–3.7 mm long, 0.4–0.8 mm wide; apex concolorous, brown or hyaline; costa occupying c. 30–50% of the leaf width, abaxially ribbed, toothed in the upper part, adaxially with cells with a large lumen throughout. Alar patches poorly to well defined, single-layered; alar cells with thin colourless to reddish walls; basal hyaline cells lacking or restricted to a few cells in 1 or 2 marginal rows; basal chlorophylllose cells short-rectangular to rectangular, the walls firm but relatively thin, not pitted. Upper laminal cells in a rather lax pattern,
rhomboidal, with the longest side straight to curved, short-oblong to oblong, 13–45 × 6–11 μm, not pitted; transition from rectangular to rhomboidal cells rather abrupt, just below the widest part of the leaf. Gametoccia and sporogones unknown.

Endemic to northern N.T. and north-eastern Qld; terrestrial and on rocks in rather dry forest and more open vegetation at 200–1100 m.

N.T.: Baroalba Ck, 15 km SSE of Jabiru airfield, H.Streimann 42371 (CANB). Qld: Windsor Tableland, 37 km NW of Mossman, H.Streimann 29748 (CANB); Gillies Rd, between Gordonvale and Atherton, W.A.Weber B-32407 (CANB).

Campylopus excurrens has been been treated as a synonym of C. eberhardtii, C. japonicus and C. sinensis. However, several characters rule out conspecificity with C. sinensis, most importantly the shape and pittedness of the upper laminal cells.

This moss is most similar to C. perauriculatus, but it has a looser arrangement of the upper laminal cells, it lacks a broad band of subquadrate cells along the margin, the border of hyaline cells is absent or poorly developed, and there is a rather abrupt transition from rectangular basal laminal cells to rhomboidal upper laminal cells just below the widest part of the leaf.

8. Campylopus flexuosus (Hedw.) Brid., Muscol. Recent., Suppl. 4: 71 (1818)


Plants to 1.0–2.5 cm tall, yellowish green to brownish green; sterile shoots uniformly foliate; microphyllous branches occasionally present. Leaves erecto-patent when dry and moist, ovate-subulate, 3.6–5.0 mm long, 0.4–0.7 mm wide; apex concolorous; costa occupying 25–50% of the leaf width, occasionally with a few teeth near the apex, adaxially the cells having large lumina throughout. Alar patches single-layered; alar cells with thin colourless to reddish walls; basal hyaline cells restricted to 2 or 3 marginal rows; basal chlorophyllose cells rectangular or more irregularly shaped, incrassate, not or only those closest to the costa weakly pitted; more distal cells ±rectangular; cells in the subula irregularly shaped, ±rectangular to ±rhomboidal, oblong to elongate, 13–30 × 6–12 μm, not pitted. Peristome Campylopus-type; sporogones not known in Australian material.

Occurs in northern W.A., northern N.T. and north-eastern Qld; also in Europe, Asia and North America, and in tropical montane areas of Central and South America and Africa. Terrestrial and on rocks in woodland or in more open vegetation; also found in disturbed habitats, at altitudes of 720–1550 m.


Campylopus flexuosus can be distinguished from other species with chlorophyllose basal cells by the subrectangular upper laminal cells and the smooth abaxial costa. Although it shares these characters with C. comosus, the adaxial cells of the costa have large lumina throughout the leaf length.

This species is very poorly known in Australia, because it has been rarely collected from a broad range of habitats, and because most collections consist of poorly developed plants. It is likely to be much more common than the small number of collections indicates because it can be found growing in lawns in the tropics.

T: Browns River, Tas., A.F.Oldfield 10; lecto: BM 8526825 (selected here); islecto: BM 825376, BM 852682–4, BM 852689, BM 852691, BM 852696, BM 852699, BM 857201; loc. id., A.F.Oldfield 11; syn: BM 825375, BM 852686–8, BM 852690, BM 852692–3; loc. id., A.F.Oldfield s.n.; syn: BM 852694, BM 852697; Southport, Tas., Stuart (BM 852680, BM 852681, BM 852695).


Illustrations: J.-P.Frahm, Lindbergia 7: 30, fig. 1.1, 1.2 (1981); J.K.Bartlett & J.-P.Frahm, J. Bryol. 12: 375, fig. 2b, c (1983), both as C. kirkii var. pilosus.

Plants to 1.5–3.5 cm tall, green to yellowish green; lower parts of larger plants often blackish; sterile shoots uniformly foliate; fertile shoots acomose. Leaves erect to appressed, or with a patent base and the upper part curved towards the stem when dry, erecto-patent when moist, narrowly ovate-lanceolate, 4.0–6.5 mm long, 0.6–1.2 mm wide; apex concolorous or with a straight or reflexed hairpoint; costa occupying 40–60% of the leaf width, abaxially ribbed except in the basalmost part, toothed distally, adaxially with hyalocysts or cells with large lumina occupying the entire laminal width directly above the alar patches. Upper laminal cells rounded-rhomboidal to oval, oblong to elongate, straight to oblique, 20–60 (–80) × 7–16 µm, not or inconspicuously pitted; cells in transition shorter to longer, more strongly pitted; innermost rows occasionally almost reaching the alar patches in the widest leaves. Peristome Campylopus-type.

Occurs in eastern N.S.W., A.C.T., Vic. and Tas.; also in New Zealand. On soil, rocks and occasionally on logs in places that receive run-off or are periodically under water (or snow) in dry to wet-sclerophyll forest, snowgum woodland or subalpine vegetation, at altitudes up to 1750 m.


Campylopus insititius has been misidentified in Australia as C. acuminatus var. acuminatus, and it can also be confused with C. introflexus and C. chilensis (all three sometimes having reflexed hairpoints), and with C. appressifolius, which can have a similar cell pattern. However, C. insititius can be distinguished from C. introflexus by the elongate, conspicuously pitted, chlorophylloselaminal cells directly above the hyaline cells, especially along the costa. Moreover, the costa is narrower than in C. chilensis, and the upper laminal cells are not or only very inconspicuously pitted.

The global distribution of C. insititius might also include southern Chile and the Falkland Islands, but it has not been possible to locate collections labelled C. acuminatus var. acuminatus from those areas.

10. Campylopus introflexus (Hedw.) Brid., Muscol. Recent., Suppl. 4: 72 (1818)


Plants to c. 4 cm tall, bright green to brownish green, occasionally appearing greyish due to hyaline hairpoints; sterile shoots uniformly foliate; fertile shoots ±comose. Leaves erect curved towards the stem or homomallously curved when dry, erecto-patent to slightly curved outwards when moist, narrowly ovate-lanceolate, (3.7–) 4.0–6.5 mm long, (0.5–) 0.6–1.2 mm wide, mostly ending in a reflexed hairpoint; costa occupying c. 30–65% of the leaf width, axially ribbed throughout, toothed towards the apex, adaxially with hyalocysts throughout. Alar patches often weakly developed, single-layered; cells hyaline, thin-walled, inflated; basal hyaline cells occupying the entire laminal width directly above the alar patches. Upper laminal cells rounded-romboidal to oval, oblolute to short-oblong, 6–25 × 6–18 μm, not pitted; cells in transition slightly larger, ±rectangular to rhomboidal. Peristome Campylopus-type.

Occurs in W.A., S.A., Qld, N.S.W., A.C.T., Vic. and Tas.; also native to Lord Howe Island, Norfolk Island, Macquarie Island, New Zealand, southern South America and southern Africa, and introduced into western Europe and western U.S.A. In Australia terrestrial and on rocks, occasionally on logs, in all but the driest habitats, mostly in dry-sclerophyll forest or dry grasslands, at altitudes to 1620 m.


In its typical form C. introflexus is one of the most easily recognisable species because of its reflected hairpoints and short, oval, strongly incrassate and non-pitted, upper laminal cells. However, many poorly developed plants can lack some or all these usually diagnostic characters. Such plants can lack or have short hyaline hairpoints, or they can exhibit rhomboidal upper laminal cells with rounded corners, not oval and as markedly thick-walled as in typical material. Furthermore, the abaxial ribs on the costa can be rather poorly developed and weakly toothed. Such forms have been recognised in Australia as C. incrassatus and C. flindersii. While it is possible that a cryptic species exists among these forms, the variation between the typical and poorly developed plants of C. introflexus appears to form a continuum. Moreover, some plants among these collections can show hints of typical C. introflexus, such as reflected hairpoints on some leaves or patches of oval upper laminal cells.


Plants to 1.5–11.0 cm tall, yellowish, with brownish basal parts; sterile shoots uniformly foliate; fertile shoots ±comose. Leaves ±appressed to erect when dry, erecto-patent to patent when moist, ovate-linear to ovate-lanceolate; apex cucullate, concolorous, occasionally with
a hyaline point in comal leaves; costa occupying c. 12–20% of the leaf width, with conspicuous side nerves, abaxially smooth throughout or slightly scabrous near the apex, adaxially with cells with large lumina throughout. Alar patches well developed, single-layered; alar cells similar to more distal cells, but the walls brown and with fewer pits; basal hyaline cells restricted to the marginal half; basal chlorophyllose cells quadrate to rectangular, thick-walled, pitted. Upper laminal cells elongate to linear, oblique, 30–75 × 8–12 μm, strongly incrassate, conspicuously pitted. Peristome Campylopus-type.

Occurs in south-eastern S.A., eastern N.S.W., southern Vic. and western Tas; also in New Zealand, southern South America and southern Africa. Terrestrial in wet or periodically wet places such as bog and peatlands, buttongrass sedgelands, and along puddles in tracks, at altitudes to 800 m.


Campylopus kirkii has previously been recognised at the varietal level as C. acuminatus var. kirkii, i.e. var. kirkii having leaves with hooded apices and var. acuminatus having leaves with acute apices or with hairpoints. What has been identified as C. acuminatus var. acuminatus in Australia and New Zealand is here recognised as C. insititius. Apart from the leaf apices, differences between C. kirkii and C. insititius include hyaline cells occupying the entire width of the lamina just above the alar patches in the latter, but restricted to a rather broader border, while the basal xitacostal cells are chlorophyllose, thick-walled and strongly pitted in C. kirkii. Furthermore, the upper laminal cells of C. insititius are elliptical and not or inconspicuously pitted, as opposed to obliquely elongate to short-linear, very strongly incrassate and conspicuously pitted in C. kirkii. These characters are more constant than the shape of the leaf apex, and they indicate that the two taxa warrant recognition at the species level.

Among Australian Campylopus species, C. kirkii is likely to be confused only with C. bicolor, with which it shares hooded leaf apices. This is especially likely near the northern limit of its range, where plants tend to have rather narrow leaves. However, C. kirkii can always be distinguished from C. bicolor by the strongly spurred costa and by the chlorophyllose basal xitacostal cells.


Plants to 5 cm tall, green; shoots uniformly foliate. Leaves erect to appressed, slightly homomallous when dry, erecto-patent and homomallous when moist, narrowly ovate-lanceolate, 3.8–5.0 mm long, 0.5–0.9 mm wide; apex concolorous, rather blunt; costa occupying c. 40–50% of the leaf width, abaxially ribbed, toothed in the upper part, adaxially with cells with large lumina throughout. Alar patches well developed, single-layered; alar cells with thin colourless to reddish walls, ±inflated; basal hyaline cells restricted to 3–7 marginal rows; basal chlorophyllose cells rectangular, rather thin-walled to incrassate, not pitted. Leaves with an initially intramarginal band of 6–8 rows of much smaller quadrate to somewhat rhomboidal cells, tapering into the margin some distance above the point where the border ends. Upper laminal cells rhomboidal to irregularly oval, occasionally almost
rectangular, isodiametric to oblong, 9–25 × 7–12 (–15) μm wide, not pitted. Peristome
Campylopus-type.

Endemic to north-eastern and south-eastern Qld and north-eastern N.S.W. Terrestrial, rarely
on rocks in rainforest or along streams at altitudes of 550–1400 m.

Qld: Big Tableland, 26 km S of Cooktown, H.Streimann 30753 (CANB); Tully Falls, J.G.Stone 8696 (MEL).

Campylopus perauriculatus has previously been recognised in Australia as C. robillardii
Besch. The difference in ornamentation of the leaf margin, serrate in the exclusively African
C. robillardii and entire in C. perauriculatus, and the fact that they occur on different
continents in my opinion warrants recognition at the species level.

Campylopus perauriculatus can be difficult to distinguish from C. excurrens and
C. appressifolius. Differences are discussed under those species.


T: Isla Desolacion, Magallanes, Chile, Apr. 1896. P.Dusén s.n.; syn: S B57290; Puerto Angusto, Magallanes,
Chile, Apr. 1896, P.Dusén s.n.; syn: S B57294; Puerto Angusto, Magallanes, Chile, 22 Mar. 1896. P.Dusén
279; syn: S B57292, S B57293, S B57296; L. Llanquihue, Chile, 15 Dec. 1896, P.Dusén s.n.; syn: S B57291,
B57295.


Plants to c. 3.5 cm tall, light green; shoots uniformly foliate. Leaves erect, often
homomallously curved when dry, erecto-patent, curved outwards when moist, narrowly
ovate-lanceolate, (3.6–) 6.2–7.0 mm long, (0.4–) 0.7–1.0 mm wide, ending in a straight
hairpoint; costa occupying c. 40–50% of the leaf width, abaxially ribbed, rather weakly
toothed towards the apex, adaxially with 2 layers of stereids. Alar patches weakly to well
developed, single-layered; cells inflated, with thin yellowish brown to reddish walls; basal
hyaline cells occupying the entire laminal width directly above the alar patches. Upper
laminal cells rounded-obrectangular to rectangular, or with somewhat oblique end walls,
7–15 × 7–10 μm, not pitted; cells in transition larger, more rhomboidal. Peristome
Campylopus-type. Sporogones not known from Australian material.

Occurs in Tas.; also in New Zealand, Islas Juan Fernández, far-southern South America and
Marion Island in the southern Indian Ocean. Found on logs in cool-temperate rainforest or on
presumably highly organic soil above the treeline, at 500–1000 m.

Tas.: Growing Swallet, Mount Field Natl Park, 4 Dec. 2007, N.Klazenga s.n. (MEL); Eagle Tarn, 5 km WSW
of Mt Field East, A.Moscal 1360 (CANB).

Campylopus purpureoacaulis can be distinguished from C. introflexus by its straight
hairpoints, subquadrate upper laminal cells and adaxial costal stereids, and from C. clavatus
by the shape of the chlorophylllose laminal cells, which are non-pitted throughout the leaf.


T: Browns River, Tas., A.F.Oldfield 11; syn: BM-Hooker 825385; Southport, Tas., Stuart s.n.; syn: BM-Hooker 825386, BM-
Hooker 825387.


T: Bulli Pass, N.S.W., W.W.Watts 96; holo: H-BR; iso: NSW(?).


Illustrations: J.K.Bartlett & J.-P.Frahm, J. Bryol. 12: 379, fig. 9 (1983); J.-P.Frahm, J. Bryol. 14: 721, fig. 15
(1987), both as C. pyriformis.
Plants to 1–3 cm tall, light green; shoots uniformly foliate. Leaves erect to erecto-patent when dry and with the tips curved in all directions, occasionally slightly flexuose, erecto-patent to homomallously curved or curved outwards when moist, ovate-subbulate, 4.3–8.2 mm long, 0.3–1.0 mm wide; apex concolorous or, occasionally, with a hyaline point; costa occupying c. 40–60% of the leaf width, abaxially weakly ribbed in the upper part, with some scattered teeth near the apex, adaxially with hyalocysts throughout. Alar patches not or poorly differentiated, single-layered; cells hyaline, thin-walled, inflated; basal hyaline cells occupying the entire laminal width above the alar patches. Upper laminal cells quadrate to rectangular or with oblique end walls, 6–30 × 5–8 μm, not pitted; cells in transition similar but often slightly larger. Peristome Campylopus-type.

Occurs in south-western W.A., eastern Qld, N.S.W., Vic. and Tas.; also in Lord Howe Island, Norfolk Island, Macquarie Island and New Zealand. Terrestrial or on rocks in all but the driest habitats, mostly in dry-sclerophyll forest or dry grasslands, at altitudes to 1750 m.


Campylopus torquatus has previously been misidentified as C. pyriformis in Australia. Furthermore, Australian plants named as C. fragilis and C. fragilis subsp. zollingerianus (syn. C. boswellii) are also referable to this species. Based on molecular sequences, Stech & Wagner (2005) demonstrated that Australian and New Zealand specimens identified as C. pyriformis or C. fragilis are not closely related to material of those species from other parts of the world. Consequently, the Australasian material is treated here as a distinct species. In contrast to C. fragilis and C. pyriformis, the leaves of C. torquatus can have hyaline points.

Campylopus torquatus is reminiscent of a Dicranella, and it can be distinguished from all other species of Campylopus by having leaves that are ±flexuose when dry.

15. Campylopus umbellatus (Schwägr. & Gaudich. ex Arn.) Paris, Index Bryol. 264 (1894)


Plants to 1.5–6.0 cm tall, yellowish to blackish green; taller plants with blackish brown lower parts; sterile shoots uniformly foliate; fertile shoots comose. Leaves appressed when dry, erecto-patent when moist, narrowly ovate-lanceolate, 4.0–4.8 mm long, 1.0–1.3 mm wide, ending in a short hyaline point; costa occupying c. 20% of the leaf width, abaxially ribbed, the ribs 2 cells high, toothed in the upper half, adaxially with 2 layers of stereids, except near the insertion where cells have distinct lumina. Alar patches well developed, double-layered; cells slightly inflated, with thin colourless to reddish walls; basal hyaline cells lacking or restricted to the margin; basal chlorophylllose cells rectangular, conspicuously pitted. Upper laminal cells oval-rhomboidal, 16–38 × 7–10 μm, not conspicuously pitted; cells in and below widest part of the leaf longer and conspicuously pitted. Comal leaves broadly ovate, with broad marginal patches of basal hyaline cells. Peristome Thysanomitron-type.

Occurs in the north-eastern Qld; also in Malesia and continental SE Asia, East Asia, the Hawaiian Islands and Polynesia. Found on rocks in streams in rainforest, at altitudes of 50–750 m.

Qld: Mobo Ck., 21 km NE of Atherton, H. Streimann 16943 (CANB); The Boulders Scenic Reserve, 6 km W of Babinda, G.E. Kantak & S.P. Churchill 930 (CANB).
Campylopus umbellatus is a very distinctive species that can only be confused with C. appressifolius. Their differences have been discussed under the latter species.

Names of uncertain status

Types could not be located for the following names:

Campylopus acuminatus Mitt., J. Linn. Soc., Bot. 12: 90 (1869)
T: Mt Forster, Hermite Island, Fuegia, Chile, J.D.Hooker.


Campylopus nigroflavus (Müll.Hal.) Paris, Index Bryol., Suppl. 94 (1900)

Campylopus pallidus Hook.f. & Wilson, in J.D.Hooker, Fl. Nov.-Zel. 2: 68 (1854)
T: East Coast and Auckland, North Island, New Zealand, Colenso; loc. id., Sinclair.

Campylopus tasmanicus Paris, Index Bryol., Suppl. 98 (1900)

Campylopus viridicatus (Müll.Hal.) Paris, Index Bryol., Suppl. 1: 99 (1900)
Dicranum viridicatum Müll.Hal., Hedwigia 36: 352 (1897). T: North Shore, Sydney, N.S.W., July 1884; Northwood, near Sydney, N.S.W., June 1884, T.Whitelegge in Hb. Melbourne; s. loc., Qld, F.M.Bailey (Hb. Brotherus).

Campylopus woollsii (Müll.Hal.) Paris, Index Bryol., Suppl. 1: 99 (1900)

Campylopus woollsii var. cylindrica Paris, Index Bryol., Suppl. 1: 99 (1900)
T: n.v.

Australian reports require confirmation

T: along track to Marimuni from the Upper Ambun Valley, Wabag Area, Western Highlands, Papua New Guinea, R.G.Robbins 3025a; holo: FH-Bartram; iso: CANB 165066, L 60092.

T: Tigre Zapallar, Fray Jorge, Chile. in open forest, terrestrial, G.H.Schwabe 232; holotype: JE.

Australian specimens: N.S.W.: Wilsons Ck, near Mullumbumby, W.A.Watts 3225 (NSW); Wingham District, 1915, *J.L.Boorman* s.n. (NSW); North Willoughby, 1885, **coll. unknown** (NSW) (Frahm, 1994: 323).


Doubtful record


Campylopus involutus was reported from Australia by Frahm (1987: 719) based on Godwin C2488 (MELU). Unfortunately, the specimen has since been lost, so this report could not be verified.

Excluded taxa


The occurrence of *Campylopus ericoides* in Australia is based on Frahm's (1987) report of *C. involutus*. *Campylopus involutus* has since been synonymised with *C. ericeticola* Müll.Hal. (Frahm, 1992). However, while *C. ericoides* is considered to belong to subg. *Thysanomitrion* (Frahm, 1992), the type material of *C. ericoides* has *Campylopus*-type peristomes. The Australian report is based on a specimens that were reported to have a *Thysanomitrion*-type peristome (Frahm, 1987: 719).

Campylopus fragilis (Brid.) Bruch & Schimp., *Bryol. Europ.* 1: 114 (1847)


Campylopus boswellii (Hampe ex Müll.Hal.) Paris, *Index Bryol.*, Suppl. 1: 89 (1900)


Campylopus pyriformis (Schultz) Brid., *Bryol. Univ.* 1: 469 (1826)

Campylopus torfaceus Bruch & Schimp., Bryol. Europ. 1: 164 (fasc. 41, Mon. 4) (1847)
T: n.v.
See discussion under Campylopus torquatus.

T: Chili, Poeppig s.n.; holo: B, destroyed; iso: L., S B89234, S B89235.

T: E Patagonia, Puerto Bueno, 31 May 1896, P.Dusén 103; lecto: S B56389 (selected here); isolecto: S B56386; S B56387; ibid., P.Dusén s.n.; syn: S B56385, S B56390.
Australian specimens identified as either Campylopus flavoviridis or C. incrassatus are here considered to be poorly developed forms of C. introflexus.

T: Java, [Indonesia], Herb. Van de Sande Lacoste ex herb. Dozy & Molkenboer; iso: L 60107.
Australian records of Campylopus laxitextus have been re-identified as C. flexuosus (mostly) and C. excurrens.


Australian records of Campylopus schmidii have been re-identified as C. introflexus.

Reports of this name for Australia were made under the assumption that C. excurrens was a synonym. However, C. excurrens is recognised here as a distinct species.

Campylopus japonicus Broth., Hedwigia 38: 207 (1899)
T: Japan, Ankarcrona s.n.; syn: not located; Shikoku, Tosa, Miyoshi; syn: H-BR.
Reports of this name for Australia were made under the assumption that C. excurrens was a synonym. However, C. excurrens is recognised here as a distinct species.

Reports of this name for Australia were made under the assumption that Campylopus excurrens was a synonym. However, C. excurrens is recognised here as a distinct species.

T: Mauritius, Robillard s.n.; iso: PC.

Campylopus robbillardii can be said to occur in Australia only if C. perauriculatus is treated as a synonym or recognised as a variety. However, C. perauriculatus is treated here as a distinct species. Campylopus inchangae is a synonym of C. robbillardii.