

CAMPTOCHAETE

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Camptochaete Reichardt, *Reise Novara, Pilze, Leber-Laubm.* 1(3): 190 (1870); from the Greek *kampto* (to bend) and *chaite* (a long hair or bristle), probably in reference to the long seta which is bent at the top, so that the capsule is borne horizontally.

Type: *C. arbuscula* (Sm.) Reichardt

Dioicous. Plants stipitate-frondose, forming wefts. Stems consisting of a creeping radiculose basal part, an unbranched ascending stipe and a pinnately to tri-pinnately branched, plagiotropic to trailing ±triangular frond, with branches mostly in a single plane; central strand present throughout the stem (except *C. leichhardtii*), absent in branches (except *C. curvata*). Stipe leaves appressed and overlapping to patent and distant; frond axis leaves terete-foliate to complanate, patent to erecto-patent, concave to plane; apex rounded-apiculate to acuminate. Branch leaves similar but smaller; margin serrulate in the upper part, entire below; costa short and double. Mid-laminal cells linear, prosenchymatous; cells at the leaf apex gradually to conspicuously shorter; alar cells irregularly shaped, pitted, forming distinct rounded patches.

Perichaetia in leaf axils along the frond axis and first order branches; perichaetial leaves with reflexed apices. Capsules long-exserted, erect to horizontal, ellipsoidal; operculum conical to rostrate.

The largest genus, *Camptochaete*, with ten species, has a mainly Australasian distribution that extends to Malesia and the Pacific. It has been revised by Tangney (1997), whose treatment is followed here. The growth form described is the general underlying pattern; however, this is often obscured by predominantly sympodial but also monopodial innovations in all parts of the stem. Furthermore, the tip of a trailing frond can root and form a new stipe and frond. The five Australian species can all be recognised by macromorphological characters only.

Tangney (1997) recognised two sections of the genus based on the orientation of the stipe leaves and the shape of the operculum. Thus, sect. *Camptochaete* has appressed and imbricate stipe leaves and a conical, blunt or apiculate operculum, while sect. *Thamniella* (Besch.) Broth. has patent and distant stipe leaves and a rostrate operculum. Representatives of sect. *Camptochaete* occur in subtropical to cool-temperate eastern Australia, as well as New Zealand and, possibly, the Hawaiian Islands. Sect. *Thamniella* occurs in Indonesia (Flores), Papua New Guinea, the Solomon Islands, Vanuatu, New Caledonia, Lord Howe Island and eastern Australia. Among the Australian species, *C. arbuscula*, *C. deflexa* and *C. leichhardtii* belong to sect. *Camptochaete*, while *C. curvata* and *C. excavata* are referable to sect. *Thamniella*.

Reference

Tangney, R.S. (1997), A taxonomic revision of the genus *Camptochaete* Reichdt., *Lembophyllaceae* (Musci), *J. Hattori Bot. Lab.* 81: 53–121.

Key

- 1 Stipe leaves patent and distant; operculum rostrate (sect. *Thamniella*).....2
1: Stipe leaves appressed and overlapping; operculum blunt or apiculate (sect. *Camptochaete*).....3

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- 2 Frond axes and branches terete-foliate and turgid; leaves broadly ovate to suborbicular; leaf apices abruptly mucronate **5. C. excavata**
- 2: Frond axes and branches complanate; leaves oblong, contracted to a short, acute often recurved apex .
..... **4. C. curvata**
- 3 Frond axes and branches subdistichous; leaf apices recurved **3. C. leichhardtii**
- 3: Frond axes and branches complanate to terete-foliate, occasionally turgid; leaf apices straight4
- 4 Plants paler, light green to yellowish green; leaves collapsed-wrinkled when dry, strongly concave and cochleariform, broadly ovate to suborbicular, obtuse or with a short point **1. C. arbuscula**
- 4: Plants darker, green or brownish green; leaves not markedly altered when dry (then occasionally striate-wrinkled), moderately concave, ovate to broadly ovate, acute to acuminate **2. C. deflexa**

CAMPTOCHAETE sect. CAMPTOCHAETE

Stipe leaves usually appressed, overlapping. Operculum conical, blunt or with a short apiculus.

1. *Camptochaete arbuscula* (Sm.) Reichardt, *Reise Novara, Pilze, Leber-Laubm.* 1(3): 191 (1870) var. *arbuscula*

Hookeria arbuscula Sm., *Trans. Linn. Soc. London* 9: 280 (1808); *Porotrichum arbusculum* (Sm.) Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 83 (1882); *Thamnum arbuscula* (Sm.) Kindb., *Hedwigia* 41: 253 (1902). T: Dusky Bay, New Zealand, *A.Menzies* 73; holo: LINN *n.v.*; iso: BM-Hooker *n.v.*; BM-Turner *n.v.*; BM-Wilson *n.v.*; fide R.S.Tangney, *J. Hattori Bot. Lab.* 81: 80 (1997).

Illustrations: R.S.Tangney, *op. cit.* 81, fig. 16; D.Meagher & B.Fuhrer, *A Field Guide to the Mosses and Allied Plants of Southern Australia* 55 (2003), as *C. arbuscula*.

Fronds (incl. stipe) 5–9 cm long, 2.0–4.5 cm wide; all parts of stem and branches terete-foliate, turgid. Stipe leaves appressed; frond axis leaves patent, suborbicular, 1.5–2.0 mm long, 1.25–1.75 mm wide, concave, wrinkled when dry; apex rounded with a short acute point. Branch leaves patent, very broadly ovate to suborbicular, 1.1–1.5 mm long, 0.80–1.25 mm wide, concave, smooth, wrinkled when dry; apex acute. Mid-laminal cells linear, 35–60 × 5–8 µm; cells at leaf apex 12–30 × 8–10 µm wide, 1.5–3.5 times longer than wide.

Capsules long-exserted, horizontal; operculum conical, blunt or apiculate.

Occurs in Vic. and Tas. in cool-temperate rainforest at altitudes of 300–1000 (–1200) m, usually on tree bases; also in New Zealand, the Auckland Islands and Campbell Island.

Vic.: Keppel Falls Scenic Reserve, Marysville, *N.Klazenga* 5446 (MEL); Sassafras Ck, 30 km SSE of Bendoc, *H.Streimann* 38011 (CANB); Bulga Section, Tarra-Bulga Natl Park, *A.W.Thies* 1627P (MEL). Tas.: Southwest Natl Park, *T.J.Entwistle* 2514 (MEL); L. St. Clair, Cradle Mountain-Lake St. Clair Natl Park, *D.H.Norris* 27976 (CANB; HO).

Camptochaete arbuscula is characterised by its robust, dendroid habit, somewhat untidy, irregularly branched fronds, and loosely turgid branches with deeply concave leaves that are wrinkled when dry and smooth when moist. Monopodially branched forms, especially when also hanging, can be confused with *Weymouthia cochlearifolia*, but they are easily separated by the pointed leaf apices and the different cell pattern.

A second variety, *C. arbuscula* var. *tumida* Tangney (1997), is endemic to the South Island of New Zealand.

2. *Camptochaete deflexa* (Wilson ex Müll.Hal.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 309 (1877)

Hypnum deflexum Wilson ex Müll.Hal., *Syn. Musc. Frond.* 2: 680 (1851); *Porotrichum deflexum* Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 83 (1882), *nom. illeg.* (superfluous); *Thamnum deflexum* (Wilson ex Müll.Hal.) Kindb., *Hedwigia* 41: 255 (1902); *Camptochaete arbuscula* var. *deflexa* (Wilson ex Müll.Hal.) Dixon, *Bull. New Zealand Inst.* 3: 273 (1927). T: New Zealand. *W.Stephenson* 7; lecto: BM, fide R.S.Tangney, *J. Hattori Bot. Lab.* 81: 87 (1997).

Isoetecium ramulosum Mitt., *Hooker's J. Bot. Kew Gard. Misc.* 8: 263 (1856); *Camptochaete ramulosa* (Mitt.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 309 (1877); *Porotrichum ramulosum* (Mitt.) Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 84 (1882); *Thamnium ramulosum* (Mitt.) Kindb., *Hedwigia* 41: 257 (1902). T: [Sealers Cove, Wilsons Promontory], Vic., *F.Mueller 170*; syn: MEL 1002111, 102094, 1002078; Steepbank R., Wilsons Promontory, Vic., *F.Mueller 58*; syn: MEL 1002096; *loc. id.*, *F.Mueller s.n.*; syn: MEL 34562.

Hypnum chlorocladum Müll.Hal., *Linnaea* 35: 622 (1868); *Lembophyllum chlorocladon* (Müll.Hal.) Paris, *Index Bryol.* 718 (1896). T: Brisbane River, Qld, *A.Dietrich*; holo: not located.

Camptochaete fruticosa Paris, *Index Bryol.*, Suppl. 1: 86 (1900); *Porotrichum fruticosum* Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 83 (1882), *nom. illeg.* (later homonym). T: Tas., *R.C.Gunn*; not located, probably in PC.

Illustrations: R.S.Tangney, *op. cit.* 88, fig. 20; W.R.Buck, D.H.Vitt & W.M.Malcolm, *Key to the Genera of Australian Mosses* 24 (2002).

Fronds (incl. stipe) 5.5–7.5 (–9.0) cm long, 2.0–4.5 cm wide; frond axes complanate when dry, less so when moist; branches terete-foliate to complanate. Stipe leaves appressed to erect-appressed; frond axis leaves patent, broadly ovate, 1.6–2.0 mm long, 0.8–1.1 mm wide, shallowly concave, smooth; apex acuminate. Branch leaves erecto-patent to patent, ovate, 1.05–1.25 mm long, 0.5–0.6 mm wide, shallowly concave, smooth; apex acuminate. Mid-laminal cells linear, 45–60 × 5–8 µm, slightly vermicular; cells at the leaf apex 30–45 × 5–8 µm, 4–9 times longer than wide.

Capsules long-exserted, horizontal; operculum blunt or apiculate.

Occurs in south-eastern Qld, eastern N.S.W., A.C.T., Vic. and Tas.; grows on rock, logs and tree bases, occasionally terrestrial in wet forest, often along creeks, at altitudes up to 1300 m. Also in New Zealand, the Auckland Islands and Campbell Island.

Qld: Binna Burra, Lamington Natl Park, *D.H.Norris 34492* (CANB). N.S.W.: Dingo Tops Forest Park, Bulga S.F., 31 km NW of Wingham, *H.Streimann 38723* (CANB). A.C.T.: Warks Rd, Brindabella Ra., 28 km WSW of Canberra, *H.Streimann 38765* (CANB). Vic.: Turtons Track, Otways S.F., *N.Klazenga 5964* (MEL). Tas.: 'German Town', 5 km NNE of St. Marys, *J.A.Curnow 2457* (CANB, HO).

Although the characters listed by Tangney (1997), and repeated here, to separate this species from *C. arbuscula* do not seem unambiguously rigorous, there is a distinct morphological gap between the two taxa and, in practice, reliable identification is possible with the aid of these diagnostic characters. In addition to those attributes listed in the key, *C. deflexa* can be distinguished from *C. arbuscula* by its tidier, triangular fronds. In mainland Australia *C. deflexa* appears to be the more common species, *C. arbuscula* being restricted to the wetter habitats and higher elevations. In Tasmania *C. arbuscula* is more common in the western half of the island, while *C. deflexa* is more common in the drier eastern half.

3. *Camptochaete leichhardtii* (Hampe) Broth., in H.G.A.Engler & K.A.E.Prant., *Nat. Pflanzenfam.* I, 3: 865 (1907)

Hypnum leichhardtii Hampe, *Linnaea* 36: 523 (1870); *Ptychomnion leichhardtii* (Hampe) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1877–78: 354 (1879); *Thamnium leichhardtii* (Hampe) Kindb., *Hedwigia* 41: 257 (1902). T: N.S.W., *L.Leichhardt*; holo: BM-Hampe; iso: BM-Schimper.

Illustration: R.S.Tangney, *op. cit.* 100, fig. 26.

Plants soft. Frond axes and branches strongly complanate, subdistichous; apices mostly flagelliform; central strand poorly developed in the stipe, absent in the frond axis and branches. Stipe leaves appressed; frond axis leaves erecto-patent to patent, ovate, mostly asymmetrical, 1.1–1.9 mm long, 0.55–0.95 mm wide, plane to conduplicate, smooth, with an acuminate recurved apex. Branch leaves erecto-patent, ovate, slightly asymmetrical, 0.55–0.90 mm long, 0.3–0.5 mm wide, plane to conduplicate, smooth, with an acuminate recurved apex. Mid-laminal cells linear, 35–80 × 5–7 µm; cells at the leaf apex 15–25 × 8–10 µm.

Capsules long-exserted, horizontal; operculum blunt.

Occurs in south-eastern Qld and north-eastern N.S.W.; grows in wet forest and scrub, on the twigs and branches of trees and shrubs. Also in Vanuatu.

Qld: Border Track, near Mt Bithongabel, Lamington Natl Park, *A.W.Thies 1623M* (MEL). N.S.W.: Brindle Ck, 26 km NNE of Kyogle, Border Ranges Natl Park, *H.Streimann 61128* (CANB); Brindle Creek Picnic Area, Wiangaree Forest Drive, *D.H.Vitt 28226* (CANB); Richmond R., *W.W.Watts s.n.* (MEL 1002237).

Camptochaete leichhardtii is characterised by its strongly complanate frond axis and branches and asymmetrically conduplicate leaves. The stipitate-frondose growth form is often difficult to observe and, occasionally, almost all branches are flagelliform.

CAMPTOCHAETE sect. THAMNIELLA

Camptochaete sect. *Thamniella* (Besch.) Broth., in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* I, 3: 865 (1907)

Thamniella Besch., *Ann. Sci. Nat., Bot.*, sér. 5, 18: 239 (1873).

Type: *C. porotrichoides* (Besch.) Broth.

Stipe leaves patent, distant; operculum rostrate above a conical base.

4. *Camptochaete curvata* Tangney, *J. Hattori Bot. Lab.* 81: 107 (1997)

T: Acacia Plateau, 13 km NE of Killarney, Great Dividing Range, Qld, *H.Streimann 243*; holo: CANB; iso: L *n.v.*, MEL, MO *n.v.*, NICH *n.v.*

Illustration: R.S.Tangney, *op. cit.* 108, fig. 31.

Fronds (incl. stipe) 1.8–6.0 cm long, 1.2–3.0 cm wide; frond axes and branches homomallous; branches curved downwards when dry; central strand present in all parts of the stem and first-order branches, absent in higher-order branches. Frond axis leaves homomallous, pointing downwards, patent, oblong, 1.35–1.75 mm long, 0.75–1.00 mm wide, concave, smooth, somewhat wrinkled when dry; apex short-acuminate, slightly recurved. Branch leaves homomallous, erecto-patent to patent, oblong, 1.1–1.6 mm long, 0.55–0.80 mm wide, concave, smooth, some leaves somewhat wrinkled when dry; apex acuminate, slightly recurved; mid-laminal cells linear, $45\text{--}75 \times 5\text{--}7 \mu\text{m}$, cells at leaf apex $15\text{--}45 \times 7\text{--}8 \mu\text{m}$, 2–6 times longer than wide.

Capsules long-exserted, horizontal.

Endemic to eastern Qld and N.S.W., in wet forest, mainly rainforest, at altitudes up to 1050 m; usually on rock, also on tree bases, tree roots and terrestrial, but always close to the ground.

Qld: Mount Lewis forestry road, 49 km NNE of Mareeba, Main Coast Ra., *H.Streimann 64758* (CANB); Binna Burra, Lamington Natl Park, *N.Klazenga 6014* (MEL). N.S.W.: Dingo Tops Forest Park, Bulga State Forest, 31 km NW of Wingham, *H.Streimann 38705* (CANB); Nelson Ck, Wadbilliga Natl Park, 14 km NE of Bemboka, *H.Streimann 49239* (CANB).

Camptochaete curvata is readily recognised by its canoe-shaped leaves and curved branches. It often grows in mixed stands with the more widespread *C. excavata*, from which it can be separated by the longer leaves with longer, more strongly recurved apices. Intermediates between the two species have not been observed.

5. *Camptochaete excavata* (Taylor) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 310 (1877)

Hypnum excavatum Taylor, *Phytologist* 1095 (1844); *Thamnum excavatum* (Taylor) Kindb., *Hedwigia* 41: 258 (1902). T: Five Islands, N.S.W., *A.Cunningham*; holo: FH-Taylor; iso: BM-Wilson, BM-Lyons.

Hypnum schlosseri Sendtn., in C.Müller, *Syn. Musc. Frond.* 2: 451 (1851); *Camptochaete schlosseri* (Sendtn.) Broth. ex Paris, *Coll. Nom. Broth.* 5 (1909); *Rigodium schlosseri* (Sendtn.) Kindb., *Enum. Bryin. Exot. Suppl.* 2: 103 (1891). T: *s. loc.*, Australia, *coll. unknown*; not located.

Hypnum vagum Hornsch. ex Müll.Hal., *Syn. Musc. Frond.* 2: 466 (1851); *Rigodium vagum* (Hornsch. ex Müll.Hal.) Reichardt, *Reise Novara, Pilze, Leber-Laubm.* 1(3): 188 (1870); *Thamniella vaga* (Hornsch. ex Müll.Hal.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876–77: 319 (1878); *Porotrichum vagum*

(Hornsch. ex Müll.Hal.) Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 83 (1882); *Coelidium vagum* (Hornsch. ex Müll. Hal.) Paris, *Index Bryol.* 279 (1894); *Lembophyllum vagum* (Hornsch. ex Müll.Hal.) Lindb., *Index Bryol.* 718 (1896); *Thamnum vagum* (Hornsch. ex Müll.Hal.) Kindb., *Hedwigia* 41: 254 (1902); *Camptochaete vaga* (Hornsch. ex Müll.Hal.) Broth., in H.G.A.Engler & K.A.E.Prantl., *Nat. Pflanzenfam.* I, 3: 865 (1907). T: *s. loc.*, Australia, *F.Sieber* 23 lecto: BM-Hooker 2588, *fide* R.S.Tangney, *J. Hattori Bot. Lab.* 81: 102 (1997); isolecto: BM-Wilson.

Illustration: R.S.Tangney, *op. cit.* 105, fig. 29.

Fronds (incl. stipe) 3–8 cm long, 1.6–4.5 cm wide. Frond axes and branches terete-foliate and turgid, rarely complanate; tips of branches often flagelliform. Frond axis leaves patent, orbicular, 1.1–1.3 mm long, 1.25–1.75 mm wide, deeply concave, smooth; apex rounded, abruptly mucronate. Branch leaves patent, orbicular, 0.75–1.00 mm long, 0.7–0.9 mm wide, concave, smooth; apex rounded, abruptly mucronate; mid-laminal cells short-linear, 30–55 × 5.0–7.5 µm; cells at the leaf apex 12–35 × 7–8 µm, 2–5 times longer than wide.

Capsules long-exserted, horizontal.

Occurs in eastern Qld, eastern N.S.W, A.C.T. and eastern Vic.; usually found in wet forest, but also in dry-sclerophyll forest or scrub at altitudes up to 1550 m, on a variety of substrata, mostly close to the ground, often on rocks. Also in Lord Howe Island and Papua New Guinea.

Qld: track from Lamins Hill Rd, Mt Bartle Frere, E of Malanda, *D.H.Norris* 42722 (CANB); Binna Burra, Lamington Natl Park, *N.Klazenga* 6013 (MEL). N.S.W.: Minamurra Falls, near Kiama, *R.G.Robbins* 1893 (CANB). A.C.T.: near Hurdle Ck, Tidbinbilla Nature Reserve, *C.R.Fulton* 78 (CANB). Vic.: headwaters of Harrisons Ck, 14 km ENE of Mallacoota, Howe Ra., *D.Verdon* 1283 (CANB).

In its typical form *C. excavata* is one of the easiest species to recognise, because of its compact habit, turgid frond axes and branches and deeply concave, orbicular, mucronate leaves. Nevertheless, it has been widely confused with *Lembophyllum divulgum* and *Weymouthia cochlearifolia*, although it can be readily separated from those taxa by its leaves that end in a short, sharp point. The stems and branches of *C. excavata* can become complanate, with the leaves almost flat, broadly ovate and acuminate. In some cases, more typical turgid stems and branches with deeply concave leaves are entirely absent, so that the plants can be confused with *C. deflexa*. However, these individuals can be recognised as *C. excavata* by the patent stipe leaves.

Tangney (1997) cited a collection from Mt Macedon in central Vic. There is also a specimen in MEL by an unknown collector from the Stirling Ranges in the south-west of W.A., although this is possibly incorrectly labelled.

Excluded Names

Camptochaete angustata (Mitt.) Reichardt, *Reise Novara Pilze, Leber-Laubm.* 1(3): 191 (1870)

Stereodon angustatus Mitt., *J. Proc. Linn. Soc.* 4: 88 (1859). T: near Wellington, New Zealand, *coll. unknown*; lecto: NY *n.v.*, *fide* R.S.Tangney, *op. cit.* 92; syn: *Kerr, Lyall, Knight* (not located).

This species is endemic to New Zealand (including the Kermadec Islands).

Camptochaete pulvinata (Hook.f. & Wilson) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 309 (Musc. 2: 213) (1877)

Isothecium pulvinatum Hook.f. & Wilson, in J.D.Hooker, *Fl. Nov.-Zel.* 2: 105 (1854). T: North Island, New Zealand, *W.Colenso*; lecto: BM-Wilson *n.v.*, *fide* R.S.Tangney, *op. cit.* 95; isolecto: BM-Hooker.

Camptochaete beckettii Broth., *Öfvers. Förh. Finska Vetensk.-Soc.* 42: 112 (1900). T: Thames, Auckland, North Island, New Zealand, *D.Petrie s.n.* [*T.W.N.Beckett* 713]; holo: H-BR; iso: CHR.

This species occurs only in New Zealand and (doubtfully) in the Hawaiian Islands.