

ORTHOTRICHUM

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Orthotrichum Hedw., *Sp. Musc. Frond.* 162 (1801); from the Greek *ortho* (erect) and *trichos* (a hair), in reference to the hairs present on the calyptra of some species.

Type: *O. anomalum* Hedw.

Autoicous (in Australia). Plants short to tall, erect, densely or loosely tufted. Stems usually branched. Leaves erect, appressed or, rarely, contorted when dry, markedly hygroscopic, ovate-lanceolate to lanceolate, usually unistratose and with an acute apex; costa strong, not reaching the apex; upper laminal cells rounded to short-rectangular, papillose, thick-walled; basal laminal cells rectangular or rhomboidal, smooth, sometimes with nodose and porose walls. Fusiform gemmae on leaves of some species.

Perigonal and perichaetial leaves not or only slightly differentiated. Calyptra large, mitrate to conical, smooth or plicate, hairy or glabrous. Capsules on main stem, immersed, emergent or exerted, cylindrical to ovoid, usually ribbed when dry; exothecial bands usually 8, each 3 or 4 cells wide; stomata immersed or superficial, usually in the central capsule region; operculum conico-rostrate. Peristome single or double; exostome teeth 8 or 16, erect to strongly decurved when dry, papillose; endostome segments 8 or absent, derived from 1 or 2 cell rows, smooth or papillose. Spores unicellular, uniform, small or medium-sized, papillose.

A genus of c. 120 species predominantly in temperate regions in both hemispheres. Represented in Australia by five non-endemic species. Diversity is greater in New Zealand with nine species, four of which are endemic. *Orthotrichum* is mainly epiphytic on native and exotic hosts; it also occurs on calcareous and siliceous rocks. Only *O. tasmanicum* reaches as far north as Qld; other species occur in S.A., eastern N.S.W., A.C.T., Vic. and Tas. from sea level to 2000 m.

Four of the seven subgenera, *Orthotrichum* Hedw., *Phaneroporum* Delogne, *Cryptoporus* (Braithw.) Limpr. and *Pulchella* (Schimp.) Vitt, occur in Australia. These can be distinguished by their cytology, the position of the stomata and other characters. Subgenera with immersed stomata have the chromosome number $n = 6$, while those with superficial stomata have the chromosome number $n = 11$. This cytological correlation is consistent for the Australian taxa examined.

References

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- 1 Basal laminal cells usually with nodose, sometimes porose walls; stomata superficial2
1: Basal laminal cells usually with smooth walls; stomata immersed4
2 Exostome erect to spreading when dry, roughly papillose; endostome often absent; leaves sometimes bistratose above; usually on rock (*I*)4. **O. rupestre**
2: Exostome reflexed or recurved when dry, moderately papillose; endostome segments 8, well developed; leaves unistratose; usually epiphytic3
3 Endostome segments usually 2 rows of cells, with compound papillae; setae long, distinct; capsules exserted (2:.)5. **O. tasmanicum**
3: Endostome segments usually 1 row of cells, with papillae usually fusing into lines; setae short, indistinct; capsules emergent to short-exserted 3. **O. hortense**
4 Exostome teeth erect to spreading when dry; endostome usually absent or of small segments; capsules erect when dry; on calcareous rock (*I*:) 2. **O. cupulatum**
4: Exostome teeth recurved when dry; endostome well developed; capsules often recurved when dry; usually epiphytic 1. **O. assimile**

1. *Orthotrichum assimile* Müll.Hal., *Syn. Musc. Frond.* 1: 704 (1849)

T: Chile, *E.F.Poppig s.n.*; lecto: H, *fide* J.Lewinsky, *Lindbergia* 10: 73 (1984).

Orthotrichum acrolepharis Müll.Hal., *Hedwigia* 37: 136 (1898). T: upper Ovens R., Vic., *A.McCann s.n.*; iso: JE.

[*Orthotrichum longithecum* auct. non R.Br.ter.: J.Lewinsky, *J. Hattori Bot. Lab.* 56: 436 (1984)]

[*Orthotrichum tasmanicum* auct. non Hook.f. & Wilson: H.P.Ramsay, *Austral. J. Bot.* 22: 308–309 (1974)]

[*Orthotrichum alpestre* auct. non Hornsch.: G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 228 (1976)]

Illustrations: J.Lewinsky, *J. Hattori Bot. Lab.* 56: 436, fig. 32; 438, fig. 33 (1984), as *O. longithecum*.

Plants loosely or densely tufted, 3.5–12.0 mm tall, yellow to olive-green above, brown to black below. Leaves appressed-flexuose when dry, ovate-lanceolate to lanceolate, 1.8–4.1 mm long; apex rounded-acute, acute or acuminate; margin recurved, entire, rarely dentate apically; upper laminal cells isodiametric, 6.5–20.0 µm wide, thick-walled, each with 2–4 low mostly unbranched papillae; basal laminal cells rectangular, 15–90 × c. 9.5 µm, usually thin-walled, smooth, without pores. Gemmae 5–7 cells long.

Calyptra conical, plicate, split, with long hairs. Capsules immersed to emergent, sometimes recurved when dry, narrowly cylindrical, deeply 8-ribbed and constricted below mouth when dry; stomata immersed. Peristome double; exostome teeth 8, recurved, papillose; endostome segments 8, well developed, narrow. Spores 6–21 µm diam. $n = 11 (10 + m)$, *fide* H.P.Ramsay, *Austral. J. Bot.* 22: 308–309 (1974), as *O. tasmanicum*; H.P.Ramsay, *J. Hattori Bot. Lab.* 74: 188 (1993).

Occurs in south-eastern N.S.W., A.C.T. and Vic.; also in New Zealand and South America. This species is primarily epiphytic, but it is also found on calcareous and non-calcareous rocks up to 1500 m.

N.S.W.: Mt Canobolas, *H.Streimann 9184* (CANB); Yarrangobilly Caves, *H.P.Ramsay 5/66* (NSW); Island Bend, *H.Streimann 4020* (CANB). A.C.T.: Naas Ck, *H.Streimann 2293* (CANB). Vic.: Buchan Caves, *J.Lewinsky 1840* (C).

2. *Orthotrichum cupulatum* Hoffm. ex Brid., *Muscol. Recent.* 2(2): 25 (1801)

var. *cupulatum*

T: Göttingen, Germany, *G.F.Hoffmann*; holo: Herb. Bridel *n.v.*

Illustrations: J.Lewinsky, *J. Hattori Bot. Lab.* 56: 430, fig. 27; 434, fig. 30 (1984).

Plants loosely tufted, 12–20 mm tall, moderately glaucous, blue-green to olive-green above, brown to black below. Leaves slightly contorted when dry, lanceolate to ovate-lanceolate, 2.3–3.2 mm long; apex acute; margin recurved, entire; base decurrent; upper laminal cells isodiametric, 8–13 μm wide, each with 2 or 3 low unbranched papillae; basal laminal cells rectangular, 32–64 \times 9.5–16.0 μm , thin-walled, without pores, smooth.

Calyptra mitrate, split, plicate, papillose. Capsules immersed to emergent, ovoid-urceolate, ribbed and constricted below the mouth when dry; ribs alternating, 8 long and 8 short; stomata immersed. Peristome usually single; exostome teeth 16, erect to spreading; endostome usually absent. Spores 19.0–22.5 μm diam. $n = 11$, *vide* H.P.Ramsay, *J. Hattori Bot. Lab.* 74: 187–188 (1993).

This species occurs on calcareous rocks in south-eastern N.S.W., A.C.T. and eastern Vic.; also in New Zealand. It can tolerate large variations in temperature, but it is not found in very dry habitats.

N.S.W.: Jenolan Caves, *H.P.Ramsay 8/87, 15/87* (NSW); Glory Hole, Yarrangobilly Caves, *W.W.Watts s.n.* (NSW); Blue Water Holes, 42 km W of Adaminaby, *J.R.Spence 4472* (NSW). A.C.T.: Cotter Reserve, *H.Streimann 4765* (CANB). Vic.: Buchan R., *I.G.Stone 14207* (MEL).

A second variety, *O. cupulatum* var. *austrocupulatum* (Dixon & Sainsbury) Lewinsky, occurs in New Zealand.

3. *Orthotrichum hortense* Bosw., *J. Bot.* 30: 97 (1892)

T: Hanmer Plains, New Zealand, *W.Roper*; lecto: OXF, *vide* J.Lewinsky, *J. Hattori Bot. Lab.* 56: 418 (1984).

Illustration: J.Lewinsky, *J. Hattori Bot. Lab.* 56: 419, fig. 21 (1984).

Plants loosely tufted, 5–20 mm tall, bright green to olive-green above, dark brown below. Leaves slightly flexuose when dry, ovate-lanceolate, 2.4–3.4 mm long, unistratose; apex long-acuminate; margin recurved, entire; upper laminal cells isodiametric to short-rectangular, 8–19 \times 6.5–14.5 μm , thick-walled, papillose; basal laminal cells rectangular to rhomboidal, 45–87 \times 8–14 μm , thick-walled, not porose, each with 2 or 3 branched papillae.

Calyptra conical, slightly split, plicate, hairy. Setae short. Capsules emergent or short-exserted, cylindrical, deeply 8-ribbed and constricted below the mouth when dry; stomata superficial. Peristome double; exostome teeth 8, recurved, moderately papillose; endostome segments 8, incurved, shorter than exostome, papillose. Spores 16–21 μm .

Rare in alpine, south-eastern N.S.W.; also in New Zealand and South America. Predominantly epiphytic, occasionally on rocks.

N.S.W.: Yarrangobilly Village, *W.W.Watts 8503* (NSW); *loc. id.*, *I.G.Stone 10824* (MEL); Yarrangobilly Caves, *W.W.Watts 8901A* (NSW); near Lawn Cemetery, Khancoban, *R.G.Coveny 17525* (NSW); Cave Ck via Blue Waterholes fire-trail, Kosciuszko Natl Park, *R.G.Coveny 17530* (NSW).

There are no records of chromosome numbers for Australian collections, but the haploid number in New Zealand is $n = 6$ (H.P.Ramsay & J.Lewinsky, *New Zealand J. Bot.* 22: 346, 1984).

4. *Orthotrichum rupestre* Schleich. ex Schwägr., *Sp. Musc. Frond.*, Suppl. 1, 2: 374 (1816)

var. *rupestre*

T: Pasterze, Austria, *C.F.Schwägrichen*; lecto: G, *vide* J.Lewinsky, *J. Hattori Bot. Lab.* 56: 398 (1984).

Orthotrichum praeperistomatium Venturi, *Rev. Bryol.* 23: 67 (1896). T: “Mt Affred” [probably Mt Arthur], Tas., Waymouth [*W.A.Weymouth*]; holo: TR, iso: H.

Orthotrichum rupestriforme Venturi, *Rev. Bryol.* 23: 67 (1896). T: Queenstown, Tas., *Weymouth* [W.A.Weymouth] 5; holo: TR.

Orthotrichum sullivanii Müll.Hal., *Hedwigia* 37: 137 (1898). T: Mt Kosciuszko, N.S.W., 1884, *D.Sullivan* 8; lecto: MEL; fide J.Lewinsky, *J. Hattori Bot. Lab.* 56: 398 (1984); isolecto: NSW; syn: Omeo, Vic., 1884, *J.Stirling* (MEL); Mt Ararat, Vic., 1883, *D.Sullivan s.n.* (MEL).

Illustration: J.Lewinsky, *J. Hattori Bot. Lab.* 56: 399, fig. 8 (1984).

Plants loosely to densely tufted or matted, 15–45 mm tall, olive-green to yellow-brown above, dark brown to black below. Leaves appressed and almost straight when dry, ovate-lanceolate, 3–4 mm long, partially bistratose above; apex acute; margin broadly recurved, entire; upper laminal cells isodiametric or elongate, $10.0\text{--}17.5 \times 6.5\text{--}13.0 \mu\text{m}$, with branched papillae; basal laminal cells rectangular or rhomboidal, $35\text{--}77 \times 10\text{--}18 \mu\text{m}$, with thick walls, nodose, with or without pores. Gemmae not known.

Calyptra conical, slightly split, plicate, long-hairy. Capsules emergent, short-ovoid to short-cylindrical, sometimes shallowly 8-ribbed, with the mouth constricted when dry; stomata superficial. Peristome single or double; exostome teeth 8 or 16, erect to spreading, roughly papillose; endostome segments absent, or 8 in single row. Spores 20–26 μm diam. Chromosome number not known for Australia.

This cosmopolitan moss occurs in south-eastern N.S.W., A.C.T., north-eastern Vic. and Tas. Grows mainly on non-calcareous rocks and boulders, occasionally on trees and shrubs, in lowlands and on mountains in dry and moist areas.

N.S.W.: Yarrangobilly Caves, *W.W.Watts 8941* (NSW). A.C.T.: Mt Gingera, *H.Streimann 3488* (CANB). Vic.: Falls Creek, *I.G.Stone 14231* (MEL).

5. *Orthotrichum tasmanicum* Hook.f. & Wilson, in W.Wilson, *London J. Bot.* 7: 27 (1848)

var. *tasmanicum*

T: North Esk R., Launceston, Tas., Sept. 1841, *R.C.Gunn 1629*; lecto: BM, fide J.Lewinsky, *J. Hattori Bot. Lab.* 56: 405 (1984); isolecto: MEL, NSW, WELT.

Orthotrichum lawrencei Mitt., in J.D.Hooker, *Bot. Antarct. Voy.* 3(2): 184 (1859). T: Tas., *R.W.Lawrence*; holo: BM.

Orthotrichum laterale Hampe, *Linnaea* 40: 309 (1876). T: Hume R., Vic., Jan. 1874, *F.Mueller*; iso: MEL, NSW.

Orthotrichum lateciliatum Venturi, in V.F.Brotherus, *Oefvers. Förh. Finska Vetensk.-Soc.* 35: 33 (1893). T: New Town Rivulet, Tas., *W.A.Weymouth 895*; lecto: TR, fide D.H.Vitt & P.-L.Nimis, *Taxon* 36: 109 (1987); isolecto: BM, H; St. Crispins, Mt Wellington, Tas., *W.A.Weymouth 897*; syn: TR.

Orthotrichum lateciliatum var. *apiculatum* Venturi, in W.A.Weymouth, *Pap. & Proc. Roy. Soc. Tasmania* 1894–95: 112 (1896). T: Hobart Rivulet, Tas., *W.A.Weymouth*; iso: H.

Orthotrichum encalyptaceum Müll.Hal., *Hedwigia* 37: 138 (1898). T: Mt Ararat, Vic., Sept. 1883, *D.Sullivan s.n.*; lecto: MEL, fide J.Lewinsky, *J. Hattori Bot. Lab.* 56: 406 (1984); isolecto: NSW; Mt Kosciuszko, N.S.W., 1884, *D.Sullivan s.n.*; syn: MEL.

Orthotrichum encalyptaceum Müll.Hal. var. *tenuisetum* Müll.Hal., *Hedwigia* 37: 138 (1898). T: southern Australia, *F.M.Campbell*; iso: BM.

Orthotrichum whiteleggei Müll.Hal., *Hedwigia* 37: 137 (1898). T: Moss Vale, N.S.W., *T.Whitelegge*; iso: MEL.

Orthotrichum campbelliae Watts & Whitel., *Proc. Linn. Soc. New South Wales* 30 (Suppl.): 94 (1906), *nom. nud.* Based on: “Victoria”, 1899, *O.Campbell* (MEL).

Orthotrichum waltheri Watts & Whitel., *Proc. Linn. Soc. New South Wales* 30 (Suppl.): 96 (1906), *nom. nud.*

Illustrations: G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 227, pl. 42 (1976); D.G.Catcheside, *Mosses of South Australia* 209, fig. 112 (1980); J.Lewinsky, *J. Hattori Bot. Lab.* 56: 406, fig. 13; 407, fig. 14 (1984).

Plants loosely tufted, 10–30 mm tall, olive-green, bright green or yellow above, dark brown below. Leaves crisped and contorted when dry, lanceolate to ovate-lanceolate, 2.7–3.7 mm long, unistratose; apex long-acute or acuminate; margin recurved, slightly undulate, entire; upper laminal cells isodiametric or short-rectangular, 6–13 μm long, thick-walled, papillose, the papillae sometimes branched; basal laminal cells rectangular to rhomboidal, $54.5\text{--}70.5 \times 8.0\text{--}14.5 \mu\text{m}$, thin- to thick-walled, nodose, porose. Gemmae not known.

Calyptra mitrate, usually hairy. Setae long. Capsules long-exserted, cylindrical-ovoid, strongly ribbed in upper half or almost smooth when dry; stomata superficial. Peristome double; exostome teeth 8, recurved when dry, moderately papillose; endostome segments 8, in 2 rows, well developed, papillose. Spores 19–24 μm diam. $n = 6$, *vide* H.P.Ramsay, *J. Hattori Bot. Lab.* 74: 185 (1993).

Occurs in S.A., eastern Qld, southern N.S.W., A.C.T., Vic. and Tas., from sea level to 2000 m; also in New Zealand. Epiphytic on native and introduced shrubs and trees, rare on non-calcareous rocks; absent from dry areas.

S.A.: Aldgate, *L.D.Williams* 648 (MEL). Qld: Mt Elliott Natl Park, *I.G.Stone* 18487 (MEL). N.S.W.: Macquarie Pass, *H.Streimann* 4836 (CANB). A.C.T.: Naas Ck, *H.Streimann* 2287 (CANB). Vic.: Sundial Peak, *I.G.Stone* 7640 (MEL).

A second variety, var. *parvithecum* (R.Br.ter.) Sainsbury, occurs in New Zealand.

Two specimens listed as *nomina nuda* have been examined at MEL. *Orthotrichum waltheri*, named by Watts & Whitelegge as a synonym of the New Zealand species *O. calvum* Hook.f. & Wilson, has been identified as *O. tasmanicum* (A.W.Thies, *Australas. Bryol. Newslett.* 32: 4, 1995). *Orthotrichum campbelliae* has been studied by D.A.Meagher (pers. comm.) and was also found to be conspecific with *O. tasmanicum*. In his revision of *Ulota*, Malta (1933) found a specimen in C.Müller's herbarium at H-BR labelled "Victoria, *O.Campbell*, 1889", the same label data as the original specimen which he recorded as *O. tasmanicum* (Malta, 1933, p. 9).