

THUIDIUM

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Thuidium Schimp., in P.Bruch, W.P.Schimper & W.T.Gümbel, *Bryol. Eur.* 5: 157 (1852); so named because of the resemblance of the plants to miniature red cedars of the genus *Thuja*.

Type: *T. tamariscinum* (Hedw.) Schimp.

Dioicous. Plants medium-sized to tall, bipinnate or partly tripinnate. Stems to c. 15 cm long. Axillary hairs consisting of 1 (–2) basal cells and 1–5 distal cells. Stem paraphyllia crowded, to c. 25 cells long, often all forked, but short ones can be simple. Branch paraphyllia more often simple, more distantly set, often confined to the basal part of the branches. Ultimate branchlets often naked. Pseudoparaphyllia in Australian species inconspicuous. Stem leaves mostly triangular, deltoid or ovate, mostly strongly plicate; apical part often subulate, less often acute or obtuse, mucicous or piliferous; margin recurved and appendiculate below; costa often appendiculate at the base; distal epidermal cells mostly papillose or prorate, often bearing chlorophyllose appendages; median leaf cells 4–10 µm wide, abaxially papillose, flat or mammillose; papillae simple or compound; adaxial ornamentation absent or weak. Leaves of ultimate branchlets ovate to ovate-oblong, concave; costa reaching to 70% of the length of the leaf, abaxially prominent, smooth or weakly papillose below, smooth or variously ornamented upward, occasionally ending in a spine; median leaf cells 4–12 µm wide, ornamented as in stem leaf cells, but adaxial ornamentation occasionally rather strong.

Inner perichaetial leaves plicate; shoulders eciliate or ciliate; costa mostly ending well below the leaf tip; median leaf cells smooth or papillose. Seta c. 2.0–5.5 cm long, usually smooth, but mammillose in *T. plumulosum*. Capsules to 5 mm long; stomata 5–40, often showing deformations; operculum mostly long-rostrate. Calyptra narrowly or broadly cucullate, smooth and naked, in *T. plumulosum* narrowly campanulate or weakly cucullate, scabrous.

Thuidium probably comprises 20–25 species, making it the largest dioicous genus of the family. Species are common in the boreal and warmer parts of the Northern Hemisphere, the tropics, South Africa, and temperate parts of the Australian region; almost all tropical species are montane plants. Many species (mainly American ones) have yet to be critically evaluated.

References

Touw, A. (2001a), A review of the Thuidiaceae (Musci) and a realignment of taxa traditionally accommodated in *Thuidium* sensu amplo (*Thuidium* Schimp., *Thuidiopsis* (Broth.) M.Fleisch., and *Pelekium* Mitt.), including *Aequatoriella* gen. nov. and *Indoithuidium* gen. nov., *J. Hattori Bot. Lab.* 90: 167–209.

Touw, A. (2001b), A taxonomic revision of the Thuidiaceae (Musci) of tropical Asia, the western Pacific, and Hawaii, *J. Hattori Bot. Lab.* 91: 1–136.

Touw, A. & Falter-Van den Haak, L. (1989), A revision of the Australasian Thuidiaceae (Musci), with notes on species from adjacent regions, *J. Hattori Bot. Lab.* 67: 1–57.

Key

- 1 Stem leaves appressed or weakly incurved when dry, ovate to ovate-lanceolate, weakly or not at all acuminate and mucicous..... **3. T. subglaucinum**
- 1: Stem leaves flexuose and erect or patent when dry, ±triangular, contracted to a very narrowly acuminate apex, often piliferous.....2

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- 2 Median cells in leaves of ultimate branches pluripapillose **2. T. laeviusculum**
- 2: Median cells in leaves of ultimate branchlets unipapillose.....3
- 3 Costa in leaves of ultimate branches abaxially with distal epidermal cells that are similar to the adjacent laminal cells; seta densely mamillate; calyptra narrowly campanulate or cucullate, scabrid.....
..... **4. T. plumulosum**
- 3: Costa in leaves of ultimate branches abaxially with distal epidermal cells that are smooth or spinose-prorate and longer than the adjacent laminal cells; seta smooth; calyptra cucullate, smooth
..... **1. T. cymbifolium**

1. Thuidium cymbifolium (Dozy & Molk.) Dozy & Molk., *Bryol. Javan.* 2: 115 (1865)

Hypnum cymbifolium Dozy & Molk., *Ann. Sci. Nat., Bot.* sér. 3, 2: 10 (1844). T: Sumatra, [Indonesia], *P.W.Korthals s.n.*; lecto: L, *fide* A.Touw & L.Falter-Van den Haak, *op. cit.* 30; Java, [Indonesia], *P.W.Korthals s.n.*, syn: L.

Hypnum nano-delicatulum Hampe, *Linnaea* 40: 323 (1876); *Thuidium nano-delicatulum* (Hampe) A.Jaeger, in A.Jaeger & F.Sauerbeck, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876–77: 259 (1878); *Cyrto-Hypnum nano-delicatulum* (Hampe) A.Jaeger, in A.Jaeger & F.Sauerbeck, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876–77: 259 (1878), *nom. inval. in synonym.* T: “Subtropical Eastern Australia”, *Eaves s.n.*; holo: BM; iso: H, L.

Hypnum plumulosiforme Hampe, *Linnaea* 40: 324 (1876); *Thuidium plumulosiforme* (Hampe) A.Jaeger, in A.Jaeger & F.Sauerbeck, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876/77: 267 (1878); *Cyrto-Hypnum plumulosiforme* (Hampe) A.Jaeger, in A.Jaeger & F.Sauerbeck, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876/77: 267 (1878), *nom. inval. in synonym.* T: “Subtropical Eastern Australia”, *Eaves s.n.*; lecto: BM, *fide* A.Touw & L.Falter-Van den Haak, *op. cit.* 30; isolecto: H; Illawarra, N.S.W., 1875, *S.Johnson s.n., p.p.*, syn: BM.

Thuidium protensulum Müll.Hal. ex Cardot, *Bull. Herb. Boissier*, sér. 2, 8: 171 (1908). T: New Caledonia, *Vieillard s.n.*; holo: PC.

[*Thuidium furfurosum auct. non* (J.D.Hook. & Wilson) Reichardt: H.P.Ramsay, in A. Löve, *Taxon* 16: 559 (1967) *p.p.*]

[*Thuidiopsis furfurosa auct. non* (J.D.Hook. & Wilson) M.Fleisch.: H.P.Ramsay, *Aust. J. Bot.* 22: 328 (1974) *p.p.*]

[*Thuidium ramentosum auct. non* (Mitt.) Mitt.: W.Mitten, *Trans. Proc. Roy. Soc. Victoria* 19: 90 (1882)]

Illustrations: A.Touw & L.Falter-Van den Haak, *op. cit.* 9, fig. 1(c); A.Touw, *op. cit.* 21, fig. 5 (2001b); H.Streimann, *The Mosses of Norfolk Island* 150, pl. 32, 151, fig. 67 (2002).

Plants yellowish green, dark green or brownish, bipinnate to tripinnate. Stems to 20 (–25) cm long. Ultimate branchlets to 25, terete when dry. Stem leaves to 1.8 mm long, deltoid-ovate, triangular-ovate or triangular; base appressed to weakly patent both wet and dry; acumen piliferous, patent, caudate, mostly at least as long as the rest of the leaf; hair to 15 cells long. Leaves of ultimate branchlets to 0.3 mm long; apex usually acute; costa weakly prominent, not cristate, distal abaxial epidermal cells elongate, often bearing 1–3 spines; median leaf cells isodiametrical or nearly so, abaxially unipapillose, adaxially smooth or nearly so; papillae low to tall, mostly curved.

Inner perichaetial leaves ciliate. Calyptra cucullate, smooth, naked. Seta smooth, to 5.5 cm long, *n* = 11, *fide* H.P.Ramsay, in Löve, *Taxon* 16: 552–561 (1967), as *T. furfurosum*, see Touw & Falter-Van den Haak, *op. cit.* 5.

Common in rainforest area in eastern Qld, N.S.W. and in south-eastern Vic.; from sea level to c. 1500 m. Widespread in East and SE Asia and in Oceania; also in Lord Howe Island, Norfolk Island and northernmost New Zealand. On tree bases, logs, rocks, banks, and occasionally terrestrial, in damp places, often close to forest streams.

Qld: Culpha Ck catchment, 41 km SE of Ravenshoe, *H.Streimann* 28989 (L). N.S.W.: Minnamurra Falls, 3 miles [c. 4.9 km] W of Jamberoo, *M.Tindale P 11018* (NSW). Vic.: Harrisons Ck, Howe Ra. E of Malacoota, Gippsland, *D.Verdon* 1274 (L).

Fruiting plants have been collected only between Brisbane and Kiama (S of Sydney). In north-eastern Queensland only small and slender plants have been found. These often have very small, short-acuminate stem leaves, and they occasionally lack forked paraphyllia.

2. *Thuidium laeviusculum* (Mitt.) A.Jaeger, in A.Jaeger & F.Sauerbeck, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1876–77: 258 (1878)

Hypnum laeviusculum Mitt., in W.M.Wilson, in J.D.Hooker, *Fl. Tasman.* 207 (1859), *hom. illeg.*; *Leskea laeviuscula* Mitt., *J. Linn. Soc., Bot.* 4: 92 (1860). T: Fort William, Milford Sound, New Zealand, *Lyall s.n.*; lecto: NY, *vide* A.Touw & L.Falter-Van den Haak, *op. cit.* 26; Tas., *W.Archer s.n.*; syn: BM, NY; New Zealand, *Kerr s.n.*; syn: NY; Wairoa R., Kaipara, New Zealand, *Mossman 742 p.p.*; syn: NY; near Wellington, New Zealand, *Stephenson 8*; syn: BM, NY.

Illustrations: A.Touw & L.Falter-Van den Haak, *op. cit.* 7, fig. 1(b). [pl. 77 in G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* (1976) shows *Thuidiopsis sparsa*.]

Plants green, yellowish or brownish, densely bipinnate to tripinnate. Stem to 15 (–25) cm long. Ultimate branchlets to 25, terete or loosely catenulate when dry. Stem leaves 0.7–1.5 (–2.0) mm long, deltoid, triangular or triangular-ovate; base appressed to erecto-patent both wet and dry; acumen often piliferous, caudate, flexuose; hair to 15 cells long. Leaves of ultimate branchlets to 0.3 mm long; apex mostly acute; costa cristate upwards; crest cells short-rectangular to quadrate and pluripapillose; median leaf cells abaxially 2–6-papillose, adaxially smooth or nearly so.

Inner perichaetial leaves ciliate. Calyptra cucullate, smooth, naked. Seta smooth, to 4.5 cm long.

Known from southern Vic. and Tas.; also in New Zealand, where it is widespread, and the Auckland Islands. Grows on damp rocks, logs, tree bases, and humus in rainforest.

Vic.: Lorne, *N.Klazenga 5995* (MEL).

Very similar to *T. cymbifolium* in general appearance, this species is easily distinguishable by the number of papillae on the leaf cells and the nature of the abaxial surface of the costa in branch leaves. A collection from N.S.W. (Paramatta, *Woolls s.n.*), reported by W.Mitten (*Trans. Proc. Roy. Soc. Victoria* 19: 90, 1882) could not be checked, but it probably relates to *T. cymbifolium*.

3. *Thuidium subglaucinum* Cardot, *Bull. Soc. Bot. Genève*, sér. 2, 3: 283 (1911)

T: Quelpart Is., Korea, Aug. 1907, *Faurie 701*; holo: PC *n.v.*

Illustration: A.Touw & L.Falter-Van den Haak, *op. cit.* 40, fig. 13.

Dioicous? Plants pale greyish green, yellowish or brownish, remotely to densely bipinnate. Stem to 10 cm long. Ultimate branchlets to 5, terete when dry. Stem leaves to 1.5 mm long, broadly ovate to ovate-lanceolate, appressed or somewhat incurved when dry, almost completely hiding the stem from view; apex muticous, broad, acute, weakly or not at all acuminate. Leaves of ultimate branchlets to 0.4 mm long, loosely imbricate when dry, patent when moist; apex acute; costa weakly or not at all prominent; abaxial epidermal cells elongate to linear, smooth or nearly so; median leaf cells rounded, abaxially pluripapillose, adaxially not ornamented; papillae low, arranged in a ring, often partly confluent or more or less stellate. Gametoecia and sporophytes not seen, unknown from Australia.

Occurs in south-eastern Qld, N.S.W., A.C.T. and Vic.; most reports are from a small area in A.C.T. and the Southern Tablelands of N.S.W. Elsewhere in the eastern Himalayas, China, Korea and Japan. Terrestrial in wet heathland and swampy grassland, between c. 700 and 1400 m alt.

Qld: Paling Yard Ck, 22 km ESE of Stanthorpe, *H.Streimann 52936* (L). N.S.W.: 2 miles [c. 3.2 km] SSE of Jerangle, Southern Tablelands, *L.G.Adams 2603* (CAMB, CHR, FH, L). A.C.T.: creek above Gibraltar Falls, *N.T.Burbidge 7542* (CANB). Vic.: Tangambalanga, *R.Simpson 946* (BM).

Immediately recognisable by its mostly appressed stem leaves lacking the narrow acumen found in all other Australian *Thuidium* species.

4. Thuidium plumulosum (Dozy & Molk.) Dozy & Molk., *Bryol. Javan.* 2: 118 (1865)

Hypnum plumulosum Dozy & Molk., *Ann. Sci. Nat., Bot.*, sér. 3, 2: 13 (1844). T: Karrau [Sungei Karau], Borneo, *P.W.Korthals s.n.*; lecto: L, *fide* A.Touw & L.Falter-Van den Haak, *op. cit.* 35; Padang-Bessie, Sumatra, [Indonesia], *P.W.Korthals s.n.*, syn: L.

Hypnum meyenianum Hampe, *Icon. Musc.* t. 8 (1844); *Thuidium meyenianum* (Hampe) Dozy & Molk., *Bryol. Javan.* 2: 121 (1865). T: Manila, Luzon, [Philippines], *Meyen s.n.*; holo: BM.

Leskea ramentosa Mitt., *Bonplandia* 9: 366 (1861); *Thuidium ramentosum* (Mitt.) Mitt., *J. Linn. Soc., Bot.* 10: 186 (1868). T: "Fiji" [Fiji], *B.C.Seemann, inter No. 863*; holo: NY.

Illustrations: A.Touw & L.Falter-Van den Haak, *op. cit.* 36, fig. 11 (1989); A.Touw, *op. cit.* 8, fig. 1 (2001b); H.Streimann, *The Mosses of Norfolk Island* 155, fig. 69 (2002).

Plants greyish green to dark green, densely bipinnate to tripinnate. Stem to 15 (–30) cm long. Ultimate branchlets to 35, closely set and rigidly parallel. Stem leaves to 1 mm long, broadly triangular-ovate or deltoid-ovate; base appressed to erecto-patent both wet and dry; acumen often piliferous, patent, narrowly triangular; hair to 8 cells long. Leaves of ultimate branchlets to 0.25 mm long, erecto-patent both wet and dry; apex mostly acute; costa cristate, the crest cells similar to the adjacent laminal cells, pluripapillose; median leaf cells isodiametric or nearly so, almost flat on both faces, abaxially unipapillose, adaxially not ornamented.

Inner perichaetial leaves strongly lacerate-ciliate, aristate; cilia and arista smooth to spinose-mamillose. Calyptra almost cylindrical, narrowly campanulate or weakly cucullate, scabrid. Seta densely mamilllose, to 4 cm long.

A tropical, lowland, rainforest species known from a few 19th century collections from Qld, and one from Vic. (probably mislabeled); widespread in tropical Malesia and south-western Oceania, including Norfolk Island. Also found in Christmas Island.

Qld: Rockhampton, 1866, *A.Dietrich s.n.* (H). Vic.?: Johnsonville, Gippsland, Aug. 1906, *Eagan 775* (BM).

Very similar to *T. cymbifolium* in general appearance, but immediately separable by its pluripapillose leaf cells. Australian collections lack sporophytes, but contain the very characteristic perichaetia that are thick and fluffy due to numerous long cilia.