ORTHOTRICHACEAE

Helen P. Ramsay[1], *Dale H. Vitt*[2] *& Jette Lewinsky-Haapasaari*†

Orthotrichaceae Arn., *Disp. Méth. Mousses* 13 (1825–26).

Type: *Orthotrichum* Hedw.

Dioicous, pseudautoicous or phyllodioicous with dwarf males, or autoicous, rarely synoicous. Plants acrocarpous or cladocarpous in loose or dense tufts, cushions or mats. Stems simple or branched, upright or creeping with upright branches; innovating branches lateral, below the sporophyte. Leaves imbricate, crowded, erect to erecto-patent when moist, appressed, flexuose or twisted, crisped or contorted when dry, lanceolate, ovate-lanceolate, oblong-lanceolate, oblong-elliptical, linear-lanceolate to linear, ligulate or occasionally lingulate, sometimes keeled, mostly entire; upper part of leaf unistratose, sometimes bistratose or multistratose; costa single, ending well below apex, percurrent or excurrent; upper laminal cells chlorophyllose, rounded to hexagonal, quadrate or short-rectangular to rhomboidal, rarely elongate, smooth, flat or bulging, mammillose or papillose and thick-walled; basal cells short-rectangular to linear, rarely hexagonal-rhomboidal, thin- or thick-walled, the walls sometimes nodose, smooth, papillose or with a single spiculose papilla; hyaline basal border present in some taxa; alar cells undifferentiated. Gemmae present or absent.

Perichaetia terminal, with differentiated or undifferentiated leaves. Calyptra usually large, mitrate to mitrate-oblong or conical-oblong, rarely campanulate or cucullate, hairy or glabrous. Setae short or long, usually smooth, sometimes twisted. Capsules immersed, emergent or exserted, erect when dry, symmetrical, broadly ovoid, oblong, cylindrical, pyriform or fusiform, rarely urceolate when dry, smooth or ribbed; operculum rostrate, rarely oblique. Peristome diplolepidous, single, double or absent; exostome teeth 8, 16 or absent, sometimes reduced, often curved when dry; endostome segments 8, 16 (rarely 32), reduced or absent; cilia absent. Spores isomorphic or anisomorphic, usually unicellular, rarely multicellular, papillose.

The family Orthotrichaceae includes c. 20 genera with c. 550 species that are widely distributed as epiphytes in temperate and tropical forests, the largest genera occurring in the Pacific region. Represented in Australia by eight genera and 42 species as well as 2 additional varieties and one subspecies; 17 taxa are endemic (*Macromitrium* 12 species; *Schlotheimia* 1; *Stoneobryum* 1; *Ulota* 1 species and 2 varieties). The family is an important component of the epiphytic bryoflora of Australia, often occurring in the canopy or at rainforest margins; also found on tree trunks and rocks. Many species are drought-tolerant and strongly hygroscopic.

The family comprises two subfamilies: Orthotrichoideae (*Orthotrichum*, *Stoneobryum*, *Ulota* and *Zygodon*) is predominantly temperate in both hemispheres, while the Macromitrioideae (*Groutiella*, *Macrocoma*, *Macromitrium* and *Schlotheimia*) is mainly tropical, subtropical and temperate in the Southern Hemisphere.

The systematic position of *Amphidium* Schimp. has been a cause of disagreement. Many researchers have placed it in Orthotrichaceae based on the sulcate capsule and differentiated strips of exothecial cells similar to *Zygodon*. However, the lack of a peristome has led others to believe the genus to be haplolepidous and to place it in Rhabdoweisiaceae (Vitt, 1973, 1984). Malta (1926) favoured its inclusion in Orthotrichaceae, and Lewinsky (1976) provided evidence based on capsule sections, the hairs on the calyptra and other data to support its

[1] c/- National Herbarium of New South Wales, Royal Botanic Gardens and Domain, Mrs Macquaries Road, Sydney, New South Wales 2000, Australia.

[2] Department of Plant Biology, Southern Illinois University Carbondale, Carbondale, IL 62901-6509, U.S.A.

Cite as: H.P.Ramsay, D.H.Vitt & J.Lewinsky-Haapasaari, *Australian Mosses Online. 47. Orthotrichaceae*. http://www.anbg.gov.au/abrs/Mosses_online/Orthotrichaceae.pdf (2012)

inclusion in Orthotrichaceae. Recent studies of nucleotide sequences as well as the presence or absence of small branchlets in the upper leaf axils, the type of rhizoid insertion, the pattern of papillosity on lateral and transverse walls and lumina, and habitat preferences support placement in the Rhabdoweisiaceae close to the Dicranaceae (Norris & Koponen, 1999; Shaw & Goffinet, 2000).

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Key to Genera

1 Stems erect-ascending, simple or sparingly branched; plants acrocarpous, with capsules on main (primary) stem 2

1: Stems creeping, freely branched, with numerous erect branches; plants cladocarpous, with capsules on erect (secondary) branches 5

2 Gemmae usually present in leaf axils, never on leaves; calyptra cucullate, not plicate; capsules long-exserted *(1)* ..... **ZYGODON**

2: Gemmae (if present) on leaves, not in leaf axils; calyptra mitrate or conical, ±plicate; capsules immersed, emergent or exserted 3

3 Upper laminal cells smooth or sometimes slightly bulging (mammillose); perichaetial leaves pale, enlarged; capsule immersed in perichaetium, on a very short seta; stomata immersed *(2:)* ..... **STONEOBRYUM**

3: Upper laminal cells papillose; perichaetial leaves not or slightly differentiated; capsule not immersed in perichaetium; seta short or long; stomata immersed or superficial 4

4 Leaves bordered near base; marginal cells quadrate to short-rectangular; transverse walls hyaline and thick; capsules exserted, with a long tapering neck; stomata superficial, often restricted to the neck; calyptra hairy *(3:)*.....**ULOTA**

4: Leaves not bordered near base; capsules immersed or exserted; stomata superficial or immersed, on the urn; calyptra glabrous or hairy.....**ORTHOTRICHUM**

5 Leaves straight, tightly erect-appressed, small and tightly spirally imbricate, not twisted or flexuose; apices not inrolled when dry *(1:)*.....**MACROCOMA**

5: Leaves erect-curved, erect-whorled, funiculate in spirals around stem, or each leaf twisted-contorted when dry, with decurved to recurved apices, twisted to tightly inrolled when dry.....6

6 Branch leaves ending in a long fragile subula, bordered in lower half by 2–5 rows of elongate hyaline cells *(5:)*.....**GROUTIELLA**

6: Branch leaves without a long fragile subula, not bordered in lower half.....7

7 Plants vivid dark green above, with a dense red tomentum below; laminal cells smooth; calyptra not plicate, enclosing capsule at maturity.....**SCHLOTHEIMIA**

7: Plants bright green or yellow-orange above, with dark brown tomentum below; laminal cells papillose, mammillose or smooth; calyptra plicate, not enclosing capsule at maturity.....**MACROMITRIUM**