BRACHYTHECIACEAE

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Brachytheciaceae Schimp., *Syn. Musc. Eur.*, 2nd edn [CXV] (1876).

Type: *Brachythecium* Schimp.

Plants minute or, usually, small to medium-sized, occasionally large, unbranched to bipinnately branched. Stems with a central strand and a cortex of 1–4 layers of small thick-walled cells. Rhizoids inserted at or just below the leaf nerve insertions, red-brown, sparingly to moderately strongly branched, smooth. Stem leaves lanceolate, ovate or cordate; apex acuminate, obtuse or rounded, occasionally apiculate; costa single, ending around mid-leaf or above, 3–4 (–5)-stratose. Median laminal cells linear or shortly so; basal laminal cells mostly shorter and wider than median cells, more strongly thick-walled and frequently porose.

Inner perichaetial leaves from an oblong or ovate base abruptly narrowed to a usually long narrow acumen that is usually erecto-patent to recurved (species with erect or inclined capsules have shorter and/or more erect leaf apices), not plicate; paraphyses present. Calyptra cucullate, smooth, naked or, rarely, with few paraphyses. Seta tall, red or orange, rarely yellowish above, smooth or mammillose. Capsules cylindrical to short-cylindrical or ovoid, often more strongly curved on the dorsal than on ventral side; annulus separating, of 1–3 rows of cells; exothecial cells slightly incrassate and occasionally slightly collenchymatous; stomata round- or ovate-pored. Peristome: exostome perfect or specialised, mostly with red or orange colors in basal parts; endostome perfect or specialised; cilia absent or present and nodose, rarely appendiculate above. Spores maturing in late autumn to early spring, in higher mountains sometimes later.

The family Brachytheciaceae probably includes 43 genera and c. 560 species. It is predominantly temperate, but is represented in all vegetation zones of the Earth. Seven genera and 22 species have been confirmed from Australia, and it is most diverse in the south-eastern mainland and Tasmania.

Several species are thought to be recent introductions to Australia, and while some are known only from man-made habitats, such as lawns and road-margins, others also occur in more natural environments. Because several widespread Australian species are shared with the Northern Hemisphere, these supposed introductions require careful evaluation. Some species might have been rare or overlooked previously, but have increased their distribution and abundance in more recent times with the creation of favorable man-made habitats, just as with many European species.

During the last decade the higher level relationships among the Brachytheciacee were the subject of intensive revisionary studies. However, because many taxa, especially those from outside the Northern Hemisphere, have not yet been evaluated the present treatment of the Australian taxa is conservative and the generic circumscriptions follow the traditional European concepts in most respects.

Due to the fact many of the most reliable diagnostic characters are found in the sporophyte, and because some gametophytic characters (e.g. groups of alar cells) require some experience before they can be accurately assessed, it is difficult to provide a key based exclusively on the gametophyte. On the other hand, since most specimens lack complete sporophytes, a key based only on gametophytic features is essential for practical identification. Although the generic key provided here is based almost exclusively on

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gametophytic characters, an overview of the most important sporophytic characters in species where sporophytes were found in Australian material is also included (Table 1).

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Key to Genera

1 Alar groups of stem leaves well differentiated, ovate or ovate-triangular, consisting of numerous small oblate to rectangular thin-walled or slightly incrassate cells that extend up along the basal leaf margin 1/6–1/3 way up leaf. ..... **SCORPIURIUM**

1: Alar groups of stem leaves differentiated or not, if ovate and consisting of small quadrate or rectangular cells, then extending at most 1/6 way up leaf 2

2 Stems and branches strongly curved when dry ..... **SCLEROPODIUM**

2: Stems and branches at most slightly curved when dry 3

3 Stem leaf costa 66–135 µm wide at the base, if less than 84 µm wide, then axillary hairs with (3–) 4–9 upper cells and the leaves imbricate, broadly obovate to broadly ovate, with a broadly obtuse or rounded and apiculate apex, strongly concave 4

3: Stem leaf nerve 18–88 µm wide at the base; axillary hairs with at most 4 upper cells; leaves differently shaped 5

4 Stem leaves abruptly narrowed to a broadly obtuse or rounded and apiculate apex; plants of drier habitats. ..... **PSEUDOSCLEROPODIUM**

4: Stem leaves gradually or abruptly tapering to a short- or long-acuminate apex; plants of wet habitats . . .. **BRACHYTHECIUM**

5 Plants medium-sized to large; stem leaves ovate or broadly ovate to almost orbicular, above shortly narrowed to a broadly obtuse, narrowly acute or broadly acuminate apex; leaves of stoloniferous shoots occasionally scale-like; margin very regularly denticulate or strongly denticulate in the upper 1/2–3/4 .... **PLATYHYPNIDIUM**

5: Plants minute to large; stem leaves varying around ovate to broadly cordate, occasionally lanceolate, gradually or abruptly narrowed to a short- or long-acuminate apex; margin above strongly to finely denticulate, but never very regularly so 6

6 Alar cells of stem leaves strongly inflated and hyaline, forming a sharply delimited triangular group that reaches from the leaf margin 2/5–4/5 of the distance towards the costa ..... **BRACYTHECIUM**

6: Alar cells of stem leaves not or slightly inflated; appearance of group varying 7

7 Alar cells oblate, quadrate, rectangular or elongate-rectangular, often giving a regular appearance, not or slightly inflated, and forming a well-delimited (sometimes small) group..... **BRACHYTHECIUM**

7: Alar cells either rectangular to short-linear and slightly inflated, or weakly differentiated and diffusely delimited from surrounding cells 8

8 Branch leaf costa usually ending in a distinct spine on the back in many or all leaves 9

8: Branch leaf costa not ending in a spine; in occasional specimens ending in a short and indistinct spine on the back of a few leaves 12

9 Stem leaves with a ±well-differentiated acumen that constitutes 1/5 or more of the leaf length (sometimes considerably longer)..... 10

9: Stem leaves without a differentiated acumen, or the acumen constituting less than 1/5 of the leaf length; if longer, then the leaves when dry (especially branch leaves) directed forwards from a spreading leaf base to incurved 11

10 Stem and branch leaves differing strongly from each other in size and shape; median laminal cells of stem leaves 5.5–8.5 µm wide; dioicous..... **EURHYNCHIUM**

10: Stem and branch leaves ±similar except for slight size differences; median laminal cells of stem leaves 6.5–11.5 µm wide; autoicous. ..... **RHYNCHOSTEGIUM**

11 Stem leaves narrowly ovate to narrowly lanceolate; stem and branch leaves with strongly inrolled margins when dry; leaves appearing very narrow, needle-like; plants small..... **RHYNCHOSTEGIUM**

11: Stem leaves ovate to broadly cordate; margins not strongly inrolled when dry; plants minute or medium-sized. ..... **EURHYNCHIUM**

12 Median laminal cells of stem leaves 4.5–8.5 µm wide. ..... **RHYNCHOSTEGIUM**

12: Median laminal cells of stem leaves 7.5–13.0 µm wide 13

13 Plants medium-sized; leaves, especially on branches, usually subcomplanate or complanate; seta smooth ..... **RHYNCHOSTEGIUM**

13: Plants medium-sized to large; leaves evenly arranged around stems and branches, often subimbricate; seta mammillose..... **BRACHYTHECIUM**

Table 1. Overview of selected sporophyte characters for Australian Brachytheciaceae for which complete sporophytes were found.

Species	Operculum	Seta	Peristome
Brachythecium mildeanum	Conical	Smooth	Perfect
B. paradoxum	Conical	Mammillose	Perfect
B. plumosum	Conical	Mammillose above	Perfect
B. rivulare	Conical	Mammillose	Perfect
B. rutabulum	Conical	Mammillose	Perfect
B. salebrosum	Conical	Smooth	Perfect
Eurhynchium asperipes	Rostrate	Mammillose	Perfect
E. laevisetum	Rostrate	Smooth to low-mammillose	Perfect
Rhynchostegium cylindritheca	Rostrate	Smooth	Specialised*
R. distratum	Rostrate	Smooth	Perfect
R. laxatum	Rostrate	Smooth	Perfect
R. muriculatum	Rostrate	Mammillose	Perfect
R. nano-pennatum	Rostrate	Smooth	Specialised*
R. tenuifolium	Rostrate	Smooth	Perfect
Scorpiurium cucullatum	Rostrate	Mammillose	Specialised*

*Occasionally referred to as “reduced”.