

## ACAULON

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*Acaulon* Mull.Hal., *Bot. Zeitung (Berlin)* 5: 99 (1847); from the Greek *a* (without) and *kaulos* (a stem or stalk), in reference to the extremely short stems of the gametophyte.

Lecto: *A. muticum* (Hedw.) Mull.Hal.

Monoicous or dioicous. Plants minute, bulbous, gregarious or scattered, ephemeral, growing on soil. Stems very short, 1–3 mm tall, lacking a central strand, with a basal tuft of fine colourless rhizoids. Leaves broadly ovate, concave; costa narrow, subpercurrent to excurrent; chlorophyllose lamellae present on adaxial surface of some species; margins plane, entire to serrate or crenulate. Laminal cells smooth; lamina KOH colour reaction red.

Perichaetia terminal; perichaetial leaves elongated. Setae very short. Capsules immersed, globose, with a minute apiculus, cleistocarpous; calyptra minute. Spores spherical or ellipsoidal, echinate or papillose, 23–65 µm diam.

*Acaulon* is an almost cosmopolitan genus of c. 15 species which occur mainly in warm, semi-arid and arid regions. Seven species are currently recognised in Australia including four endemic taxa. Although *Acaulon* species have a distinctive bulbiform habit due to the large immersed capsules surrounded by elongate perichaetial leaves, they can be mistaken for *Phascum*, and microscopic examination is required to distinguish the two genera. The KOH colour reaction of the leaf lamina works well for this genus, resulting in a distinctive red reaction in the upper laminal cell walls.

### References

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- 1 Plants to 1 mm tall; lamellae absent; leaf margins recurved .....2
- 1: Plants c. 2 mm tall; leaves with 2 or 3 irregular longitudinal lamellae (often inconspicuous) on the adaxial surface of the costa; margins not recurved .....3
- 2 Costa excurrent in a reddish gold arista .....1. **A. chrysacanthum**
- 2: Costa excurrent in a long hyaline hairpoint .....5. **A. leucochaete**

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- 3 Plants triquetrous when viewed from above; leaves strongly keeled ..... **7. A. triquetrum**
- 3: Plants not triquetrous when viewed from above; leaves not keeled ..... 4
- 4 Costa short-excurrent; apex long-acuminate, to 200  $\mu\text{m}$  long, often recurved and reflexed ..... **2. A. eremicola**
- 4: Costa long-excurrent, 300–700  $\mu\text{m}$  long ..... 5
- 5 Spores echinate; capsules brown; leaf margin usually entire ..... **6. A. mediterraneum**
- 5: Spores papillose; capsules orange or dark rust-brown; leaf margin entire, crenulate or irregularly dentate ..... 6
- 6 Mature spores 30–50  $\mu\text{m}$ , finely papillose; capsules usually orange; leaf margin usually entire ..... **4. A. integrifolium**
- 6: Mature spores 50–65  $\mu\text{m}$ , very coarsely granular; capsules rust-brown to dark brown; leaf margin usually crenulate to irregularly dentate ..... **3. A. granulosum**

**1. Acaulon chrysacanthum** I.G.Stone, *J. Bryol.* 9: 213 (1976)

T: Murray Valley Hwy, near Boundary Bend, Vic., 15 June 1969, *I.G.Stone 1385*; holo: MEL.

Illustrations: I.G.Stone, *op. cit.* 214, fig. 1; 215, fig. 2; 216, fig. 3 (1976).

Monoicous. Plants simple, bulbiform, to c. 2 mm tall, glossy reddish gold. Leaves imbricate, incurved, broadly ovate or oblong-ovate, deeply concave; outer leaves minute, bract-like; inner leaves larger c. 1.5 mm long; apex acute; costa reddish gold, excurrent in an arista; lamellae in 2 (–3) rows, each lamella 2–9 cells high, undulating; terminal cells slightly mammillate; leaf margins entire, occasionally irregularly crenulate and slightly reflexed at the apex. Upper laminal cells rhombic to short-oblong, those below hyaline, oblong-hexagonal or rectangular.

Perichaetial leaves to c. 1.5 mm long. Calyptra minute, delicate, mitrate. Setae very short, inclined. Capsules globose, c. 0.8 mm diam., glossy reddish gold. Spores spherical, papillose, c. 30–35  $\mu\text{m}$  diam.

Endemic to Australia, occurring in S.A., N.S.W. and Vic.; on soil in semi-arid to arid areas.

S.A.: E of Port Germein, *I.G.Stone 23681* (MEL). N.S.W.: 5 miles [c. 8 km] SE of Wilcannia, *I.G.Stone 11544* (MEL); near Darling R., 2 km S of Pooncarie, *I.G.Stone 11537* (MEL). Vic.: Lake Danaher Bushland Reserve, *H.M.Jolley 185* (MEL); between Boundary Bend and Swan Hill, *I.G.Stone 1760* (MEL); near Salt L. on road to Pink L., Patchewollock, *I.G.Stone 2776* (MEL).

The range of this species is concentrated in north-western Victoria and south-western New South Wales; it is known from only one locality in South Australia. *Acaulon chrysacanthum* is one of only two lamellate species in the genus, and it can be distinguished from *A. leucochaete* by the presence of a reddish gold arista on each leaf.

**2. Acaulon eremicola** I.G.Stone, *J. Bryol.* 10: 467 (1979)

T: Mt Olga Gorge, Ayers Rock [Uluru], Uluru-Kata-Tjuta Natl Park, N.T., 13 June 1977, *I.G.Stone 5134*; holo: MEL.

Illustrations: I.G.Stone, *op. cit.* 10: 468, fig. 1; 469, fig. 2; facing p. 472, pl.1 (1979).

Dioicous. Plants gregarious, 1.8–3.0 mm tall, green to yellowish gold. Rhizoids pale. Leaves broadly ovate or oblong, deeply concave; outer leaves small, bract-like, c. 0.45 mm long; inner leaves 1.0–1.7 mm long; apex long-acuminate; costa weak, excurrent in a recurved arista to 350  $\mu\text{m}$  long; margin variable, entire or crenulate near the apex, plane or incurved when moist. Upper laminal cells rhomboidal, 15–25  $\mu\text{m}$  wide; basal cells elongate-rectangular.

Calyptra conical mitrate, usually persistent. Capsules subglobose, yellow to golden brown, 0.5–0.7 mm diam.; apiculus minute. Spores spherical or ellipsoidal, finely papillose with irregular clusters of papillae, pale brown, 35–45  $\mu\text{m}$ .

Endemic to W.A., N.T. and S.A. This uncommon species grows on soil in arid regions, usually near desert mountains.

W.A.: The Loop, Murchison Gorge, *I.G.Stone 6154* (MEL); Paynes Find, *I.G.Stone 6997* (MEL); Eneabba, *I.G.Stone 23543* (MEL). N.T.: Mt Sonder, *A.C.Beauglehole 27434* (MEL); George Gill Ra., *A.C.Beauglehole 27042* (MEL); Uluru, Uluru-Kata-Tjuta Natl Park, *A.C.Beauglehole 25885* (MEL); SE of Mulga Park HS, *A.C.Beauglehole 25743* (MEL). S.A.: Everard Ra., *A.C.Beauglehole 25617* (MEL).

*Acaulon eremicola* is characterised by the recurved leaf arista. Perichaetia were abundant among the specimens examined, but perigonia were not observed. However, Stone (1979) noted perigonia among rhizoids or protonemal strands at the base of female plants.

### 3. *Acaulon granulosum* I.G.Stone, *J. Bryol.* 15: 257 (1988)

T: Hattah Lakes Natl Park, Vic., 10 Sept. 1960, *A.C.Beauglehole 57230*; holo: MEL.

Illustrations: I.G.Stone, *op. cit.* 258, fig. 1; 264, fig. 4a–c (1988).

Dioicous or monoicous. Plants simple, 1.5–2.0 mm tall, pale yellowish green to brown. Leaves broadly ovate, concave; inner leaves larger than outer, convolute, orbicular; apex cuspidate, recurved, often reddish; costa weak, narrow, reddish brown, usually excurrent in a recurved arista, 70–100  $\mu\text{m}$  long; margin entire below, recurved, irregularly crenulate or dentate above. Laminal cells smooth, 30–60  $\times$  15–25  $\mu\text{m}$ ; marginal cells narrower, red-brown, rhombic to oblong-rhombic or irregularly hexagonal.

Calyptra minute, mitrate. Seta very short, 0.09–0.12 mm long, straight. Capsules globose, c. 0.6 mm diam., apiculate, rust-brown to dark brown. Spores spherical or short-ellipsoidal, dark brown or reddish brown, very coarsely granular, 50–65  $\mu\text{m}$ .

Endemic to western W.A. and north-western Vic.; grows on soil in semi-arid and arid regions.

W.A.: Goomalling, *I.G.Stone 6972* (MEL); The Loop, Murchison Gorge, *I.G.Stone 6150* (MEL). Vic.: unnamed salt lake near Jeparit, *H.M.Jolley 126* (MEL); NE of Dimboola, *I.G.Stone 14460* (MEL); Whipstick, Bendigo, *I.G.Stone 185* (CANB).

Sterile specimens are difficult to identify, although when fertile the comparatively large spores are diagnostic. Perichaetia were observed, but perigonia were not, although Stone (1988) observed perigonia at the base of female plants and described them as gemmiform.

### 4. *Acaulon integrifolium* Mull.Hal., *Bot. Zeitung (Berlin)* 12: 745 (1855)

*Sphaerangium integrifolium* (Mull.Hal.) A.Jaeger, *Gen. Sp. Musc.* 1: 184 (1873). T: Yarra River, Vic., *F.Mueller s.n.*; lecto: MEL.

Illustrations: I.G.Stone, *op. cit.* 260, fig. 2a–c; 262, fig. 3a–h (1988).

Plants minute, 1.0–2.5 mm tall, gregarious or scattered, pale green when young, appearing bleached when old. Leaves ovate or broadly ovate to rotundate, 0.50–1.75 mm long, concave, strongly appressed when dry, weakly spreading when moist; apex acute; costa subpercurrent to percurrent, occasionally excurrent in a mucro, not markedly recurved; margins plane, entire. Upper laminal cells subquadrate to rhomboidal 12–15  $\mu\text{m}$  wide; basal cells rectangular, hyaline, with thin walls.

Setae very short, to 0.2 mm. Capsules globose, 0.45–0.80 mm diam., orange-brown. Spores spherical, usually orange, 25–50  $\mu\text{m}$  diam., finely papillose.

Occurs in all States and Territories of Australia; widespread, especially in suburban gardens on undisturbed soil. Also in Europe, western Asia, North Africa and New Zealand.

W.A.: Pallinup R., *I.G.Stone 6529* (MEL). N.T.: Stanley Chasm, 7 June 1974, *J.H.Willis* (MEL 2278639). S.A.: Spring Gully Natl Park, near Clare, *D.G.Catcheside 78.292* (AD). Qld: Dawson Ra., *I.G.Stone 21148* (MEL). N.S.W.: Koorawatha, *W.W.Watts 7040* (NSW). A.C.T.: Black Mtn, *H.Streimann 51979* (CANB). Vic.: Nine Mile Square Track, Wyperfeld Natl Park, 21 Aug. 1984, *D.C.Pike* (MELU). Tas.: Bruny Is., July 1911, *L.Rodway* (HO).

The most common species in Australia, *A. integrifolium* is characterised by the entire leaf margin, subpercurrent or very short-excurrent costa, orange-brown capsules and finely papillose spores. It is newly reported here from the Northern Territory.

**5. *Acaulon leucochaete*** I.G.Stone, *J. Bryol.* 9: 217 (1976)

T: Boundary Bend, Vic., 19 July 1969, *I.G.Stone 1548B*; holo: MEL.

Illustrations: I.G.Stone, *op. cit.* 220, fig. 5j–m; 221, fig. 6; 222, fig. 7 (1976).

Plants simple, bulbiform, to c. 2 mm tall, pale red-gold. Leaves ovate or broadly ovate; apex acute; costa excurrent in a hyaline flexuose hairpoint; lamellae in 2 (–3) rows, each lamella 2–9 cells high, undulating; terminal cells slightly mammillate; upper leaf margin irregularly dentate to serrate.

Calyptra minute, mitrate, persistent. Setae very short, curved. Capsules globose, c. 0.6 mm diam., with a very short apiculus. Spores spherical, dull yellow, papillose, c. 23–25 (–30)  $\mu\text{m}$  diam.

Occurs in W.A., S.A., N.S.W. and Vic., on soil in semi-arid to arid areas; endemic.

W.A.: 501 mile post from Perth to Carnarvon, *I.G.Stone 8018* (MEL). S.A.: Mannum, *L.D.Williams 2281* (AD). N.S.W.: 30 km N of Wilcannia, *I.G.Stone 11641* (MEL). Vic.: Boort Rd, 15 miles [c. 24 km] from Kerang, *I.G.Stone 1603* (MEL).

Although Stoneburner *et al.* (1993) reported *Acaulon leucochaete* from the Northern Territory, specimen details were not provided, and a study of all available specimens of *Acaulon* in Australian herbaria has failed to locate such specimens. This species is readily distinguished from all but *A. chrysacanthum* by the presence of lamellae on the adaxial surface of the costa. Leaves with a distinctive, hyaline, flexuose hairpoint separate it from the latter.

**6. *Acaulon mediterraneum*** Limpr., *Laubm. Duetschl.* 1: 180 (1885)

T: Sardinia, Italy, *Moris & Lisa*; n.v.

Illustrations: I.G.Stone, *op. cit.* 262, fig. 3i–o (1988); C.Casas, S.Sergio, R.M.Cros & M.Brugues, *Cryptog., Bryol. Lichénol.* 11: 69, fig. 6 (1990).

Plants simple, bulbiform, 1–2 mm tall. Leaves ovate to broadly ovate; apex acute, reflexed; costa subpercurrent to percurrent; margins plane, usually entire. Upper laminal cells 15–37  $\times$  15–16  $\mu\text{m}$ ; basal cells rectangular, hyaline.

Capsules globose, dark brown, 0.4–0.6 mm diam. Spores spherical, 28–36  $\mu\text{m}$  diam., densely long-echinate.

Occurs in W.A., S.A., Qld and Vic.; grows on soil in semi-arid to arid areas. Also in Europe and North Africa.

W.A.: Lesmurdie Falls, *I.G.Stone 6208* (MEL). S.A.: N of Donovans Landing, *A.C.Beaglehole 16227* (MEL). Vic.: Rosanna, *I.G.Stone 14482* (MEL); near Echuca, *I.G.Stone 14587* (MEL).

This species is represented by 12 collections in Australian herbaria. A single specimen from Qld (*I.G.Stone 21133*) has almost smooth spores and may be referable to *Acaulon muticum* var. *rufescens* (A.Jaeger) H.A.Crum. However, the spores are immature, and further collections are required to confirm the identity of this specimen. *Acaulon mediterraneum* is very similar to *A. integrifolium*, and the two are difficult to separate in the absence of mature spores.

**7. *Acaulon triquetrum*** (Spruce) Mull.Hal., *Bot. Zeitung (Berlin)* 5: 100 (1847)

*Phascum triquetrum* Spruce, *London J. Bot.* 4: 189 (1845). T: Europe, n.v.

Illustrations: D.G.Catcheside, *op. cit.* 138, fig. 61; I.G.Stone, *op. cit.* 262, fig. 3p–x (1988).

Plants minute, 1.0–1.5 mm tall, reddish gold, triquetrous when viewed from above. Leaves oval, concave, recurved, keeled; apex acute; costa excurrent, recurved; margins reflexed near the apex, serrate, often with paired blunt teeth. Upper laminal cells 12–16  $\mu\text{m}$  wide,  $\pm$ hexagonal; basal cells larger, short-rectangular.

Capsule globoses, inclined, with a short blunt apiculus. Spores spherical, finely papillose, c. 30  $\mu\text{m}$  diam.

Occurs in W.A., N.T., S.A., Qld, N.S.W. and Vic.; widely distributed in Europe, West Asia and North Africa. In Australia widespread in drier regions but apparently rare and usually scattered among other mosses.

W.A.: Geraldton, *D.G.Catcheside* 73.126 (PERTH). N.T.: Mt Sonder, *A.C.Beauglehole* 27434 (MEL). S.A.: Wilpena Pound, 27 Aug. 1984, *G.A.M.Scott* (MELU). N.S.W.: 30 km N of Wilcannia, *I.G.Stone* 11573 (MEL). Vic.: Boundary Bend, *I.G.Stone* 1523 (MEL).

This species is readily recognised by the triquetrous shape of the plants when viewed from above. It has been recorded from six Australian States and Territories, but is represented by only 26 collections in Australian herbaria.