Flora of Tasmania



1 HYDATELLACEAE 1

Marco F Duretto 2

Small, tufted, glabrous, annual or perennial herbs, subaquatic or aquatic, sometimes wholly submerged. Stem reduced; roots fibrous. Leaves alternate, linear to filiform, flattened to terete, 1-veined, slightly widened at the base; sheath and ligule absent. Inflorescence a bisexual (heterogamous) or unisexual (homogamous) terminal capitulum-like structure (head), sessile or scapose, with an involucre of 1–4 pairs of equal, membranous, 1-veined bracts. Flowers numerous, unisexual, without a perianth or bracteoles. Staminate flowers a solitary stamen; filament relatively stout; anther basifixed, bilocular, dehiscing longitudinally. Pistillate flowers a solitary carpel; ovary unilocular, with or without 3 prominent ribs; ovule 1, pendulous; stigmas sessile, 2–6, filamentous, each a single row of large cells. Fruit membranous, dehiscent or indehiscent. Seeds solitary, ovoid; endosperm replaced by starchy perisperm.

A monogeneric, aquatic or subaquatic family (see generic account for species and distributional details). Hydatellaceae have highly reduced flowers and inflorescences and were, until recently, included in the Poales (eg. APG II 2003) though they have also been placed in Centrolepidaceae and in their own order Hydatellales (for discussion see Hamann 1998; Saarela et al. 2007; Sokoloff et al. 2008a). Recent studies based on molecular data have indicated that Hydatellaceae should not be placed in Poales or indeed with the remainder of the Monocotyledons but at the 'base' of the Angiosperm phylogenetic tree (Saarela et al. 2007; APG III 2009). This discovery has led to a flurry of high profile research on this small and once overlooked family (eg. Rudell et al. 2007, 2008, 2009a, 2009b; Tillich et al. 2007; Friedman 2008; Remizowa et al. 2008; Sokoloff et al. 2008a, 2008b, 2010). Hydatellaceae are now placed in the Nymphaeales with the aquatic families Nymphaeaceae (Waterlillies: worldwide) and Cabombaceae (worldwide) (see Saarela et al. 2007; Sokoloff et al. 2008a; Stevens 2008; APG III 2009).

Key references: Cooke (1987); Hamann (1998); Sokoloff et al. (2008a).

External resources: accepted names with synonymy & distribution in Australia (APC); author & publication abbreviations (IPNI); mapping (ALA, AVH, NVA); nomenclature (APC, APNI, IPNI).

1 TRITHURIA

Trithuria Hook.f., Bot. Antarct. Voy. III. (Fl. Tasman.) 2(6): 78 (1858).

Synonymy: Juncella F.Muell. ex Hieron., Nat. Pflanzenfam. [Engler & Prantl.] T. II 4(11): 15 (1888). Hydatella Diels, Bot. Jahrb. Syst. 35: 93 (1904).

Description details as per family.

An aquatic or subaquatic genus of 12 species found in Australia (10 spp.), New Zealand (1 sp.) and India (1 sp.). Sokoloff (2008a) monographed the family and determined that the distinction between *Trithuria* and *Hydatella* could not be maintained and so combined them. *Trithuria* is the older name and so has priority even though the family name was based on *Hydatella*. Five species (4 endemic) are found in south-western Western Australia, four are confined to northern Australia, one is found across southern Australia, and one is endemic to Tasmania.

- 1 This work can be cited as: Duretto MF (2011) 1 Hydatellaceae, **2011:1.** In MF Duretto (Ed.) *Flora of Tasmania Online*. 4 pp. (Tasmanian Herbarium, Tasmanian Museum & Art Gallery: Hobart). **www.tmag.tas.gov.au/floratasmania**
- 2 Tasmanian Herbarium, Tasmanian Museum & Art Gallery, Private Bag 4, Hobart, Tasmania 7001.
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1. Inflorescence bisexual; ovaries triquetrous; fruits ribbed, opening by 3 valves; seeds honeycombed

1 T. submersa

1: Inflorescence usually unisexual; ovaries globular; fruits smooth, indehiscent; seeds smooth

2 T. filamentosa

1 Trithuria submersa Hook.f., Bot. Antarct. Voy. III. (Fl. Tasman.) 2(6): 79, t. 138A (1858)

Juncella submersa (Hook.f.) Hieron., Nat. Pflanzenfam. [Engler & Prantl.] T. II 4(11): 14 (1888).

Illustrations: Morley & Toelken (Eds), Flowering Plants in Australia 374, fig. 220e (1983); Cooke, Fl. Australia 45: 5, fig. 21a-c (1987); Conn, Fl. New South Wales 4: 266 (1993); Conn, Fl. Victoria 2: 629, fig. 126a, b (1994).

Small annual herb; growing ± submerged in fresh water; roots fibrous; leaves and inflorescences often bright red when growing in open situations, green when shaded. Leaves 1–3(–6) cm long, lax, filiform, elliptical in transverse section, apex tapering, base widened slightly and with narrow hyaline margins. Inflorescence bisexual (heterogamous), scapose or sessile; scapes several, to 10 cm long, filiform, erect, elongating in the fruiting stage and usually becoming longer than the leaves, each with a terminal head; the head 2–3 mm in diam., made of closely packed, minute, unisexual flowers, surrounded by an involucre of 4–6 bracts; bracts lanceolate to ovate, 2–4 mm long, longer than flowers. Staminate flowers few, usually 2–4 near the centre of the head; filament to 2 mm long, red; anther purple. Pistillate flowers usually 10–20(–35) per head; ovary obovoid-triquetrous with rounded angles; stigmas 3, filamentous, septate, sometimes bifid, red, often unequal in length. Fruit obovoid with 3 prominent angles, 0.5–0.8 mm long, opening from the base in 3 valves. Seed honeycombed. Flowering &/or fruiting Sep.-Jan.

Tas. (FLI, TCH, TNM, TSE); also WA, SA, NSW, Vic. Localized but sometimes abundant in marshes, roadside soaks or on the margins of lakes and lagoons especially in the midlands and north of the state. The capitulum (head) can be on a scape longer than the leaves or sessile. This variation is seen across Australia and requires further investigation.

2 Trithuria filamentosa Rodway, Pap. & Proc. Roy. Soc. Tasmania 1897: 48 (1898)

Hydatella filamentosa (Rodway) W.M.Curtis, Records of the Queen Victoria Museum 50: 5 (1974).

Illustrations [often as H. filamentosa]: Rodway, Fl. Tasman., facing p. 232 (1903); Stones & Curtis, The Endemic Flora of Tasmania 6: t. 203 (1978); Cooke, Fl. Australia 45: 5, fig. 21e (1987); Kirkpatrick, Alpine Tasmania 146, fig. 66a (1997).

Small annual or perennial herb, dioecious or sometimes monoecious; often growing submerged and forming clumps several cm in diameter; rootstock in perennial plants erect, c. 1.5 mm in diam., bearing fibrous roots and leaves crowded for a length of c. 1 cm below the apex, the old leaves long persistent. Leaves erect, filiform-terete, 0.5–2.5(–5) cm long, apex narrowed, rounded and forming a hydathode, proximal 1/3 of the blade colorless with the base slightly flattened and widened. Inflorescence usually unisexual (homogamous), rarely bisexual (heterogamous), scapose; male heads fewer than female; scapes usually much shorter than the leaves though sometimes longer, to 2 cm long, each with a terminal head; heads to 2 mm diam., made of closely packed, minute, unisexual flowers, surrounded by an involucre of 2–4 bracts; bracts lanceolate, c. 4–5 mm long, longer than flowers. Staminate flowers 3–6 per head; filaments c. 6 mm long, sometimes reddish; anthers red-purple. Pistillate flowers to 20 per head; ovary globular; stigmas 5–6, filamentous, septate, red, usually unequal in length. Fruit elliptical-ovoid, apiculate, indehiscent. Flowering &/or fruiting Dec.-Apr.

Tas. (TCH, TSR, TWE); endemic. Localized and uncommon on the Central Plateau and Mount Field, where usually found submerged in lakes and tarns. In the south-west it is also often found on stream margins and in swamps.



REFERENCES

- ALA (Atlas of Living Australia) www.ala.org.au
- APC (Australian Plant Census) www.chah.gov.au/apc/about-APC.html
- APG II (2003) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* **141** 399–436.
- APG III (2009) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* **161** 105–121.
- APNI (Australian Plant Name Index) www.anbg.gov.au/cgi-bin/apni
- AVH (Australia's Virtual Herbarium) (Council of Heads of Australasia) www.avh.rbg.vic.gov.au/avh/
- Cooke DA (1987) Hydatellaceae. Flora of Australia 45 1-5.
- Friedman WE (2009) Hydalellaceae are water lilies with gymnospermous tendencies. Nature 453 94-97.
- Hamann U (1998) Hydatellaceae. In K Kubitzki (Ed.) *The Families and Genera of Vascular Plants.* Volume 4. *Flowering Plants Monocotyledons; Alismatanae and Commelinanae (except Gramineae).* pp. 231–234. (Springer: Berlin)
- IPNI (International Plant Name Index) www.ipni.org/index.html or www.us.ipni.org/index.html
- NVA (Natural Values Atlas) (Department of Primary Industries and Water: Hobart) www.dpiw.tas.gov.au/inter.nsf/WebPages/LJEM-6TV6TV?open
- Remizowa MV, Sokoloff DD, Macfarlane TD, Yadav SR, Prychid CJ, Rudall PJ (2008) Comparative pollen morphology in the early-divergent angiosperm family Hydatellaceae reveals variation at the infraspecific level. *Grana* **47** 8–100.
- Rudall PJ, Eldridge T, Tratt J, Ramsay MM, Tuckett RE, Smith SY, Collinson ME, Remizowa MV, Sokoloff DD (2009a) Seed fertilization, development, and germination in Hydatellaceae (Nymphaeales): implications for endosperm evolution in early Angiosperms. *American Journal of Botany* **96** 1581–1593.
- Rudall PJ, Remizowa MV, Beer A, Bradshaw E, Stevenson DW, Macfarlane TD, Tuckett RE, Yadav SR, Sokoloff DD (2008) Comparative ovule and megagametophyte development in Hydatellaceae and water lilies reveal a mosaic of features among the earliest angiosperms. *Annals of Botany* **101** 941–956.
- Rudall PJ, Remizowa MV, Prenner G, Prychid CA, Tuckett RE, Sokoloff DD (2009b). Non-flowers near the base of extant angiosperms? Spatiotemporal arrangement of organs in reproductive units of Hydatellaceae, and its bearing on the origin of the flower. *American Journal of Botany* **96** 67–82.
- Rudall PJ, Sokoloff DD, Remizowa MV, Conran JG, Davis JI, Macfarlane TD, Stevenson DW (2007) Morphology of Hydatellaceae, an anomalous aquatic family recently recognized as an early-divergent angiosperm lineage. *American Journal of Botany* **94** 1073–1092.
- Saarela JM, Hardeep SR, James AD, Endress PK, Mathews S, Marchant AD, Briggs BG, Graham SW (2007). Hydatellaceae identified as a new branch near the base of the angiosperm phylogenetic tree. *Nature* **446** 312–315.
- Sokoloff D, Remizowa MV, Macfarlane TD, Rudall PJ (2008a) Classification of the early-divergent angiosperm family Hydatellaceae: one genus instead of two, four new species and sexual dimorphism in dioecious taxa. *Taxon* **57** 179–200.
- Sokoloff DD, Remizowa MV, Macfarlane TD, Tuckett RE, Ramsay MM, Beer AS, Yadav SR, Rudall PJ (2008b) Seedling Diversity in Hydatellaceae: Implications for the Evolution of Angiosperm Cotyledons. *Annals of Botany* **101** 153–164.
- Sokoloff DD, Remizowa MV, Yadav SR, Rudall PJ (2010) Development of reproductive structures in the sole Indian species of Hydatellaceae, *Trithuria konkanensis*, and its morphological differences from Australian taxa. *Australian Systematic Botany* **24** 217–228.
- Stevens PF (2008) Angiosperm Phylogeny Website. Version 9, June 2008. http://www.mobot.org/MOBOT/research/
- Tillich H-J, Tuckett R, Facher E (2007) Do Hydatellaceae belong to the monocotyledons or basal angiosperms? Evidence from seedling morphology. *Willdenowia* **37** 399–406.
- **NOTE**: Web addresses can and do change: a list of current web addresses will be maintained on the *Flora of Tasmania Online* website [www.tmag.tas.gov.au/floratasmania].



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