

FISSIDENS SUBG. FISSIDENS

Fissidens Hedw. subg. *Fissidens*

Type: *F. bryoides* Hedw.

Small to robust plants, terrestrial, rupestral or corticolous, occasionally aquatic. Stems usually with a central strand. Leaves with or without a limbidium; costa with 2 or 3 stered bands. Capsules terminal or lateral; stomata usually present. Peristome various.

Six sections are known from Australia.

FISSIDENS SUBG. FISSIDENS SECT. AREOFISSIDENS

Fissidens Hedw. subg. *Fissidens* sect. *Areofissidens* Müll.Hal., *Syn. Musc. Frond.* 1: 46 (1848).

Lecto: *F. palmatus* Hedw.

Small terrestrial plants. Leaves whitish green, soft, shrunken when dry and difficult to soak out, lanceolate or lingulate; apex acute or acuminate; costa ending well below the apex, or percurrent to excurrent, usually *bryoides*-type. Limbidium marginal or intramarginal, usually on all laminae, often terminating below the apex, occasionally only on vaginant laminae, or lacking. Laminal cells lax, elongate-hexagonal, prosenchymatous or parenchymatous, always enlarged near the costa in the proximal part of vaginant laminae, usually smooth (except *F. biformis*). Setae terminal, smooth. Exothecial cells 28–40 around the periphery of the capsule. Peristome *scariosus*-type.

Seven species are known from Australia.

References

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- Stone, I.G. (1989), *Fissidens cucullatus* and *Fissidens inaequiretis* spp. nov. from New South Wales, Australia, *J. Bryol.* 15: 737–746.

- 1 Leaves with a marginal or intramarginal limbidium of prosenchymatous cells, at least on vaginant laminae.....2
- 1: Leaves usually lacking a limbidium of elongate cells; marginal row of cells often short and bluntly toothed on dorsal and apical laminae.....6

- 2 Leaves with a strictly marginal limbidium virtually throughout, of thick-walled prosenchymatous cells, 2–3 or more cells wide, 1–3-stratose.....3
- 2: Leaves with an intramarginal limbidium at least on vaginant laminae, of thin-walled prosenchymatous cells, 1–3 cells wide, uni- or bistratose.....5
- 3 Costa ceasing well below the apex.....**F. maceratus**
- 3: Costa percurrent to excurrent.....4
- 4 Laminal cells smooth..... **F. zollingeri**
- 4: Laminal cells strongly mammillose or unipapillose..... **F. biformis**
- 5 Limbidium present on all laminae, but not complete, mostly 1 or 2 cells wide; intramarginal row bistratose in part; cells in mid-lamina 20–25 × 12–15 µm.....**F. darwinianus**
- 5: Limbidium on lower part of vaginant laminae only, c. 3 cells wide, unistratose; cells in mid-lamina c. 10–15 × 10–12 µm..... **F. inaequiretis**
- 6 Fruiting plants minute, 0.5–1.0 mm tall; leaves less than 3-jugate; costa percurrent to long-excurrent .
..... **F. altisetus**
- 6: Fruiting plants larger, 2–6 mm tall; leaves more than 3-jugate; costa subpercurrent, percurrent or barely excurrent.....**F. lagunensis**

Fissidens altisetus Dixon, in H.N.Dixon & W.Greenwood, *Proc. Linn. Soc. New South Wales* 55: 271 (1930)

T: Lautoka, Fiji, on mountain track in dense shade, *W.Greenwood 211*; holo: BM.

Illustration: H.N.Dixon & W.Greenwood, *op. cit.* pl. 8, fig. 6a–d.

Rhizautoicous. Plants bud-like, 0.5–1.0 mm tall; protonema persistent. Stems 0.1–0.2 mm long. Leaves 2- or 3-jugate (vegetative and perichaetial), narrowly lanceolate, widest below, 0.25–1.00 mm long, 0.10–0.18 mm wide; apex acuminate; costa 20–30 µm wide, often excurrent; cusp to 130 µm long. Vaginant laminae half to three-quarters the leaf length, partly open to open. Dorsal lamina narrowly tapering, failing or reaching the base; margin entire or bluntly toothed; laminal cells oblong to irregularly 5- or 6-sided, 20–40 × 10–12 µm wide, increasing in size from margin to costa, larger basally in vaginant lamina, 25–70 × 10–15 µm.

Perigonia gemmiform. Calyptra mitriform, c. 0.35 mm long, smooth or ±rough. Seta 1.8–5.0 mm long; vaginula 0.25–0.30 mm long, exposed. Capsules slightly asymmetrical; theca 0.30–0.45 mm long; operculum rostrate, equal. Spores 8–10 µm diam.

Occurs in north-eastern Qld, on crumbling rock in deep shade in lowland rainforest, always mixed with other species and often overlooked. Also in Fiji, and probably other Pacific islands.

Qld: Helenvale, 25 km S of Cooktown, *I.G.Stone 19241, 19232, A.G.Stone, A.Thorsborne & M.Thorsborne* (MEL).

Although included in the synonymy of *F. bogoriensis* M.Fleisch. by Iwatsuki & Suzuki (1996), I prefer to maintain *F. altisetus* as a distinct species. All plants are fertile, scattered on a persistent, flat protonema, each virtually a minute perichaetium or perigonium, and very similar in general habit to *Nanobryum thorsbornei*. In both *F. bogoriensis* and *F. lagunensis* fruiting plants are all more than 3-jugate, the smallest plants all sterile.

Fissidens biformis Mitt., *J. Linn. Soc., Bot. (suppl.)* 1: 141 (1859)

T: Matale, Ceylon, [Sri Lanka], *Gardner 626*; holo: NY.

Illustration: H.C.Gangulee, *op. cit.* 484, fig. 223.

Rhizautoicous (?). Plants flabelliform. Stems short, 0.3–1.0 mm long; hyaline axillary nodules weak. Leaves mostly 4–6-jugate, erect, ligulate-lanceolate, 1.3–1.6 mm long, 0.20–0.25 mm wide; limbidium complete, very thick-walled, 2–3-seriate; apex acute; costa narrow, excurrent in a long pointed cell. Vaginant laminae reaching c. mid-leaf, closed. Dorsal lamina tapered to the base; margin entire; laminal cells with a large central papilla,

±hexagonal, 8–10 µm wide, broader towards the costa and in vaginant laminae where they are proximally smooth, rectangular, 35–55 × 15–20 µm.

Setae terminal, 2.0–3.5 mm long, thin. Capsules erect, ±symmetrical; theca c. 0.5 mm long and 0.25 mm wide.

Occurs in north-eastern Qld from Cooktown south to Hinchinbrook Island near Cardwell, on semi-shaded soil banks in rainforest. Also in India, Sri Lanka and Malaysia.

Qld: Quarantine Bay, near Cooktown, *I.G.Stone 22042B* (MEL); Helenvale, *I.G.Stone 19234 p.p.* (MEL); Hinchinbrook Is., *I.G.Stone 24917 p.p.* (MEL).

Illustrations provided by Gangulee (1971) and others lack papillae, although they are clearly present in the holotype and very obvious in cross-section. *Fissidens angustifolius* Sull. (syn. *F. dixonianus* E.B.Bartram) from Oceania is very close to *F. biformis*.

Fissidens darwinianus Catches. & I.G.Stone, *J. Adelaide Bot. Gard.* 11: 3 (1988)

T: Rapid Ck, Darwin, N.T., *V.Pedersen*; holo: MEL 1023242.

Illustrations: D.G.Catcheside & I.G.Stone, *op. cit.* 4, fig. 1; 5, fig. 2.

Dioicous. Plants green, 1.0–2.5 mm tall, c. 1 mm wide; protonemata persistent. Leaves to 5-jugate, to 1.0–1.4 mm long, c. 0.3 mm wide, broadest in the apical lamina; border 1–3 rows of longer thicker-walled cells, outermost cells c. 20 × 10 µm, inner cells occasionally bistratose, longer (30–60 µm) and narrower, forming a weak intramarginal limbidium; apex acute; costa percurrent or barely excurrent; margin weakly crenulate. Vaginant laminae reaching c. mid-leaf, closed; laminal cells ±hexagonal, 16–20 × 12–15 µm, in proximal part of vaginant laminae, oblong, to 50 × 18 µm.

Setae terminal, 4–5 mm long. Capsules inclined, asymmetrical, 0.5–0.6 mm long; exothecial cells quadrate to rectangular, collenchymatous, 25–30 × 10–20 µm. Peristome teeth 35–40 µm wide at the base.

Apparently endemic to northern N. T. and north-eastern Qld; grows on shaded soil with other minute *Fissidens* spp.

Qld: Kirrama S.F., Cardwell, *I.G.Stone 15001 p.p.* (MEL); Helenvale, 25 km S of Cooktown, *I.G.Stone 19232 p.p.* (MEL).

Fissidens darwinianus is rather similar to *F. bogoriensis* M.Fleisch., which occurs from Java to Japan, but the latter is autoicous. It also has larger laminal cells (30–45 × 20–25 µm), those at the base of the vaginant laminae reaching 80 µm long.

Fissidens inaequiretis I.G.Stone, *J. Bryol.* 15: 738 (1989)

T: Fernleigh, road to Pearces Creek, Richmond River, N.S.W., *W.W.Watts 851*; holo: NSW; iso: H-BR *n.v.*

Illustrations: I.G.Stone, *op. cit.* 741, fig. 2; 742, fig. 3.

Dioicous. Plants to 6 mm tall. Leaves 4–10-jugate, ±linear, 0.5–2.0 mm long, 0.15–0.30 mm wide; apex acute to acuminate; costa strong, subpercurrent to barely excurrent. Vaginant laminae reaching mid-leaf or less, narrowed above, open or partly open; limbidium 1–4 rows wide, unistratose, intramarginal in lower two-thirds. Dorsal lamina tapered, the proximal cells especially large; margin serratulate or crenulate; laminal cells smooth, ±isodiametric, c. 10 µm wide near the margin, c. 15 × 10 µm within, to 80 × 20 µm juxtacostally at the base of the vaginant lamina.

Perigonia terminal; perigonial leaves broad-shouldered; apical lamina narrow. Calyptra mitriform, ±rough, c. 0.3 mm long. Setae terminal, 4–9 mm long. Capsules erect, elliptical; theca 0.5–0.9 mm long, 0.3–0.5 mm wide; operculum rostrate. Spores 8–12 µm diam.

Endemic to north-eastern N.S.W.; known only from the type locality.

The type specimen was annotated by W.W.Watts “*F. dealbatus* H.F. & W. Det. Brotherus”. The collection is a mixture, and it is possible that the duplicate sent to Brotherus contained different components. *Fissidens inaequiretis* resembles *F. lagunensis*, but the latter lacks the

intramarginal border in the vaginant laminae, it has the narrower marginal bands of short cells (1 or 2 rows, not 4), and the inner cells are larger (c. 20 µm wide) and more regular.

Fissidens lagunensis E.B.Bartram, *Farlowia* 1: 504 (1944)

Fissidens diversiretis E.B.Bartram, *Philipp. J. Sci.* 68: 21 (1939), *nom. illeg.* (later homonym). T: Mt Maquiling, Laguna Prov., Luzon, Philippines, mostly above the hot mud springs and entirely below the mossy forest, 6 Oct. 1935, *H.H.Bartlett 15697*; holo: FH.

Rhizautoicous. Plants flabelliform, to 3 mm tall, crumpled when dry. Stems to c. 0.5 mm long. Leaves 3–6-jugate, linear, 1.0–2.3 mm long, 0.10–0.25 mm wide; apex acute to acuminate; costa usually subpercurrent. Vaginant laminae not reaching mid-leaf, partly open, usually elimbate. Dorsal lamina tapered to the base; margin rounded-serrate; laminal cells hexagonal, 20–45 × 15–20 µm, smaller and equidimensional at the margin, 10–15 µm wide; to 60 µm long near the base of the vaginant lamina.

Calyptra mitriform, c. 0.4 mm long. Setae c. 4 mm long, twisted. Capsules ±cylindrical, c. 0.5 mm long and 0.3 mm wide; operculum c. 0.6 mm long.

Occurs in north-eastern Qld; on soil in rainforest. Also in Malesia, Japan and the Philippines.

Qld: South Johnstone R., Palmerston Natl Park, *I.G.Stone 18993* (MEL); Helenvale, *I.G.Stone 19240 p.p.* (MEL).

Iwatsuki & Suzuki (1982) placed this species into synonymy with *F. bogoriensis* M.Fleisch. However, we consider the two to be distinct. Thus, in *F. lagunensis* the leaves are narrower, longer and elimbate, and the areolation and costa are different from those of the type of *F. bogoriensis*.

Fissidens maceratus Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 91 (1882)

T: Brisbane River, Qld, *F.M.Bailey*; holo: NY.

Fissidens splachnobryoides Broth., in K.M.Schumann & C.A.G.Lauterbach, *Fl. Schutzgeb. Südsee* 81 (1900). T: Butaueng, New Guinea, *Kaernbach*; holo: H-BR.

Illustrations: H.C.Gangulee, *Mosses E. India* 463, fig. 211 (1971), as *F. splachnobryoides*; Z.Iwatsuki & T.Suzuki, *J. Hattori Bot. Lab.* 51: 451, pl. 5 (1982), as *F. splachnobryoides*; I.G.Stone, *J. Bryol.* 15: 117, fig. 1; 118, fig. 2 (1988).

Dioicous. Plants pale green, small, 1–9 mm tall, 1.5–3.0 mm wide. Stems with a small central strand; axillary nodules weak. Leaves 4–10-jugate, lingulate-lanceolate, broadest in the apical lamina, 0.4–2.6 mm long, 0.1–0.6 mm wide; limbidium of very narrow substereid cells on all laminae, mostly bistratose, 2–5 cells wide, reaching or almost reaching the acute apex; costa thin, failing well below the apex. Vaginant laminae reaching mid-leaf, closed; margin entire, occasionally weakly sinuate; laminal cells thin-walled, smooth to mammillose, mostly 30–40 × 15–20 µm, smaller apically, longer basally. Propagula axillary green multicellular filaments.

Setae c. 4 mm long, terminal. Capsules rare, erect, 0.7–1.0 mm long. Spores 15–20 µm diam.

Occurs in the Kimberley region of northern W.A., in montane rainforest in north-eastern Qld, in drier country to the west, and in south-eastern Qld; grows on soil and crumbling limestone. Also in India, Sri Lanka, SE Asia, Indonesia, New Guinea, China and New Caledonia.

W.A.: Winjana Gorge, Kimberley, May 1988, *G.A.M.Scott* (MEL). Qld: Maidenhair Grotto, Hippie Tower, Chillagoe, *I.G.Stone 21765* (MEL); Granite Gorge, Mareeba, *I.G.Stone 15926* (MEL); Hippie Tower, Chillagoe, *M.Godwin C2498* (AD, MEL); Balancing Rock, Chillagoe, *I.G.Stone 16716* (MEL).

Pursell (1997) placed *F. maceratus* in the synonymy of *F. flaccidus* Mitt., along with *F. mollis* Mitt. and other names. I have seen the type of *F. mollis*, and I do not consider it to be conspecific with *F. maceratus*. Therefore, I prefer to retain *F. maceratus*, at least for the present.

Fissidens zollingeri Mont., *Ann. Sci. Nat., Bot.*, sér. 3, 4: 114 (1845)

T: Java [Indonesia], *Zollinger 1604*; holo: PC *n.v.*, *fide* C.Müller (1848). [Zhi-Hua Li (1985) remarked that “no *Fissidens* could be found among these plants”.]

Fissidens xiphioides M.Fleisch., *Hedwigia* 38: 125 (1899). T: Buitenzorg [Bogor], Java, [Indonesia], *M.Fleischer*; lecto: FH *n.v.*, *fide* Z.Iwatsuki & T.Suzuki, *op. cit.* 367 (1982).

Illustrations: H.C.Gangulee, *Mosses E. India* 479, fig. 220; 481, fig. 221 (1971), as *F. xiphioides*; Z.Iwatsuki & T.Suzuki, *op. cit.* 459, pl. 13 (1982).

Synoicous. Plants ±flabelliform or elongate, 2–6 mm tall, 1.8–2.5 mm wide; axillary hyaline nodules prominent. Leaves ±oblong, 1.5–1.8 mm long, 0.35–0.45 mm wide; limb narrow, ±complete to the acute apex; costa percurrent to excurrent. Vaginant laminae reaching mid-leaf, closed. Dorsal lamina often ending in a rounded lobe at the base; laminal cells irregularly hexagonal, 12–25 × 10–15 µm, those at base of vaginant laminae to 50 µm long. Green multicellular filamentous propagula present on protonemata and, occasionally, in leaf axils.

Setae 2–3 mm long. Capsules symmetrical, erect; theca oblong-elliptical, 0.5–1.0 mm long; operculum conical-rostrate.

Occurs in N.T, Qld and north-eastern N.S.W.; grows on shaded or semi-shaded damp soil, occasionally on rock. Widespread in tropical and subtropical Asia, from India to Japan, Oceania and South America.

N.T.: Conder Pt, Melville Is., *H.Streimann 42497* (CANB, NY); Kakadu Natl Park, *L.A.Craven & G.Whitbread 6771* (CANB). Qld: Bizant, Lakefield Natl Park, *I.G.Stone 23828* (MEL); Mount Elliot Natl Park, *I.G.Stone 8425* (MEL). N.S.W.: Pholis Gap, Nightcap Natl Park, 13 June 1983, *H.S.Curtis* (MEL).

Similar to *F. curvatus*, but differs in the occurrence of axillary propagula in leaves, a synoicous inflorescence, erect capsules and *scariosus*-type peristome. We follow Pursell (1988) in including *F. zollingeri* in sect. *Areofissidens* rather than sect. *Fissidens* because of the large juxtacostal cells and *scariosus*-type peristome.