Hypopterygiaceae

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HYPOPTERYGIACEAE

Hans (J.D.) Kruijer[1]

Hypopterygiaceae Mitt., *J. Proc. Linn. Soc., Bot.*, Suppl. 1: 147 (1859).

Type: *Hypopterygium* Brid.

Dioicous or monoicous, unisexual or partly bisexual. Plants forming loose to dense groups of dendroids or fans, occasionally forming mats, pleurocarpous. Rhizome creeping, sympodially branched, tomentose. Stems horizontal (rarely creeping), ascending or erect, simple or branched and differentiated into stipe and rachis; branches usually lateral, rarely ventral, distant or closely set. Foliation complanate and anisophyllous or partly non-complanate and isophyllous. Leaves in 3, 8 or 11 (rarely more) ranks, but arranged in 2 lateral rows of asymmetrical leaves and a ventral row of smaller symmetrical leaves (amphigastria) in the distal part of the stem or frond, distant or closely set, symmetrical or asymmetrical; apex usually acuminate. Gemmae absent or filiform. Gametoecia usually lateral, occasionally dorsal or ventral. Calyptra cucullate or mitrate. Capsules subglobose to ovoid-oblong; operculum rostrate. Peristome diplolepideous; exostome teeth 16 (absent from *Catharomnion*); endostome with 16 processes, ciliate or not. Spores subglobose to broadly ellipsoidal, scabrous.

The family consists of seven genera and 21 species with a predominantly Gondwanan distribution. It occurs mainly in humid forests of warm-temperate to tropical areas of the world, and it is most diverse in Indo-Malaysia. Three genera and six species are known with certainty from Australia.

The Hypopterygiaceae have been regarded as comprising two subfamilies: Hypopterygioideae (*Canalohypopterygium*, *Catharomnion*, *Dendrocyathophorum*, *Dendrohypopterygium*, *Hypopterygium* and *Lopidium*) and Cyathophoroideae (Kindb.) Broth. (*Cyathophorum* and *Cyathophorella*). The former is characterised by gametophytes with branched stems differentiated into a stipe and rachis and by horizontal, ascending or vertical sporophytes. Cyathophoroideae have simple or weakly branched stems and horizontal to descending sporophytes. Some authors treated the Cyathophoroideae as a separate family; others proposed a different classification, and placed genera of the Hypopterygiaceae in the Daltoniaceae or Hookeriaceae. However, according to Kruijer (2002), the Hypopterygiaceae constitute a monophyletic group that is best retained as a separate family nested in the Hookeriales-Leucodontales-Hypnales clade. Thus, there is no need to distinguish subfamilies. In this treatment, the classification and circumscription of the family, its genera and species follow Kruijer (2002).

The name of the family Lophidiaceae Brid. ex Rodway (Rodway, 1914), based on *Lopidium*, is illegitimate because it includes *Hypopterygium*.

Species are very variable in size and habit, and distantly foliate plants often appear rather different to closely foliate individuals of the same species. Branched plants with a loose or distant ramification have a different appearance to those that are branched with numerous and closely set branches; both types of ramification often occur within the same species. Branches and leaves are oriented roughly at right angles to the direction of most intense incident light.

W.Mitten, Musci Indiae Orientalis, *J. Proc. Linn. Soc., Bot.*, Suppl. 1: 1–171 (1859); N.C.Kindberg, Studien über die Systematik der pleurokarpischen Laubmoose, *Bot. Centralbl.* 76: 84–87 (1898); N.C.Kindberg, Grundzüge einer Monographie über die Laubmoos-Familie Hypopterygiaceae, *Hedwigia* 40: 275–303 (1901); M.Fleischer, Hypopterygiaceae, in *Musc.*

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Buitenzorg 3: 1064–1097 (1908); L.Rodway, Lophidiaceae (sic), *Pap. & Proc. Roy. Soc. Tasmania* 1913: 234–239 (1914); V.F.Brotherus, Hypopterygiaceae, *Nat. Pflanzenfam.*, 2nd edn, 11: 270–278 (1925); H.N.Dixon, Hypopterygiaceae, *in* Studies in the bryology of New Zealand, *Bull. New Zealand Inst.* 3(5): 239–298 (1927); G.O.K.Sainsbury, A handbook of New Zealand mosses, *Bull. Roy. Soc. New Zealand* 5: 1–490 (1955); H.A.Miller, An overview of the Hookeriales, *Phytologia* 21: 243–252 (1971); C.M.Matteri, Revision de las Hypopterygiaceae (Musci) Austrosudamericanas, *Bol. Soc. Argent. Bot.* 15: 229–250 (1973); M.R.Crosby, Toward a revised classification of the Hookeriaceae (Musci), *J. Hattori Bot. Lab.* 38: 129–141 (1974); W.R.Buck, Taxonomic and nomenclatural arrangement in the Hookeriales with special notes on West Indian taxa, *Brittonia* 39: 210–224 (1987); W.R.Buck, Another view of familial delimitation in the Hookeriales, *J. Hattori Bot. Lab.* 64: 29–36 (1988); A.Whittemore & B.Allen, The systematic position of *Adelothecium* Mitt. and the familial classification of the Hookeriales (Musci), *Bryologist* 92: 261–271 (1989); J.D.Kruijer, Hypopterygiaceae of the World, *Blumea*, Suppl. 13: 1–388 (2002).

KEY TO GENERA

1 Stems usually simple, occasionally with a few innovations or a few distant branches, not differentiated into stipe and rachis, terete or quadrangular; sporophytes projecting beneath plane of gametophore .... **1. CYATHOPHORUM**

1: Stems branched, differentiated into stipe and rachis, terete; sporophytes projecting above plane of gametophore 2

2 Plants pinnate to bipinnate; laminal leaf cells collenchymatous; walls incrassate; costa of lateral frond leaves percurrent or nearly so; setae mammillose; calyptra glabrous or with long paraphyses several cells wide *(1:)*.....**3. LOPIDIUM**

2: Plants usually palmate or umbellate, less often pinnate or flabellate; laminal leaf cells not collenchymatous; walls thin; costa of lateral frond leaves reaching 80% of leaf length at most; setae smooth; calyptra glabrous ..... **2. HYPOPTERYGIUM**

1. CYATHOPHORUM

Cyathophorum P.Beauv., *Mag. Encycl.* 9, 5: 324 (1804); from the Greek *κυαθος* (*cyathos*, a cup) and *φορεω* (*phoreo*, to bear), in reference to the vaginula.

Hookeria Sm. sect. *Cyathophorum* (P.Beauv.) Arn., *Disp. Méth. Mousses* (preprint) 56 (1825 [1826?]); *Mém. Soc. Hist. Nat. Paris*, sér. 2, 2: 305 (1826); *Cyathophorum* P.Beauv. sect. *Eu-Cyathophorum* Broth., *Nat. Pflanzenfam.* I, 3: 966 (1907); *nom. illeg. pro Cyathophorum* P.Beauv. sect. *Cyathophorum*; *Cyathophonum* P.Beauv. ex Brid., *Muscol. Recent.*, Suppl. 4: 149 (‘1819’) [1818], *nom. inval., err. pro Cyathophorum* P.Beauv. T: *Cyathophorum pteridioides* P.Beauv., *nom. illeg. incl. spec. prior*. [*Anictangium bulbosum* Hedw.].

Stems usually simple, occasionally branched or with a few innovations, not differentiated, tomentose at the base and where creeping, terete or quadrangular; rudimentary branches absent; central strand present; axial cavities absent; axillary hairs absent or 4–11-celled. Foliation complanate. Leaves in 3 ranks; apex rounded or acuminate; costa forked or simple; laminal cells prosenchymatous, hexagonal, thin-walled. Calyptra mitrate, fleshy, pale to dark brown. Setae descending, straight to curved, ochraceous, smooth; base widened. Capsules erect, ochraceous to reddish ochraceous; rostrum straight. Exostome present; endostome at least partly ciliate; basal membrane reaching 33–50% of the exostome.

Cyathophorum comprises seven species in eastern Africa, Indo-Malaysia, warm-temperate parts of China and Japan, Melanesia, southern Polynesia (except New Caledonia), eastern Australia, and New Zealand. Represented in Australia by a single species.

Cyathophorum bulbosum (Hedw.) Müll.Hal., *Syn. Musc. Frond.* 2: 14 (1851)

Anictangium (*nom. rej.*) *bulbosum* Hedw., *Sp. Musc. Frond.* 43, t. 6, figs 1–5 (1801); *Hedwigia bulbosa* (Hedw.) Brid., *J. Bot. (Schrader)* 1: 272 ('1800') [1801]; *Anoectangium* (*nom. cons.*) *bulbosum* (Hedw.) Schwägr., *Sp. Musc. Frond.*, Suppl. 1, 1: 36 (1811); *Cyathophorum pteridioides* P.Beauv., *Mag. Encycl.* 9, 5: 324 (1804), *nom. illeg. incl. spec. prior.* [*Anictangium bulbosum* Hedw.]. T: "Insulae Australes", *collector unknown* (absent from the Hedwig-Schwägrichen herbarium in G, not located elsewhere); lecto: The illustrations in Hedwig (1801), *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 24, 295 (2002).

Leskea pennata Labill., *Nov. Holl. Pl.* 2, 26: 106, t. 253, fig. 1 ('1806') [1807]; *Hookeria pennata* (Labill.) Sm., *Trans. Linn. Soc. London* 9: 277 (1808), *nom. illeg. incl. spec. prior.* [*Anictangium bulbosum* Hedw.]; *Pterigophyllum pennatum* (Labill.) Brid., *Muscol. Recent.*, Suppl. 4: 151 ('1819') [1818], *nom. illeg. incl. spec. prior.* [*Anictangium bulbosum* Hedw.]; *Cyathophorum pennatum* (Labill.) Brid., *Bryol. Univ.* 2: 722 (1827), *nom. illeg. incl. spec. prior.* [*Anictangium bulbosum* Hedw.]; *Hypnum pennatum* (Labill.) Poir., *in* Steudel, *Nomencl. Bot.* 2: 201 (1824), *nom. nud.* (in synon.) [*Hookeria pennata* (Labill.) Sm.]. T: "in capite van Diemen", [Tas.], *J.-J.H. de Labillardière*; type material not seen with certainty: BM?, FI?

Hookeria pennata (Labill.) Sm. var. *minor* Wilson & Hook.f., *in* J.D.Hooker & W.Wilson, *Fl. Antarct.* 1: 143, t. 62, fig. 3 (1844); *Cyathophorum pennatum* (Labill.) Brid. var. *minus* (Wilson & Hook.f.) Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 120 ('1855') [1854]; *Cyathophorum bulbosum* (Hedw.) Müll.Hal. var. *minus* (Wilson & Hook.f.) Paris, *Index Bryol.* 294 (1894); *Cyathophorum pennatum* (Labill.) Brid. f. *minus* (Wilson & Hook.f.) Brizi, *Atti Reale Accad. Lincei, Rendicanti Cl. Sci. Fis.*, Ser. 5, 2: 103 (1893), as *minor*, *nom. nud.*; *Ann. Reale Ist. Bot. Roma* 6: 352 (1897), as *minor*; *Cyathophorum minus* (Wilson & Hook.f.) M.Fleisch., *Musc. Buitenzorg* 3: 1097 (1908), *nom. illeg. incl. spec. prior.* [*Cyathophorum densirete* Broth.]. T: "Lord Auckland's Islands" [Auckland Is.], *Antarct. Exp. 1839–43, J.D.Hooker s.n.*; holo: BM (sub *W 86.b*); iso: BR, FH, L, NY.

Cyathophorum densirete Broth., *Oefvers. Förh. Finska Vetensk.-Soc.* 35: 51 (1893), as *Cyatophorum*. T: South Road Forest, Circular Head, Tas., 21 Apr. 1892, *W.A.Weymouth 862*; holo: H *n.v.*; iso: BM, JE, NY.

Illustrations: B. & N.Malcolm, *Mosses and other Bryophytes* 10, 37, 71, 152, 203 (2000); J.D.Kruijer, *Blumea*, Suppl. 13: 50, pl. 3D; 298, fig. 46; 306, fig. 48B; 308, fig. 49B (2002); W.R.Buck, D.H.Vitt & W.M.Malcolm, *Key to the Genera of Australian Mosses* 36 (2002).

Dioicous. Plants occasionally gemmiferous. Stems to 6 (–12) cm tall, usually quadrangular in section, occasionally weakly terete; terminal cell of axillary hairs ±rectangular, elongate to linear, 55–95 × 8–15 µm, smooth. Leaves dull or glossy; margin usually serrate-dentate, rarely ciliate; teeth 1–7-celled, to 150 (–400) µm long; border absent or interrupted; costa reaching 16–50% of lamina length; laminal cells 45–205 × 20–50 µm. Lateral leaves ovate to lanceolate, 3.0–10.5 mm long, 1–4 mm wide; amphigastria round to oblong, 1–4 mm long, 0.5–4.0 mm wide. Calyptra 0.4–0.6 mm long. Setae 0.8–3.0 mm long. Capsules subglobose to ellipsoidal, 1.2–2.3 mm long, 1.0–1.3 mm wide; operculum long-rostrate, 0.8 mm long. OPL: PPL: IPL = 4: 2: 4–8(–10)c. Exostome teeth 290–510 µm long, 70–140 µm wide. Spores 10–25 µm. *n* = 5, based on material from Vic. and New Zealand, *fide* H.P.Ramsay, *in* A.Löve, *Taxon* 16: 559 (1967); M.E.Newton, *J. Bryol.* 7: 399, 400 (1973); H.P.Ramsay, *Austral. J. Bot.* 22: 327, 328 (1974). Plates 59, 60.

Occurs in Qld, N.S.W., Vic., Tas. and south-eastern S.A. at elevations up to 1670 m; also in Papua New Guinea, New Zealand, Auckland Is., Chatham Is., Lord Howe Is. and perhaps on Norfolk Is. and New Ireland. Grows on soil, rock (basalt, sandstone, granite and limestone), rotting logs or stem bases and the trunks of trees and tree ferns; less often on branches of trees, rarely found submerged in streams near the water-line, in forests and fern thickets, frequently in moist, shaded places, especially in gullies and near streams. Map 233.

S.A.: Mt Gambier, *F.Mueller s.n.* (MEL). Qld: Mt Bellenden Ker, *H.Streimann 27380* (CANB). N.S.W.: Nadgee State Forest, *H.Streimann 38062* (CANB). Vic.: Mount Napier State Park, *A.C.Beauglehole 3881* (MEL). Tas.: Tasman Penin., 3 Feb. 1899, *W.A.Weymouth s.n.* (CANB, NY).

Most plants are shorter than 6 cm; larger ones are known from Vic. and Tas., and plants more than 7.5 cm in length were found only in Vic. Plants from Qld lack gemmae and have leaves that are predominantly set with unicellular teeth, while southern specimens are occasionally gemmiferous and show a predominance of multicellular teeth at their leaf margins. In all areas most stems are simple, but undamaged, branched stems do occur and may be found more frequently in nature than are known from herbarium material. Damaged stems frequently have a few innovations, and those growing in particularly wet conditions are occasionally dark olive-green. The axillary hairs are especially difficult to observe and, in addition, they are often damaged or lost.

Fruiting specimens were frequently found in Vic. and Tas., but these are uncommon elsewhere in Australia.

Labillardière (*loc. cit.*) and Palisot de Beauvois (*Mém. Soc. Linn. Paris* 1: pl. 8, fig. 6, 1822) depicted completely non-ciliate endostomes of *Cyathophorum bulbosum*. However, the endostomes are usually entirely ciliate, although partly non-ciliate endostomes are sometimes seen.

Doubtful Records

Canalohypopterygium tamariscinum (Hedw.) Kruijer, *Lindbergia* 20: 87 (1996)

Leskea tamariscina Hedw., *Sp. Musc. Frond.* 212, t. 51, figs 1–7 (1801). T: "Insulae Australes & Jamaica" (Jamaican material excluded), unknown collector (absent from the Hedwig-Schwägrichen herbarium in G, not located elsewhere); lecto: The illustrations in Hedwig (1801), *fide* H.Kruijer, *Lindbergia* 20: 85–88 (1996).

Hypnum setigerum P.Beauv., *Prodr.* 70 (1805); *Hypopterygium setigerum* (P.Beauv.) Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 118 ('1855') [1854], *nom. illeg. incl. spec. prior.* (*Leskea tamariscina*), *fide* H.Kruijer, *Lindbergia* 20: 85–88 (1996).

Hypopterygium commutatum Müll.Hal., *Syn. Musc. Frond.* 2: 6 (1850), *nom. illeg. incl. spec. prior.*; *Canalohypopterygium commutatum* (Müll.Hal.) Frey & Schaepe, *J. Hattori Bot. Lab.* 66: 269 (1989), *nom. illeg. incl. spec. prior.* (*Leskea tamariscina*), *fide* H.Kruijer, *Lindbergia* 20: 85–86 (1996).

Reported for mainland Australia and Tasmania by Sainsbury (1955, as *Hypopterygium setigerum*), but almost certainly endemic to New Zealand. G.A.M.Scott & I.G.Stone (*The Mosses of Southern Australia* 398, 1976, as *H. commutatum*) found no records of *C. tamariscinum* for Australia, likewise Kruijer (2002). The few herbarium specimens of *C. tamariscinum* said to come from Australia or Tasmania proved to be misidentified or are almost certainly mislabelled.

Catharomnion ciliatum (Hedw.) Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 119 ('1855') [1854]

Pterigynandrum ciliatum Hedw., *Sp. Musc. Frond.* 84, t. 17, figs 7–13 (1801). T: "Insulae Australes", unknown collector (absent from the Hedwig-Schwägrichen herbarium in G, not located elsewhere); lecto: The illustrations in Hedwig (1801), *fide* J.D.Kruijer, *Blumea* Suppl. 13: 131 (2002).

Reported from mainland Australia and Tasmania, but almost certainly confined to New Zealand and Chatham Is. Rodway (1914) and Sainsbury (*Pap. & Proc. Roy. Soc. Tasmania* 90: 37, 1956) suggested that the Tasmanian record was erroneous. Kruijer (2002) suggested that Tasmanian records made by various authors in the Australian and New Zealand literature were based on almost certainly mislabelled material gathered by R.C.Gunn. Gunn's collections are the only ones that are indicated to come from Tasmania, and they probably originated in New Zealand.

Hampe (in F.Mueller, *Fragm.* 11 (Suppl.): 52, 1880) reported the species from mainland Australia based on collections made by F.Mueller, but these collections were not found (Kruijer, 2002).

Dendrohypopterygium filiculiforme (Hedw.) Kruijer, *Blumea*, Suppl. 13: 105 (2002)

Leskea filiculiformis Hedw., *Sp. Musc. Frond.* 212, t. 50, figs 1–5 (1801), as *filiculaeformis*; *Hypopterygium filiculiforme* (Hedw.) Brid., *Bryol. Univ.* 2: 712 (1827). T: "Insulae Australes", *collector unknown* (absent from the Hedwig-Schwägrichen herbarium in G); lecto: the illustrations in Hedwig (1801), *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 24, 105 (2002).

This moss has not been reported from Australia in the literature, and it is almost certainly endemic to New Zealand. The few specimens that are labelled as coming from Australia (and Norfolk Is.) are presumed to have been mislabelled (Kruijer, 2002). Four specimens in BM collected by Ludwig Leichardt are labelled "Australia & New Zealand", but they were probably collected in New Zealand.

2. HYPOPTERYGIUM

Hypopterygium Brid., *Bryol. Univ.* 2: 709 (1827); from the Greek *ὑπο* (*hypo-*, under) and *πτερυγιον* (*pterygion*, a little wing), in reference to the amphigastria.

Hypopterygium Brid. sect. *Euhypopterygium* Müll.Hal., *Syn. Musc. Frond.* 2: 3 (1850), *nom. illeg.* [*Hypopterygium* Brid. sect. *Hypopterygium*]; *Hypopterygium* Brid. subg. *Euhypopterygium* Bosch & Sande Lac., *Bryol. Jav.* 2: 10 (1861), *nom. illeg.* [*Hypopterygium* Brid. subg. *Hypopterygium*]; *fide* R. van der Wijk *et al.* (*Index Musc.* 3: 178, 1964), based on *Hypopterygium* Brid. sect. *Euhypopterygium* Müll.Hal. Lecto: *Hypopterygium laricinum* (Hook.) Brid. [= *Hypopterygium tamarisci* (Sw.) Brid. ex Müll.Hal.].

Hypopterygium Brid. sect. *Pseudotamariscina* Kindb., *Hedwigia* 40: 285 (1901), as *Pseudo-Tamariscina*; *Hypopterygium* Brid. subsect. *Pseudotamariscina* (Kindb.) M.Fleisch., *Musc. Buitenzorg* 3: 1080 (1908), as *Pseudo-Tamariscina*. T: *Hypopterygium tasmanicum* Kindb. [= *H. didictyon* Müll.Hal.].

Hypopterygium Brid. subg. *Euhypopterygium* Kindb., *Hedwigia* 40: 284 (1901), *nom. illeg.*; *Hypopterygium* Brid. sect. *Euhypopterygium* (Kindb.) M.Fleisch., *Musc. Buitenzorg* 3: 1080 (1908), *nom. illeg.*, incl. type of *Hypopterygium* Brid., *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 139 (2002).

Hypopterygium Brid. sect. *Tamariscina* Kindb., *Hedwigia* 40: 287 (1901), *nom. illeg.*; *Hypopterygium* Brid. subsect. *Tamariscina* (Kindb.) M.Fleisch., *Musc. Buitenzorg* 3: 1083. (1908), *nom. illeg.*, incl. type of *Hypopterygium* Brid., *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 139 (2002).

Plants pinnate to umbellate. Stipe tomentose or glabrous above base. Frond transversely (ob-) ovate to elliptic, glabrous (partly tomentose in one species); ramification pinnate to bipinnate (or partly tripinnate); rudimentary branches absent; axes terete; central strand present; axial cavities absent; axillary hairs 2–4-celled. Foliation partly or entirely complanate. Leaves in 3, 8 or 11 (or rarely more) ranks at stipe and in 3 ranks at rachis and branches, dull or slightly glossy; costa simple, reaching 67–80% the length of the lateral leaves, one-third to excurrent in amphigastria; laminal cells prosenchymatous (partly parenchymatous in one species), hexagonal, thin-walled. Calyptra cucullate, white to ochraceous, glabrous, partly membranous, partly fleshy. Setae ascending to erect, straight to uncinate, ochraceous to (reddish) brown, smooth; base narrow. Capsules cernuous to pendulous, ochraceous or brown; rostrum oblique. Exostome present; endostome ciliate; basal membrane reaching 30–50% of the length of the exostome.

A genus of seven species in mainly humid, tropical and subtropical regions of both hemispheres; also in warm-temperate regions of the Southern Hemisphere and East Asia and along the western and north-eastern coasts of the Pacific Ocean. Represented in Australia by three non-endemic species.

T.Pfeiffer, J.D.Kruijer, W.Frey & M.Stech, Systematics of the *Hypopterygium tamarisci* complex (Hypopterygiaceae, Bryopsida): implications of molecular and morphological data. Studies in austral temperate rain forest bryohytes 9, *J. Hattori Bot. Lab.* 89: 55–70 (2000).

1 Stipe and basal frond leaves in 8 ranks; dorsal leaves present in basal part of rachis; laminal cells parenchymatous to prosenchymatous, rectangular or hexagonal; terminal cell of axillary hairs usually short-linear to linear, smooth or covered with white substances (cells with white substances visible as white dots with hand lens)..... **1. H. didictyon**

1: Stipe and basal frond leaves in 3 or 11 (or more) ranks; dorsal leaves absent; laminal cells prosenchymatous, hexagonal; terminal cell of axillary hairs short to elongate, never short-linear or linear, smooth or weakly covered with white substances (only visible with light microscope)..... 2

2 Dioicous; plants usually strongly palmate to umbellate, rarely flabellate, not gemmiferous; stipe frequently more than 15 mm long; distal frond leaves weakly to coarsely serrate-dentate, not caducous; teeth usually more than 20; border green *(1:)*..... **2. H. discolor**

2: Monoicous or dioicous; plants pinnate to bipinnate (or partly tripinnate), palmate or umbellate, gemmiferous or not; stipe less than 15 mm long; distal frond leaves entire or weakly serrate to weakly serrate-dentate, occasionally caducous in palmate to umbellate plants; teeth fewer than 20; border colourless ..... **3. H. tamarisci**

1. Hypopterygium didictyon Müll.Hal., *Syn. Musc. Frond.* 2: 9 (1850)

Hypopterygium didyctium Müll.Hal. ex Berthier, *Rev. Bryol. Lichénol.* 38: 546 ('1971–72') [1972], *nom. illeg. orthogr. err. pro H. didictyon* Müll.Hal. T: Hermite Island, Cape Horn, Magellanes Prov., Chile, *J.D.Hooker s.n., Antarct. Exped. 1839–43*; holo: B (destroyed); lecto: L, *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 144 (2002); isolecto: BM (*s.n.*, sub nos *163* and *W. 154*), E (*n.v.*), H (*n.v.*), S (sub nos *23* and *24* in Herb. Kindberg), TDC.

Hypopterygium novaeseelandiae Müll.Hal., *Bot. Zeitung (Berlin)* 9: 562 (1851), as *novae-seelandiae*. T: "ad corticem arborum dejectarum sylvarum prope Kaipara" [(Wairoa) Forests, Kiapara Harbour], North Island, New Zealand, 1850, *S.Mossman 722*; holo: B (destroyed), lecto: NY, *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 144 (2002); isolecto: BM (sub no. *22*, which is probably an error for no. *722*), JE? (*s.n., s. loc.*).

Hypopterygium smithianum Hook.f. & Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 118 ('1855') [1854]; *H. smithii* Wilson ex Kindb., *Enum. Bryin. Exot.* 20 (1888), *nom. illeg. orthogr. err. pro H. smithianum* Hook.f. & Wilson]. *Hookeria rotulata auct. non* Hedw.: J.E.Smith, *Trans. Linn. Soc. London* 9: 279 (1808); according to Hooker & Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 118 ('1855') [1854]; J.E.Smith (*loc. cit.*) identified a plant from New Zealand collected by A.Menzies which was almost certainly a syntype of *H. smithianum*. T: "Dusky Bay" [Dusky Sound], South Island, New Zealand, 1791, *A.Menzies 74*; lecto: BM, *fide* J.D.Kruijer, *Blumea* Suppl. 13: 144 (2002); isolecto: BM; Bay of Islands, North Island, New Zealand, *A.Cunningham* "etc."; syn: not located; East Coast and interior, North Island, New Zealand, *W.Colenso s.n.*; syn: not located with certainty, probably *W.Colenso 2535*, BM (*s. loc.*) and *W.Colenso 2560*, BM (*s. loc.*); East Coast and interior, North Island, New Zealand, *J.Sinclair s.n.*; syn: not located with certainty, possibly the original material of *H. pallidisetum* Wilson, *nom. nud.* (in synon.), in BM; Port William, Stewart Island, [New Zealand], 1850, *D.Lyall 80*; syn: BM.

Hypopterygium glaucum Sull., *Proc. Amer. Acad. Arts* 3: 184 (1855); *H. novaeseelandiae* Müll.Hal. var. *glaucum* (Sull.) Dixon, *Bull. New Zealand Inst.* 3(5): 295 (1927); *H. novaeseelandiae* Müll.Hal. f. *glaucum* (Sull.) Vitt, *New Zealand J. Bot.* 12: 205 (1974). T: New Zealand, *U.S. Exploring Exped. Wilkes 1838–42*; holo: FH? (not located); iso: BM, NY.

Hypopterygium tasmanicum Müll.Hal. ex Kindb., *Hedwigia* 40: 285. (1901). T: Tas., May 1890, *Bochard s.n.*; holo: S (sub no. *12*); iso: B (destroyed).

Illustrations: K.W.Allison & J.Child, *Mosses of New Zealand* pl. 29 (1971); C.M.Matteri, *Bol. Soc. Argent. Bot.* 15: 242, pl. 3 (1973); J.D.Kruijer, *Blumea*, Suppl. 13: 147, fig. 16; 148, fig. 17 (2002).

Dioicous. Plants palmate or umbellate, not gemmiferous. Stipe to 15 mm long, tomentose, glabrous when young. Frond to 3.5 cm wide, glabrous or partly tomentose; branches not caducous; terminal cell of axillary hairs usually rectangular, rarely elliptic, elongate to short-linear to linear, 40–95 × 5–15 µm, smooth or covered with a white substance. Stipe leaves in 8 ranks. Frond leaves in 8 ranks in the basal part of the rachis, in 3 ranks in the distal part of the frond, transverse-ovate to oblong, (0.2–) 0.5–2.0 mm long, 0.2–1.5 (–2.0) mm wide; distal ones occasionally caducous; margin entire to coarsely serrate-dentate; teeth 1-celled, to 20 µm long; border entire, colourless; laminal cells 20–95 × 5–30 µm. Calyptra 2.7–3.9 mm long. Setae 12–18 mm long. Capsules ellipsoidal, 1.1–2.4 mm long, 0.7–1.5 mm wide; operculum 2.0–2.5 mm long. OPL: PPL: IPL = 4: 2: 6–8c. Exostome teeth (440?–) 630–640 µm long, (120–) 140–160 µm wide. Spores 9–16 µm. *n* = 6, *fide* M.E.Newton, *J. Bryol.* 7: 399, 400 (1973), as *H. novae-seelandiae*.

Occurs in N.S.W., Vic. and Tas. and rare in S.A; at elevations up to 1660 m. Also in New Zealand, Auckland Is.; Campbell Is., Chatham Is. and southern South America; doubtfully in Norfolk Is. Grows on soil, rocks, rotting logs and tree trunks in forest and scrubby woodland, frequently near streams and in humid habitats. Map 234.

S.A.: Mt Gambier, *Wilhelmi s.n.* (BM, RO). N.S.W.: White Rock Mtn, *J.H.Willis s.n.* (MEL). Vic.: Errinundra R., *H.Streimann 36592* (B, CANB, NY). Tas.: Mt Wellington, *R.A.Bastow 147* (MEL, NSW); Wylds Craig, *D.A. & A.V.Ratowsky B44e* (CANB, GRO, NY).

The collection from S.A. (BM and RO) is credited to F.Mueller, but it was probably collected by Wilhelmi (*fide* E.Hampe, *Linnaea* 28: 215, 1856).

Fruiting specimens were frequently found.

This species was included in G.A.M.Scott & I.G.Stone's (*The Mosses of Southern Australia* 396, 1976) circumscription of *H. rotulatum*.

2. Hypopterygium discolor Mitt., *in* J.D.Hooker, *Handb. New Zealand Fl.* 2: 488 (1867)

T: "Wairoa forests Kiapara" [Kiapara Harbour], North Island, New Zealand, *S.Mossman s.n.*; lecto: NY, *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 163 (2002); Auckland, North Island, New Zealand, *C.Knight s.n.*; syn: not located; (excluded from syntypes: Auckland, North Island, New Zealand, *Jupp s.n.* NY [= *H. didictyon* Müll.Hal.]).

Hypopterygium scottiae Müll.Hal., *Linnaea* 35: 619 (1868). T: "Ash Island ad or. flum. Hunter [Hunter R.] litor. orient. Novae Hollandiae", N.S.W., *H.Scott s.n.*; syn: B (destroyed); lecto: BM; *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 163 (2002); isolecto: NY; Brisbane River, "Austral. or. aeq." [Qld], *A.Dietrich s.n.* syn: B (destroyed); isosyn: BM, BM ("1864"), JE, JE ("1865"), MEL (sub no. *451*), NY, W.

Illustrations: J.D.Kruijer, *Blumea*, Suppl. 13: 164, fig. 20; 166, fig. 21 (2002).

Dioicous. Plants palmate to umbellate (rarely flabellate), rarely gemmiferous. Stipe to 30 mm long, tomentose at base; stipe leaves in 3 ranks (rarely 11 ranks in basal third of stipe). Frond to 3.5 cm wide, glabrous; branches not caducous; terminal cell of axillary hairs elliptic to rectangular, short to elongate, 30–70 × 10–30 µm, smooth or weakly covered with a white substance. Frond leaves in 3 ranks, transverse-ovate to elliptic, 0.5–1.5 mm long, 0.5–1.5 mm wide, persistent; margin (entire to) coarsely serrate-dentate; teeth 1 (or 2)-celled, to 40 µm long; border entire, green; laminal cells 15–60 × 15–25 µm. Calyptra 2.0–2.5 (–3.0) mm long. Setae 9–40 mm long. Capsules barrel-shaped to narrowly ellipsoidal, 1.4–2.0 (–2.5) mm long, 0.9–1.5 mm wide; operculum 1.5–2.0 mm long. OPL: PPL: IPL = 4: 2: 6–10c. Exostome teeth 540–640 µm long, 125–160 µm wide. Spores 10–15 µm.

Occurs in coastal areas of eastern Qld and N.S.W. at elevations up to 330 m. Grows mainly on sandy soil in riverine rainforest, monsoon forest with a dense shrubby understorey and dry monsoon scrub, most frequently in shade, and near streams or in other damp places. Also in New Zealand (North Island), but not collected there since the nineteenth century. Map 235.

Qld: Bundaberg, *H.Smithurst 270* (MEL, NSW); Fraser Is., *C.Borough 4* (CANB, L). N.S.W.: Ballina, *W.W.Watts 3412* (NSW).

A report from Mt Gambier, S.A. (W.Mitten, *Trans. & Proc. Roy. Soc. Victoria* 19: 76, 1882) could not be verified. However, it was presumably based on a misidentification of *H. tamarisci* or *H. didictyon*. An erroneous report from Tasmania (H.W.Lett, *J. Bot.* 42: 252, 1904) was based on a misidentification of *H. tamarisci*.

Gemmiferous plants are rare and are usually damaged, while fruiting specimens are common in most collections with female plants.

3. Hypopterygium tamarisci (Sw.) Brid. ex Müll.Hal., *Syn. Musc. Frond.* 2: 8 (1850)

Hypnum tamarisci [Sw. ex] Sw., *Fl. Ind. Occid.* 3: 1825 (1806); Sw., *Prodr.* 141 (1788), *nom. inval.* (pre-starting point); *Hookeria arbuscula* Arn., *Disp. Méth. Mousses* (preprint) 56 (1825 [1826?]); *Mém. Soc. Hist. Nat. Paris*, sér. 2, 2: 305 (1826), *nom. illeg.* (later homonym), *non* Sm., *Trans. Linn. Soc. London* 9: 280, t. 23, fig. 3 (1808) [= *Camptochaete arbuscula* (Sm.) Reichardt]. T: Jamaica, *O.Swartz s.n.*; holo: UPS *n.v.*; iso: G, S, W (damaged).

Hypopterygium rotulatum (Hedw.) Brid. var. *incurvum* Brid., *Bryol. Univ.* 2: 714 (1827). T: "Nova Hollandia" [Australia], 1822; holo: B, ex Herb. A.P. de Candolle, *s. coll.*; iso: JE, ex Herb. Bridel, *s. coll., s. dat.*

Hypopterygium tenellum Müll.Hal., *Bot. Zeitung (Berlin)* 12: 557 (1854); *H. rotulatum auct. non* Hedw.: Montagne, *Ann. Sci. Nat. Bot.*, sér. 2, 17: 243 (1842), *fide* C.Müller, *Bot. Zeitung (Berlin)* 12: 558 (1854); *H. rotulatum* Mont. ex Okamura, *J. Coll. Sci. Imp. Univ. Tokyo* 36, 7: 25 (1915), *nom. nud.* (in synon.). [*Hypopterygium tenellum* Müll.Hal.]; given as a synonym, but probably meant as a misidentification. T: Nilgiri Hills, Tamil Nadu, India, *Schmid s.n.*; lecto: JE, *fide* T.Pfeiffer *et al., J. Hattori Bot. Lab.* 89: 65–66 (2000); isolecto: B (destroyed), BM, NY; Nilgiri Hills, Tamil Nadu, India, *Perrottet s.n.*; syn: B (destroyed), BM.

Hypopterygium muelleri Hampe, *Linnaea* 28: 215 (1856); *Pterobryon muelleri* (Hampe) Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 81 (1882). T: "In lapidibus ad ripam fluminis Buchan humidam" [Buchan R.], Vic., Mar. 1854, *F.Mueller s.n.* holo: BM (not located); holo?: MEL, *fide* J.D.Kruijer, *Glasgow Naturalist* 23(2): 16 (1997), sub no. *40*; iso: MEL, WELT, both sub. nos *40* and *111*. Types of *Hypopterygium muelleri* are absent from E.Hampe's herbarium (BM) and were not located in other herbaria, except for two specimens in MEL and one in Sainsbury's herbarium in WELT; see also T.Pfeiffer *et al., J. Hattori Bot. Lab.* 89: 68 (2000). The potential holotype is provided with annotations by E.Hampe. There is no evidence that another specimen from Buchan R. (in TDC) belongs to the type material, because its collector is unknown.

Hypopterygium viridulum Mitt., *in* J.D.Hooker, *Handb. New Zealand Fl.* 2: 487 (1867). T: Akaroa, Banks Penin., Canterbury, "Middle Island" [South Island], New Zealand, *Kerr s.n.*; lecto: NY, *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 200 (2002); Wellington, North Island, New Zealand, *Stephenson s.n.*; syn: not located with certainty; Wangaroa, North Island, New Zealand, *Kerr s.n.*; syn: not located; New Zealand, *Stephenson 11b*; syn?: NY; New Zealand, *Stephenson 20*; syn?: BM; NY.

Hypopterygium rigidulum Mitt. subsp. *balantii* Müll.Hal. ex Kindb., *Hedwigia* 40: 295 (1901); *H. rigidulum* Mitt. var. *balantii* Kindb. ex Streimann & J.Curn., *Austral. Fl. & Fauna Ser.* 10: 213 (1989), *nom. inval., err. pro H. rigidulum* Mitt. subsp. *balantii* Müll.Hal. ex Kindb. T: Botanical Garden of Berlin: palm house of the "Flora", Charlottenburg, Berlin, Germany, "ad truncum *Balantii antarctii*", 13 Nov. 1885, *H.Graef s.n.*; lecto: S, *fide* J.D.Kruijer, *Glasgow Naturalist* 23(2): 16 (1997) (sub. nos *45* and *33* in Herb. Kindberg); isolecto: B (destroyed), JE; Botanical Garden of Berlin: palm house of the "Flora", Charlottenburg, Berlin, Germany, "ad truncum [putrid.?] *Balantii antarctii*", Nov. 1888, *H.Graef s.n.*; syn: B (destroyed); S (sub. nos *45* and *33* in Herb. Kindberg), JE.

Hypopterygium scottiae Müll.Hal. subsp. *denticulatum* Kindb., *Hedwigia* 40: 296 (1901). T: Toowoomba, Qld, but erroneously presented as being located in "Van Diemensland" [Tas.], [*C.*]*H.Hartmann s.n.*, "distr. Rehmann n. *20*"; holo: S.

Illustrations: F.M.Bailey, *Compr. Cat. Queensland Pl.* 665, fig. 635 (1913); J.D.Kruijer, *Blumea*, Suppl. 13: 48, pl. 2e & f; 210, fig. 29; 211, fig. 30; 212, fig. 31; 213, fig. 32; 214, fig. 33; 220, fig. 34 (2002); H.Streimann, *The Mosses of Norfolk Island* 103, fig. 47; 105, pl. 20 (2002).

Dioicous or monoicous and unisexual or (in part) bisexual. Plants pinnate to palmate or umbellate, gemmiferous or not. Stipe to 15 mm long, tomentose at base. Frond to 3.5 cm wide, glabrous; branches caducous or not; terminal cell of axillary hairs suborbicular to elliptic, short to oblong (or elongate), 20–75 × 10–30 µm, smooth. Stipe leaves in 3 or 11 (or more) ranks. Frond leaves in 3 ranks, transversely elliptic to ovate or elliptic, (0.1–) 0.7–1.2 mm long, (0.1–) 0.3–1.0 mm wide; distal ones occasionally caducous; margin entire to weakly (or coarsely) serrate-dentate; teeth 1-celled, to 15 (–30) µm long; border entire, colourless; laminal cells 20–60 × 10–25 µm. Calyptra 1.5–2.5 mm long. Setae 4.0–14.5 mm long. Capsules ovoid to ellipsoidal or urceolate, 1.3–2.3 mm long, 0.7–1.2 mm wide; operculum 1.3–1.8 mm long. OPL: PPL: IPL = 4: 2: 6(–8)c. Exostome teeth 360–630 µm long, 105–130 µm wide. Spores 12–17 µm. *n* = 9, 18, c. 27 and 36, based on material from Mt Wilson, N.S.W., *fide* H.P.Ramsay, *Proc. Linn. Soc. New South Wales* 91: 220–230 (1967), as *H. rotulatum* (Hedw.) Brid. Plates 61–63.

Occurs in S.A., Qld, N.S.W., A.C.T., Vic. and Tas.; also in Lord Howe Is. and Norfolk Is.; a widespread pantropical and warm-temperate species. Grows on rocks (basalt, limestone and sandstone), the trunks of trees and palms, tree ferns, less often on rotting logs, vines and climbers, or on soil, usually in dry to wet forests, frequently near streams, in moist or wet places, or in semi-shaded and shaded habitats. Found at altitudes up to 1660 m, but only to 480 m in Vic. and Tas. Map 236.

S.A.: Naracoorte Caves, *A.J.Downing 0944* (MACQ). N.S.W.: Cann Valley Hwy, *H.Streimann 058506* (L). A.C.T.: Tidbinbilla Nature Reserve, *H.Streimann 1065* (B, CANB). Vic.: Mt Drummer, *D.Verdon 1253* (L). Tas.: St. Marys, *J.Curnow 2448* (CANB).

In Qld and north-eastern N.S.W. plants smaller than 1.5 cm predominate at every altitude, and medium-sized plants occur mostly at 500–1000 m; plants larger than 4.5 cm are rare. In south-eastern N.S.W., Vic. and Tas. small and medium-sized plants are almost equally abundant at all elevations.

Almost every plant has entire, weakly serrate or serrate-dentate leaves, but the frond leaves of a few plants from two localities near Proserpine, Qld are moderately to coarsely (serrate to) serrate-dentate. These plants did not grow under exceptional conditions.

The species shows considerable morphological variation across its global range. Regional and some ecological variation is especially noticeable in life form, size, sexuality and the presence or absence of propagules. Two informal variants of *H. tamarisci* can be recognised in Australia (Pfeiffer *et al.*, 2000; Kruijer, 2002). These are not sharply defined, and intermediates frequently occur in every part of the distributional range of the species.

'*Australasian*' *variant*: Monoicous (or dioicous). Plant (pinnate to) palmate or umbellate, frequently gemmiferous. Costa of frond amphigastria reaching 33–67% of amphigastrium length (to excurrent). Branches occasionally caducous. Equally frequent on rocks and as an

epiphyte, less common on soil and rotting logs. Distribution: Qld, N.S.W., A.C.T., Vic., Tas., Lord Howe Is., Norfolk Is., New Zealand, New Caledonia.

'*Australian*' *variant*: Dioicous. Plant pinnate to bipinnate (or partly tripinnate), not gemmiferous. Costa of frond amphigastria reaching 67% of amphigastrium length to excurrent. Branches not caducous. Most frequent on rocks, less common on soil, rotting logs and as an epiphyte. Distribution: Qld, N.S.W., A.C.T., Vic., Tas.

The 'Australasian' variant predominates in Qld and north-eastern N.S.W. The variants have equal occurrence in south-eastern N.S.W. and Vic., and the species is rare in Tas.

Doubtful Species

Hypopterygium rotulatum (Hedw.) Brid., *Bryol. Univ.* 2: 713 (1827)

Leskea rotulata Hedw., *Sp. Musc. Frond.* 213, t. 51, figs 8–13 (1801). T: "Insulae meridionales", *coll. unknown* [absent from the Hedwig-Schwägrichen herbarium in G; not located elsewhere]; lecto: The illustrations in Hedwig (1801), *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 250 (2002).

Hedwig's description and illustrations of *H. rotulatum* do not differentiate this taxon from other *Hypopterygium* species, and they have caused considerable confusion (Kruijer, 2002). Specimens from Australia that had been identified as *H. rotulatum* proved to be either *H. didictyon* or *H. tamarisci*. H.N.Dixon's (*Bull. New Zealand Inst.* 3(5): 296, 1927) *H. rotulatum* agrees with *H. tamarisci*. Reports of *H. rotulatum* in G.A.M.Scott & I.G.Stone (*The Mosses of Southern Australia* 396, 1976) are referable to *H. didictyon* and *H. tamarisci*.

3. LOPIDIUM

Lopidium Hook.f. & Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 119 ('1855') [1854]; from the Greek *λοπίς* (*lopis*, a scale); the authors did not give any reference or indication as to which part of the plant they had in mind when they invented the name *Lopidium* for their new genus.

Hypopterygium subg. *Lopidium* (Hook.f. & Wilson) Bosch & Sande Lac., *Bryol. Jav.* 2: 8 (1861); *Hypopterygium* sect. *Lopidium* (Hook.f. & Wilson) Mitt., *J. Linn. Soc., Bot.* 12: 329 (1869); *Lophidium* Brid. ex Rodway, *Pap. & Proc. Roy. Soc. Tasmania* 1913: 237 (1914), *nom. illeg. incl. gen. prior., err. pro Lopidium* Hook.f. & Wilson.

Lecto: *L. concinnum* (Hook.) Wilson.

Plants pinnate to bipinnate, occasionally tripinnate, flabellate or weakly dendroid, rarely simple. Stipe tomentose at base. Frond rhomboidal to ovate to shortly linear-elliptic, glabrous; rudimentary branches absent; axes terete; central strand present or absent; axial cavities present or absent; inclusions colourless to olivaceous or reddish brown; axillary hairs 2–4-celled. Foliation complanate except for the stipe base and innovations (occasionally not complanate in *L. concinnum*). Leaves in 3 ranks, dull; apex obtuse or acute or acuminate; costa simple, nearly percurrent to excurrent; laminal cells collenchymatous, isodiametric, transversely hexagonal or hexagonal; walls incrassate. Calyptra cucullate, white, pale ochraceous or partly brown, glabrous or set with paraphyses, partly membranous, partly fleshy. Setae horizontal or ascending, straight to uncinate, ochraceous to brown, mammillose. Capsules erect to pendulous, ochraceous to brown; rostrum oblique. Exostome present; endostome not ciliate or rudimentary-ciliate by 1 (or 2) plates; basal membrane reaching no more than one-third the length of the exostome.

A genus of two species, both of which occur in Australia. *Lopidium struthiopteris* occurs mainly in the Palaeotropics, while *L. concinnum* is a (warm-) temperate species of the Southern Hemisphere. Species show great variability in the size of the plant, the length of the stipe, rachis and branches, and the degree of ramification and the number of branches, a character that has a considerable impact on the shape of the frond.

Gemmae always absent; monoicous; paraphyses absent or present in mature perichaetia, never extending; exostome teeth at least 70 µm wide; calyptra glabrous ..... **1. L. concinnum**

Gemmae present; dioicous; paraphyses present in mature perichaetia, frequently longer than perichaetial leaves; exostome teeth less than 70 µm wide; calyptra set with paraphyses ..... **2. L. struthiopteris**

1. Lopidium concinnum (Hook.) Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 119 ('1855') [1854]

Leskea concinna Hook., *Musci Exot.* 1: t. 34 (1818); *Hookeria concinna* (Hook.) Hook. & Grev., *Edinburgh J. Sci.* 2: 232 (1825); *Hypopterygium concinnum* (Hook.) Brid., *Bryol. Univ.* 2: 711 (1827). T: "Dusky Bay" [Dusky Sound], South Island, New Zealand, 1791, *A.Menzies s.n.*; holo: BM (sub nos *84* and *H. 1529a*); iso: BM (fragments sub no. *H. 1529b*), G? (*n.v.*), S; iso?: NY (Herb. Mitten, *s. loc.*). Several annotations in Wilson's herbarium attached to the specimens with the number *H. 1529b* refer to them as original specimens and duplicates of the holotype.

Lopidium pallens Hook.f. & Wilson, *in* J.D.Hooker, *Fl. Nov.-Zel.* 2: 119 ('1855') [1854]; *Hypopterygium pallens* (Hook.f. & Wilson) Mitt., *Hooker's J. Bot. Kew. Gard. Misc.* 8: 265 (1856); *Hypopterygium pallens* (Hook.f. & Wilson) Reichardt, *Reise Novara, Pilze, Leber-Laubm.* 1(3): 194 (1870), *nom. illeg.* (later homonym). T: Hutt Valley, Wellington, North Island, New Zealand, *D.Lyall 126*; lecto: BM, *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 255 (2002); Waikehi, New Zealand, *J.Sinclair s.n.*; syn: BM; Ship Cove, New Zealand, *D.Lyall s.n.*; syn: BM; Bay of Islands, North Island, New Zealand, *J.D.Hooker 386* ("New Zealand, Antarct. Exp. 1839–43"); syn: BM; Auckland, North Island, New Zealand, *J.Sinclair s.n.*; syn: BM; Wellington, North Island, New Zealand, *D.Lyall 112*; syn: BM; Milford Sound, South Island, New Zealand, *D.Lyall 23*; syn: BM; Bligh's Sound, South Island, New Zealand, *D.Lyall 184*; syn: BM.

Hypopterygium hyalinolimbatum Müll.Hal. ex Kindb., *Hedwigia* 40: 281 (1901), *nom. nud.* (in synon.) [*H. pallens* (Hook.f. & Wilson) Mitt. subsp. *plumarium* (Mitt.) Kindb.]; *Lopidium hyalinolimbatum* M.Fleisch., *Hedwigia* 63: 213 (1922), *nom. nud.*; *H. hyalolimbata* Müll.Hal. ex Burges, *Proc. Linn. Soc. New South Wales* 60: 88 (1935), *nom. illeg., orthogr. err. pro H. hyalinolimbatum* Müll.Hal. ex Kindb. Based on: Moss Vale, N.S.W., 8 Nov. 1884, *T.Whitelegge s.n.* [MEL (sub no. *189*, "on rocks"), S].

Illustrations: B. & N.Malcolm, *Mosses and other Bryophytes* 1, 78, 86, 156 (2000); J.D.Kruijer, *Blumea*, Suppl. 13: 50, pl. 3b; 257, fig. 37; 258, fig. 38; 270, fig. 41B (2002); W.R.Buck, D.H.Vitt & W.M.Malcolm, *Key to the Genera of Australian Mosses* 37 (2002).

Monoicous (or dioicous), unisexual (in Australia). Plants not gemmiferous. Stipe to 2.0 (–2.5) cm long. Frond to 5 (–9) cm long; central strand absent; axial cavities absent, cortical or central, 5–9 (T.S.); terminal cell of axillary hairs suborbicular to rectangular, short to elongate, (10–) 15–35 × (7–) 10–15 µm, smooth. Frond leaves ovate to oblong or lanceolate-ovate, 0.5–3.5 mm long, (0.2–) 0.5–1.5 mm wide; distal ones occasionally caducous; margin weakly serrate-dentate to moderately serrate; teeth 1-celled, to 40 µm long; border entire or interrupted near the leaf apex, colourless; laminal cells 7–20 × 7–20 µm. Paraphyses of mature perichaetia absent or filiform or leaf-like, to 1.3 mm long, to 0.2 mm wide, shorter than the perichaetial leaves. Calyptra 1.2–2.5 mm long, glabrous. Setae 3.5–6.0 mm long. Capsules subglobose to cylindrical, 0.7–2.0 mm long, 0.4–1.0 mm wide; operculum 0.9–1.4 mm long. OPL: PPL: IPL = 4: 2: 4–6c. Exostome teeth 390–600 µm long, 75–90 µm wide. Basal membrane reaching one-third of the exostome. Spores 11–20 µm. n = 12, *fide* H.P.Ramsay, *in* A.Löve, *Taxon* 16: 559 (1967); H.P.Ramsay, *Austral. J. Bot.* 22: 327, 328 (1974); G.A.M.Scott & I.G.Stone, *The Mosses of Southern Australia* 401 (1976), based on material from N.S.W. Plate 64.

Occurs in N.S.W., Vic. (to 1130 m altitude) and Tas. (to 500 m), and possibly in southern Qld; restricted to the east and south of the Great Dividing Range. Grows on trunks, stem bases and the branches of trees; also on tree ferns and on rocks; less frequently terrestrial or on exposed roots, in forests, often in shaded or wet habitats. Also in New Zealand, Chile, Bolivia and Brazil, and doubtfully in Norfolk Is. (Kruijer, 2002). Map 237.

N.S.W.: Nadgee State Forest, *H.Streimann 38183* (CANB, NY). Vic.: Turtons Rd, Otway Ra., *H.Streimann 2453* (CANB, L). Tas.: Hellyer Gorge, *W.A.Weber & D.McVean B-33365* (GRO, NICH, NY).

One specimen was possibly collected in southern Qld [Moreton Bay (MEL)], but its collector is unknown and mislabelling cannot be ruled out.

Plants show great variability in the length and density of the leaves and amphigastria. Deeply shaded plants often have distant leaves and amphigastria, and are frequently weakly branched with a few, short and distant branches. Fruiting specimens were frequently found.

According to Kruijer (2002) most plants belong to an informal "anisophyllous" variant of *L. concinnum* which is characterised by having an anisophyllous foliation and asymmetrical, ovate to ovate-oblong lateral leaves. Other plants belong to an "isophyllous" variant with partly or entirely isophyllous foliation with symmetrical, ovate to lanceolate-ovate lateral leaves. Isophyllous plants are often dioicous, predominantly male, and frequently have caducous frond leaves. Plants that belong to the anisophyllous variant are less often dioicous and have less frequently caducous leaves. The two variants are not sharply defined, and intermediates are known.

2. Lopidium struthiopteris (Brid.) M.Fleisch., *Musc. Buitenzorg* 3: 1073 (1908)

Hypnum struthiopteris Brid., *Muscol. Recent.*, Suppl. 2: 87 (1812); *Pterygophyllum struthiopteris* (Brid.) Brid., *Muscol. Recent.*, Suppl. 4: 151 ('1819') [1818]; *Hookeria struthiopteris* (Brid.) Arn., *Disp. Méth. Mousses* (preprint) 56 (1825 [1826?]); *Mém. Soc. Hist. Nat. Paris*, sér. 2, 2: 305 (1826); *Hypopterygium struthiopteris* (Brid.) Brid., *Bryol. Univ.* 2: 716 (1827). T: In Insula Borboniâ hâbitat [Réunion], *P.Commerson*(?) *s.n.*; holo: B (destroyed); iso: not located with certainty; Réunion, *P.Commerson s.n.*; neo: BM, *fide* J.D.Kruijer, *Blumea*, Suppl. 13: 265 (2002).

Lopidium pinnatum Hampe, *Linnaea* 38: 672 (1874); *Hypopterygium pinnatum* (Hampe) A.Jaeger, *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1874–75: 150 (*Gen. Sp. Musc.* 2: 66) (1876); *Hypopterygium struthiopteris* (Brid.) Brid. subsp. *pinnatum* (Hampe) Kindb., *Hedwigia* 40: 282 (1901); ?*Hypopterygium planatum* Müll.Hal. ex Mitt., *in* F.Mueller, *Fragm.* 11 (Suppl.): 114 (1881), *nom. inval., err. pro H. pinnatum* (Hampe) A.Jaeger?; *Hypopterygium planatum* Hampe ex Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 76 (1882), *nom. inval., err. pro H. pinnatum* (Hampe) A.Jaeger; *Lopidium planatum* Hampe ex Mitt. ex Streimann & Klazenga, *Cat. Austral. Mosses* 112 (2002), *nom. inval., err. pro H. planatum* Hampe ex Mitt. T: Mt Elliot, Qld, *K.Fitzalan s.n.*; holo: BM; iso?: MEL ("parce intermixitum"), S (sub no. 8).

Hypopterygium daymanianum Broth. & Geh., *in* V.Brotherus, *Oefvers. Förh. Finska Vetensk.-Soc.* 40: 193 (1898); *Hypopterygium struthiopteris* (Brid.) Brid. subsp. *daymanianum* (Broth. & Geh.) Kindb., *Hedwigia* 40: 283 (1901); *Lopidium daymanianum* (Broth. & Geh.) M.Fleisch., *Musc. Buitenzorg* 3: 1071 (1908). T: Mt Dayman, Milne Bay Prov., [Papua] New Guinea, 1894?, *W.E.Armit Jnr s.n.*; holo: H *n.v.*; iso: FH (ex Herb. Geheeb), S (sub 658, ex Herb. Brotherus).

Illustrations: H.Mohamed & H.Robinson, *Smithsonian Contr. Bot.* 80: 41, figs 151–158; 42, figs 159–168 (1991); M.L.So, *Mosses & Liverworts of Hong Kong* 61 (1995); J.D.Kruijer, *Blumea*, Suppl. 13: 50, pl. 3a; 269, figs 39, 40; 270, fig. 41A (2002).

Dioicous. Plants frequently gemmiferous. Stipe to 3 cm long. Frond to 6 cm wide; central strand present or absent; axial cavities absent, (sub)central, 1 or 2 (T.S.); terminal cell of axillary hairs suborbicular to narrowly elliptic, short, 10–20 × 7–15 µm wide. Frond leaves ovate to lanceolate-ovate, (0.3–) 1.0–2.5 mm long, (0.1–) 0.4–1.0 mm wide, not caducous; margin entire or weakly serrate to moderately serrate-dentate; teeth 1 or 2-celled, to 18 µm long; border absent, interrupted or entire; laminal cells 5–20 (–25) × 5–15 µm. Paraphyses of mature perichaetia leaf-like, to 2.5 mm long, 0.05 mm wide, at least a few longer than the perichaetial leaves. Calyptra 2.1–2.5 mm long, set with paraphyses. Setae 4–10 mm long. Capsules barrel-shaped to cylindrical, 1.9–3.1 mm long, 0.6–1.0 mm wide; operculum 1.2–2.0 mm long. OPL: PPL: IPL = 4: 2: (4?–)6–8c. Exostome teeth 300–345 µm long, 50–60 µm wide. Basal membrane reaching c. 10% the height of the exostome. Spores 13–19 µm. *n* = 11, *fide* S.Inoue, *Misc. Bryol. Lichenol.* 8: 112 (1979), based on Japanese material.

Occurs in eastern Qld and north-eastern N.S.W.; grows on tree trunks, also on treelets, branches and climbers, occasionally on tree ferns, rock (granite, limestone, conglomerate and sandstone) and rotting logs, rarely on soil; found in forest, usually in deep or partial shade, but occasionally in open habitats. Also in Africa, Indo-Malaysia, warm-temperate parts of China and Japan and Melanesia. Map 238.

Qld: Mt Finnegan, *L.J.Brass 20093* (FH); Walter Hill Ra., *H.Streimann 30553* (CANB, L, NY); Lamington Natl Park, *B.M.Thiers 1205* (NY). N.S.W.: Briggsvale, *H.Streimann 6633* (CANB).

Lopidium struthiopteris was reported from Tasmania by W.Mitten (*J. Proc. Linn. Soc., Bot.* 4: 96, 1860) and from New Zealand, Tasmania and Chile by J.D.Hooker (*Handb. New Zealand Fl.* 489, 1867), because they erroneously considered this species to be conspecific with *L. pallens* Hook.f. & Wilson.

The dimensions of the frond leaves, the shape of the leaf apex and the extent of the leaf border show great variability. The border of branch leaves is frequently less well developed than that in rachis leaves. The absence of a leaf border or the presence of a faint or interrupted border occurs most frequently in small plants or small stems of medium-sized or large plants. A border is frequently absent in the leaves of minute plants. Small plants occur at every altitude, but large plants are possibly restricted to higher elevations.

A variant found most commonly in Qld is represented by ±slender plants that have only a few distant branches. The branches and lateral frond leaves are usually erecto-patent.

The 'normal' variant of *L. struthiopteris* predominates in most other parts of the distributional area of the species, but it also occurs in Qld. Plants are moderately to densely branched and have several to numerous, closely set branches. The branches are patent to widely patent. The lateral frond leaves similarly often patent to widely patent, and are less frequently erecto-patent than in the 'Queensland' variant. The two variants are not sharply defined and intermediates are known (Kruijer, 2002).

Doubtful Species

Lopidium nematosum (Müll.Hal.) M.Fleisch., *Hedwigia* 63: 213 (1922)

Hypopterygium nematosum Müll.Hal., *J. Mus. Godeffroy* 3: 80 (1874); *H. struthiopteris* (Brid.) Brid. subsp. *nematosum* (Müll.Hal.) Kindb., *Hedwigia* 40: 282 (1901). T: N.S.W., *Mrs Kayser s.n.*; holo: B (destroyed); iso: not located.

This is probably conspecific with one of the two accepted *Lopidium* species (Kruijer, 2002).