

## PAPILLARIA

Heinar Streimann†

*Papillaria* (Müll.Hal.) Lorentz, *Moosstudien* 165 (1864), *nom. cons.*; from the Latin *papilla* (a nipple, teat or bud), in reference to the nipple-like protuberances on the leaf cells.

*Neckera* subsect. *Papillaria* Müll.Hal., *Syn. Musc. Frond.* 2: 134 (1850).

Type: *P. nigrescens* (Sw. ex Hedw.) A.Jaeger

Plants small to large, usually dull. Primary and secondary stems clearly differentiated; secondary stems pendant and often hanging in long festoons; branching generally squarrose. Branch leaves spirally arranged, loosely or closely appressed to the branch, ovate, oblong-lanceolate or triangular, usually asymmetrical, acuminate, less commonly apiculate; base often cordate, usually strongly auriculate; margin variable, inconspicuously dentate or dentate near the base; costa red to reddish brown, extending at least half-way along the leaf. Laminal cells thick-walled, pluripapillose, often obscured; median cells elliptic or oblong-rhomboidal; upper and marginal cells similar; basal cells longer, rectangular, thin-walled; auricular cells rhomboidal or linear-rhomboidal, thick-walled, in divergent or arcuate rows; alar cells poorly differentiated.

Calyptra cucullate, pilose. Seta smooth, short, erect. Capsules ovoid or oblong, smooth, exerted; operculum steeply conical; rostrum generally curved. Peristome: exostome teeth irregular; endostome segments irregular, linear to filiform, papillose, perforated; cilia rudimentary.

The largest genus of the Meteoriaceae, *Papillaria* includes c. 70 species, and it is most diverse in Pacific region. Seven species are known from Australia, one of which is endemic. These mosses are common in the canopies and on tree branches and trunks in tropical, subtropical and temperate forest; they can also be found in drier habitats and at cooler elevations and latitudes.

### References

- Scott, G.A.M. & Stone, I.G. (1976), *The Mosses of Southern Australia* 369–373.
- Streimann, H. (1991a), Taxonomic studies on Australian Meteoriaceae (Musci). 1. Introduction, and the genus *Papillaria*, *J. Hattori Bot. Lab.* 69: 203–256.
- Streimann, H. (1991b), Taxonomic studies on Australian Meteoriaceae (Musci). 3. *Papillaria nitens* (Hook. f. & Wilson) Sainsb., *J. Hattori Bot. Lab.* 70: 43–50.
- Streimann, H. (1992), Moss genus *Papillaria* (Meteoriaceae) in the Pacific, *J. Hattori Bot. Lab.* 71: 83–111.

### Key

- 1 Costa extending to half the leaf length; laminal cells sparingly papillose .....2
- 1: Costa extending to more than two-thirds the leaf length; laminal cells densely papillose .....3
- 2 Leaves twisted; papillae up to 7 or 8 per laminal cell .....4. **P. intricata**
- 2: Leaves straight; papillae to 2 or 3 per laminal cell .....6. **P. nitens**
- 3 Auricular cells meeting the leaf border at right angles; margin entire; cells  $\pm$ uniform in size .....4
- 3: Auricular cells parallel to the leaf border; margin generally denticulate; cell size variable .....5

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- 4 Plants very slender; leaves to 0.5 mm wide, carinate in T.S.; costa strong and slightly flexuose ..... 7. **P. zeloflexicaulis**
- 4: Plants slender, leaves more than 0.5 mm wide, caniculate in T.S.; costa thin and straight ..... 3. **P. flexicaulis**
- 5 Leaf margin recurved, strongly bent back at mid-leaf; auricles with a broad border of long narrow cells .. 2. **P. flavolimbata**
- 5: Leaf margin plane; auricles lacking a broad border ..... 6
- 6 Leaves smoothly curved; costa usually straight, if flexuose then forked ..... 5. **P. leuconeura**
- 6: Leaves undulate and plicate; costa flexuose, never forked ..... 1. **P. crocea**

**1. Papillaria crocea** (Hampe) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 267 (1877) [Ad. 2: 171]

*Pilotrichum croceum* Hampe, *Linnaea* 25: 715 (1853); *Neckera crocea* (Hampe) Müll.Hal., *Bot. Zeitung (Berlin)* 15: 779 (1857). T: Van Diemens Land [Tas.], *C.Stuart*; holo: BM.

*Meteorium cuspidiferum* Wilson, in J.D.Hooker, *Fl. Nov.-Zel.* 2: 101 (1854); *Papillaria cuspidifera* (Wilson) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 272 (1877) [Ad. 2: 176]. T: Bay of Islands, [New Zealand], *J.D.Hooker*; holo: BM.

*Neckera kermadecensis* Müll.Hal., *Bot. Zeitung (Berlin)* 15: 779 (1857); *Papillaria kermadecensis* (Müll.Hal.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 265 (1877) [Ad. 2: 169]; *Pilotrichella kermadecensis* (Müll.Hal.) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 50 (1881); *Meteorium kermadecense* (Müll.Hal.) Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 82 (1882). T: Kermadec Is., 1854, *Cuming*; iso: H.

*Neckera reginae* Hampe, *Linnaea* 40: 319 (1876); *Papillaria reginae* (Hampe) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 272 (1877) [Ad. 2: 176]; *Pilotrichella reginae* (Hampe) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 50 (1881). T: s. loc., Qld, *C.H.Hartman*; holo: BM; iso: LD.

Illustrations: A.Noguchi, *J. Hattori Bot. Lab.* 41: 243 (1976); H.Streimann, *J. Hattori Bot. Lab.* 69: 222, 224 (1991); H.Streimann, *The Mosses of Norfolk Island* 106, pl. 21; 110, fig. 49 (2002).

Plants usually slender, rarely robust, yellow-brown to dark green. Leaves dense, ±imbricate, erect when dry, erecto-patent in 5 ranks when moist. Branch leaves broadly cordate, ovate-triangular to broad lanceolate (0.8–) 1.0–1.5 (–2.0) mm long, 0.4–0.8 (–1.0) mm wide, acute, rarely acuminate, plicate on each side of the costa; base broadly obtuse; margin slightly undulate in the auricles, entire or with weak denticulations on the auricles; costa extending almost to the apex, slightly flexuose. Apical laminal cells longer, narrower, occasionally sigmoid, smooth; upper cells rounded-rhomboidal, oval or rhomboidal, (3–) 7–13 (–15) × 2–5 (–7) µm; median cells similar, densely papillose; auricular cells linear-rhomboidal, to 10 × 3–5 µm, with few or no papillae; cells towards the base slightly smaller, parenchymatous, near the costa to 30–35 (–60) µm long, thin-walled, prosenchymatous.

Calyptra 2.3–2.5 mm long. Seta 2.8–5.0 mm long. Capsules ovoid, 1.3–1.6 mm long; operculum 0.8–1.2 mm long. Peristome: exostome teeth linear, c. 650 µm long; endostome segments linear, c. 500 µm long. Spores 23–30 µm diam.

Common in moist forests and scrub in eastern Qld and N.S.W., less so in the A.C.T., Vic. and Tas.; Lord Howe Island; usually on lower tree trunks, but also in the canopy in dense forest, and on rocks, vines, rotting logs and tree roots; also extends to Norfolk Island and New Zealand (including Kermadec Islands). Widespread from India through Asia to New Zealand and the Pacific islands.

Qld: Windsor Tableland, 38 km NW of Mossman, *H.Streimann 29718* (CANB, NY). N.S.W.: Mt Lindsay, *Forsyth* (FH). A.C.T.: Cascades Trail, Tidbinbilla Nature Reserve, 28 km SW of Capital Hill, Canberra, *J.A.Curnow & H.Lepp 3363* (CANB, KRAM, NY). Vic.: Loch, Dec. 1913, *Murdock* (MEL). Tas.: Trevallyn Ck, South Esk R., Launceston, *W.A.Weymouth 2055* (H, HO).

**2. Papillaria flavolimbata** (Müll.Hal. & Hampe) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 267 (1877) [Ad. 2: 171]

*Neckera flavolimbata* Müll.Hal. & Hampe, *Linnaea* 26: 502 (1853); *Pilotrichella flavolimbata* (Müll.Hal. & Hampe) Paris, *Index Bryol.* 944 (1897). T: s. loc., [Australia]; lecto: BM, *fide* H.Streimann, *J. Hattori Bot. Lab.* 69: 227 (1991); isolecto: BM, MEL.

*Meteorium cerinum* Hook.f. & Wilson, in J.D.Hooker, *Fl. Tasman.* 2: 203 (1859); *Trachypus cerinus* (Hook.f. & Wilson) Mitt., *J. Linn. Soc., Bot.* 4: 91 (1860); *Neckera cerina* (Hook.f. & Wilson) Taylor, in W.Mitten, *J. Linn. Soc., Bot.* 4: 91 (1860); *Meteorium cuspidiferum* Wilson var. *cerinum* (Hook.f. & Wilson) Mitt., *Handb. New Zealand Fl.* 2: 459 (1867); *Papillaria cuspidifera* (Wilson) A.Jaeger var. *cerina* (Hook.f. & Wilson) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 272 (1877) [Ad. 2: 176]; *Pilotrichella cerina* (Hook.f. & Wilson) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 50 (1881), *nom. illeg., incl. spec. prior.*; *Papillaria cerina* (Hook.f. & Wilson) Paris, *Index Bryol.* 902 (1896). T: on trees in creek, [Tas.], W.Archer; lecto: BM, *fide* H.Streimann, *loc. cit.*; isolecto: NY.

*Meteorium limbatum* Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 82 (1882), *nom. illeg., incl. spec. prior.*

Illustrations: H.Streimann, *op. cit.* 228, 229, 231; J.Beever, K.W.Allison & J.Child, *Mosses of New Zealand*, 2nd edn 120 (1992); D.Meagher & B.Fuhrer, *A Field Guide to the Mosses and Allied Plants of Southern Australia* 71 (2003).

Plants medium to large, robust, yellowish or pale to dark green. Stem and branch leaves imbricate, turgid, erect to erecto-patent when dry or moist. Branch leaves broadly lanceolate-triangular, (1.1–) 1.9–2.2 (–3.0) mm long, 0.6–1.6 mm wide; auricles clasping the base; margin undulate, entire or with slight denticulations on the auricles; mid-leaf margin strongly bent back abaxially; costa indistinct, extending c. three-quarters of the leaf length. Upper laminal cells rhomboidal to narrowly oval, (7–) 18–20 (–42) × 5–7 µm; marginal cells to 25 µm long; median cells rhomboidal to narrowly oval, (7–) 12–20 × 5–7 µm; cells nearer the costa parallel to it, more remote cells oblique to the costa, rarely vertical; papillae usually dense; basal cells rarely papillose, cells nearer the costa (25–) 50–65 × 5–7 µm, parallel to the margin; cells more remote from the costa in auricles, becoming thinner, elliptic with rounded ends; marginal cells smooth, rectangular, thick-walled, forming a conspicuous border 1–4 cell rows wide in the upper lamina.

Calyptra c. 3.5 mm long. Seta 7.5–12.6 mm long. Capsules ovoid, (1.6–) 2.0–2.5 mm long; operculum 0.9–1.2 mm long. Peristome: exostome teeth c. 600 µm long; endostome segments c. 400 µm long. Spores 20–25 µm diam.

Known from south-eastern Qld, N.S.W., A.C.T., Vic. and Tas.; grows in temperate forest, *Nothofagus*-dominated forest and wet-sclerophyll forest, most common at higher altitudes; usually on trunks and branches and in the canopy of trees and shrubs, rarely saxicolous. Also in New Zealand.

Qld: Mt Kingarow, Bunya Mountains Natl Park, W.B.Schofield (UBC). N.S.W.: Mt Kaputar, Nandewar Ra., 44 km NNE of Boggabri, H.Streimann 9291 (CANB, H, L, MO, NICH, NY). A.C.T.: Hurdle Ck, Tidbinbilla Nature Reserve, 23 km SW of Capital Hill, Canberra, H.Streimann 55700 (*Musci Austral. Exs.* 432) (CANB). Vic.: Changos Ck, Young Creek Track, 18 km NW of Apollo Bay, H.Streimann 58583 (CANB, H, NY). Tas.: Blue Tiers, 7km ENE of Weldborough, S.J.Jarman 1783 (CANB, HO).

### 3. *Papillaria flexicaulis* (Wilson) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 271 (1877) [Ad. 2: 175]

*Meteorium flexicaule* Wilson, in J.D.Hooker, *Fl. Nov.-Zel.* 2: 101 (1854); *Trachypus flexicaulis* (Wilson) Mitt., *J. Linn. Soc., Bot.* 4: 91 (1860). T: Hawkes Bay, New Zealand, W.Colenso; lecto: BM, *fide* H.Streimann, *J. Hattori Bot. Lab.* 69: 232 (1991); isolecto: BM.

*Meteorium filipendulum* Hook.f. & Wilson, in J.D.Hooker, *Fl. Tasman.* 2: 203 (1859); *Papillaria filipendula* (Hook.f. & Wilson) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 271 (1877); *Pilotrichella filipendula* (Hook.f. & Wilson) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 50 (1881). T: *s. loc.*, Tas., Lawrence; lecto: BM, *fide* H.Streimann, *loc. cit.*; isolecto: BM

*Neckera scottiae* Müll.Hal., *Linnaea* 35: 621 (1868); *Pilotrichella scottiae* (Müll.Hal.) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 50 (1881); *Papillaria scottiae* (Müll.Hal.) A.Jaeger, *Index Bryol.* 908 (1897). T: Ash Is., Hunter R., [N.S.W.], Miss H.Scott; Brisbane R., [Qld], G.Reichenbach; syn: NY.

Illustrations: A.Noguchi, *J. Hattori Bot. Lab.* 41: 241 (1976); D.H.Norris & T.Koponen, *Acta Bot. Fenn.* 131: 29 (1985); H.Streimann, *op. cit.* 234, 235.

Plants slender, medium-sized, dull dark green. Stems and branches terete; leaves strongly appressed or erect when dry, erecto-patent when moist. Branch leaves triangular to ovate-concave, 0.8–1.7 (–2.0) mm long, 0.4–1.2 mm wide, acute; base broadly cordate; margin slightly crenulate; costa extending to c. three-quarters of the leaf length. Upper laminal cells rhomboidal, with rounded corners, rarely oval, (7–) 10–15 × 3–5 µm; median cells similar, at

times appearing oblique to the costa; juxtacostal cells near the base  $26\text{--}50 \times 5 \mu\text{m}$ , away from the costa intersecting the margin at  $\pm$ right angles, their shape and size variable on lowest part of lamina distant from the costa.

Calyptra c. 1.8 mm long. Seta 3.0–8.7 mm long. Capsules ovoid, c. 1.2 mm long; operculum c. 1 mm long. Peristome: exostome teeth lanceolate, c.  $350 \mu\text{m}$  long; endostome segments narrowly linear, to  $200 \mu\text{m}$  long. Spores  $7\text{--}20 \mu\text{m}$  diam.

Occurs in eastern Qld, N.S.W., Vic. and Tas.; in rainforest, monsoon forest and dry-sclerophyll forest, very rare in *Eucalyptus* woodland; on shrubs or treelet branches, tree trunks, rarely on exposed roots, vines and road cuttings; also on rock, especially limestone. Also from India through Asia and the Pacific Ocean to southern South America.

Qld: Undara Crater, Nov. 1984, *M. Goodwin s.n.* (MELU); Carnarvon Hwy, 68 km N of Injune, *H. Streimann 52038 (Musci Austral. Exs. 372)* (CANB). N.S.W.: Gap Rd, 8 km W of Ballina, *H. Streimann 43417 (Musci Austral. Exs. 184)* (CANB). Vic.: Mitchell River Natl Park, 27 km NW of Bairnsdale, *F.E. Davies 624A* (CANB). Tas.: Scottsdale–St. Helens Hwy, 1.5 mile [c. 2 km] E of Parr Rivulet, *D.H. Norris 31895* (H, NY).

This readily recognisable species is less variable than *P. crocea* or *P. flavolimbata*. The branch apices are often attenuate, especially on slender trailing forms, and the cells in acute leaf apices are generally similar to the upper laminal cells. Numbers of papillae increase gradually towards the leaf margin, but they do not become dense; leaf margins often appear slightly crenulate due to papillae or slightly projecting marginal cells.

#### **4. *Papillaria intricata* (Mitt.) Müll.Hal. & Broth., *Abh. Naturwiss. Vereine Bremen* 16(3): 505 (1900)**

*Meteorium intricatum* Mitt., *J. Linn. Soc., Bot.* 10: 171 (1868). T: Tutuila, [American Samoa]; holo: NY; iso: CANB, FH, MEL, NY.

Illustrations: A. Noguchi, *J. Hattori Bot. Lab.* 41: 243 (1976); H. Streimann, *J. Hattori Bot. Lab.* 69: 238, 239 (1991); H. Streimann, *J. Hattori Bot. Lab.* 71: 102 (1992).

Plants medium-sized, slender, dark green, but darkening to deep reddish brown with age. Leaves erecto-patent when dry, only slightly more so when moist. Branch leaves lanceolate to ovate, 1.2–1.4 mm long, 0.3–0.5 mm wide; acuminate or shortly attenuate, twisted; base cordate; margin  $\pm$ recurved, the basal margin denticulate, distantly and less prominent further up the leaf; costa weak or indistinct, extending to mid-leaf. Apical laminal cells to  $25 \times 2 \mu\text{m}$ , thin-walled, smooth; upper and median cells linear, to  $40 \times 3 \mu\text{m}$ , thin-walled, with 4–6 small papillae in a row over each lumen; auricular cells irregularly rhomboidal, (5–) 13 (–17)  $\times 3\text{--}5 \mu\text{m}$ ; alar cells inconspicuous, variable, irregularly quadrate, c.  $12 \mu\text{m}$  wide, the basal auricular cells rectangular; basal juxtacostal cells rectangular,  $15\text{--}30 \times 4\text{--}12 \mu\text{m}$ , in 1 or 2 rows.

Calyptra slightly hairy. Seta 2.7–3.1 mm,  $\pm$ smooth. Capsules oblong-cylindrical, asymmetrical; operculum rostrate. Peristome teeth elongate; basal membrane lacking. Spores not seen in the Australian specimen.

Known from a single 19th century collection from eastern Qld; widespread in the south-western Pacific Ocean.

Qld: Rockhampton, *A. Dietrich* (H).

All but the earliest reports of *P. intricata* from Australia were misidentifications of *P. nitens*. However, the two taxa are quite distinct, the twisted branch leaves of *P. intricata* being diagnostic, and *P. nitens* having recurved leaves and a distinctive golden colour.

#### **5. *Papillaria leuconeura* (Müll.Hal.) A. Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 267 (1877) [Ad. 2: 171]**

*Neckera leuconeura* Müll.Hal., *Syn. Musc. Frond.* 2: 670 (1851). T: Java, [Indonesia], *C.L. von Blume*; holo: n.v.; iso: L.

*Neckera amblyacis* Müll.Hal., *Linnaea* 36: 521 (1870); *Pilotrichella amblyacis* (Müll.Hal.) Hampe, in *F. Mueller, Fragm.*, Suppl. 11: 50 (1881), as *amblyacris*; *Meteorium amblyacis* (Müll.Hal.) Mitt., *Trans. &*

*Proc. Roy. Soc. Victoria* 19: 82 (1882); *Papillaria amblyacis* (Müll.Hal.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 267 (1877). T: Leichhardt, N.S.W., coll. unknown; lecto: BM, fide H.Streimann, *J. Hattori Bot. Lab.* 69: 240 (1991).

*Neckera squamata* Hampe, *Linnaea* 36: 522 (1870); *Papillaria squamata* (Hampe) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 112 (1881). T: locality and collector unknown; holo: BM.

*Neckera eavesiana* Hampe, *Linnaea* 40: 319 (1876); *Papillaria eavesiana* (Hampe) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 266 (1877) [Ad. 2: 170]; *Pilotrichella eavesiana* (Hampe) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 50 (1881); *Meteorium eavesiana* (Hampe) Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 82 (1882). T: “subtropical eastern Australia”, *Eaves*; holo: BM; iso: H, MEL.

*Pilotrichella eavesii* Kindb., *Enum. Bryin. Exot.* 27 (1888), nom. illeg., incl. spec. prior.

Illustrations: H.Streimann, *op. cit.* 241, 242, 244; H.Streimann, *J. Hattori Bot. Lab.* 71: 105 (1992).

Plants medium-sized, yellowish to brownish green. Branches terete, julaceus; leaves erect, densely imbricate, only slightly erecto-patent when moist. Branch leaves smoothly convex, ovate-oblong to panduriform, (0.9–) 1.1–1.5 (–1.9) mm long, 0.4–0.8 mm wide, acuminate to ±cucullate, with a short recurved mucro; base ±cordate to broadly auriculate; margin erect or slightly undulate above mid-leaf; auricles variably denticulate; costa extending to 75% of the leaf length, rarely to the apex. Apical laminal cells variable, often sinuose or quadrate at the extreme apex, 15–25 × 2–4 µm; upper leaf cells elliptic to rhomboidal, 10–23 × 2–7 µm, with strong irregular wall thickening, often sinuose; median cells similar, 10–13 (–23) × 3–7 µm; juxtacostal cells above the base transparent, porose, more elongate, to 65 × 4 µm, prosenchymatous; auricular cells elliptical, c. 10 × 3 µm, in divergent rows, thicker-walled than in the upper leaf; leaf margin hyaline in the distal 75% of the leaf, to 4 cells wide, with straighter thicker cells; apparent alar cells brownish, irregularly quadrate to rectangular away from the margin.

Calyptra c. 3 mm long. Seta 2–6 mm long. Capsules ovoid, 1.6–3.5 mm long; operculum c. 0.9 mm long, straight or curved. Peristome: exostome teeth lanceolate, 350–450 µm long; endostome segments linear, as long as the teeth. Spores 17–20 (–25) µm diam.

Occurs in eastern Qld, N.S.W. and Tas.; grows on native and exotic trees and shrubs, also on logs, in road cuttings, and on vines and ferns. Distributed from India, through Malesia, SE Asia, New Caledonia, Lord Howe Island to New Zealand.

Qld: Windsor Tableland, 38 km NW of Mossman, *H.Streimann 29717* (CANB, H, L, NICH, NY); Crediton S.F., 19 km SW of Finch Hatton, *H.Streimann 37702* (B, CANB, COLO, DUKE, MEXU, MHA, MO, NAM, NY, RNG, W). N.S.W.: Cox Rd, Toonumbar S.F., 29 km NW of Kyogle, *H.Streimann 6960* (CANB, H, L); Mt Dromedary, 13 km SW of Narooma, *H.Streimann 27933* (ALTA, B, BA, BISH, CANB, DUKE, FH, H, HO, MICH, NAM, NFLD, NY, RNG). Tas.: “Van Diemens Land”, *sine dat.*, *D.L.Lawrence* (BM).

*Papillaria leuconeura* is very variable, especially in Qld, where there is a gradation from the southern “*amblyacis*” form to the tropical “*leuconeura*” form. The former has ±cucullate, acuminate leaves; the cells are comparatively short and broad (c. 15 × 7 µm), and branch leaf sides are often nearly parallel. The more tropical form has oblong-ovate leaves, more elongate sigmoid cells (to 25 × 3 µm) and a thinner costa. Occasionally the costa can be obscure, but it is usually more prominent on older leaves; often the costa forks above mid-leaf and is flexuose.

## 6. *Papillaria nitens* (Hook.f. & Wilson) Sainsbury, *Rev. Bryol. Lichénol.* 21: 221 (1952)

*Meteorium nitens* Hook.f. & Wilson, in J.D.Hooker, *Fl. Nov.-Zel.* 2: 101, 87, fig. 7 (1854); *Barbella nitens* (Hook.f. & Wilson) Nog., *J. Hattori Bot. Lab.* 58: 100 (1985). T: “Northern Island”, [North Island, New Zealand], A.Sinclair; lecto: BM, fide H.Streimann, *J. Hattori Bot. Lab.* 70: 44 (1991); isolecto: BM.

*Meteorium fulvum* Mitt., *J. Linn. Soc., Bot.* 4: 85 (1860); *Papillaria fulva* (Mitt.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1875–76: 267 (1877) [Ad. 2: 171]; *Pilotrichella fulva* (Mitt.) Hampe, in F.Mueller, *Fragm.*, Suppl. 11: 50 (1881). T: Tarwin, Vic., F.Mueller; holo: NY; iso: MEL 29182, MEL 32242.

*Neckera dimorpha* Müll.Hal., *Linnaea* 37: 517 (1872); *Pilotrichella dimorpha* (Müll.Hal.) A.Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1877–78: 508 (1879) [Ad. 2: 772]; *Meteorium dimorphum* (Müll.Hal.) Mitt., *Trans. & Proc. Roy. Soc. Victoria* 19: 82 (1882). T: Blue Mtns, N.S.W., coll. unknown; holo: BM; iso: MEL.

*Papillaria nitidiuscula* Broth., *Proc. Linn. Soc. New South Wales* 41: 593 (1916). T: Tintenbar, Richmond R., N.S.W., July 1900, W.W.Watts 4363; lecto: H, *vide* H.Streimann, *loc. cit.*; isolecto: NSW.

*Papillaria nitidiuscula* Broth. ex Dixon, *Bull. New Zealand Inst.* 3: 261 (1927), *nom. illeg., incl. spec. prior.* T: Ballina, N.S.W., July 1900, W.W.Watts; holo: BM; iso: H, NSW.

Illustrations: A.Noguchi, *op. cit.* 101, 102 (1985); H.Streimann, *op. cit.* 46–48; H.Streimann, *J. Hattori Bot. Lab.* 71: 107 (1992).

Plants small to medium-sized, slender, flexuose soft, pale green to pale golden green, often slightly glossy. Leaves lanceolate-subulate, 1.7–1.9 mm long, 0.6–0.7 mm wide, slightly plicate, distally contracted into a long filiform subula; base broadly triangular; auricles inflexed; costa slender and extending to mid-leaf, or indistinct. Apical laminal cells variable, often to 57  $\mu$ m long; cells in the upper leaf smooth, linear-rhomboidal, 25–37  $\times$  2–3  $\mu$ m; median cells similar but often sigmoid and with 1–3 small papillae per cell to the leaf margin; cells close to the base smaller, broader; auricular cells divergent, their inner corners often with small area of quadrate cells.

Calyptra 2.0–2.5 mm long. Seta 1.5–5.0 mm long. Capsules symmetrical, rounded-oblong, c. 1.5 mm long; operculum not seen. Peristome: exostome teeth c. 400  $\mu$ m long; endostome segments shorter, filiform, hyaline. Spores 12–17  $\mu$ m diam. (immature).

Occurs in Qld, N.S.W., Vic. and Tas.; also in New Caledonia and New Zealand. Common in tropical, temperate and wet-sclerophyll forests, and extending to drier vegetation including heath; grows on trees, shrub branches, rarely on palm leaves, vines and a rock face; uncommon at low altitudes in Vic. and Tas.

Qld: Windsor Tableland, *I.G.Stone 16011* (MELU); Crediton S.F., 16 km SW of Finch Hatton, *H.Streimann 37701* (CANB, NY). N.S.W.: Gloucester R., 28 km WSW of Gloucester, *H.Streimann 6457* (CANB, DUKE, H, PRE, RNG, NY, UBC). Vic.: Princes Hwy, Bemm R., 8 km SSW of Club Terrace, *H.Streimann 35538* (CANB). Tas.: Mt Direction, East Tamar, *W.A.Weymouth 252* (HO).

*Papillaria nitens* is characterised by the golden colour and leaf ‘rolling’, i.e. the margins bend back abaxially in mid-leaf forming a tube.

## 7. *Papillaria zeloflexicaulis* Streimann, *J. Hattori Bot. Lab.* 69: 247 (1991)

T: Richmond River, N.S.W., *C.Moore*; holo: NY; iso: BM.

Illustration: H.Streimann, *op. cit.* 248.

Plants small to medium, very slender, light to dark green, ageing to brownish green. Stems and branches terete, julaceous. Leaves erect, densely imbricate, slightly erecto-patent when moist, in 5 ranks. Branch leaves concave, cordate to lanceolate, (0.3–) 0.5–0.9 (–1.1) mm long, c. 0.5 mm wide, acuminate; base cordate; margin usually entire, rarely denticulate at the base; costa extending c. two-thirds of the leaf length, thick, reddish brown, often slightly flexuose above mid-leaf. Apical laminal cells elongate to rhomboidal, (7–) 10–15 (–20)  $\times$  c. 5  $\mu$ m; upper and median cells rhomboidal, 7–13  $\times$  c. 5  $\mu$ m; marginal cells quadrate (c. 7  $\mu$ m wide); juxtacostal cells becoming elongate-elliptical; basal juxtacostal cells to 38  $\mu$ m long, diverging towards the margin which they intersect at right angles; basal cells  $\pm$ rectangular; basal corner cells elliptical, 5–7  $\mu$ m long; 1 or 2 rows of marginal cells not papillose.

Calyptra c. 1.8 mm long. Seta 2–3 mm long. Capsules erect, ovoid, c. 1.3 mm long; operculum 0.5–0.8 mm long. Peristome: exostome teeth linear-lanceolate, to 420  $\mu$ m long; endostome segments linear, c. 370  $\mu$ m long. Spores 12–18 (–23)  $\mu$ m diam.

This endemic species is uncommon in lowland tropical and subtropical forest, fringing tropical forest and *Araucaria* vine thicket in eastern Qld and north-eastern N.S.W.

Qld: trail from Eungella to Eungella Natl Park, *D.H.Norris 38451* (HSU); Pine Mountain S.F., 24 km SSW of Calliope, *H.Streimann 52494* (CANB, BRNM, KRAM, MO, NY, TAL, W). N.S.W.: Upper Thora Rd, 28 km W of Bellingen, *B.Barnsley 178* (CANB); Wyong, *W.W.Watts 9501* (NSW).

This moss is superficially similar to *P. flexicaulis*, but it has a more delicate habit, the leaves on trailing branches being more slender, and the papillae do not obscure the cell outlines.