

Amendments to Australasian *Cryphaea* (Cryphaeaceae, Bryopsida)

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In Australasia the genus *Cryphaea* Mohr (Cryphaeaceae, Bryopsida) is represented by five species: *C. ovalifolia* (C. Müll.) Jaeg., *C. chlorophyllosa* C. Müll., *C. tenella* (Schwaegr.) Hornsch. ex C. Müll., *C. acuminata* Hook. f. & Wils. and *C. parvula* Mitt. *Cryphaea tenella* is the correct name of the taxon that has been called *C. exannulata* Dix. & Sainsb., and the material that has been called *C. tenella* represents two species: *C. acuminata* and *C. parvula*. *Bryobartlettia costata* Buck, previously synonymized with *C. tenella*, is a taxonomic synonym of *C. acuminata*. *Cryphaea consimilis* Mont. is reinstated as a species distinct from *C. tenella* and excluded from the Australasian flora. Lectotypes are designated for *C. acuminata*, *C. exannulata* and *C. parvula*. *Cryphaea parvula* and *C. acuminata* are illustrated and compared in line drawings. A key to the Australasian species is given. Three species occur in Australia and all five in New Zealand.

Preparation of the treatment of the moss family Cryphaeaceae for the *Flora of Australia* Project (see Anonymous 1990) revealed some intriguing taxonomic problems. The generic as well as specific taxonomy of the Australian representatives of the family seemed to be insufficiently understood. It soon became clear, however, that studying Australian or Australasian material was not sufficient to solve the problems, but the geographic scope of the studies had to be extended. In a previous paper (Enroth 1995) resulting from this work I attempted to elaborate the circumscription and specific contents of the genus *Cyrtodon* Par. & Schimp., and also made some comments on *Dendrocryphaea* Broth. and three Australasian species of *Cryphaea* Mohr. Further exami-

nation of type specimens and literature revealed that the Australasian species of the latter genus had been misinterpreted, this, of course, resulting in usage of incorrect nomenclature.

Fife (1995) recognized three species of *Cryphaea* for New Zealand. Of those, *C. dilatata* Hook. f. & Wils. actually belongs to *Cyrtodon* (Enroth 1995). According to my observations, five species of *Cryphaea* are encountered in Australasia. Two of those, *C. ovalifolia* (C. Müll.) Jaeg. and *C. chlorophyllosa* C. Müll., were treated and illustrated by Enroth (1995); they are included in the identification key below but not further dealt with here. This paper focuses on the taxonomy of the three remaining species, *C. tenella* (Schwaegr.)

Hornsch. ex C. Müll., *C. acuminata* Hook. f. & Wils. and *C. parvula* Mitt.

Key to the Australasian species of Cryphaea

1. Leaf apices obtuse *C. ovalifolia*
— Leaf apices acute to acuminate 2.
2. Annulus absent; exostome teeth up to ca. 200 µm long, smooth to faintly papillose 3.
— Annulus deciduous; exostome teeth ca. 300–400 µm long, coarsely spiculose-papillose 4.
3. Plants relatively robust; leaf apices acute *C. chlorophyllosa*
— Plants slender; leaf apices acuminate *C. tenella*
4. Stem leaves to ca. 1.5 mm long; branch leaves mostly tapering above midleaf; arista of post-fertilization inner perichaetial leaves flexuous, more or less spreading, at least 2/3 of the length of leaf lamina, which is usually not whitish *C. parvula*
— Stem leaves ca. 1.0 (– 1.2) mm long; branch leaves mostly tapering below midleaf; arista of post-fertilization inner perichaetial leaves not flexuous (although often slightly sinuous), erect, ca. 1/3–1/2 the length of leaf lamina, which is usually whitish *C. acuminata*

***Cryphaea tenella* (Schwaegr.) Hornsch. ex C. Müll.**

Linnaea 18: 679. 1845. — *Neckera tenella* Schwaegr., Spec. Musc. Suppl. 2(2): 163. 198. 1827. — *Pilotrichum tenellum* (Schwaegr.) C. Müll., Syn. Musc. Fr. 2: 166. 1851. — Type: Australia. New South Wales, Sieber (“In Nova Hollandia lectum a Siebero”; Schwaegrichen 1827) (not seen).

Cryphaea brevidens C. Müll., Hedwigia 41: 130. 1902. — Syntypes: Australia. New South Wales, prope Sydney, 1872, *Kayser s. n.* (duplicate BM!); same locality, 1881, *Woolfs s. n.* (not seen); Richmond River, 1881, *Fawcett s. n.* (two duplicates H-BR!). — Synonymized by Fleischer (1914).

Cryphaea exannulata Dix. & Sainsb. in Sainsb., Trans. Proc. Roy. Soc. New Zealand 75: 182. 1945, *syn. nov.* — Lectotype (designated here): New Zealand. East Coast Land District, near Ruatoria, Mokoivi, Mt. Hikurangi, on bark, 1. IV. 1929, *Sainsbury 703* (BM!; isolectotypes BM!, CHR!, WELT!). Syntype: New Zealand. South Auckland Land District, between Lake Rotoehu and Bay of Plenty, ca. 500 ft, on supplejack (*Rhipogonium scandens*) stems in bush gully, 7. III. 1941, *Allison s. n.* (two duplicates CHR!, “1016” and “1264”, WELT-29795!, 5684!).

Illustrations: Scott & Stone 1976: 349 (fig. 65), as *Cryphaea exannulata*.

It is clear from Dixon’s (1927) discussion that he had not seen type material of *Cryphaea tenella*. I

borrowed all specimens held at BM, and there is indeed no type material. I also requested to borrow type specimens from other pertinent herbaria (E, NY, W), but with negative results. However, there is enough evidence to demonstrate that Dixon’s interpretation of *C. tenella* was erroneous, resulting in subsequent misapplication and false synonymy of that name. Dixon lumped all slender Australasian species of *Cryphaea* with relatively well-developed peristomes and differentiated annuli in the synonymy of *C. tenella* — which, as I have observed, actually has a poorly developed peristome and no annulus at all. As it often goes, one mistake leads to another. Thus, when Dixon later saw specimens of true *C. tenella* from New Zealand, he (in Sainsbury 1945) described them as a new species, *C. exannulata* Dix. & Sainsb.; the latter name has since then been widely applied in Australasia. My argumentation is based on phytogeographic information, old literature and old herbarium specimens identified as *Cryphaea tenella* before Dixon published his 1927 paper.

First, the provenance of the type material of *Cryphaea tenella* speaks against the correctness of Dixon’s notions. The material was collected in New South Wales by F. W. Sieber. He collected nowhere else in Australia (Ramsay & Seur 1994), which precludes the possibility of false original geographic information. After studying hundreds of Australian specimens of *Cryphaea*, I realized that in that country plants in accordance with Dixon’s concept of *C. tenella* are strictly restricted to Tasmania — a fact completely overlooked by Dixon. True *C. tenella*, on the other hand, is common and sometimes apparently abundant in suitable habitats in eastern New South Wales.

Second, Dixon (1927) himself referred to the paper of Müller (1844): “C. Mueller, it may be added, in Linn. xviii, 678, having authentic specimens of the Australian *C. tenella* before him, emphasizes the fact of the nerve being non-excurrent in that species.” In fact, Müller only repeated, almost word by word, what was already said by Schwaegrichen (1827). That Müller apparently really had original material of *C. tenella* before him is significant, for he described the leaves as “*lanceolato-acuminatis*”; in Dixon’s concept of *C. tenella*, the leaves should be (broadly) ovate-acuminate, as they indeed are in *C. acuminata*, *C. parvula* and *C. consimilis*. Also, when Müller (1902) described *C. brevidens* C. Müll.

from New South Wales, he compared it with *C. tenella*, noting that the former can be distinguished by the longer leaves (“*haecce species foliis multo longioribus raptim distinguitur*”). *Cryphaea brevidens* was later synonymized with *C. tenella* by Fleischer (1914).

According to Dixon (1927), the “complicated synonymy” of *Cryphaea tenella* is due principally to Hooker’s (1855) notions. I disagree. Dixon placed the names *C. consimilis*, *C. parvula*, *C. acuminata*, and *C. pusilla* in the synonymy of *C. tenella*. He made the incorrect statement that Hooker did not compare their new species *C. acuminata* with *C. consimilis*, “nor does the description suggest any differences, except that the lid in *C. consimilis* is described as *conico obtuso*, and in *C. acuminata* as *conico rostellato*.” In fact, Hooker’s descriptions of *C. consimilis* and *C. acuminata* compare the two and point out differences in the ramification pattern (and thus habit) as well as perichaetial leaves. Dixon’s conclusion “It looks as if Hooker and Wilson had later recognized that there was only one species involved, but considered it different from the S. American *C. consimilis*” is completely unwarranted. As Dixon noted, Hooker’s description of *C. consimilis* was accompanied by the remark “Perhaps *Neckera tenella* [...] may be the same, but if so, it is incorrectly figured.” The point is that *N. tenella* (= *Cryphaea tenella*) is not the same as *C. consimilis*, although Dixon thought so, and it was not incorrectly figured in Schwaegrichen (1827). Dixon too much emphasized the allegedly excurrent costa in *C. tenella* versus the non-excurrent costa in *C. acuminata* — the two species can not be reliably distinguished by costal characters.

Cryphaea tenella can best be distinguished from *C. acuminata* and *C. parvula*, the two species it resembles in habit, by the distinctly keeled, gradually tapering narrowly ovate-acuminate to lanceolate-acuminate leaves, absence of an annulus, and much shorter (ca. 150–200 µm) exostome teeth. It is distributed in the tropical Pacific and Australasia, being much less common in New Zealand than in eastern Australia. The detailed distribution in the Pacific needs further study.

Additional representative specimens examined. — **Australia.** *Queensland.* Ravenshoe, *Watts* 648 (NSW-381821); Brisbane, 3 Mile Scrub, 1884, *Tryon* s. n. (MEL-56857). *New South Wales.* Bellbird Creek, *Melville* 2751A (MEL-1101685); Minna Murra Falls reserve near Jamberoo, Kiama District,

1964, *Willis* s. n. (MEL-1015696). **New Zealand.** *North Island.* Northland Land District, E Northland and Islands ecological region and district, near Ohaeawai, White Pine Bush, 1978, *Bartlett* s. n. (AKU-186846). Central Auckland Land District, vicinity of Auckland, *Cheeseman* s. n. (AKU-12089). South Auckland Land District, Pukeatua, W Taupo Co., 1919, *Petrie* s. n. (WELT-1098); W side of Kaimai Range, Cambridge–Tauranga Road, 700 ft, by streamlet in shady bush, bark of *Fuchsia*, 1947, *Sainsbury* 7565 (WELT-14046); Fitzgerald Glade near Tirau, on dead branch in forest, 1970, *Hamlin* 2443 (WELT-4233). East Coast Land District, Paukau near Silica Quarry, on smooth bark in shady bush, 1931, *Sainsbury* 1025 (WELT-5683). *South Island.* Westland Land District, near Punakaiki, ramicolous on *Myrsine*, 1979, *Bartlett* 18583 (WELT-8390).

Cryphaea acuminata Hook. f. & Wils. (Fig. 1 a–d)

Fl. Nov. Zel. 2: 102. 88, f. 4. 1854. — Lectotype (designated here): New Zealand. Hawke’s Bay Land District, 1852, *Colenso* s. n. (BM!, “3620”, with Hooker’s herbarium stamp; isolectotypes BM!, E!). Syntypes: Same region and collector (BM!, “1191” and “3011”, with Hooker’s herbarium stamp; NY!, “1191”).

Bryobartlettia costata Buck, *Brittonia* 33: 479. 14–18. 1981, *syn. nov.* — Type: New Zealand. South Island, Nelson Land District, Cobb Valley, near Alpine Garden above Cobb Reservoir, Tasman Mountains, 2 700 ft, corticolous on lower branches of *Nothofagus fusca*, 2. I. 1979, *Bartlett* 71 (holotype NY!). — Synonymized with *Cryphaea tenella* by Beever (1992).

Illustrations: Whittier 1976: 227 (fig. 62), as *Cryphaea tenella*.

The specimens previously assigned to *Cryphaea tenella* in various herbaria represent *C. acuminata* or *C. parvula*, or both, since they occasionally form mixed colonies. *Cryphaea acuminata* can always be distinguished by the relatively short and stiff rather than flexuous arista of the post-fertilization inner perichaetial leaves (Fig. 1c). The laminae of those leaves typically have a distinct whitish tinge (this tinge is sometimes encountered in *C. parvula*, too). There are also other distinctions relative to *C. parvula*. Thus, especially the branch leaves of *C. acuminata* are more crowded and the branch epidermis is hardly visible between them. The shape of those leaves also differs: in *C. acuminata*, they are mostly narrowed below midleaf to a long, piliferous and variably spreading acumen (Fig. 1b). The operculum of *C. acuminata* is conic-rostrate (Fig. 1d) while that of *C. parvula* is conic and with a more gradually tapering apex (Fig. 1f).

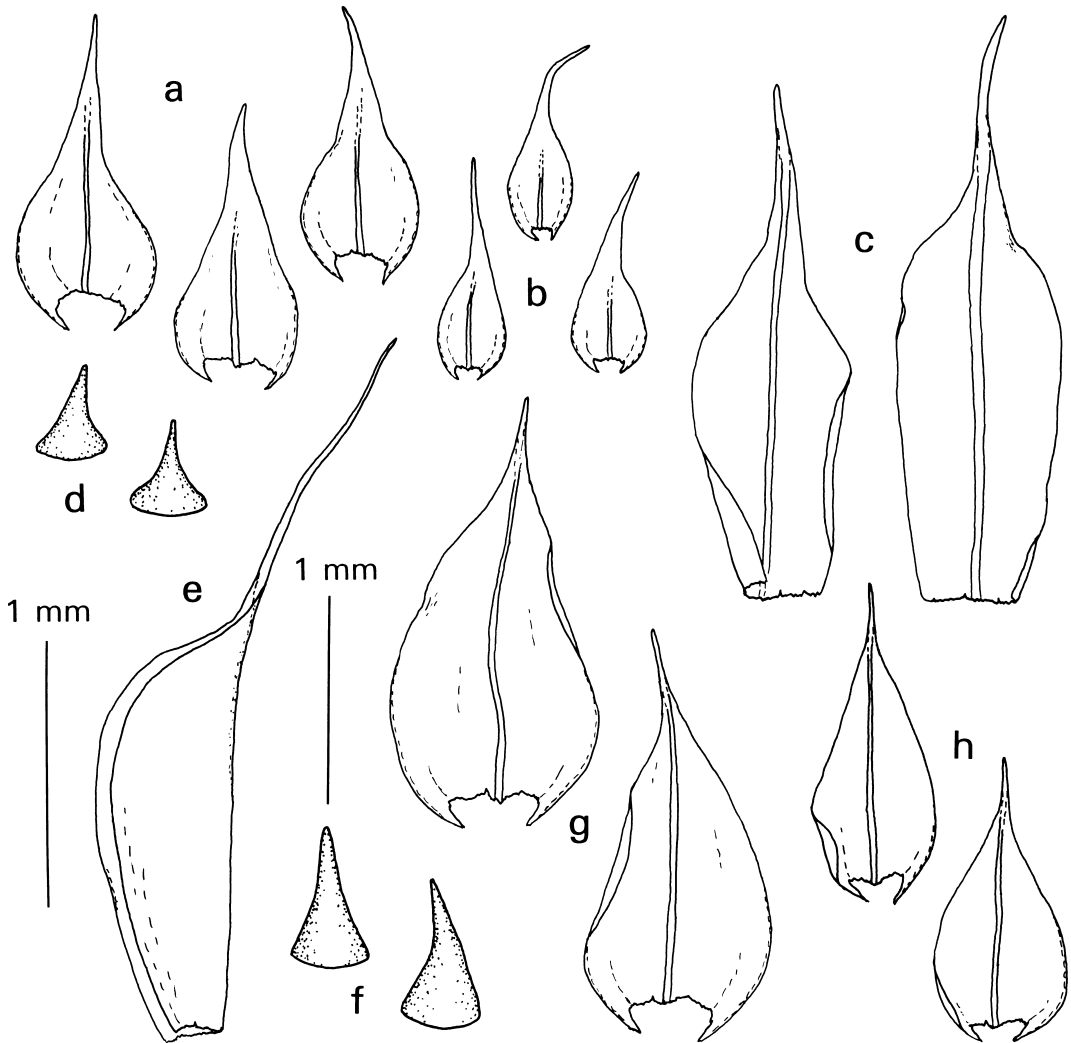


Fig. 1. a-d. *Cryphaea acuminata* Hook. f. & Wils. (from *Beever s. n. 18. V. 1984, AKU*). — a: Three stem leaves. — b: Three branch leaves. — c: Two post-fertilization inner perichaetial leaves. — d: Two opercula. — e-h. *Cryphaea parvula* Mitt. (from *Beever & Ramsay s. n. 3. XII. 1984, AKU*). — e: Post-fertilization inner perichaetial leaf. — f: Two opercula. — g: Two stem leaves. — h: Two branch leaves. — Use the left hand scale for a-c, e, g and h, and the right hand scale for d and f.

Finally, the habit also is different, because *C. parvula* frequently produces “normal-length” branches and is therefore subpinnate, while *C. acuminata* mostly appears unbranched. In fact, that appearance is caused by the fact that nearly all branches of *C. acuminata* remain very short and produce a perichaetium to the apex. With some experience, the habit distinctions are sufficient for reliable identification.

The length of costa of *Cryphaea acuminata* is variable. It may reach well into the acumen or end at

midleaf, occasionally even below that. It is always somewhat diffuse and poorly demarcated above.

Cryphaea acuminata is probably endemic to New Zealand. It does not occur in Australia, nor have I seen any specimens from the Pacific islands. The illustrations in Whittier’s (1976) book on the moss flora of the Society Islands were made from New Zealandian specimens.

Additional representative specimens examined. — **New Zealand.** *North Island.* Taranaki Land District, Waitaria, Bay

View, *McMahon s. n.* (WELT-3816). Hawke's Bay Land District, Wairoa County, Mangaruhe River Crossing, Ohuka Road, on bark of bough of small tree, 1952, *Sainsbury 17357* (WELT-13853, mixed with *C. parvula*). Wellington Land District, Horokiwi Reserve, Paromata, valley floor, ca. 200 ft, *Beilschmiedia tawa* / *Melicytus ramiflorus* open tree land, on trunk of *M. ramiflorus*, 1988, *Polly s. n.* (WELT-26142). *South Island*. Nelson Land District, at edge of N end of Lake Rotoiti, 2 200 ft, on bark, 1947, *Sainsbury 8014* (WELT-13862); upper Wairau, Hells Gate, 810 m, *Hebe venustula*-matagouri scrub, bark of matagouri, 1988, *Glenny 88-465* (WELT-26802). Marlborough Land District, Blenheim-Rotoiti Road, upper Wairau Valley, ca. 2 000 ft, by stream at forest edge, on bark of *Fuchsia*, 1947, *Sainsbury 7911* (WELT-13861); Haldon Hills, 700 m, on *Myrsine australis* trunk, 1987, *Glenny s. n.* (WELT-9369). Canterbury Land District, North Canterbury, on bark of *Discaria*, 1941, *Healy s. n.* (WELT-13860); Peel Forest Scenic Reserve, Clarke Flat, on trunk of *Coprosma rhamnoides*, 1984, *Beever s. n.* (AKU); Mt. Cass, 526 m, trees in open pasture, bark of *Sophora microphylla*, 1988, *Glenny 88-269* (WELT-10461). Otago Land District, Queenstown, Lake Wakatipu, ca. 1 100 ft, on tree trunk, 1947, *Allison 1018* (WELT-16285).

Cryphaea parvula Mitt. (Fig. 2 e-h)

in Hook. f., Handbook New Zealand Fl. 460. 1867. — *Cyrtodon parvulus* (Mitt.) Fleisch., Hedwigia 55: 284. 1914. — Lectotype (designated here): New Zealand. Otago Land District, *Hector s. n.* (NY!; isolectotypes BM!, NY!).

I recently (Enroth 1995) treated *Cryphaea parvula* as a taxonomic synonym of *C. tenella*. This was based on Dixon's (1927) species concepts which, as discussed above, were incorrect. The distinctions between *C. parvula* and *C. acuminata* were discussed under the latter, above.

In Australasia, *Cryphaea parvula* is mainly distributed and fairly common in New Zealand. The Australian occurrences are restricted to Tasmania. Its possible extra-Australasian distribution remains to be studied.

Additional representative specimens examined. — **Australia.** *Tasmania*. Coal River Tier, near Richmond, without collector, "Herb. Oldfield" (BM, H-BR, NY); Wish Island, N.W. Bay River above the Wellington Falls, without collector, "Herb. Oldfield" (BM); Mt. Wellington, in gully below Sawpitz, 1912, *Rodway s. n.* (H-BR). **New Zealand.** *North Island*. South Auckland Land District, Highway 4, 34 km N of Taumarānui, on trunks of willows by stream, shaded, 1984, *Beever & Ramsay s. n.* (AKU). Wellington Land District, Lake Wairarapa, forest on Mt. Bruce, *Martin 129.9* (CHR). *South Island*. Nelson Land District, NW Nelson ecological region, Totaranui ecological district, Abel Tasman National

park, near Astrolabe Point, corticolous, damp forest, streamside, 1977, *Linzey s. n.* (AKU-186842). Canterbury Land District, Banks Peninsula, "Rocky Peak", 1.6 miles SE of summit of Mt. Sinclair, peak above Montgomery Scenic Reserve, ca. 2 100–2 297 ft, margin of forest, epiphytic, *Fife 7196* (CHR-406280).

Excluded and doubtful taxa

Cryphaea consimilis Mont.

Ann. Sci. Nat. Bot. sér. 3, 4: 100. 1845. — Type: Chile. "Chili austral", *Gay s. n.* (holotype PC!).

Hooker (1855) was the first to apply the name *Cryphaea consimilis*, up till then used only for Chilean plants, to a specimen from New Zealand. He noted not having seen the original material and the identification was thus based on the protologue. After Hooker, the name *C. consimilis* was used for Australian specimens by Bastow (1887). However, plants exactly matching the original Chilean material do not occur in Australasia.

The sporophyte and vegetative leaf characters of *Cryphaea consimilis* are identical with those of *C. parvula*. The differences reside in the post-fertilization inner perichaetial leaves, which in the former are wider and taper much more abruptly into an arista only about 1/3 of the lamina length. Relative to *C. acuminata*, the Chilean plants differ in the more abruptly tapering perichaetial leaves, finer arista, and different operculum shape, the latter being identical with *C. parvula*.

Additional specimens examined. — **Chile.** Arique, *Lechler 654* (H-BR, ex herb. Mitten); Panguipulli, 1928, *Atanasit (?) 1057.3* (G).

Cryphaea pusilla C. Müll.

Hedwigia 41: 130. 1902. — Type: New Zealand. North Canterbury, 1892, *Naylor Beckett* (not seen).

The taxonomic content of this name remains unknown, pending study of type material. Müller's (1902) protologue contains the sentences "*folia caulina minuta, e basi decurrente ventricosovata in acumen perangustum raptim fere attenuata*" and "[*folia perichaetialia*] *parum majora robustius subulata inferne pallidius tenerius areolata*". Those characters, and especially the pale inner perichaetial leaves, suggest *Cryphaea acuminata*.

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