

## BUELLIA

John A. Elix<sup>1</sup>

*Buellia* De Not., *Giorn. Bot. Ital.* 2: 174 (1864), *nom. cons.*

Named by De Notaris after his friend Esperanzo Buelli.

Type: *B. disciformis* (Fr.) Mudd

*Hafellia* Kalb, H.Mayrhofer & Scheid., in K.Kalb, *Lich. Neotrop.* 9: 9 (1986). T: *H. parastata* (Nyl.) Kalb, H.Mayrhofer & Scheid. [= *B. parastata* (Nyl.) Zahlbr.]

Thallus crustose, superficial, thin, smooth to rugulose, continuous, membranous to rimose and areolate or scaly, 1–5 cm wide, 35–70  $\mu\text{m}$  thick, corticate or not, rarely immersed and inconspicuous. Prothallus absent or present as a thin dark brown or black marginal line. Isidia and soredia absent. Upper surface white, grey-white to grey, yellow-grey, brown or greenish. Photobiont a unicellular green alga; cells 8–14  $\mu\text{m}$  diam., not forming a continuous layer. Medulla and lower cortex present or absent. Ascomata apothecial, orbicular, sessile or rarely subimmersed; disc dark brown to black, rarely pruinose, plane to convex or weakly concave; margin concolorous with the disc, usually persistent, becoming excluded in convex apothecia; thalline exciple absent; proper exciple carbonised, dark red-brown to  $\pm$ black, consisting of radiating agglutinated hyphae, uniformly pigmented or with a paler inner zone. Epihymenium 10–30  $\mu\text{m}$  thick, brown or greenish, K<sup>+</sup> violet, yellow-green, olive or K<sup>-</sup>; hypothecium 50–170  $\mu\text{m}$  thick, brown to dark brown, occasionally not differentiated from the exciple; hymenium 60–150  $\mu\text{m}$  thick, colourless, often interspersed with oil droplets, amyloid. Paraphyses septate, 1–2  $\mu\text{m}$  thick, simple or with short branches near the apices; apices clavate, 3–5  $\mu\text{m}$  thick, usually brown-capitate, K<sup>+</sup> purple or K<sup>-</sup>. Asci of *Lecanora*-type, clavate, 2–16-spored; apex wall layers thickened; apex amyloid, with a distinct axial mass. Ascospores olive to dark brown, 1–3-septate, thick-walled, *Callispora*-type, with weak to strong subapical and septal wall thickenings, ellipsoidal, 12–65  $\times$  4–25  $\mu\text{m}$ ; outer wall smooth to strongly ornamented; torus present or absent. Conidiomata pycnidial, laminal, immersed, pyriform; conidiophores of type V (*sensu* Vobis, 1980), acrogenous. Conidia bacilliform or weakly clavate, 5–6  $\times$  0.8–1.2  $\mu\text{m}$ .

*Buellia s. str.* (formerly *Hafellia* Kalb, H.Mayrhofer & Scheid.) is one of the few well-delimited groups within *Buellia s. lat.* (Bungartz, 2008). It is characterised by *Callispora*-type ascospores, bacilliform or weakly clavate conidia, an often strongly oil-interspersed hymenium, and by the presence of norstictic acid, diploicin and congeners of 4,5-dichlorolichexanthone. For nomenclatural reasons, the name *Hafellia* must be regarded as a synonym of *Buellia s. str.* because *B. disciformis*, the conserved type of *Buellia*, shares all the typical characters of '*Hafellia*'. Thus, Moberg *et al.* (1999) suggested changing the listed type of *Buellia* to *B. aethalea* (Ach.) Th.Fr. However, *B. disciformis* had already been chosen as the type of *Buellia* when that name was conserved against *Gassicurtia* Fée. The suggested replacement of a conserved type would have been the first such action in the history of the Botanical Code. The proposal was not recommended by the Committee for Fungi (Gams, 2004), and the decision to reject the proposal of Moberg *et al.* (1999) was accepted by general vote at the International Botanical Congress in Vienna in 2005. Therefore, the species formerly included in *Hafellia* must now be regarded as *Buellia s. str.*, and the remaining species of *Buellia s. lat.*, which are not closely related, must be excluded from the genus.

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*Buellia s. str.* is a pantropical and pantemperate genus currently thought to contain c. 30 species world-wide; 19 of them occur in Australia. Most grow on bark and wood, and one species is saxicolous.

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### Key

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|----|--|------------------------------|
| 1  | Thallus saxicolous.....  | <b>12. B. procellarum</b>    |
| 1: | Thallus corticolous or lignicolous.....  | 2                            |
| 2: | Epihymenium K+ violet (1: ).....   | 3                            |
| 2: | Epihymenium K-.....  | 5                            |
| 3  | Asci with 16 ascospores (2).....   | <b>11. B. pleiotera</b>      |
| 3: | Asci with 8 ascospores.....  | 4                            |
| 4  | Thallus K+ red; norstictic acid present (3: ).....                                   | <b>1. B. bahiana</b>         |
| 4: | Thallus K-; norstictic acid absent.....  | <b>14. B. reagenella</b>     |
| 5  | Asci 2-spored (2: ).....   | 6                            |
| 5: | Asci 4- or 8-spored.....   | 7                            |
| 6  | Ascospores 38–61 × 15–24 µm (5).....   | <b>13. B. pseudotetrapla</b> |
| 6: | Ascospores 22–42 × 10–16 µm.....   | <b>5. B. dissa</b>           |
| 7  | Asci usually 4-spored; ascospores 28–45 × 14–18 µm (5: ).....                        | <b>18. B. tetrapla</b>       |
| 7: | Asci usually 8-spored; ascospores usually smaller.....                               | 8                            |
| 8  | Thallus K-; 4,5-dichlorolichexanthone present or lichen substances absent (7: )..... | 9                            |
| 8: | Thallus K+ yellow or red; atranorin or norstictic acid present.....                  | 12                           |
| 9  | 4,5-Dichlorolichexanthone present (8).....   | <b>19. B. xanthonica</b>     |
| 9: | Lichen substances absent.....  | 10                           |

10:	Ascospores 30–38 × 12–16 µm (9:)	7. <b>B. levieri</b>
10	Ascospores 12–20 × 5–9 µm	11
11:	Ascospores with a smooth outer wall, 1-septate (10:)	9. <b>B. microsporella</b>
11:	Ascospores with a markedly ornamented outer wall, commonly 3-septate	8. <b>B. metaphragmia</b>
12	Thallus K+ red; norstictic acid present (8:)	13
12:	Thallus K+ yellow; atranorin present	17
13	Ascospores more than 22 µm long (12)	14
13:	Ascospores less than 22 µm long	15
14	Ascospores smooth, with strong subapical wall thickenings (13)	6. <b>B. fraudans</b>
14:	Ascospores strongly ornamented, with weak subapical wall thickenings	16. <b>B. subcrassata</b>
15	Thallus glossy, thick, cartilaginous or subsquamulose; epihymenium K–; ascospores 12–18 × 4–6 µm (13:)	15. <b>B. rechingeri</b>
15:	Thallus dull, thin; epihymenium K+ yellow-green or K–; ascospores 15–22 × 6–14 µm	16
16	Ascospores 6–8 µm wide; epihymenium K+ yellow-green, olive or K–; hafellic acid absent (15:)	2. <b>B. curatellae</b>
16:	Ascospores 8–14 µm wide; epihymenium K–; hafellic acid present	17. <b>B. subtropica</b>
17	Ascospores less than 28 µm long, with weak subapical wall thickenings; diploicin absent (12:)	4. <b>B. disciformis</b>
17:	Ascospores usually more than 28 µm long, with strong subapical wall thickenings; diploicin present	18
18:	Ascospore wall strongly ornamented; lumina straight (17:)	3. <b>B. demutans</b>
18:	Ascospore wall smooth; lumina bent	10. <b>B. parastata</b>

## 1. *Buellia bahiana* Malme, *Ark. Bot.* 21A: 17 (1927)

*Hafellia bahiana* (Malme) Sheard, *Bryologist* 95: 82 (1992). T: Rio Vermelho, Bahia, Brazil, *G.O.A. Malme* 12; lecto: S, *vide* J.W. Sheard, *Bryologist* 95: 82 (1992).

For further synonymy see Marbach (2000).

Illustrations: J.W. Sheard, *op. cit.* 80, fig. 1; B. Marbach, *Biblioth. Lichenol.* 74: 254, fig. 120 (2000), both as *Hafellia bahiana*.

Thallus corticolous or lignicolous, 1–3 cm wide, thin, continuous, membranous to areolate, white, grey-white or pale grey, uneven or occasionally verrucose. Prothallus not apparent except when abutting other species (then black). Apothecia common, 0.1–0.7 mm wide, sessile, contiguous or not; disc black, epruinose, plane or slightly convex; margin black, narrow, persistent. Proper exciple dark brown to brown-black, paler internally. Epihymenium 10–15 µm thick, olive to blue-green or dark olive-green, K+ violet. Hymenium 65–85 µm thick, interspersed with oil droplets. Hypothecium 35–80 µm thick, dark brown. Asci 8-spored. Ascospores 1-septate, 13–20 × 5.5–8.0 µm, often slightly elongated at the ends, with strong subapical and septal wall thickenings; outer wall smooth. Pycnidia not seen.

*Chemistry*: Thallus K+ red, P+ yellow or yellow-orange; containing norstictic acid (major), connorstictic acid (minor or trace).

This mainly pantropical-subtropical species is common on bark and wood in coastal and hinterland forests in W.A., Qld and Tas. Also in Africa, North, Central and South America and the Pacific (the Hawaiian Islands, New Caledonia and Tahiti).

W.A.: Nookaminne picnic area, 4 km W of Quairading, *J.A. Elix* 31791 (CANB). Qld: Forrest Beach, 18 km ESE of Ingham, *J.A. Elix* 36791 (CANB). Tas.: Moores Hill, *G. Kantvilas* 222/80 (HO).

This lichen is characterised by the white, grey-white or pale grey thallus, the 8-spored asci, the K+ violet epihymenium, the comparatively small ascospores with strong subapical and septal wall thickenings and a smooth outer surface, and by the presence of norstictic acid.

## 2. *Buellia curatellae* Malme, *Ark. Bot.* 21A: 18 (1927)

*Hafellia curatellae* (Malme) Marbach, *Biblioth. Lichenol.* 74: 255 (2000). T: Aricá, near Cuiabá, Mato Grosso, Brazil, “in cortice *Curatellae americanae*, in cerrado subruderali”, 19 Nov. 1893, *G.O.A. Malme* 2012 (*Lich. Austroamer. Herb. Regnell.* 132); lecto: S, *vide* S.R. Singh & D.D. Awasthi, *Biol. Mem.* 6: 176 (1981).

For further synonymy see Marbach (2000).

Illustration: B.Marbach, *op. cit.* 258, fig. 122, as *Hafellia curatellae*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, membranous, finely rimose to deeply rimose and areolate, whitish, grey-white to grey or pale yellow-brown, weakly to markedly verrucose. Prothallus black or not apparent. Apothecia common, 0.1–0.7 mm wide, moderately immersed to sessile; disc black, epruinose, plane to convex; margin black, thick, narrow, or excluded in convex apothecia. Proper exciple brown-black, with or without a paler inner part. Epithymenium 10–15  $\mu\text{m}$  thick, olive-brown or blackish green, K+ clear yellow-green, olive or K-. Hymenium 60–100  $\mu\text{m}$  thick, interspersed with oil droplets. Hypothecium 80–120  $\mu\text{m}$  thick, greenish black to dark olive-brown. Asci 8-spored. Ascospores 1-septate, 15–22  $\times$  6–8  $\mu\text{m}$ , with weak to moderately strong subapical wall thickenings; outer wall smooth or weakly ornamented. Pycnidia not seen.

**Chemistry:** Thallus K+ red, P+ yellow or yellow-orange; containing norstictic acid (major), conorstictic acid (minor or trace).

This pantropical-subtropical species occurs on bark and wood in coastal and inland forest and woodland in W.A., Qld and N.S.W. Also in South America, Africa, Papua New Guinea, New Caledonia and the Hawaiian Islands.

W.A.: Bullfinch–Evanston road, 51.3 km N of Bullfinch, *J.A.Elix 32503* (CANB). Qld: Glasshouse Mtns, Maleny, Sept. 1995, *K. & A.Kalb* (Herb. Kalb). N.S.W.: Barrington Tops Natl Park, NE of Scone, *K.Kalb 21804* (Herb. Kalb).

This lichen is characterised by the whitish, grey-white to grey or pale yellow-brown thallus, the 8-spored asci, the olive-brown or blackish green epithymenium (reacting K+ clear yellow-green, olive or K-), the comparatively small ascospores with weakly to moderately strongly subapical wall thickenings and a smooth or weakly ornamented wall, and by the presence of norstictic acid.

### 3. *Buellia demutans* (Stirt.) Zahlbr., *Cat. Lich. Univ.* 7: 348 (1931)

*Lecidea demutans* Stirt., *Trans. Roy. Soc. Victoria* 17: 71 (1881); *Hafellia demutans* (Stirt.) Pusswald, in B.Marbach, *Biblioth. Lichenol.* 74: 259 (2000). T: Qld, locality unknown, *F.M.Bailey 82*; holo: BM.

*Lecidea callispora* C.Knight, *Trans. Linn. Soc. London, Bot.* 2: 45 (1882); *Buellia callispora* (C.Knight) J.Steiner, *Bull. Herb. Boissier*, sér. 2, 7: 645 (1907); *Hafellia callispora* (C.Knight) H.Mayrhofer & Sheard, in J.W.Sheard, *Bryologist* 95: 84 (1992). T: N.S.W. [neighbourhood of Sydney], *C.Knight 23*; lecto: WELT *n.v.*, fide H.Mayrhofer, *Beih. Nova Hedwigia* 79: 532 (1984).

*Lecidea restituta* Stirt., in F.M.Bailey, *Queensland Agric. J.* 5: 39 (1899); *Buellia restituta* (Stirt.) Zahlbr., *Cat. Lich. Univ.* 7: 400 (1931). T: near Brisbane, Qld, *F.M.Bailey 163*; holo: GLAM *n.v.*; iso: BM *n.v.*

*Lecidea subconnexa* Stirt., in F.M.Bailey, *Queensland Agric. J.* 5: 38 (1899); *Buellia subconnexa* (Stirt.) Zahlbr., *Cat. Lich. Univ.* 7: 417 (1931). T: c. 60 miles [c. 95 km] W of Brisbane, Qld, on bark, 1892, *Mrs Heywood McEwen s.n.*; holo: BM *n.v.*

For further synonymy see Marbach (2000).

Illustrations: J.W.Sheard, *Bryologist* 95: 80, fig. 2 (1992), as *Hafellia callispora*; B.Marbach, *op. cit.* 262, fig. 124, as *Hafellia demutans*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, continuous or rimose, whitish, yellow-white, grey, grey-white or pale yellow-grey, smooth to weakly verrucose. Prothallus black or absent. Apothecia common, 0.5–0.9 mm wide, sessile, but occasionally initially erumpent in specimens with thicker thalli; disc black, epruinose, plane or slightly convex; margin black, moderately thick, persistent. Proper exciple dark brown. Epithymenium 10–20  $\mu\text{m}$  thick, red-brown, K-. Hymenium 80–150  $\mu\text{m}$  thick, densely interspersed with oil droplets. Hypothecium 150–200  $\mu\text{m}$  thick, dark brown. Asci (4–) 8-spored. Ascospores 1-septate, 22–40  $\times$  9–14  $\mu\text{m}$ , with strong subapical and septal wall thickenings; outer wall moderately strongly ornamented; lumina straight. Conidia bacilliform, c. 5  $\times$  1  $\mu\text{m}$ .

**Chemistry:** Thallus K+ yellow, C-, P+ yellow; containing atranorin (major), diploicin (major), isofulgidin (minor), fulgidin (minor or trace).

Very common on bark and wood in coastal and hinterland areas of W.A., S.A., Qld, N.S.W. and Vic. Also in South America, South Africa, New Zealand and the Pacific (the Hawaiian Islands and New Caledonia).

W.A.: along road to The Loop and Z-Bend, Kalbarri Natl Park, 24 km NE of Kalbarri township, *J.A.Elix* 33652 (CANB, PERTH). S.A.: Waterfall Gully, Mount Lofty Ra., 30 Sept. 1965, *A.C.Beauglehole* (MEL). Qld: Tin Can Inlet, Tin Can Bay, Wide Bay District, *J.A.Elix* 22808 (CANB). N.S.W.: Bermagui township, *J.A.Elix* 28838 (CANB). Vic.: 13.4 km NNW of Rheola, 1 Feb. 1964, *R.B.Filson* (MEL).

*Buellia demutans* is characterised by the whitish, yellow-white, grey, grey-white or pale yellow-grey thallus, asci generally with 8 rather large ascospores with strong septal and subapical wall thickenings and a moderately strongly ornamented outer surface, and by the presence of atranorin and diploicin. Rarely, some asci contain 4 spores, so that this species can be confused with *B. tetrapla*; however, some asci in the same apothecium will always contain 5–8 spores.

#### 4. *Buellia disciformis* (Fr.) Mudd, *Man. Brit. Lich.* 216 (1861)

*Lecidea parasema* var. *disciformis* Fr., *Novae Sched. Crit.* 9 (1826); *Hafellia disciformis* (Fr.) Marbach & H.Mayrhofer, in B.Marbach, *Biblioth. Lichenol.* 74: 259 (2000). T: *Fries* 215A [centre specimen]; lecto: UPS, *fide* K.Kalb & J.A.Elix, *Mycotaxon* 68: 478 (1998).

*Lichen parasemus* Ach., *Prodr. Lich.* 64 (1799), *nom. illeg.*; *Lecidea parasema* (Ach.) Ach., *Methodus* 35 (1803), *nom. illeg.*; *Buellia parasema* (Ach.) De Not., *Giorn. Bot. Ital.* 2, 1: 198 (1846), *nom. inval.*; *Buellia parasema* (Ach.) Th.Fr., *Lichenogr. Scand.* 589 (1874), *nom. illeg.* T: ex agro Comensi, [Italy], *S.Garovaglio*; lecto: R–DE NOT, *fide* K.Kalb & J.A.Elix, *Mycotaxon* 68: 478 (1998).

Illustrations: B.Marbach, *op. cit.* 268, fig. 126, as *Hafellia disciformis*; I.M.Brodo, S.D.Sharnoff & S.Sharnoff, *Lichens of North America* 187, fig. 146 (2001).

Thallus corticolous or lignicolous, immersed to superficial, 3–4 cm wide, thin to thick, rimose, whitish or grey-white, smooth to weakly verrucose. Prothallus black or absent. Apothecia common, 0.3–1.3 mm wide, sessile; disc black, epruinose, plane or slightly convex; margin black, moderately thick, persistent. Proper exciple brown-black. Epithymenium 10–15 µm thick, brown to olive-brown, K–. Hymenium 100–120 µm thick, densely inspersed with oil droplets. Hypothecium 120–170 µm thick, dark brown, somewhat paler than the exciple. Asci 8-spored. Ascospores 1-septate, 17–28 × 7–10 µm, with weak subapical wall thickenings; outer wall smooth. Conidia bacilliform, 5.5–8.5 × 0.7–1.0 µm.

*Chemistry*: Thallus K+ yellow, C–, P+ yellow; containing atranorin (major), ±fulgidin (trace), ±fulgoicin (trace), ±norfulgoicin (trace), ±brialmontin 1 (trace), ±brialmontin 2 (trace).

This cosmopolitan species grows on wood and bark in coastal and hinterland forests in Qld, N.S.W., Vic. and Tas. Also in Europe, Asia, Macaronesia, North America and the Pacific islands.

Qld: Nanango Rd, Bunya Mountains State Forest, 64 km NE Dalby, *J.A.Elix* 37925 (CANB). N.S.W.: Bermagui Trig. Stn, *J.A.Elix* 28843 (CANB). Vic.: Goonmirk Rocks Rd, Errinundra Flora Reserve, 13 km S of Bendoc, *H.Streimann* 36615b (B, CANB). Tas.: 1.5 km W of Bicheno, *J.A.Curnow* 2530 (CANB).

This species is characterised by the immersed to superficial, white or grey-white thallus, the 8-spored asci, ascospores of intermediate size with weak, subapical wall thickenings and a smooth outer surface and by the presence of atranorin as the only major lichen substance.

#### 5. *Buellia dissa* (Stirt.) Zahlbr., *Cat. Lich. Univ.* 7: 357 (1931)

*Lecidea dissa* Stirt., *Trans. Glasgow Soc. Field Naturalists* 4: 94 (1875); *Rinodina dissa* (Stirt.) H.Mayrhofer, *Beih. Nova Hedwigia* 79: 532 (1984); *Hafellia dissa* (Stirt.) H.Mayrhofer & Sheard, in J.W.Sheard, *Bryologist* 95: 87 (1992). T: “ad ligna decorticata in Tasmania”, 1875, *H.Paton s.n.*; holotype: GLAM *n.v.*; iso: BM.

Illustrations: H.Mayrhofer, *op. cit.* 531, fig. 21; 536, figs 26–28, as *Rinodina dissa*; W.Pusswald, G.Kantvilas & H.Mayrhofer, *Muelleria* 8: 134, figs 1, 2; 135, fig. 5 (1994), as *Hafellia dissa*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, continuous, membranous to areolate, white, grey-white or pale yellow-grey, uneven or occasionally verrucose. Prothallus not apparent. Apothecia 0.2–1.0 mm wide, sessile; disc black, epruinose, plane or becoming convex; margin black, moderately thick, persistent or excluded in convex apothecia. Proper exciple dark red-brown, paler in the inner part. Epithymenium 10–20 µm thick, brown to red-brown, K–. Hymenium 80–120 µm thick, inspersed with oil droplets. Hypothecium 140–160 µm thick, dark red-brown. Asci 2-spored. Ascospores 1-septate, 22–42 × 10–16 µm, with

moderately strong subapical and septal wall thickenings; outer wall strongly ornamented. Conidia bacilliform, c.  $5 \times 1 \mu\text{m}$ .

**Chemistry:** Thallus K<sup>+</sup> yellow, C<sup>-</sup>, P<sup>+</sup> yellow; containing atranorin (major), diploicin (major), isofulgidin (minor), fulgidin (minor or trace).

Common in W.A., S.A., N.S.W., Vic. and Tas.; occurs on bark and dead wood in dry-sclerophyll forest. Also in South Africa.

W.A.: Drovers Cave Natl Park, Jurien Rd, 6 km NE of Jurien Bay, *J.A.Elix* 28923 (CANB). S.A.: Corrynton Park Rd, 8 km W of Eden Valley, Mount Lofty Ra., *J.A.Elix* 37220 (CANB). N.S.W.: Apsley Falls, Oxley Wild Rivers Natl Park, 20 km E of Walcha, *J.A.Elix* 36274 (CANB). Vic.: Doncaster, 1 Sept. 1884, *F.M.Reader* (MEL). Tas.: 5 km S of Beaconsfield, *G.Kantvilas* 221/80 (HO).

*Buellia dissa* is characterised by the white, grey-white or pale yellow-grey thallus, bisporous asci, comparatively large ascospores with moderately strong septal and subapical wall thickenings and a strongly ornamented outer surface, and by the presence of atranorin and diploicin.

## 6. *Buellia fraudans* (Starbäck) Elix, *Fl. Australia* 57: 659 (2009)

*Karschia fraudans* Starbäck, *Bih. Kongl. Svenska Vetensk.-Akad. Handl.* 25, Afd. 3(1): 10 (1899); *Hafellia fraudans* (Starbäck) Pusswald, in B.Marbach, *Biblioth. Lichenol.* 74: 269 (2000). T: Santo Angelo prope Cachoeira, Rio Grande do Sul, Brazil, 26 Jan. 1893, *G.O.A.Malme* (*Fung. Regnell.* 215); holotype: S.

Illustration: B.Marbach, *op. cit.* 270, fig. 127, as *Hafellia fraudans*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, continuous to rimose and ±areolate, whitish, grey-white, grey or pale yellow-brown, weakly to markedly verrucose. Prothallus black or not apparent. Apothecia 0.2–1.1 mm wide, sessile; disc black, epruinose, plane or becoming convex; margin black, moderately thick, persistent or excluded in convex apothecia. Proper exciple dark red-brown, paler in the inner part. Epihymenium 10–20  $\mu\text{m}$  thick, brown, K<sup>-</sup>. Hymenium 120–150  $\mu\text{m}$  thick, interspersed with oil droplets. Hypothecium 40–60  $\mu\text{m}$  thick, dark brown. Asci 8-spored, occasionally with fewer ascospores. Ascospores 1-septate,  $22\text{--}34 \times 8\text{--}14 \mu\text{m}$ , with strong subapical and septal wall thickenings; outer wall smooth. Pycnidia not seen.

**Chemistry:** Thallus K<sup>+</sup> red, P<sup>+</sup> yellow or yellow-orange; containing norstictic acid (major), connorstictic acid (minor or trace).

Occurs on bark and wood in hinterland forest in eastern Qld and N.S.W. Also in South America and the Hawaiian Islands.

Qld: Lamins Hill Lookout, SE of Butchers Ck, Atherton Tableland, *H.Mayrhofer* 11926 & *E.Hierzer* (GZU). N.S.W.: Mount Hyland Nature Reserve, 20 km N of Hernani, *J.A.Elix* 36659 (CANB).

*Buellia fraudans* is characterised by the whitish, grey-white, grey or pale yellow-brown thallus, the usually 8-spored asci, the relatively large ascospores with strong subapical and septal wall thickenings and a smooth outer surface, and by the presence of norstictic acid. *Buellia subcrassata* is similar, but the ascospores have weak, subapical wall thickenings and a strongly ornamented outer surface.

## 7. *Buellia levieri* Jatta, *Boll. Soc. Bot. Ital.* 1910: 258 (1911)

*Hafellia levieri* (Jatta) Pusswald & Kantvilas, in W.Pusswald, G.Kantvilas & H.Mayrhofer, *Muelleria* 8: 138 (1994). T: “ad truncos prope Geeveston, [Tas.], alt. 800 p [240 m]”, *W.A.Weymouth s.n.*; holotype: NAP *n.v.*

Illustrations: W.Pusswald, G.Kantvilas & H.Mayrhofer, *op. cit.* 134, fig. 4; 137, fig. 7, as *Hafellia levieri*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, continuous to rimose and areolate, whitish, grey-white or pale yellow-grey, uneven to weakly verrucose. Prothallus black or not apparent. Apothecia scattered, 0.2–0.8 mm wide, sessile; disc black, epruinose, plane or slightly concave; margin black, thick and inrolled when young, moderately thick at maturity, persistent. Proper exciple dark red-brown, paler in the inner part. Epihymenium 10–20  $\mu\text{m}$  thick, brown, K<sup>-</sup>. Hymenium 100–150  $\mu\text{m}$  thick, interspersed with oil droplets. Hypothecium 40–60  $\mu\text{m}$  thick, dark brown. Asci 8-spored, occasionally with fewer ascospores. Ascospores

1-septate,  $30\text{--}38 \times 12\text{--}16 \mu\text{m}$ , with strong subapical and septal wall thickenings; outer wall smooth. Pycnidia not seen.

*Chemistry*: Thallus K–, C–, KC–, P–; no lichen substances detected.

Occurs on bark and wood in hinterland forest in W.A., Qld, N.S.W. and Tas. Also in South America.

W.A.: 20 km S of Moora along Gingin Rd, 3 km E on Bullbarnet Rd, *J.A.Elix 37169* (CANB). Qld: Gambubal State Forest, Cons Plain, E of Emu Vale, *J.Hafellner 16369* & *G.N.Stevens* (GZU). N.S.W.: The Pinnacle, NE of Wiangaree, Tweed Ra., Border Ranges Natl Park, *J.Hafellner 19167*, *P.Merrottsy* & *R.W.Rogers* (GZU). Tas.: Little Fisher R., 1983, *G.Kantvilas* (HO).

This species is characterised by the whitish, grey-white or pale yellow-grey thallus, the 8-spored asci, comparatively large ascospores with very strong subapical and septal wall thickenings and a smooth outer surface, and by the absence of lichen substances.

### 8. *Buellia metaphragmia* (C.Knight) Elix, *Fl. Australia* 57: 660 (2009)

*Lecidea metaphragmia* C.Knight, *Trans. Linn. Soc. London, Bot.* 2: 44 (1882); *Hafellia metaphragmia* (C.Knight) Pusswald, in J.A.Elix, *Australas. Lichenol.* 63: 5 (2008). T: [neighbourhood of Sydney] N.S.W., “ad cortices arborum”; lecto: the illustration in C.Knight, *Trans. Linn. Soc. London, Bot.* 2: pl. 8, fig. 22 (1882), *vide* W.Pusswald, in J.A.Elix, *Australas. Lichenol.* 63: 5 (2008).

Thallus corticolous or lignicolous, 1–3 cm wide, thin, membranous, continuous to finely rimose and areolate, whitish or grey-white, densely covered with brown granules. Prothallus not apparent. Apothecia common, 0.2–0.4 mm wide, sessile; disc black, epruinose, plane to weakly convex, glossy; margin black, thick, prominent. Proper exciple brown-black. Epithemium 10–20  $\mu\text{m}$  thick, brown, K–. Hymenium 50–80  $\mu\text{m}$  thick, not interspersed with oil droplets. Hypothecium 50–70  $\mu\text{m}$  thick, brown. Asci usually 8-spored, rarely 4- or 6-spored. Ascospores 1–3-septate,  $12\text{--}20 \times 5\text{--}9 \mu\text{m}$ , with strong subapical thickenings and weak septal wall thickenings; outer wall markedly ornamented. Pycnidia not seen.

*Chemistry*: Thallus K–, C–, P–; no lichen substances detected.

This endemic species occurs on bark and dead wood in dry-sclerophyll forest in W.A., N.S.W. and Vic.

W.A.: Walebing, Quarrell Ra., Moora–New Norcia road, 22 km S of Moora, *J.A.Elix 37541* (CANB); 30 km W of Hyden and c. 30 km E of Kondinin, 18 Aug. 1994, A. & K.Kalb (Herb. Kalb 27725). N.S.W.: Mount Kaputar Natl Park, *P.Merrottsy 401* (BRI). Vic.: Copi Flats, Wyperfeld Natl Park, M. & H.Mayrhofer 4696 (GZU).

*Buellia metaphragmia* is characterised by the small, multiseptate ascospores with strong subapical wall thickenings and angular lumina and by the absence of lichen substances.

The holotype (in WELT) was lost, and a supposed duplicate in H is a mixture of *Buellia tetrapla* and *Buellia* sp. In view of Knight’s detailed protologue and excellent illustration, the latter was chosen as lectotype.

### 9. *Buellia microsporella* Elix, *Fl. Australia* 57: 660 (2009)

*Hafellia microspora* Pusswald, in J.A.Elix, *Australas. Lichenol.* 60: 17 (2007). T: Tuttaning Reserve, Pingelly, W.A., *J.Kruiskamp s.n.*; holo: MEL.

Illustration: J.A.Elix, *op. cit.* 19, fig. 4 (2007), as *Hafellia microspora*.

Thallus corticolous or lignicolous, 1.0–2.5 cm wide, thin, continuous, smooth to indistinctly areolate, whitish to pale grey or pale green, uneven or occasionally verrucose. Prothallus not apparent. Apothecia common, 0.1–0.4 mm wide, sessile; disc black, epruinose, plane or slightly convex; margin black, thin, usually persistent, becoming excluded in convex apothecia. Proper exciple dark brown to brown-black; rim more distinctly pigmented than the inner part. Epithemium 10–20  $\mu\text{m}$  thick, brown, K–. Hymenium 70–100  $\mu\text{m}$  thick, not interspersed with oil droplets. Hypothecium 70–80  $\mu\text{m}$  thick, brown. Asci 8-spored. Ascospores 1-septate,  $12\text{--}17 \times 5\text{--}7 \mu\text{m}$ , with moderately strong subapical wall thickenings and narrow septal wall thickenings; outer wall smooth. Conidia bacilliform, c.  $5 \times 1 \mu\text{m}$ .

**Chemistry:** Thallus K<sup>-</sup>, C<sup>-</sup>, KC<sup>-</sup>, P<sup>-</sup>; containing ±brialmontin 1 (minor), ±brialmontin 2 (minor).

This endemic species occurs on bark and wood in hinterland forest and woodland in W.A., S.A., Vic. and Tas.

W.A.: Wotto Nature Reserve, First North Rd, 21 km by road NE of Eneabba, *J.A.Elix* 28873 (CANB, PERTH). S.A.: Dark Island Heath, near Keith, 30 Dec. 1982, *R.L.Specht* (BRI). Vic.: Dimboola, 18 July 1896, *F.Reader* (NSW). Tas.: summit of MacGregor Peak, *G.Kantvilas* 473/02 (NSW).

This lichen is characterised by a whitish to pale grey or pale green thallus, 8-spored asci, very small ascospores with moderately strong subapical wall thickenings and a smooth outer wall and by the absence of lichen substances or with accessory brialmontins 1 and 2. *Buellia reagenella* is morphologically similar, but it has a distinctly yellowish upper surface, a K<sup>+</sup> violet reaction of the epihymenium, and it contains 4,5-dichlorolichexanthone.

#### **10. *Buellia parastata* (Nyl.) Zahlbr., *Cat. Lich. Univ.* 7: 386 (1931)**

*Lecidea parastata* Nyl., *Bull. Soc. Linn. Normandie*, sér. 2, 2: 92 (1868); *Hafellia parastata* (Nyl.) Kalb, H.Mayrhofer & Scheid., in K.Kalb, *Lich. Neotrop.* 9: 9 (1986). T: Lifou, Loyalty Islands, New Caledonia, *E.F.Déplanche s.n.*; holotype: H-NYL 11071.

For further synonymy see Marbach (2000).

Illustrations: J.W.Sheard, *Bryologist* 95: 80, fig. 4 (1992); B.Marbach, *Biblioth. Lichenol.* 74: 273, fig. 128 (2000), both as *Hafellia parastata*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, continuous to rimose and areolate, whitish, yellow-white, grey, grey-white or pale yellow-grey, smooth or weakly verrucose. Prothallus black or absent. Apothecia scattered, 0.6–1.4 mm wide, sessile; disc dark brown, rarely black, epruinose, plane or slightly convex; margin black, moderately thick, persistent or partly excluded in convex apothecia. Proper exciple dark brown. Epihymenium 15–25 µm thick, brown, K<sup>-</sup>. Hymenium 80–150 µm thick, densely interspersed with oil droplets. Hypothecium 40–60 µm thick, dark brown. Asci 8-spored, rarely 4- or 6-spored. Ascospores 1-septate, 30–41 × 12–21 µm; lumina often bent, with very strong subapical and septal wall thickenings; outer wall smooth. Pycnidia not seen.

**Chemistry:** Thallus K<sup>+</sup> yellow, C<sup>-</sup>, P<sup>+</sup> yellow; containing atranorin (major), diploicin (major), isofulgidin (minor), fulgidin (minor or trace).

This pantropical species occurs on bark and dead wood in coastal and hinterland areas of Qld. Also in North, Central and South America, Africa, Asia and the Pacific (New Caledonia).

Qld: Tandora, c. 25 km ENE of Maryborough, *J.Hafellner* 18369 & *R.W.Rogers* (BRI, GZU); c. 1 km NW of Forest Stn, Mount Mee State Forest, *J.Hafellner* 16903 & *G.N.Stevens* (GZU); end of Weir Rd, Kuranda, NW of Cairns, *H.Mayrhofer* 11903 & *E.Hierzer* (GZU).

*Buellia parastata* is characterised by the whitish to pale yellow-grey thallus, the mainly 8-spored asci, large ascospores with very strong septal and subapical wall thickenings and a smooth outer spore surface and by the presence of diploicin and atranorin. *Buellia demutans* differs in having ascospores with a strongly ornamented outer wall and straight lumina.

#### **11. *Buellia pleiotera* Malme, *Ark. Bot.* 21A: 18 (1927)**

*Hafellia bahiana* var. *pleiotropa* (Malme) Sheard, *Bryologist* 95: 82 (1992); *Hafellia pleiotera* (Malme) Marbach, *Biblioth. Lichenol.* 74: 274 (2000). T: Cuiabá, Mato Grosso, Brazil, 23 Dec. 1892, *G.O.A.Malme* 2027B; holotype: S.

For further synonymy see Marbach (2000).

Illustration: B.Marbach, *op. cit.* 277, fig. 131, as *Hafellia pleiotera*.

Thallus corticolous or lignicolous, 2–3 cm wide, thin, rimose and areolate, pale yellow-brown to yellow-grey, smooth or weakly verrucose. Prothallus not apparent. Apothecia 0.3–0.5 mm wide, sessile; disc black, epruinose, plane or becoming convex; margin black, moderately thick, persistent or excluded in convex apothecia. Proper exciple dark brown; inner zone somewhat paler. Epihymenium 10–15 µm thick, olive-green to blackish, K<sup>+</sup> violet.



Hymenium 90–100 µm thick, interspersed with oil droplets. Hypothecium 60–70 µm thick, brown-black. Asci 16-spored, rarely with 8 or 12 ascospores. Ascospores 1-septate, 12–18 × 5–7 µm, with weak subapical wall thickenings; outer surface smooth. Pycnidia not seen.

*Chemistry*: Thallus K+ red, P+ yellow or yellow-orange; containing norstictic acid (major), conorstictic acid (minor or trace), ±methylpseudonorstictate (trace).

Rare on bark in coastal forest in Qld. Also in Africa, South America and the Pacific (New Caledonia).

Qld: near Minyama, Sunshine Coast, c. 100 km N of Brisbane, *K. & A. Kalb 19774* (Herb Kalb).

This lichen is characterised by the yellow-brown or yellow-grey thallus, mostly 16-spored asci, small ascospores with weak, subapical wall thickenings and a smooth outer surface, the K+ violet epihymenium and norstictic acid in the thallus. The broadly similar *B. bahiana* has 8-spored asci and ascospores with strong subapical and septal wall thickenings.

## 12. *Buellia procellarum* A.Massal., *Mem. Imp. Reale Ist. Veneto Sci.* 10: 64 (1861)

*Rinodina procellarum* (A.Massal.) H.Mayrhofer, *Beih. Nova Hedwigia* 79: 522 (1984); *Hafellia procellarum* (A.Massal.) H.Mayrhofer & Sheard, *Bryologist* 95: 87 (1992). T: Cape Bonae Spei [Cape of Good Hope], South Africa, *H.Wawra s.n.*; holo: VER *n.v.*; iso: W.

*Buellia macrospora* Müll.Arg., *Bull. Herb. Boissier* 1: 51 (1893). T: Vic., locality unknown, 1892, *F.R.M. Wilson 123*; holo: G.

*Buellia macrosporoides* Müll.Arg., *Bull. Herb. Boissier* 3: 642 (1895). T: Thursday Island, Qld, 1887, *C.Knight 210*; lecto: G *n.v.*, *fide* H.Mayrhofer, *Beih. Nova Hedwigia* 79: 522 (1984).

Illustration: H.Mayrhofer, *op. cit.* 36, fig. 24, as *Rinodina procellarum*.

Thallus saxicolous, 1–4 cm wide, thin, continuous to rimose or areolate, white, yellow-white, yellow-grey or grey, smooth. Prothallus brown-black, black or absent. Apothecia common, 0.2–1.2 mm wide, sessile, but occasionally slightly immersed; disc black, epruinose, plane or convex; margin black, moderately thick, persistent. Proper exciple dark brown to black. Epihymenium 10–20 µm thick, brown, K-. Hymenium 80–110 µm thick, interspersed with oil droplets. Hypothecium 60–75 µm thick, dark brown. Asci 4- or 6-spored or with fewer than 4 ascospores. Ascospores 1-septate, 22–40 × 10–18 µm, with strong subapical and septal wall thickenings; outer wall moderately strongly ornamented. Conidia bacilliform, 5–7 × c. 1 µm.

*Chemistry*: Thallus K+ yellow, C-, P+ yellow; containing atranorin (major), diploicin (major), isofulgidin (minor), fulgidin (minor or trace).

Very common on rocks in coastal and hinterland areas of S.A., Qld, N.S.W., A.C.T., Vic. and Tas. Also in South Africa.

S.A.: 4 km W of Carey Gully along the Forest Range Rd, *J.A.Elix 2822* (CANB). Qld: Mt Peregian, N of Coolum, *H.Mayrhofer 11625*, *E.Hierzer, G.N & N.Stevens* (CANB, GZU). N.S.W.: Morans Rock, Putty Rd, Colo, Hawkesbury District, *H.Mayrhofer 11132 & E.Hierzer* (CANB, GZU). A.C.T.: Aranda Bushland, Canberra Nature Park, 4 km W of Canberra, *J.A.Elix 28735* (CANB). Vic.: Middle Mtn, 2 km NE of Suggan Buggan, East Gippsland, *D.Verdon 3600* (CANB). Tas.: New Norfolk, *H.Mayrhofer 10652*, *E.Hierzer & G.Kantvilas* (CANB, GZU, HO).

*Buellia procellarum* is characterised by the saxicolous substratum, the white, yellow-white, yellow-grey or grey thallus, asci with 6 or fewer ascospores that are comparatively large with strong septal and subapical wall thickenings and a moderately strongly ornamented outer surface, and by the presence of atranorin and diploicin in the thallus. *Buellia demutans* is similar, but it is corticolous or lignicolous, and it usually has 8-spored asci.

## 13. *Buellia pseudotetrapla* (Pusswald) Elix, *Fl. Australia* 57: 660 (2009)

*Hafellia pseudotetrapla* Pusswald, in B.Marbach, *Biblioth. Lichenol.* 74: 280 (2000). T: Peckmans Plateau, Katoomba, N.S.W., *J.A.Elix 3201*; holo: CANB.

Illustration: B.Marbach, *op. cit.* 281, fig. 134, as *Hafellia pseudotetrapla*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, continuous, membranous to areolate, white, grey-white or pale yellow-grey, uneven or verrucose. Prothallus not apparent.

Apothecia 0.2–1.2 mm wide, sessile; disc black, epruinose, plane or becoming convex; margin black, moderately thick, persistent or excluded in convex apothecia. Proper exciple brown. Epithymenium 10–20 µm thick, dark brown, K–. Hymenium 100–120 µm thick, interspersed with oil droplets. Hypothecium 40–50 µm thick, dark brown. Asci 2-spored, rarely 3-spored. Ascospores 1-septate, 38–61 × 15–24 µm, with moderately strong subapical and septal wall thickenings; outer wall strongly ornamented. Pycnidia not seen.

Chemistry: Thallus K+ yellow, C–, P+ yellow; containing atranorin (major), diploicin (major), isofulgidin (minor), fulgidin (minor or trace).

This species is common on bark in hinterland forest in W.A., S.A., N.S.W., Vic. and Tas. Also in Central America.

W.A.: Yellowdine Nature Reserve, along the Great Eastern Hwy, 56 km E of Southern Cross, *J.A.Elix* 32385 (CANB, PERTH). S.A.: Sandy Creek Natl Park, 5 km W of Lyndoch, *J.A.Elix* 4190 (CANB). N.S.W.: road between Echo Pt and Carrington Park, Blue Mtns, K. & A. *Kalb* 18886 (Herb. Kalb). Vic.: Cheltenham, Melbourne, 6 Jan. 1887, *F.R.M. Wilson* (NSW). Tas.: locality unknown, *R.B. Verreaux* 10283 (H).

*Buellia pseudotetrapla* is characterised by the white, grey-white or pale yellow-grey thallus, the 2 (–3)-spored asci, large ascospores with moderately strong septal and subapical wall thickenings and a strongly ornamented outer surface and by the presence of atranorin and diploicin. It is very similar to *B. dissa*, but its ascospores are significantly larger.

#### 14. *Buellia reagenella* Elix, *Fl. Australia* 57: 660 (2009)

*Hafellia reagens* Pusswald, in B. Marbach, *Biblioth. Lichenol.* 74: 281 (2000). T: Lake Yealering, W.A., *J.A.Elix* 21700 & *M.V. Sargent*; holo: CANB.

Thallus corticolous or lignicolous, 1.0–2.5 cm wide, thin, continuous, smooth to indistinctly areolate, yellow-white to pale yellow-grey or yellow-green, uneven or occasionally verrucose. Prothallus a black line surrounding the thallus, or not apparent. Apothecia common, 0.1–0.5 mm wide, sessile; disc black, epruinose, plane or slightly convex; margin black, thin, usually persistent, becoming excluded in convex apothecia. Proper exciple dark brown to brown-black. Epithymenium 15–20 µm thick, dark brown, K+ violet. Hymenium 80–130 µm thick, interspersed with oil droplets. Hypothecium 40–50 µm thick, brown. Asci 8-spored or with fewer ascospores. Ascospores 1-septate, 12–20 × 5–8 µm, with moderately strong subapical but narrow septal wall thickenings; outer wall smooth. Conidia bacilliform, c. 5 × 1 µm.

Chemistry: Thallus K–, C–, KC–, P–; containing 4,5-dichlorolichexanthone (major), ±brialmontin 1 (minor), ±brialmontin 2 (minor).

Occurs on bark and wood in hinterland forest and woodland in W.A., N.S.W., Vic. and Tas. Also in South America.

W.A.: Wotto Nature Reserve, First North Rd, 21 km by road NE of Eneabba, *J.A.Elix* 28867 (CANB, PERTH). N.S.W.: Dangars Gorge, Oxley Wild Rivers Natl Park, 18.5 km SSE of Armidale, *J.A.Elix* 36436 (CANB). Vic.: Rotamah I., The Lakes Natl Park, 7 May 1984, *J.H. Willis* (MEL). Tas.: summit of Mt Murray, *G. Kantvilas* 181/06 (HO).

This species is characterised by the yellow-white to pale yellow-grey or yellow-green thallus, usually 8-spored asci, the K+ violet epithymenium, the comparatively small ascospores with moderately strong subapical but narrow septal wall thickenings and a smooth outer surface, and by the presence of 4,5-dichlorolichexanthone.

#### 15. *Buellia rechingeri* Zahlbr., *Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl.* 81: 274 (1907)

*Hafellia rechingeri* (Zahlbr.) Marbach, *Biblioth. Lichenol.* 74: 283 (2000). T: road between Assau and Sataua, Savai [Savai'i], [Western] Samoa, K & L. *Rechinger* 2644; lecto: W, *fide* A. Mangold, *J.A.Elix* & H.T. Lumbsch, *Fl. Australia* 57: 660 (2009).

Illustration: B. Marbach, *op. cit.* 284, fig. 135, as *Hafellia rechingeri*.

Thallus corticolous or lignicolous, 2–5 cm wide, thick, glossy, cartilaginous or scaly, weakly rimose, white, pale grey or yellow-grey, smooth. Prothallus not apparent. Apothecia 0.3–0.5

mm wide, sessile; disc black, epruinose, plane or becoming convex; margin black, moderately thick, persistent or excluded in convex apothecia. Proper exciple dark brown; inner zone somewhat paler. Epihymenium 10–15  $\mu\text{m}$  thick, dark brown to blackish, K–. Hymenium 60–80  $\mu\text{m}$  thick, interspersed with oil droplets. Hypothecium 70–100  $\mu\text{m}$  thick, brown-black. Asci 8-spored. Ascospores 1-septate, 12–18  $\times$  4–6  $\mu\text{m}$ , with weak to moderately strong subapical wall thickenings; outer surface weakly ornamented. Pycnidia not seen.

**Chemistry:** Thallus K+ red, P+ yellow or yellow-orange; containing norstictic acid (major), connorstictic acid (minor or trace).

Occurs on bark and wood in hinterland forest in tropical W.A., N.T. and Qld; also in Western Samoa.

W.A.: head of Donkey Ck, Donkey Escarpment, 27 km S of Drysdale River Stn, *J.A.Elix 28010* (CANB). N.T.: Howard Springs road, 34.5 km SE of Darwin, *J.A.Elix 37105* (CANB). Qld: road to Mt Fox, 43 km SW of Ingham, *H.Streimann 37125* (B, CANB).

*Buellia rechingeri* has a white to grey or pale yellow-grey thallus with a smooth, thick, cartilaginous or scaly upper surface, 8-spored asci, small ascospores with weak to moderately strong subapical wall thickenings and a weakly ornamented outer surface and norstictic acid in the thallus.

#### **16. *Buellia subcrassata* (Pusswald) Elix, *Fl. Australia* 57: 660 (2009)**

*Hafellia subcrassata* Pusswald, in B.Marbach, *Biblioth. Lichenol.* 74: 283 (2000). T: Kerry, Duck Creek Rd, near Lamington Natl Park, close to O'Reillys Mountain Resort, Qld, 18 Aug. 1993, *H.Mayrhofer 11385*, *E.Hierzer & R.W.Rogers*; holo: CANB.

*Buellia disciformis* var. *wilsonii* Räsänen, *Suom. Elain-ja Kasvit. Seuran Van. Tiedon. Pöytäkirjat* 3: 181 (1949). T: Landsborough, southern Qld, 1890, *F.R.M.Wilson s.n.*; holo: H.

Thallus corticolous or lignicolous, 2–5 cm wide, thin, continuous to rimose and areolate, white, grey-white, grey or pale yellow-grey, often with brown granules on the surface. Prothallus not apparent. Apothecia 0.2–0.9 mm wide, sessile; disc black, epruinose, plane or becoming convex; margin black, moderately thick at first, persistent or excluded in convex apothecia. Proper exciple dark red-brown, paler in the inner part. Epihymenium 10–20  $\mu\text{m}$  thick, brown, K–. Hymenium 120–150  $\mu\text{m}$  thick, interspersed with oil droplets. Hypothecium 40–60  $\mu\text{m}$  thick, dark brown. Asci 8-spored, occasionally with fewer ascospores. Ascospores 1-septate, 26–32  $\times$  9–12  $\mu\text{m}$ , with weak subapical and septal wall thickenings; outer wall moderately ornamented. Conidia bacilliform, 5–7  $\times$  c. 1  $\mu\text{m}$ .

**Chemistry:** Thallus K+ red, P+ yellow or yellow-orange; containing norstictic acid (major), connorstictic acid (minor or trace),  $\pm$ 4,5-dichlorolichexanthone (trace).

Occurs on bark and wood in rainforest in south-eastern Qld and Tas.; also in Central America.

Qld: on road to Bald Mtn, c. 7 km NE of Mt Colliery, E of Warwick, *J.Hafellner 17000 & G.N.Stevens* (GZU). Tas.: lower slopes, South Sister, *G.Kantvilas 267/04* (HO).

*Buellia subcrassata* is characterised by the white, grey-white, grey or pale yellow-grey thallus, usually 8-spored asci, moderately large ascospores with weak septal and subapical wall thickenings and a moderately ornamented outer surface and by the presence of norstictic acid. *Buellia fraudans* is very similar, but that species has thicker septal and subapical wall thickenings and slightly larger ascospores.

#### **17. *Buellia subtropica* (Elix) Elix, *Fl. Australia* 57: 660 (2009)**

*Hafellia subtropica* Elix, in J.A.Elix & P.M.McCarthy, *Australas. Lichenol.* 62: 20 (2008). T: Diehard Ck, Mann River Nature Reserve, 50 km E of Glen Innes, N.S.W., 1 May 2005, *J.A.Elix 37066*; holo: CANB.

Illustrations: J.A.Elix & P.M.McCarthy, *op. cit.* 22, figs 1, 2, as *Hafellia subtropica*.

Thallus corticolous, 1–3 cm wide, thin, finely rimose to deeply rimose and areolate, whitish, grey-white to grey, weakly to markedly verruculose. Prothallus black or not apparent.

Apothecia 0.2–1.2 mm wide, moderately immersed to sessile; disc black, epruinose, initially concave, becoming plane to weakly convex, ±tuberculate; margin black, thin or excluded in convex apothecia. Proper exciple brown-black, with or without a paler inner zone. Epihymenium 10–15 µm thick, olive-brown to dark brown, K–. Hymenium 70–120 µm thick, interspersed with oil droplets especially towards the base. Hypothecium 80–150 µm thick, brown-black. Asci 8-spored. Ascospores 1-septate, 16–23 × 8–14 µm, with weak subapical and septal wall thickenings; outer wall moderately ornamented. Pycnidia not seen.

**Chemistry:** Thallus K+ red, P+ yellow or yellow-orange; containing norstictic acid (major), hafellic acid (major), neopaludonic acid (trace), neosubpaludonic acid (trace), connorstictic acid (minor or trace).

This endemic species occurs on bark in montane forest in south-eastern Qld and north-eastern N.S.W.

Qld: Nanango Rd, Bunya Mountains State Forest, 64 km NE of Dalby, *J.A.Elix 37958* (CANB). N.S.W.: Hakea Walk, Washpool Natl Park, Gibraltar Ra., 78 km E of Glen Innes, *J.A.Elix 37259* (CANB).

This lichen is characterised by the whitish, grey-white to grey thallus, the 8-spored asci, comparatively small ascospores with weak subapical wall thickenings, a moderately ornamented outer spore wall and by the presence of norstictic and hafellic acids in the thallus. *Buellia curatellae* has narrower ascospores (6–8 µm wide), an epihymenium that often reacts K+ clear yellow-green or olive, a ±smooth outer spore wall, and it contains only norstictic and connorstictic acids.

### 18. *Buellia tetrapla* (Nyl.) Müll.Arg., *Flora* 71: 139 (1888)

*Lecidea tetrapla* Nyl., *Flora* 69: 325 (1886); *Buellia callispora* var. *tetrapla* (Nyl.) J.Steiner, *Bull. Herb. Boissier*, sér. 2, 7: 645 (1907); *Hafellia tetrapla* (Nyl.) Pusswald, in B.Marbach, *Biblioth. Lichenol.* 74: 288 (2000). T: N.S.W., [neighbourhood of Sydney], *C.Knight s.n.*; holotype: H-NYL 10362 p.p.

*Lecidea subrepleta* Stirt., in F.M.Bailey, *Queensland Agric. J.* 5: 39 (1889); *Buellia subrepleta* (Stirt.) Zahlbr., *Cat. Lich. Univ.* 7: 420 (1931). T: Jimbour, Qld, June 1895, *F.M.Bailey 11*; lectotype: GLAM n.v., *fide* R.W.Rogers, *Austrobaileya* 1: 505 (1982).

*Lecidea discors* Stizenb., *Ber. Tätigk. St. Gallischen Naturwiss. Ges.* 1889/90: 173 (1891); *Buellia discolorans* (Stizenb.) Zahlbr., *Cat. Lich. Univ.* 7: 356 (1931); *Buellia discors* (Stizenb.) H.Magn., *Ark. Bot.*, ser. 2, 3(10): 374 (1954). T: prope Uitenhagen, Promontorium Bonae Spei [Cape of Good Hope], South Africa, *Krauss s.n.*; holotype: ZT.

For further synonymy see Marbach (2000).

Illustration: B.Marbach, *op. cit.* 290, fig. 137, as *Hafellia tetrapla*.

Thallus corticolous or lignicolous, 1–4 cm wide, thin, continuous, membranous to areolate, white, grey-white or pale yellow-grey, uneven or verrucose. Prothallus not apparent. Apothecia 0.2–1.2 mm wide, sessile; disc black, epruinose, plane or becoming convex; margin black, moderately thick, persistent or excluded in convex apothecia. Proper exciple brown. Epihymenium 10–20 µm thick, dark brown, K–. Hymenium 100–120 µm thick, interspersed with oil droplets. Hypothecium 40–50 µm thick, dark brown. Asci usually 4-spored, rarely 3-spored. Ascospores 1-septate, 28–45 × 14–18 µm, with strong subapical and septal wall thickenings; outer wall strongly ornamented. Pycnidia not seen.

**Chemistry:** Thallus K+ yellow, C–, P+ yellow; containing atranorin (major), diploicin (major), isofulgidin (minor), fulgidin (minor or trace).

Common on bark in hinterland forest and woodland in W.A., S.A., Qld, N.S.W., A.C.T. and Vic. Also in South America, South Africa, the Mascarene Islands (Réunion), New Zealand and the Hawaiian Islands.

W.A.: Gwambygine Nature Reserve, 11 km S of York, *J.A.Elix 31735* (CANB). S.A.: Corrynton Park Rd, 8 km W of Eden Valley, Mount Lofty Ra., *J.A.Elix 37232* (CANB). Qld: Morans Falls track, O'Reillys, Lamington Natl Park, 20 May 1969, *S.Brownlie* (MEL). N.S.W.: Patonga Ck, 1 km NW of Patonga, *W.Pusswald 15* (CANB). A.C.T.: Molonglo Gorge Reserve, 7 Sept. 1995, *K.Kalb, J.A.Elix & G.Kantvilas* (CANB). Vic.: Lakes Entrance, 10 Nov. 1901, *R.A.Bastow* (MEL).

This species is characterised by the white to grey-white or pale yellow-grey thallus, usually 4-spored asci, rather large ascospores with strong septal and subapical wall thickenings and a strongly ornamented outer surface and by the presence of atranorin and diploicin. *Buellia dissa* has predominantly 2-spored asci and smaller ascospores.

**19. *Buellia xanthonica* (Elix) Elix, *Fl. Australia* 57: 660 (2009)**

*Hafellia xanthonica* Elix, *Australas. Lichenol.* 59: 36 (2006). T: First North Rd, Wotto Nature Reserve, 21 km by road NE of Eneabba, W.A., 5 May 2004, *J.A.Elix* 28876; holo: PERTH; iso: CANB.

Illustrations: J.A.Elix, *op. cit.* 38, figs 1–4, as *Hafellia xanthonica*.

Thallus corticolous or lignicolous, 1.0–2.5 cm wide, thin, continuous, smooth to indistinctly areolate, yellow-white to pale yellow-grey or yellow-green, uneven, occasionally verrucose. Prothallus appearing as a black line surrounding the thallus, or not apparent. Apothecia common, 0.4–1.5 mm wide, sessile; disc black, epruinose, plane or slightly convex; margin black, thin, usually persistent, becoming excluded in convex apothecia. Proper exciple dark brown to brown-black, the inner part somewhat paler. Epithymenium 10–20 µm thick, dark brown, K–. Hymenium 70–100 µm thick, interspersed with oil droplets. Hypothecium 60–80 µm thick, brown. Asci usually 8-spored, occasionally with fewer ascospores. Ascospores 1-septate, 14–35 × 6–15 µm, with moderately strong subapical but narrow septal wall thickenings; outer wall smooth. Pycnidia not seen.

*Chemistry*: Thallus K–, C–, KC–, P–; containing 4,5-dichlorolichexanthone (major), ±brialmontin 1 (minor), ±brialmontin 2 (minor).

Endemic on bark and wood in hinterland forest and woodland in W.A., N.S.W. and Tas.

W.A.: Great Northern Hwy, 72 km NE of Wubin, *J.A.Elix* 33487 (CANB). N.S.W.: Terraban Gap Nature Reserve, along Black Stump Way, 31 km E of Dunedoo, *J.A.Elix* 36121 (CANB). Tas.: SE end of beach, Wineglass Bay, *G.Kantvilas* 735/03 (HO).

*Buellia xanthonica* is characterised by the yellow-white to pale yellow-grey or yellow-green thallus, the mainly 8-spored asci, ascospores of intermediate size with moderately strong subapical but narrow septal wall thickenings and a smooth outer wall, and by the presence of 4,5-dichlorolichexanthone. *Buellia reagenella* is rather similar, but it has a K+ violet epithymenium and smaller ascospores.