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Article

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Bazzania polita sp. nov., a rare New Zealand species (Lepidoziaceae, Marchantiophyta) with an assessment of branching type as a character

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Abstract

Bazzania polita **sp. nov.** is described from New Zealand from two collections. It resembles *B. exempta* in having leafy branches that are predominantly ventral-intercalary, but the leaves are more broadly rectangular, and the dorsal leaf margin is more ampliate. The underleaves of *B. polita* are connate with the leaves on both sides versus free in *B. exempta*, and they are toothed as well as lobed versus lobed but untoothed in *B. exempta.* Neither leaves nor underleaves of *B. polita* are caducous (leaves are caducous in *B. exempta*). The hyaline portion of the underleaf surface and the leaf margins of *B. polita* are asperulate, versus smooth throughout in *B. exempta.* Seven New Zealand species that commonly have leafy ventral-intercalary branches were sampled for variation between populations. In five species the proportion of leafy ventral-intercalary branches varied a great deal, suggesting that branching type in these species is environmentally influenced. If a species with a high proportion of leafy ventral-intercalary branches is known from a single specimen, it cannot be concluded that this is a constant feature of the species.

Key words: *Bazzania accreta*, *Bazzania exempta*, branching type, key to species, Marchantiopsida, endemic, liverwort, new species

Introduction

Bazzania Gray (1821: 704) is a large, worldwide genus with 12 species known in New Zealand (Gibb *et al.* 2022). A new species of *Bazzania* was found by examining specimens at the Allan Herbarium, Lincoln (CHR), and Auckland Museum herbarium (AK). It is described here from a collection made at a site in the Waikato region and previously identified as *B. hochstetteri* Reichardt (1966: 959) Hodgson (1954: 11). While working on the description of this specimen a single plant from a second location was found in a Department of Conservation survey collection made in south Westland. This single plant has no leafy branches and was identified by its leaf and underleaf features. *Bazzania polita* resembles *B. exempta* Engel (2006: 197) in having predominantly ventral-intercalary branches with leaves of normal size as opposed to microphylls, a feature apparently shared otherwise in Australasia only with the widespread species *B. vittata* (Gottsche in Gottsche, Lindenberg and Nees 1845: 216) Trevisan (1877: 414).

Methods

Specimens were examined with dissecting and compound microscopes, and photographs were taken through a Leica DM2500 compound microscope to use for drawing and presentation as photographs. Before photographing, shoots were treated with pure domestic bleach for about 2 min to make the tissue transparent, then stained with dilute methylene blue. Scanning electron microscope (SEM) photographs were taken using a Hitachi desktop SEM after sputter-coating the specimen with gold. The whole-plant photograph of Fig. 1A was taken with a Canon DSLR camera, with macro lens and backlighting of the specimen.

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Branching types of specimens were counted for seven New Zealand species, which commonly have normal-leaved, ventral-intercalary branches. This was done to evaluate how taxonomically useful this feature is by finding out how constant the phenomenon of leafy ventral branches is within each species. Specimens were teased apart while floating in water, or soaked and patted dry with tissue paper. Counts were made from whole plants and from plant fragments by removing part of the specimen, teasing it apart and counting all branches in that part, so avoiding any sampling bias. Microphyllous ventral-intercalary branches were also counted, but counts are not presented here for the sake of simplicity.

Results

Table 1 summarises the results of counting normally leafy branches. The ratio of normally leafy ventral branches to the total number of leafy branches is given as a percentage.

TABLE 1. Summary of proportion of normally leafy branches that are ventral-intercalary (VI) to the total number of normally leafy branches.

	No. of leafy branches counted	No. of population samples counted	Mean proportion of VI branches for species	Range in proportions of VI branches for species
B. polita	40	1	88%	not applicable
B. exempta	26	2	100%	no range
B. hochstetteri	330	34	27%	0–50(84)%
B. engelii	227	7	25%	10–90%
B. okaritana	121	4	11%	2–22%
B. nitida	201	6	72%	8–94%
B. monilinervis	85	4	87%	53–100%

Bazzania polita is known from a single abundant specimen (the type) and one other plant that is unbranched, so variation in the proportion of leafy ventral-intercalary branching is unknown.

Bazzania hochstetteri had a great deal of variation in the normal-leaved branches, from 0 to 50% of ventral leafy branches with a mean of 27%, but with one outlier: AK 257251 had 84% of leafy branches ventral. This specimen is undoubtedly *B. hochstetteri* based on its abundant caducous leaves and leaf size and shape matching the type.

Bazzania engelii Glenny and Bartlett (2008: 176) varied even more in the proportion of normal-leaved ventral branches, from 10 to 90% with a mean of 28% and the proportion bimodal: 10, 13, 18, 22, 23, 86, 90%.

Bazzania okaritana Meagher and Glenny (2007: 60) had the lowest proportion of ventral leafy branches of the species counted (only 11% overall) and was less variable in that proportion (2–22%).

Bazzania nitida (Weber 1815: 43) Grolle (1960: 210) and *B. monilinervis* (Lehmann and Lindenberg 1832, 56) Trevisan (1877: 414) both had higher mean proportions of ventral leafy branches, and both were variable in that proportion, *B. nitida* particularly so (8–94%).

Taxonomy

Bazzania polita Glenny **sp. nov.**

Diagnosis: Plants glossy, ventral-intercalary branches with normal leaves predominating over terminal branches (9:1), leaves 1000–1160 µm long, 430–575 µm wide, asymmetrically truncate-ovate, subvittate, leaf surfaces smooth, margins asperulate, underleaves subopposite, 1–2-connate, hyaline cells occupying distal ⅔ of the underleaf area, apex and margins sharply toothed, hyaline cells asperulate, neither leaves nor underleaves caducous but leaf lobe tips often breaking.

Type: New Zealand, North Island, Central Volcanic Plateau Ecological Region, Ātiamuri Ecological District, Whakamaru, upper Mangakowhiriwhiri Stream gorge, 38 28’ 37”S, 175 48’ 18” E, 300 m. *PJ de Lange 9314*, 24 October 2010. Holotype: AK 318121! Isotypes: CHR 612548! F, NSW.

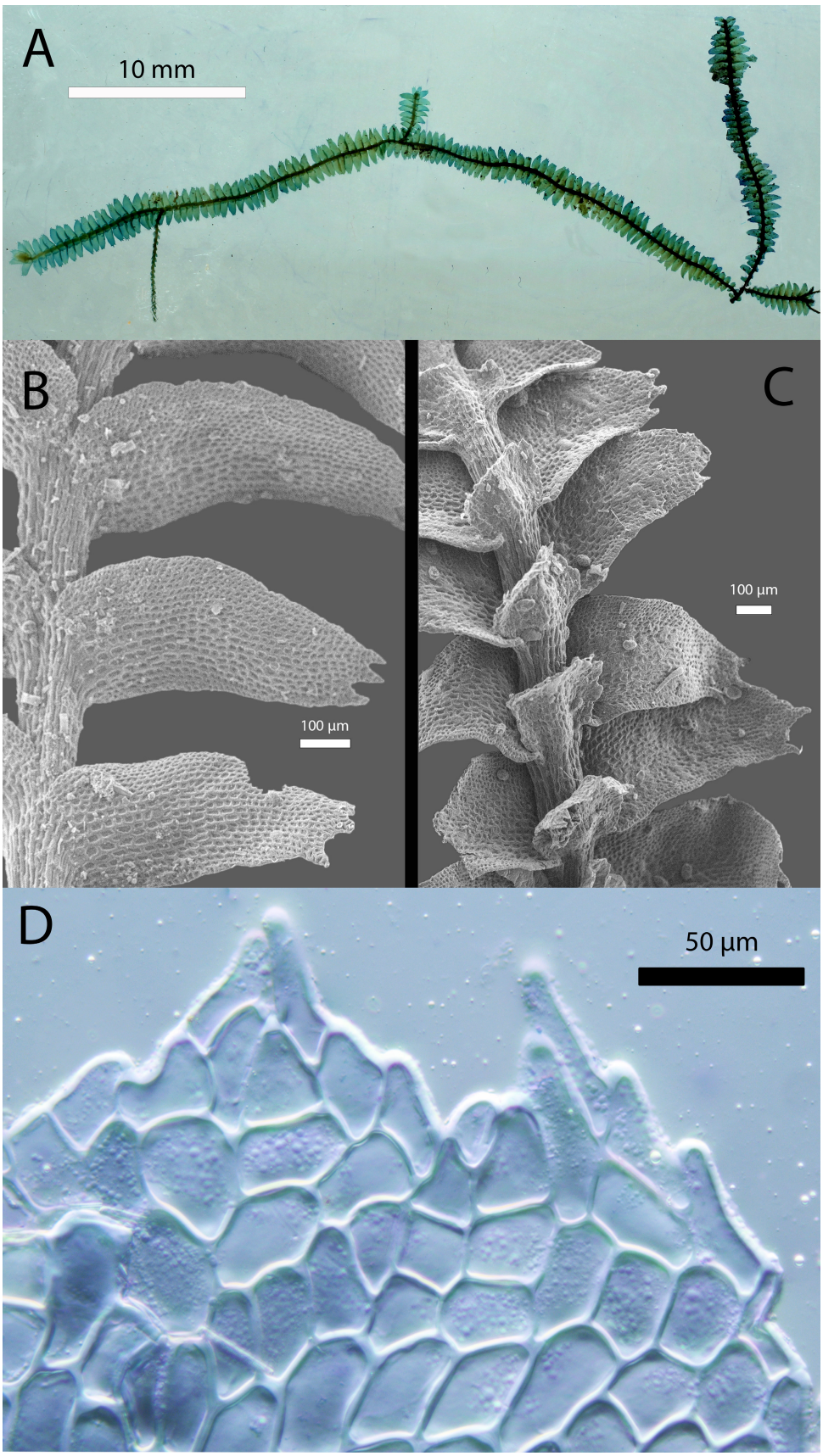

FIGURE 1. *Bazzania polita.* A. Whole plant with all branches ventral-intercalary, one geotropic branch on far left with microphyllous leaves. B. Shoot in dorsal view showing subopposite, slightly distant leaves, and moderately ampliate dorsal leaf margin. C. Shoot in ventral view showing overlapping of leaves, the angle of underleaves to the stem, and narrow connation of underleaves to the lateral leaves. D. Hyaline apex of the underleaf showing the size and density of the papillae that give the hyaline part of the underleaf an asperulate appearance. All photographed from the holotype by D Glenny.

Description (derived only from the type): Plants forming a loosely interwoven mat, 38–69 mm long, brown-green when fresh, pale brown when dry, membranous and translucent, leaf surfaces glossy. Shoots 2.0–2.2 mm wide, often becoming narrower in distal parts, to 1.7 mm. Branching infrequent, 0–4 per plant (Fig. 1A).

Of plants that are branched, 54% of branches are microphyllous ventral-intercalary branches, 41% ventral-intercalary with normal leaves, and 4% terminal, of the *Frullania* type. Ventral-intercalary shoots with normal leaves often reduced in width (1.6–1.8 mm wide). Stem 180–200 µm diameter. Rhizoids not seen. Leaves membranous, subopposite (leaves alternating dorsally but only slightly offset ventrally), incubous, oriented at c. 90° to the stem, contiguous to slightly overlapping; 1000–1160 µm long, 430–575 µm wide, asymmetrically truncate-ovate; the dorsal margin extending to the dorsal stem midline but leaving most of the dorsal stem surface visible (Fig. 1B), plane when moist, channelled when dry, slightly convex, the apex not incurved when moist or dry, the apex truncate (sometimes the acroscopic tooth over-reaching the other 2 teeth), with (2)3 apical teeth that vary in relative size, the 2 or 3 teeth equal in size or the acroscopic tooth being larger; teeth 4–6 cells long and 3–5 cells wide at base, composed of 6–14 cells, the teeth parallel to each other or divergent; sinuses between the teeth and leaf margins near the apex sometimes with extra-small teeth composed of 1 cell. Dorsal leaf margin moderately ampliate at the leaf base (Fig. 1B, Fig. 2A, Fig. 3A, C).

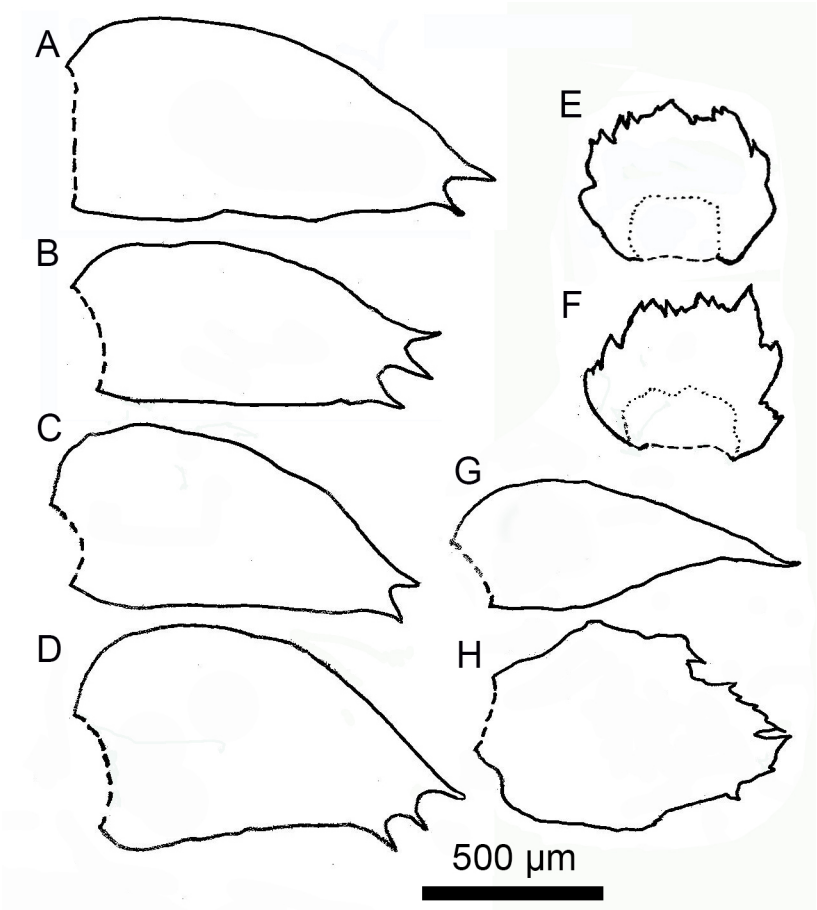

FIGURE 2. *Bazzania polita.* A–D. Leaf outlines from a single plant showing variation in shape and size. E, F. Underleaf outlines from single plant showing variation. Dotted line at mid-underleaf shows the limit of chlorophyllose cells. G. Half-leaf outline. H. Half-underleaf outline. All drawn from the holotype by D Glenny.

Ventral leaf margin straight or slightly convexly curved, not decurrent. Subvitta c. 5–6 cell rows wide at midleaf; 3 cells from the ventral margin at midpoint of leaf, grading to non-vittate cells between the mid-leaf and leaf apex; cells of vitta base rectangular, the largest 43–62 µm long, 28–34 µm wide with moderate, convex, prismatic trigones. Non-vittate cells in distal half of leaf square to rectangular, 17–25 µm long, 14–20 µm wide, walls c. 4 µm thick, trigones concave and moderate. Cells on the acroscopic margin 11–18 µm long, 12–14 µm wide, the outer cell wall 4–6 µm thick. All leaf cells chlorophyllose. Oil-bodies not known. Leaf surfaces mostly smooth but asperulate at apical tooth margins and both leaf margins for their full length. Branch half-leaf narrowly ovate, symmetrical, 800–885 µm long, 360–390 µm wide, margins entire, apex acuminate; marginal 2–5 rows of cells and apical 10 rows of cells hyaline (Fig.

2G). Branch half-underleaf ovate, variable in size, 400–815 µm long, 370–580 µm wide, lobed or not, margins toothed or not; cells hyaline except for the basal 4 rows of cells (Fig. 2H). Underleaves wider than the stem, lying loosely against the stem but with the apex slightly curved away from the stem (Fig. 1C), usually connate on both sides by 1–5 cells but sometimes 1-connate; 390–580 µm long, 450–620 µm wide; wider than long (length:width ratio 0.80–0.91:1), plane, rectangular or broadly ovate, apex with 4 lobes divided at most 0.16× the length of the underleaf, which are themselves sharply toothed, outer margins with 0–3 weak lobes; 10–12 rows of cells forming a hyaline border in the distal 0.6 of the underleaf and extending for 2 cell rows on the margin to the underleaf base, chlorophyllose base 5–8 rows deep; cells of the chlorophyllose zone 27–38 µm long, 18–27 µm wide, square to rectangular, walls 5–6 µm thick with a middle lamella visible, trigones concave. Cells of the hyaline zone rectangular, 14–21 µm long, 6–10 µm wide, walls 2 µm thick, trigones small and concave, slight intermediate thickenings sometimes present. Hyaline portion of the underleaf asperulate (Fig. 1D). Lacking asexual reproduction by caducous leaves or underleaves, but leaf lobe tips often broken. Gynoecia and androecia unknown.

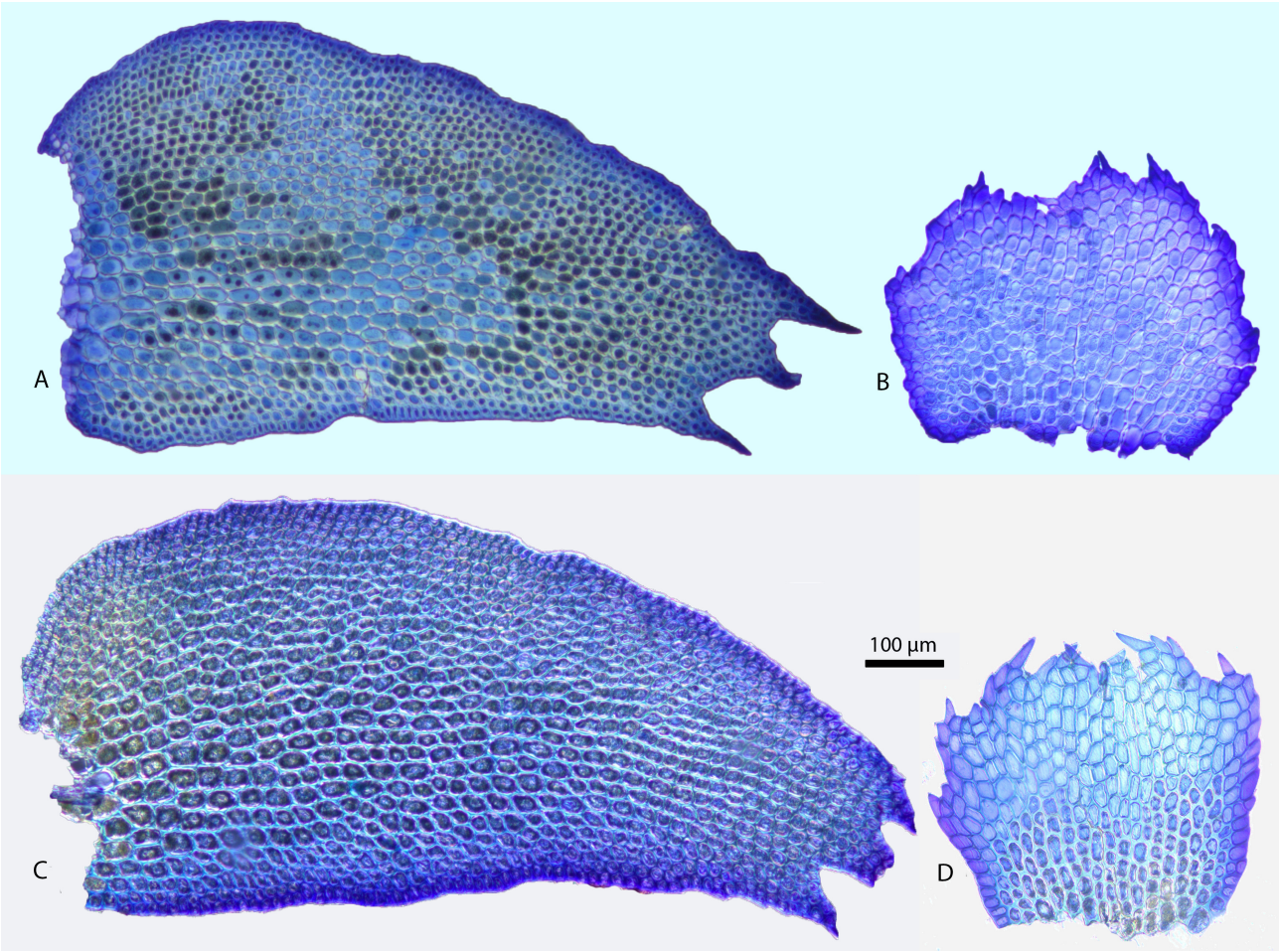

FIGURE 3. *Bazzania polita.* Comparison of leaves and underleaves from the two known collections. In D the hyaline and asperulate portion of the underleaf occupies the distal 60% of the underleaf as well as the margins and extends to the underleaf base. A and B photographed from the holotype, C and D photographed from Westland, Bruce Bay, Papakeri Creek, R. Long, CHR 662337, by D Glenny, all stained with methylene blue. 100 µm scale bar applies to A–D.

Distribution: New Zealand: Auckland (Whakamaru), Westland (Bruce Bay), elevational range: 300–460 m.

Ecology: The type was near a stream at the bottom of a steep-sided ignimbrite gorge. The site is constantly shaded by overhanging, dense, *Phyllocladus trichomanoides* Don (1832: 159)—dominated forest. Plants formed a dense sheet 2 × 3 m on a dry, overhanging, ignimbrite rock face immediately above the stream flood-line. The plants were associated with *Lepidozia spinosissima* (Hooker & Taylor in Taylor 1846: 373) Mitten in Hooker (1854–1855: 146). The Bruce Bay specimen was from an unknown microhabitat but was under disturbed forest with a *Cyathea smithii* Hooker, 1854–1855: 8) canopy with emergent *Pterophylla racemosa* (Linnaeus 1782: 227) Pillon & Hopkins in Pillon *et al.* (2021: 1198) and other tree species.

Etymology: Polita means polished or glossy, referring to an obvious glossiness and transparency, shared with *Bazzania exempta, B. monilinervis* and *B. nitida*, and contrasting with most other New Zealand species that have leaves that are matt and opaque (e.g. *B. adnexa* ((Lehmann and Lindenberg in Lehmann 1832: 58) Trevisan 1877: 414), *B. engelii*, *B. hochstetteri*, *B. involuta* (Montagne 1843: 253) Trevisan (1874: 414), *B. mittenii* (Stephani 1886: 242) Stephani (1889: 132), and *B. okaritana*).

Conservation status: Data deficient in the New Zealand Threatened Species Classification (Townsend *et al.* 2008), because it is known from two localities but the distance between the two sites and their differences in habitat suggests it may be at many other sites, particularly as the Bruce Bay site has a common successional type of forest.

Discussion

Branching type proportions and variation in proportions

Meagher (2013) presented a table showing ratios of branching types for 25 Australasian *Bazzania* species. Meagher counted branching types from 10 segments of individual plants in one specimen per species. Of the species sampled, eight had a higher proportion of ventral-intercalary normal-leaved branches than terminal branches. Only in *B. vittata* did he find no terminal branches (but a collection at CHR had 12% terminal branches). The very high ratio of normally leafy ventral-intercalary branches to terminal branches in *B. exempta* and *B. polita* appears to be exceptional in Australasia.

Meagher's method of counting branching types put branching types on a quantitative footing but did not indicate variation between populations. To investigate that variation, we sampled between 4 and 34 specimens for seven New Zealand species in which normal-leaved ventral-intercalary branches are commonly found. The large range between the lowest and highest proportion of leafy ventral branches in some species (particularly *B. engelii*, *B. hochstetteri*, and *B. nitida*) suggests there is a strong environmental influence on branching type in at least some species. At the time of publication of *Bazzania engelii* (Glenny and Bartlett 2008) only two specimens, both with high proportions of leafy ventral branches, were known. It was assumed that a high proportion of such branches was a defining feature of the species but proportions as low as 10% can be found. Similarly, had a single sample of *B. monilinervis* been counted that had 100% of leafy branches ventral one might have concluded that lack of terminal branching was a feature of the species, when in fact terminal branches can be as plentiful as ventral leafy branches (Table 1).

However, two non-type specimens of *Bazzania exempta* were consistent in their lack of terminal branching, and Engel (2006) observed only one terminal branch in the type, suggesting there is very little variation in branching type in this species. *Bazzania polita* may be similar in this respect, but it isn't possible to say without further specimens.

Comparison to similar species

Bazzania polita is most similar to *B. exempta* (Fig. 4) and shares with it the following features. Branching type in both is predominantly normally leafy ventral-intercalary. Ventral-intercalary shoots in both are narrower than the main shoot, and the main shoots also narrow distally. Leaves of both are subopposite and do not hide the dorsal stem surface. Both vary in toothing of the leaf near its apex.

Bazzania polita differs from *B. exempta* in the following features. The leaves of *B. polita* are never caducous, whereas they are in *B. exempta.* The leaves of *B. polita* are shorter (1000–1100 µm) than those of *B. exempta* (1200–1500 µm long) and wider (500–575 µm wide in *B. polita* versus 400–550 µm wide in *B. exempta*). The ratio of leaf length to width differs: 1.9–2.1:1 in *B. polita* versus 2.4–2.7:1 in *B. exempta*. *Bazzania polita* is more ampliate at the dorsal leaf base than *B. exempta*. The underleaves of *B. polita* are toothed as well as lobed (Fig. 4), whereas *B. exempta* merely has rounded lobes at the apex, or the underleaf is entire (Fig. 4C, D, and E). The underleaves of *B. polita* are (1)2-connate but free in *B. exempta.* Leaf margins of *B. polita* are asperulate while *B. exempta* shows no trace of this. In *B. polita* the underleaf is asperulate in the hyaline portion (Fig. 1D) while it is smooth in *B. exempta*.

Bazzania polita shares two features with *Bazzania okaritana* (Meagher and Glenny 2007): the underleaves are usually connate on both sides, and in both species the underleaf surface is asperulate in the hyaline portion. *Bazzania polita* differs from *B. okaritana* in having leafy branches nearly exclusively ventral-intercalary versus predominantly terminal in *B. okaritana*. The underleaves of *B. polita* are toothed as well as lobed (lobes are rounded but untoothed in

B. okaritana). The underleaves of *B. polita* are sometimes 1-connate but always 2-connate in *B. okaritana*. The leaves of *B. polita* are shorter (1000–1160 µm versus 1500–1800 µm in *B. okaritana*), and the underleaves of *B. polita* lie flat to stem but are widely spreading in *B. okaritana*.

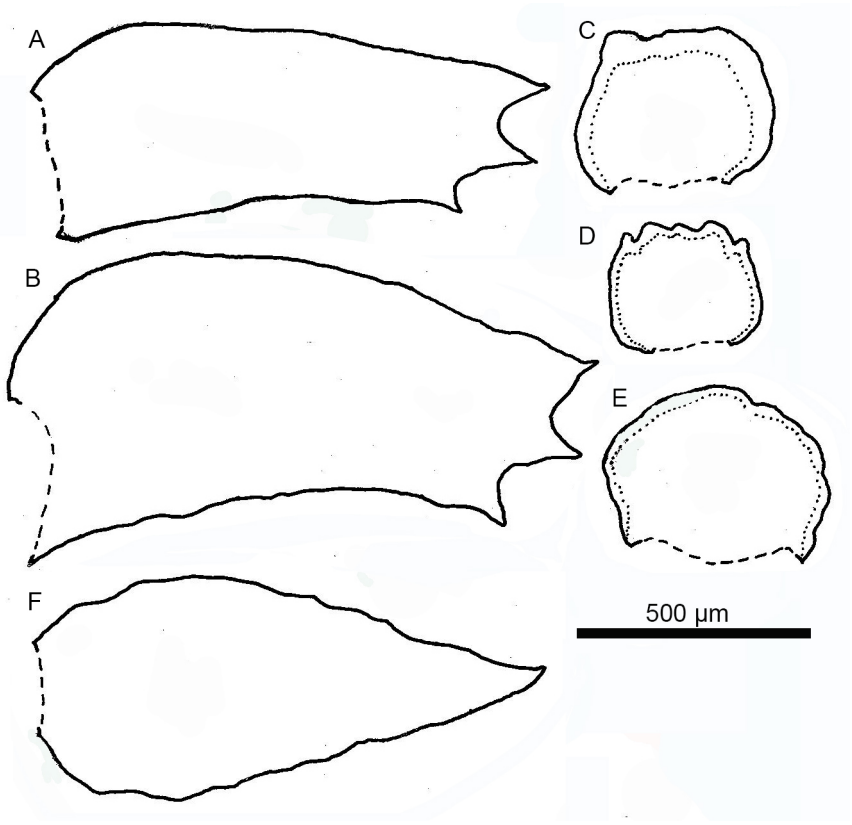

FIGURE 4. *Bazzania exempta*. A and B. Leaf outlines. C–E. Underleaf outlines. Dotted line at mid-underleaf shows the limit of chlorophyllose cells. F. Half-leaf outline. 500 µm scale bar applies to A–F. All drawn from Western Nelson, Ōparara River, *D. Glenny 14772a & K. Frogley*, CHR 668214, by D Glenny.

Bazzania polita shares four features with *B. engelii*: in neither species are the leaves caducous; the underleaves are usually connate on both sides,;the underleaf surface is asperulate in the hyaline portion and the underleaf margins are toothed. The two differ in the following respects. Leafy branches of *B. polita* are nearly exclusively ventral-intercalary versus predominantly terminal (75% on average) in *B. engelii*. The leaves of *B. polita* are shorter (1000–1160 µm versus 1100–1300 µm long in *B. engelii*. The underleaves of *B. polita* lie flat to the stem versus at 45º to the stem with the apex recurved in *B. engelii*.

Bazzania hochstetteri is also a membranous-leaved species with leaves and underleaves of a very similar size to *B. polita*. Both have toothed underleaves, although this toothing is variable in *B. hochstetteri*. Most importantly, the type of *B. hochstetteri*, and all other specimens of *B. hochstetteri* seen (with few exceptions), has caducous leaves and sometimes caducous underleaves.

Bazzania vittata shares with *B. polita* a high proportion of leafy ventral branches. *Bazzania vittata* is distinctive in being glaucous, leaf surfaces are finely scabrous, the vitta is distinct, the underleaves are free, the underleaf apex is entire to crenulate, and the underleaf cells are hyaline throughout (Meagher 2019 and pers. obs.). *Bazzania vittata* does not occur in New Zealand.

Bazzania accreta (Lehmann and Lindenberg in Gottsche, Lindenberg and Nees (1845: 222) Trevisan (1877: 414), has a similar leaf shape to *B. polita* and *B. exempta.* However, it has a low proportion of ventral-intercalary branches (1.6% of normally leafy branches, Meagher 2013), and has underleaves that are usually longer than wide (Meagher 2019), whereas *B. polita* has underleaves that are always wider than long.

A revised key to New Zealand *Bazzania* species is provided below. *Bazzania accreta* is not included, because the sole specimen on which Meagher (2006, 2008) based its presence in New Zealand (*G.A.M. Scott 8212* Stewart Island, OTA) does not have the diagnostic feature of that species (Meagher 2019): underleaves that are longer than wide. This specimen is *B. okaritana*. We know of no other New Zealand specimens of *B. accreta*.

Key to New Zealand *Bazzania* species

1a Leaves with an obvious vitta 2
1b Leaves without an obvious vitta (may be weakly vittate) 4

2a Leaves glaucous, ice-blue under UV light ..... *B. tayloriana* (Mitten in Hooker 1854: 147) Kuntze (1891: 832)
2b Leaves not glaucous, faintly green or yellow under UV light 3

3a Leaves with apical teeth obscure or short, ending at most in 2 uniseriate cells ..... *B. nitida*
3a Leaves with apical teeth long, ending in (5)6–8 uniseriate cells when intact ..... *B. monilinervis*

4a Leaves 2.1–2.8 mm long; underleaves longer than wide ..... *B. novae-zelandiae* ((Mitten in Hooker 1854: 148) Bescherelle and Massalongo 1889: 233)
4b Leaves 0.65–1.47 mm long; underleaves wider than long or equally wide as long 5

5a Underleaves 4–6-lobed to a depth of 0.3× underleaf length with underleaf lobes narrow spines ..... *B. mittenii*
5b Underleaves toothed and/or lobed, when lobed, the lobes broadly rounded 6

6a Some leaves on shoots caducous 7
6b Leaves never caducous 8

7a Leafy branches mostly ventral-intercalary; underleaves free; leaf acroscopic base weakly ampliate ..... *B. exempta*
7b Leafy branches mostly terminal; underleaves 2-connate; leaf acroscopic base moderately to strongly ampliate ..... *B. hochstetteri*

8a Underleaf margins and apex with many multicellular teeth; leaves distinctly toothed near the apex (as well as 3-lobed) 9
8a Underleaves with single-celled teeth projecting from lobes or lobed only; leaves not or indistinctly toothed at the apex 10

9a Underleaves 1134–1640 µm wide, strongly reflexed so that the adaxial surface is exposed to ventral view, margins not recurved wet or dry ..... *B. involuta*
9b Underleaves 550–950(1025) µm wide, not strongly reflexed and at c. 45˚ to stem when dry, margins recurved to make the underleaf hooded ..... *B. adnexa*

10a Leaves 1500–1800 µm long, leaf acroscopic base weakly ampliate; underleaves lacking teeth ..... *B. okaritana*
10b Leaves 1000–1300 µm long; leaf acroscopic base moderately to strongly ampliate; underleaves toothed 11

11a Ventral-intercalary branches with normal leaves almost universal, terminal branches rare; underleaves (1)2-connate, lying against the stem, not recurved at the apex ..... *B. polita*
11b Ventral-intercalary branches 10–90% with normal leaved branches (on average 29%); underleaves invariably 2-connate, at 45º to the stem with the apex recurved ..... *B. engelii*

Specimens examined

Bazzania engelii: Western Nelson, Stockton Plateau, Weka Stream, *R Bartlett*, CHR 592014 (type). Western Nelson, Stockton Plateau, Herbert Stream, *J Hughes*, CHR 592013. Western Nelson, Lake Clara, *D Glenny 8105*, CHR 527435. Western Nelson, Te Kuha ridge, *D Glenny 13147*, CHR 638562. Western Nelson, Mt Fleming, *D Glenny 14564b & M Renner*, CHR 657949. Southland, Catlins Forest, *D Glenny 10386*, CHR 606729.

Bazzania exempta: Western Nelson, Ōparara River, *D Glenny 14772a & K Frogley*, CHR 668214. Volcanic Plateau, Whakamaru, *P de Lange 7881,* AK 304950.

Bazzania hochstetteri: Chatham Islands, Maipito Road swamp forest, *P de Lange*, AK 302674. Northland, Waipoua, *J Braggins*, AK 257251. Northland, Okahu Forest, *M Renner*, AK 282843. Northland, Warawara, *J Braggins*, AK 335849. Auckland, Hauturu, *J Braggins*, AK 315753. Auckland, Hauturu, *J Braggins*, AK 315758. Auckland, Hauturu, *J Braggins*, AK 313254. Auckland, Hauturu, *J Braggins*, AK 315688. Auckland, Hauturu, *J Braggins*, AK 314338. Auckland, Hauturu, *J Braggins*, AK 315642. Auckland, Hauturu, *J Braggins*, AK 315699. Auckland, Hauturu, *J Braggins*, AK 312831. Auckland, Hauturu, *J Braggins*, AK 315757. Auckland, Hauturu, *J Braggins*, AK 315742. Auckland, Hauturu, *J Braggins*, AK 315770. Auckland, Hauturu, *J Braggins*, AK 315713. Auckland, Hauturu, *J Braggins*, AK 615668. Auckland, Rangitoto Island, *J Braggins*, AK 293572. Auckland, Rangitoto Island, *J Braggins*, AK 257178. Auckland, Oratia, *J Braggins*, AK 357944. Auckland, Waitakere Range, Spraggs Bush, *J Braggins*, AK 323980. Auckland, Aotea, Mt Hobson, *J Braggins*, AK 325217. Auckland, Aotea, *R Lloyd*, AK 163978. Auckland, Coromandel, F. Hochstetter, MPN 36600 (type). Auckland, Moehau, *J Braggins*, AK 314361. Auckland, Moehau, *J*

Braggins, AK 314362. Auckland, Waitewhenua, DG 14353, CHR 630907. Volcanic Plateau, Tupapakura, *J Braggins*, AK 349239. Volcanic Plateau, Waipapa River, *J Braggins*, AK 325188.

Taranaki, Mt Taranaki, Potemae track, *J Braggins*, AK 254397. Taranaki, Mt Taranaki, Puffer Track, *J Braggins*, AK 258507. Southern North Island, Akatarawa, *J Braggins*, AK 323742.

Southern North Island, Mt Bruce, *J Braggins*, AK 290442. Western Nelson, Mt Burnett, *J Braggins*, AK 286076.

Bazzania monilinervis: Western Nelson, Te Kuha ridge, *D Glenny 8441*, CHR 526344. Western Nelson, Fyfe River, *D Glenny 6201*, CHR 507132. Western Nelson, Ōparara River, *D Glenny 14772b & K Frogley*, CHR 668215. Western Nelson, Denniston Plateau, *D Glenny 12025*, CHR 635053.

Bazzania nitida: Gisborne, Matawai, *D Glenny 11372a*, CHR 620332. Western Nelson, Te Kuha ridge, *D Glenny 8451*, CHR 526354. Western Nelson, Ohikanui River, *M Renner*, CHR 580790. Westland, Haupiri Ridge, *D Glenny 9163*, CHR 571099. Westland, Kellys Creek, *L Visch,* CHR 625774. Westland, Haast, Makarora, Blue River, *T Hay*, CHR 585178.

Bazzania okaritana: Westland, Okarito, *D Glenny 9191*, CHR 571121 (type). Stewart Island, Pryse Peak, *D Glenny 11708*, CHR 624588. Stewart Island, Pryse Peak, *D Glenny 11696*, CHR 624578. Stewart Island, Sylvan Cove, *A Pritchard*, CHR 598112.

Bazzania polita: Volcanic Plateau, Whakamaru, *P de Lange 9334,* AK 318121 and CHR 612548 (type). Westland, Bruce Bay, Papakeri Creek, NZTM 1330060E 5163468N, 460 m, dominated by tree ferns with emergent *Pterophylla racemosa*, with *Acaena anserinifolia, Carex imbecilla, C. megalepis*, *Euchiton limosus, Juncus usitatus*, *Ranunculus foliosus*, *R. Long*, 11 March 2020, CHR 662377.

Bazzania vittata: Australia, Queensland, Paluma, *D Glenny 9540*, CHR 582718.

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