

A revision of *Blechnum vulcanicum* (Blume) Kuhn and related taxa (Blechnaceae) in Malesia and Oceania

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Abstract

The species included in the *Blechnum vulcanicum* group are all characterised by the presence of unique, minute, surface outgrowths on various aerial parts of a plant; these have previously in error been described as short hairs. However, these so-called ‘hairs’ are distinctive and consist of about 4 to 7 cells in a linear arrangement. The species of *Blechnum* that have this feature are here recognised as a new Section, *Blechnum* sect. *Pilosa* T.C.Chambers. The species *Blechnum vulcanicum* (Blume) Kuhn has been widely cited in taxonomic, floristic and ecological studies for Malesia, Australasia and Oceania, but shows much variation across this wide geographic range. The present study rejects this broad view and recognises a total of 13 species in this group. This includes three new species (*Blechnum aequabile* T.C.Chambers, *B. humile* T.C.Chambers and *B. megavulcanicum* T.C.Chambers), and three new combinations (*Blechnum deltoides* (Colenso) T.C.Chambers, *B. feani* (E.D.Br.) T.C.Chambers, and *B. tovvii* (E.D.Br.) T.C.Chambers).

Introduction

Originally described from Java, the species *Blechnum vulcanicum* (Blume) Kuhn has been widely cited in taxonomic, floristic and ecological studies for Malesia (although apparently absent from peninsular Malaysia), Australasia and Oceania. In Australasia and Oceania this name has been applied to plants in the Solomons, as well as many Pacific Islands east to Tahiti, including the Marquesas and the Cook Islands, Fiji, New Caledonia; and SE Australia, Tasmania and throughout New Zealand to its southern limit on Stewart Island. Several specific and varietal names have sometimes been applied to these various and somewhat varying populations but in most publications they have been identified either as *Lomaria vulcanica* Blume or *Blechnum vulcanicum* (Blume) Kuhn. Detailed field and herbarium studies have revealed that some of these populations have both morphological and geographical integrity justifying separate taxonomic status. Brownlie and Philipson (1971) drew attention to the need for monographic revision of this group, pointing out that the nearest relative to the Rarotongan and Society Island plants of *Blechnum vulcanicum* appeared to be what up until then had sometimes been referred to as *Lomaria pilosa* Brack. from Fiji.

A defining morphological feature of this species group is the presence of characteristic straight hairs that consist of 5 to 7 cells and are 2–7(–10) mm long, normally tapering evenly from a slender base to a finer but rounded apex with each cell filled with a clear liquid in reasonably fresh material (Fig. 1c). This distinctive

feature forms the basis for recognition of this group as a separate section of the genus, sect. *Pilosa*, formally described below.

Investigating this group has proved difficult not only because some taxa are rarely encountered in the field, and in herbaria are represented by relatively few collections, but also because it is not always possible to differentiate phenotypic from genotypic variation. Further, the often discontinuous distribution of the taxa, together with their relative rarity makes systematic collecting and study, especially in remote localities in the field, somewhat limited. The interpretation presented here for some taxa may require further adjustment as a result of more detailed field and laboratory observations. Future detailed macromolecular studies may assist in defining and confirming taxonomic boundaries between species.

Conservation status

In the interests of conservation of the taxa in the Section *Pilosa* a note of caution is necessary as many of the occurrences of members are isolated, often small, plants in very vulnerable populations. Only in exceptional circumstances, and when there are many individual plants in a single population, should a whole plant be removed. In the senior author's experience mature specimens of sect. *Pilosa* collected in the field rarely survive for more than a few months in cultivation. Therefore to ensure survival of taxa and maintenance of diversity, only small samples are required; so, if needed for cultivation, a single mature fertile pinna placed into a small sterile bag and sealed and planted as soon as possible using standard sterile techniques will be adequate. For herbarium records one single sterile frond and a single fertile frond, each carefully cut at the base including the persistent basal stipe scales (avoiding damage to the apical region of the rhizome/caudex), makes an adequate specimen if accompanied by detailed notes on the dimensions of the caudex, and range of dimensions of sterile and fertile fronds and, if present, creeping rhizomes as well as details of the habitat. Careful and minimal handling of collected fronds is essential as the fine hairs in some taxa are fragile and easily reduced in number.

Ecological and geographic distribution of *Blechnum* Section *Pilosa*

Members of *Blechnum* sect. *Pilosa* as defined in the present paper mostly occur in a wide range of humid forest and rainforest habitats from sea-level in coastal vegetation to montane communities and are more frequently present on the ground in open woodland and in forest margins but some species are also present in exposed montane and subalpine grasslands. In forested areas, many occur in sheltered habitats or on steep sites and are most frequently to be found colonising slopes in the vicinity of waterfalls and semi-shaded river banks, as well as on track and road cuttings in humid woodland areas.

The geographic distribution of members of this Section may be explained by a combination of trans-oceanic wind dispersal and by limited ancient Gondwana land connections. In terms of trans-oceanic migration, the habitat of most of the taxa of this Section would appear to have resulted from wind distribution of spores. Somewhat variable populations of *B. deltooides* (Colenso) T.C.Chambers are recorded from various locations in Tasmania and Eastern Victoria, and from New Zealand. The minor variation between these populations suggests relatively recent divergence resulting from dispersal of spores from Tasmania across the Tasman, carried on the prevailing westerly winds. More recently, a specimen from Chile (*Cherry* 9799, NSW 415409) was found to have the same distinctive hairs on the abaxial surface of its sterile fronds, suggesting that spores of sect. *Pilosa* had reached to the west coast of southern South America.

Other prevailing wind patterns almost certainly account for the present distribution of some members of the sect. *Pilosa* on a number of very isolated oceanic islands in the Pacific region, some of which are of volcanic origin. Some of these occurrences are presumably sufficiently ancient to account for further evolution, in isolation, of characters that differentiate these taxa. For example, two taxa apparently closely related to *Blechnum deltooides*, *Blechnum feani* (E.D.Br.) T.C.Chambers and *Blechnum tovii* (E.D.Br.) T.C.Chambers, appear to have evolved on one island of the Marquesas (Hiva Oa) while *B. deltooides* itself is recognised here as a variable species, which occurs in New Zealand, where it is widespread, and in south-eastern Australia. Other examples of isolated taxa, belonging to the Section *Pilosa*, are found on relatively small distant islands in the Pacific region. These include *Blechnum nukuhivense* E.D.Br. endemic to the island of Nukuhiva in the Marquesas, *B. venosum* from Nukuhiva but also from Rapa in the Tubuai Islands with a possible record from Pohnpei (Ponape) in the Caroline Islands in Micronesia, *B. glabrescens* T.C.Chambers & Sykes from Rarotonga (Cook Islands), Western and American Samoa, with additional records from Aneityum (Vanuatu), as well as *Blechnum megavulcanicum* T.C.Chambers from Bougainville and the Solomon Islands. These are here interpreted as further probable examples of evolution in isolation.

In terms of what may be much older Gondwanan distributions, the taxa occupying ancient land masses that were until 116 million years ago more closely connected would include the Malesian and possibly the Papuanian *Blechnum vulcanicum* and the closely related *Blechnum pilosum* (Brack.) Brownlie from Fiji. Subsequent evolution and distribution appear to have resulted in *Blechnum aequabile* T.C.Chambers in Fiji as well as on Upolu in Samoa, Rarotonga in the Cook Islands, Rapa in the Tubuai Islands and, in Vanuatu, the islands of Aneityum, Tanna and Espiritu Santo. It should be noted that *Blechnum vulcanicum* s.str. is poorly represented in collections from the Philippine Islands. The only Philippine specimens seen for this study were from the northernmost island, Luzon, but one would expect that this taxon may be (or has previously been, prior to over-clearing of the native vegetation) present on other islands of the Philippines.

Note on species authorship and classification

This paper is based substantially on a manuscript by the first author, T.C Chambers, who was unable to complete it due to ill health. Recognition and ranking of taxa, comments on distribution, dispersal and ecology, and any discussion of relationships are his alone. The second author has revised the key, made extensive editorial changes to the text and adjusted it to journal style; he has added the references to more recent phylogenetic work and is responsible for ensuring that nomenclature and typification accords with the International Code of Nomenclature (Turland *et al.* 2018).

The classification of Blechnaceae followed here is the more traditional, inclusive view favoured by the senior author. In the past few years, there have been a number of papers on the family resulting from DNA-based phylogenetic work (Perrie *et al.* 2014; Gasper *et al.* 2016; Pteridophyte Phylogeny Group [PPG] 2016; Gasper *et al.* 2017; Dittrich *et al.* 2017). These papers reach one of two major conclusions regarding the classification of the genus and family. Perrie *et al.* (2014) favour a view of *Blechnum* that accepts some generic segregates but is enlarged to include *Doodia*; their analysis places members of sect. *Pilosa* as strongly supported subclade in the 'Occidentale' clade, which includes the type of *Blechnum*, *B. occidentale*. The classification of Gasper *et al.* (2016) recognises multiple genera and, under this scheme, the species considered here would fall into the segregate genus *Cranfillia*.

Taxonomy

Blechnum* Section *Pilosa T.C.Chambers, *sect. nov.*

Diagnosis: All members of this section possess characteristic straight, uniseriate, colourless to buff-coloured hairs that are 2–7(–10) mm long, and normally consist of 5 to 7 cells tapering evenly from a slender base (less than 1 mm diameter) to a finer but rounded apex and varying from abundant to sparsely distributed on various parts of the sterile and fertile fronds.

Type: *B. pilosum* (Brack.) Brownlie

Rhizomes usually creeping and producing a small erect *caudex* (sometimes several) rarely more than 20 cm in height and 1.0–3.5 cm diameter and clothed by the bases of old stipes and densely clothed at the apex of the caudex with linear, acuminate to attenuate, entire, mahogany red-brown scales which in dried specimens are often spirally twisted at their apices; *caudex scales* and those at the base of stipes are entire and, in most species, concolorous; scales shed from the stipe above the basal region frequently leave a raised brown scar on an otherwise glabrous, shiny and usually stramineous surface; basal stipe scales are in some taxa intermingled with the typical hairs arising from the stipe surface. The caudex of most taxa supports a crown of relatively few (4–7) sterile fronds, and seasonally fewer lomarioid fertile fronds. The caudex may in some taxa give rise to one or more slender creeping rhizomes. *Sterile laminae* are variable in size from 15 cm or less long, and 5 cm or less wide at the base to 100 cm long and 30 cm or more, wide, and with one exception are either broadly deltoid to narrowly triangular or lanceolate, but in some taxa may tend to be ovate-lanceolate and, in one taxon, distinctly deltoid. The dissection of the lamina varies from pinnatifid to pinnatisect, and the texture from chartaceous to coriaceous, with the colour in living specimens varying from dull to bright mid-green, but more usually yellow-green to bronze on the adaxial surface. *Sterile segments* are usually fully adnate except for the basal pair (or several pairs on large fronds) which tends to be basiscopically free, distinctly falcate and often markedly deflexed. In contrast the terminal segment is often pinnatifidly lobed at its base. *Fertile fronds* in most of the taxa have longer stipes than those of the sterile frond. Fertile laminae vary from having approximately the same dimensions as sterile fronds to being significantly longer, but in most species they are distinctly narrower than the sterile fronds. *Fertile segments* are slender, linear, often contiguous and adnate, the *sorus* tending to spread at the rhachis acropically and/or basiscopically. In several species these basal fertile segment pair(s) are more distinctly falcate and sometimes spaced; hairs variable in distribution on the fertile

lamina. *Indusium* varies from red-brown to dark-brown and papery, entire to lacerate and sometimes fringed with the characteristic hairs. *Spores* bilateral, generally of the order of $34\text{--}40 \times 25\text{--}30 \mu\text{m}$ and, when viewed by SEM, have a perine that is scabrate to rugulate, enclosing a smooth to finely granulate exine.

Note: In some taxa the hairs are few and localised and may only be found by careful examination, even on well preserved herbarium specimens. On mature fronds of Australian specimens of *Blechnum deltooides*, for example, they are usually only found towards or at the base of the stipe. These hairs have in many previous publications either been omitted from descriptions or overlooked.

Chromosome numbers: chromosome counts for taxa in this group are few and are cited where available. The difficulties in cultivating mature specimens in sect. *Pilosa* have meant that it has not been possible to acquire suitable root tip material for cytological studies.

Key to species of *Blechnum* sect. *Pilosa*

1. Sterile fronds simple or pinnatifid **6. *B. nukuhivense***
- 1: Sterile fronds pinnatisect to pinnate 2
2. Sterile fronds on mature plants usually >70 cm long, sometimes exceeding 100 cm 3
- 2: Sterile fronds shorter, 8–70(–75) cm long 4
3. Rhizome short, erect; fronds often pendulous; sterile laminae with main veins of pinnae sparsely pilose to almost completely glabrous on the abaxial face [Samoa & Cook Islands] **8. *B. glabrescens***
- 3: Rhizome forming a slender, erect caudex up to 60 cm tall; sterile laminae with main veins of pinnae distinctly pilose on the abaxial face [Papua New Guinea (Bougainville) & Solomon Islands] **10. *B. megavulcanicum***
4. Sterile fronds quite short, <10 cm long [West Papua] **13. *B. humile***
- 4: Sterile fronds 10–70(–75) cm long 5
5. Scales extending well above the base of the stipe, deciduous but leaving dark spots or small tubercles 6
- 5: Scales not extending above the base of the stipe 10
6. Scales covering the entire length of the stipe; scales dense, at least 1 mm wide; caudex relatively massive, c. 8 cm wide **12. *B. venosum***
- 6: Scales on stipe 0.1–0.5 mm wide, mostly restricted to the lower part; caudex, where present, more slender, to 3.5 cm wide 7
7. Sterile lamina very broadly deltoid, >35 cm wide at base; approaching an equilateral triangle in outline [Fiji, Samoa, Vanuatu, Rarotonga, Tubuai] **2. *B. aequabile***
- 7: Sterile lamina narrowly triangular, up to 20 cm wide at base 8
8. Sterile fronds with segments usually pilose on both surfaces; adaxial surface in living material often bronze (drying to a dull fawn), mostly shortly adnate and acute at the apex and somewhat coriaceous in texture [Malesia] **1. *B. vulcanicum***
- 8: Sterile fronds not as above; segments usually pilose only on the abaxial surface [Australasia, Pacific] 9
9. Sterile lamina typically < 15 cm wide at base [New Zealand, Tasmania, Victoria] **3. *B. deltooides***
- 9: Sterile lamina typically > 15 cm wide at base [New Caledonia, Vanuatu, Tonga] **9. *B. hirsutum***
10. Sterile segments/pinnae 10 or more pairs 10–12 cm long, 1.0–1.2 cm wide, almost all spaced, sometimes up to 3 cm apart towards the base of the lamina and up to 1 cm apart towards the apex (the lowermost 3 pairs sometimes shortly stalked) [Fiji, Vanuatu] **11. *B. phanerophlebium***
- 10: Sterile segments/pinnae closely inserted, not spaced, adnate except for the basal 2–3 pairs that are basiscopically free 11

11. Sterile lamina at least 35 cm long; stipes bearing [numerous] very short hairs to c. 0.2 mm long [Fiji, Rarotonga, Samoa] 7. *B. pilosum*
11. Sterile lamina to 20 cm long [Marquesas] 12
12. Stipe of sterile frond equal to or longer than the lamina; basal stipe scales c. 10 mm long, 1 mm wide; spores c. $67 \times 56 \mu\text{m}$ 5. *B. tovii*
12. Stipe of sterile frond shorter than the lamina; basal scales c. 8 mm long, 1.2 mm wide, tending to be bicolorous; spores c. $46 \times 36 \mu\text{m}$ 4. *B. feani*

1. *Blechnum vulcanicum* (Blume) Kuhn, *Ann. Mus. Bot. Lugduno-Batavi* 4: 284 (1869)

Basionym: *Lomaria vulcanica* Blume, *Enum. Pl. Javae*, 202 (1828)

Type citation: ‘Crescit ad rupes crateri montis Gede proximas’

Type: ‘Muur over de holte aan Goenoeng Batoe,’ *Blume s.n.* (lectotype, designated by Chambers & Farrant (2001: 340): L), see note below.

Spicanta vulcanica (Blume) Kuntze, *Revis. Gen. Pl.* 1: 822 (1891)

Cranfillia vulcanica (Blume) Gasper & V.A.O. Dittrich, *Phytotaxa* 275(3): 208 (2016)

=*Lomaria villosa* Fée, *Mém. Foug.*, 5: 68 (1852)

Type: Habitat in Java, *T. Lobb* 266 (holotype: RB 144552; isotypes: BM 000801654, BM 000801655; LE 00008453)

Published illustration: Chambers & Farrant (2001, 2012) fig. 17 [a–e: NSW 408728; f: CANB 469535; and g: NSW 408720]

Rhizome creeping and forming an erect caudex 20 cm or more in height with rhizome scales mid to dark red-brown and sometimes tending to be somewhat bicolorous. *Sterile fronds* 20–40(–70) cm long and 7–20 cm wide towards the lamina base with stipes often about half the length of the frond, green-brown to bronze on adaxial surface in living material drying to a dull fawn, slender and pilose, the hairs usually dense and persistent over most of the frond; scales at base of stipe linear, slender, acuminate, entire, concolorous dark red-brown, shiny, 10–25 mm long, 1–3 mm wide and persistent; deciduous scales on the remainder of the stipe leave a raised dark scar on the otherwise pale smooth stramineous surface. *Sterile lamina* linear-triangular, pinnatisect to pinnate, 6–30 or more pairs of adnate segments, the basal pair(s) deflexed, semi-adnate, free on their basiscopic margin; rhachis and costae stramineous to brown, densely and persistently pilose, the shiny white to fawn hairs are linear, 2–5(–10) mm long; sterile segments coriaceous, oblong, obtuse (in smaller fronds), to narrowly triangular and acuminate, (in larger fronds), slightly falcate, 4.0–8.0 cm long, 0.7–1.5 cm wide, adnate, margins thickened and crenate, veins once furcate near the costa and densely pilose. *Fertile fronds* with longer stipes usually pilose; fertile lamina variable in size, often smaller; *fertile segments* slender, linear 0.4–0.6 cm wide, often at least 1/3 longer than the sterile, and spaced and slightly dilated at the rhachis especially towards the lamina base, contiguous towards the apex; in large fronds the basal segment pairs have a linear triangular sterile area at the junction with the rhachis; *indusium* entire to erose and usually either with marginal hairs or multicellular outgrowths. *Spores* $42.5 \times 32.7 \mu\text{m}$; perine scabrous to rugulose; exine smooth to granulose or microverrucose (Chambers & Farrant 2001, 2012, fig. 1h).

Distribution and habitat: *Blechnum vulcanicum* as defined here, based on the type from Java, is found in cool, moist partly shaded habitats in forest and sometimes in more exposed grasslands and is widespread (but rarely abundant) through much of Malesia including at least in the northern Philippines, but it is apparently absent from Peninsula Malaya. It also occurs in Papua New Guinea.

Selected specimens examined: INDONESIA: Java: W. Java, Tjibodas, 1430 m, *T.G. Walker* T12763, T12784 & T12779 (BM 000801660–BM 000801662); Mt Gede, *Walker* 11229 (BM 000801663); N. side of Gede-Pangrango massif, 2500–3000 m, *Jermy* 7101 (BM 000801664); [without specific locality] *Zollinger* 3397 (LE 00008454). Sumatra: G. Sulggalan, *C.G. Matthew s.n.* (K); Kandang Badag, *Raciborski s.n.* (K, L, NSW 367498, NSW 416862). Sulawesi (Celebes): Bonthain, Boeakang, *Teysmann* 13732 (K, L 3516900). PAPUA NEW GUINEA, New Ireland: Ridge E of Weitin River, 12 km WNW of Taron, *Croft* 294, 24 Oct 1975 (NSW 408728, NSW 408726). Northern Province: W slopes of Mt Kenive, *Croft* LAE65211, 2 Aug 1974 (CANB 469535). PHILIPPINES: Luzon: Mt Banahaw, 2100 m, *M.G. Price* 2150 (NSW 408720–408721, including juveniles).

Typification: Chambers and Farrant (2001: 343) say that “the holotype was not found”. By this they meant that a single sheet collected from Mt Gede had not been located. Their lectotype was chosen from original material from Gunung Batu, which is only about 10 km NNE of Mt Gede. On the Leiden database, there are three sheets listed from this site: barcodes L 0051113, L 0051114, and L 0051115, which are labelled ‘type’, ‘holotype’,

and ‘type’ respectively. None of these sheets has been imaged and, because of the upcoming move of their herbarium, the collections are now not physically accessible for checking (Roxali Bijmoer, *pers. comm.* 2018). However, the senior author’s notes suggest that the sheet with barcode L 0051115 is the lectotype, chosen because “it appears to be the only authentic material with a fertile frond”.

Notes: 1. The species was named from the type locality on the slopes of a volcano in Java, but it is not restricted to such habitats.

2. As noted above, the name *Blechnum vulcanicum* has been variously applied incorrectly to a number of geographically isolated, morphologically distinct populations and is here applied only to Malesian material.

3. The Malesian material still shows some variation but is here treated as a single taxon. The sterile fronds are densely and persistently pilose usually on both adaxial and abaxial lamina surfaces, with pale brown or fawn hairs also present on the rhachis, costae and veins. Some populations lack the hairs at the base of the stipe towards the zone of persistent scales.

4. There is a wide range of frond size through the Malesian region. Generally, plants with larger sterile fronds tend to have segments with acuminate apices while those with smaller fronds tend to be obtuse, and large sterile fronds may have more than two pairs of basal segments strongly deflexed and not fully adnate to the rhachis. There is considerable variation between populations in the distribution and density of the hairs on the fertile segments. Frequently the basal fertile segments have a small sterile photosynthetic area at the junction with the rhachis.

5. It should be noted that plants occasionally give rise, from the apex of the caudex, to one or more slender creeping stoloniferous rhizomes 0.2–0.3 cm in diameter that are sparsely clothed with short slender linear-triangular, acuminate, entire reddish-brown scales.

6. Copeland (1960) reports that the Philippine specimen that he had examined (from Mt Canlaon on the island of Negros) was glabrous, but all Philippine specimens examined by the senior author are markedly pubescent.

2. *Blechnum aequabile* T.C.Chambers, *sp. nov.*

Diagnosis: Both sterile and fertile fronds linear–triangular in outline; sterile fronds with segments tending to be chartaceous, slightly bronzed on the adaxial surface and with 6–12(–25) pairs of segments; fertile lamina somewhat similar in outline but sometimes more slender; the characteristic hairs usually abundant on most surfaces.

Type: Fiji: Vanua Levu: Mt Delaikoro, 1000 m, Apr 1962, *R.G. Robbins s.n.* (holotype: NSW 383759)

Lomaria pilosa Brack. *auct., pro parte, U.S. Expl. Exped.* 16: 125–6 (1854).

Blechnum vulcanicum var *rapense* E.D.Br., *Bull. Bernice P. Bishop Mus.* 89: 72 (1931)

Type: Rapa, Feb 1922, *E.H. Quayle XX* (holotype: BISH 1000234)

Blechnum vulcanicum auct. non (Blume) Kuhn, Brown and Brown (1931: 69); see also Copeland (1932: 46)

Rhizome an erect or sub-erect caudex up to at least 35 cm in length (but usually much shorter) and 2.5 cm diameter covered with the bases of old stipes and persistent scales which are dark brown to red-brown, linear, entire, acuminate 10–15(–20) mm long and 1.0–2.0 mm wide. *Sterile fronds* with stipes 30 cm or more long, stramineous to brown sometimes glabrous but more frequently pilose and with scales similar to those on the rhizome persistent at the base and deciduous above the base leaving brown slightly raised scars. *Sterile lamina* very broadly triangular in outline an almost equilateral triangle up to at least 45 cm long, and 38 cm or more wide at the base, pinnatisect below and pinnatifid near apex; *sterile segments* chartaceous, linear oblong, variable in width from 0.8 cm to 2.0 cm, acuminate and sometimes attenuate, the basal pair deflexed and free on the basiscopic margin and nearly always strongly falcate 6–12(–25) pairs, mid-green, pilose to almost glabrous on the adaxial surface, entire, and most with the margins pilose, the basal pair often slightly shorter and strongly falcate; rhachis brown, pilose (densely on the abaxial surface). *Fertile lamina* similarly broadly triangular, but usually slightly smaller; *fertile segments* slender, linear ± 2.5 mm wide, adnate, spaced on the rhachis and spreading at the region of attachment especially near the lamina base; hairs variable in their distribution; *indusium* brown, usually entire at maturity but some specimens slightly erose. Figure 1.

Distribution and habitat: As defined here *Blechnum aequabile* extends from the Marquesas south to the Cook Islands and west to Fiji and Vanuatu. Plants of similar form occur on Rapa I. in the Tubuai group, the extreme south eastern limit of the Society Islands. It is possible that this species also occurs on other Pacific islands but none of the specimens examined shows enough detail to be included in this taxon.



Fig. 1. *Blechnum aequabile* T.C.Chambers, from holotype (NSW 383759). **a**, habit, showing sterile and fertile fronds; **b**, basal scale; **c**, characteristic hairs; **d**, detail of sterile pinnae. Scale bar: a =12 cm; b = 0.4 cm; c = 0.15 cm; d = 2 cm. Illustration: L. Elkan.

Specimens examined: FIJI: Ovalau: *Milne* 337, 337a (K 000721921); Vanua Levu: Crest of Korotini Range, between Navitho Pass & Mt Ndelaikoro, 650–900 m, *A.C. Smith* 529 (BM 000801688, K 000721920). SAMOA: Upolu, Mt Tofua, *Graeffe* 1039 (K 000672929); Upolu, *E. Betche* 111 (K 000672933); s.loc., Mar 1878, *Whitmee*

s.n. (K 000672930–K 000672932). VANUATU: Aneityum: *s.loc.*, *Gunn & Natives s.n.* [fertile frond] (NSW 383824). Tanna: Laminaoura, *Bernardi 12918* (K 000754253, K 000754254). Espiritu Santo: West ridge above Navaka River, *Chambers s. n.* (BM); Mt Tabwemasana, N.E. slopes, *Braithwaite* (K); ‘New Hebrides’ (fertile frond), May 1903, *W.T. Quaipe s.n.* (NSW 395328). COOK ISLANDS: Rarotonga: Maungaroa summit 1650 ft (503 m), 1899 Expedition, *Cheeseman s. n.* (AK 1139791, –95, –97); Summits of mountains, *Cheeseman 752* (K); Raemaru 350 m, *W. Sykes 2585* (CHR); Te Kou, *W.R. Philipson 10435* (L). TUBUAI ISLAND: Rapa Iti: Mitiperu, Maungaeae ridge, forest edge, *Fosberg 11576* (BISH 98712, BISH 98713).

Note: *B. vulcanicum* var. *rapense* was described by E.D. Brown as being similar to, but larger than, her var. *feani* [=*B. feani*].

3. *Blechnum deltoides* (Colenso) T.C.Chambers, *comb.nov.*

Basionym: *Lomaria deltoides* Colenso, *Tasmanian J. Nat. Sci.* 1: 376 (1843)

Type citation: ‘In woods in Te Waiiti District, nearly same locality as preceding. January, 1842.’

Type: New Zealand: North Island: Shaded woods, Te Waiiti, Interior, Dec 1841, *Colenso s.n.* (holotype: WELT, barcode P003239; isotypes: [New Zealand, *Colenso 290*] K 001092698)

=*Lomaria deflexa* Colenso, *Tasmanian J. Nat. Sci.* 2: 178 (1845) non *Lomaria deflexa* Baker, *J. Bot.* 26: 226 (1888) nom. illeg. (= *Blechnum deflexum* Diels).

Type citation: ‘Dry clayey banks, sides of rivers, country between Turanga and the River Wairoa, E. Coast, Dec. 1841.’

Type: New Zealand: North Island: clayey banks, country between Poverty Bay and the River Wairoa, Dec 1841, *Colenso s.n.* (holotype: WELT barcode P003238 [in Herb Colenso]; isotype: [New Zealand, *Colenso 268* (on same sheet as *Lomaria deltoides*)] K 001092697).

=*Lomaria paucijuga* Colenso, *Trans. & Proc. New Zealand Inst.* 20: 222 (1888)

Type citation: ‘Sides of Mount Tongariro, County of East Taupo; 1887: Messrs. Owen & Hill’

Type: Tongariro, *H. Hill s.n.* (holotype: WELT, barcode P003332 ex Herb. Colenso; isotype: K 001092696). See Brownsey (1979: 288–289) for a summary of the Colenso types at WELT.

Lomaria vulcanica auct. non Blume, Dobbie (1921: 184–185)

Blechnum vulcanicum auctt. non (Blume) Kuhn, [New Zealand] e.g. Cheeseman, (1925); Crookes and Dobbie (1963: 278); Allan (1961: 84); Brownsey and Smith-Dodsworth (1989: 149); [Australia] e.g. Garrett (1996: 57); Jones and Clemesha (1981: 102, fig. 99); Duncan and Isaac (1986: 215); Chambers and Farrant (1998: 381, fig. 125D).

Published illustrations (all as *Blechnum vulcanicum*): [New Zealand Brownsey and Smith-Dodsworth (1989) fig. 190 & pl. 34F]; [Australia] Jones and Clemesha (1981: 102, fig. 99); Chambers and Farrant (1998: fig. 125D); Duncan and Isaac (1986: fig. 20.16; plate 8, figs. 2–3); Garrett (1996: photos 29, 30 – illustrating the effect of growing in full sun).

Rhizome short creeping to semi-erect forming a small, short caudex. *Sterile fronds* variable in size, usually 10–50(–68) cm long, forming a spreading crown, often pendulous, with characteristic hairs always present but variously distributed, sometimes deciduous but often persistent on abaxial surfaces; stipes 10–36 cm long, varying from about half to about equal the length of the lamina (very rarely slightly longer), pale brown; scales dark reddish brown, deciduous from the lower part of the stipe leaving dark spots or small tubercles but persistent at the base and intermingled with the characteristic, persistent straight white hairs. *Sterile lamina* mid-green to yellow-green, 8–30(–40) cm long, 4–10(–15) cm wide, narrowly oblong-deltoid, but may be elliptic when basal segments are slightly shorter; *sterile segments* adnate, sometimes falcate, obtuse in smaller fronds otherwise acute to acuminate, basal pair of segments markedly falcate, often deflexed and basiscopically free. *Fertile frond* with a relatively longer stipe; *fertile segments* 3.0–4.5 cm long, 2.0–3.5 mm wide, linear with a slightly dilated adnate junction with the rhachis, increasingly spaced towards the lamina base and the basal pair strongly deflexed and falcate; *indusium* dark red-brown, lacerate and sometimes fringed with the characteristic hairs. *Spores* 29 (24–33) × 41 (36–47) μm; perine smooth (under light microscope) but scabrate to rugulate under SEM with the envelope slightly larger than the exine which is smooth to granulate (Large & Braggins 1991).

Chromosome number: [New Zealand] *n*=34 (Brownlie 1954: 666, under the name *B. vulcanicum*); [Australia] *n*=33 (Quinn 1961: 5, under the name *B. vulcanicum* – vouchers from Hellyer Gorge and Collinsvale).

Distribution and habitat: New Zealand to south-eastern Australia, in a range of habitats from lowland to montane forests on the three main islands. In the North Island occurs at low altitudes from the Bay of Islands in the North southwards becoming more frequent on forest margins and in montane forest habitats and often to be found colonising damp earth-banks in roadside cuttings. In the South Island present in suitable habitats from sea-level to montane forest and mountain shrub/grassland; at its southern limit on Stewart Island it is present at lower altitudes. In Tasmania, it occurs frequently in lowland to mountainous areas, especially in western and south-western districts, and is found in cool humid habitats, often on moist cliffs and near waterfalls. On mainland Australia, it is confined to the Snowy Range in Eastern Victoria where it is extremely rare and localised.

Selected specimens: NEW ZEALAND: North Island: Coromandel Peninsula, on Kaitarakihi Track, 1971, *Parris 01484* (NSW 367511); Taurewa (west of Mt Tongariro), *Chinnock s.n.* (NSW 367506); Rotorua, pumice lands, 10 Mar 1932, *Reid s.n.* (NSW 367501); Kakahi, Upper Wanganui River, *G. Smith s.n.* (NSW 367503 ex herb. Cheeseman). South Island: Tennyson Inlet, Marlborough Sounds, *Hynes s.n.* (AK 120392); Marlborough, Wakamarina riverbed, 6 Nov 1991, *Douglass, Banks & Glasson 34/91* (NSW 653045, ex CHR 474115); Otira Gorge, *Tindale s.n.* (NSW 367502); Upper Maitai Valley, Nelson, *Chambers 255* (AK 166941); Plantation Drive, Dunedin, *Chambers 191* (AK 166956); Summit Haast, 11 Feb 1983, *Tindale 7036 & Sykes* (NSW 367509). Stewart Island: s.loc., 29 Mar 1954, *Mrs Willa 364* (AK 166949); Mill Bay, Halfmoon Bay, *Hynes s.n.* (AK); Ringa Ringa, *Lysaght 76* (BM – See note 5 below). AUSTRALIA: Tasmania: Gordon River, Jan 1937, *G.L. Davis & F.L.C. Davis s.n.* (NSW 363613); Franklin River, 7 Feb 1845, *R.C. Gunn 1522* (NSW). Victoria: Bryce Gorge, 5 Jan 1981, *N.G. Walsh 2484* (MEL 1581085, NSW 363615); Bryce Gorge, Snowy Range, 17 Apr 1986, *N.G. Walsh 1596* (MEL 1549457, NSW 363614).

Typification: 1. The date of Colenso's publication of the name *Lomaria deltooides* was 3 February 1843 (Plomley 1969). The type bears a different date from that given in the protologue but the date on the specimen is incorrect. The synopsis of Colenso's travels (St George 2009) shows that he did not reach Te Waiti [now Te Whaiti] until January 4, 1842 but it also shows that he would have collected the type of *L. deflexa* in the latter half of December 1841. The documentation presented by St George (2009: 163) indicates unquestionably that the specimens of both taxa sent by Colenso to Hooker were part of the same gathering as those in WELT. Colenso's shipment to Kew was sent via Sydney, from where it did not depart until April 1843 (St George 2009: 178), well after the date of publication of the name. The duplicates at K are numbered according to Colenso's list and are now mounted on a single sheet that comprises one sterile and three fertile fronds. Under these circumstances, it is reasonable to consider the types at WELT to be holotypes and the subsets at Kew to be isotypes.

2. The much later synonym, *Lomaria paucijuga* Colenso, is at the smaller end of the size range with 5 or 6 pairs of obtuse segments, typical of populations in comparable habitats. The holotype at WELT is a poor specimen, consisting of two detached fronds. The main part of this collection was apparently sent to Kew in May of 1890, making it an isotype. The Kew specimen consists of four fronds attached to part of the rhizome and shows two severed stipes where the fronds at WELT were presumably detached. Colenso's annotation “ $\frac{2}{3}$ rds of my spns” supports the view that this isotype is the greater part of the type collection, despite the lack of mention of Hill as collector.

Notes: 1. *Blechnum deltooides* is a variable taxon and much of this variation is to be seen in Colenso's types which almost certainly represent morphological variations in response to extreme ecological conditions. Colenso's earliest description of *Lomaria deltooides* covers much of the variation described in more detail in his later publications; Colenso's *Lomaria deflexa* is at the larger end of the range with 22 pairs of acuminate segments ciliated on the margins. The type of *Lomaria deltooides* Colenso is from a smaller plant that lacks hairs on the segment margins.

2. Most of the New Zealand material tends to have segments that are often pilose and have distinctive pale brown, entire scales with the segment margins slightly thickened; the hairs tend to be shed as fronds mature and the hairs even on the abaxial surface of the sterile segments are often mostly lost. Some of these individuals have stipes where the degree of hairiness approach that of the New Caledonian *Blechnum hirsutum* Rosenst., a species with much larger fronds.

3. In several populations from the western side of the South Island, as well as in all south-eastern Australian populations, the hairs on mature fronds are confined to the region of the basal stipe scales. The Australian plants also tend to have longer laminae than their New Zealand counterparts, and have segments that are more consistently acuminate, these minor variations suggesting quite recent differentiation of populations across the Tasman.

4. The two vouchers of '*Blechnum vulcanicum*' that were sampled by Perrie *et al.* (2014) have not been examined but the localities of the specimens Perrie 3461 & Shepherd from North Island, New Zealand and R.K. Wilson 73 from Bryce Gorge in Victoria, indicate that they are undoubtedly representatives of this species. The phylogenetic analysis of Perrie *et al.* (2014) shows very little molecular divergence between these samples, further emphasizing the close relationship of the populations.

5. The New Zealand specimen from Ringa Ringa, A.M. Lysaght 76 (BM), along with several other specimens, were annotated in 1956 by the late A.H.G. Alston as '*Blechnum (Lomaria) deltooides*' suggesting that he had come to the same taxonomic opinion as presented in the present revision.

4. *Blechnum feani* (E.D.Br.) T.C.Chambers, *comb. et stat. nov.*

Basionym: *Blechnum vulcanicum* var. *feani* E.D.Br., *Bull. Bernice P. Bishop Mus.* 89: 72, fig. 14A a, b (1931)

Type citation: 'Marquesas, Hivaoa, Feani, altitude 700 meters, December, 1921, Brown no. 1086'

Type: Marquesas: Hiva Oa, Feani, 800 m, Dec 1921, F.B.H. & E.D.W. Brown 1086 (lectotype here designated: BISH 98739, barcode BISH 1000233; probable isoelectotypes: Hivaoa, 800 m, Dec 1921, F.B.H. & E.D.W. Brown 1086 (BISH 496105–6, n.v.).

Published illustration: Brown and Brown (1931: fig. 14A)

Scales on *caudex* and at base of the stipes 8 mm long and 1.2 mm wide, membranous but denser and darker-brown along their mid-region. *Sterile fronds* with stipes shorter than the lamina, to c. 8 cm long; *sterile lamina* ovate, 13–18 cm long and up to c. 9.5 cm wide; *sterile segments* 8–11, acute to acuminate; the basal pair semi-adsnate and deflexed; hairs present on rhachis, costae and on the abaxial surface of the segments, especially on the veins and margins. *Fertile fronds* shorter than the sterile fronds; *fertile lamina* at least half the width of the sterile lamina and with stipe c. 7 cm long and pilose. *Spores* c. 46 × 36 μm (Brown and Brown 1931: 72).

Distribution: From the limited information available, the species is endemic to the island of Hiva Oa in the Marquesas Group in French Polynesia.

Etymology: The name is taken from Mt. Feani, one of two major peaks on Hiva Oa. The epithet is, therefore, indeclinable.

Notes: 1. Brown and Brown (1931) report that this taxon resembles the New Zealand taxon *B. deltooides* but in *B. feani* the scales at the base of the stipe are shorter and have opaque cells along their mid-region.

2. The only specimens examined are those listed as types. A single sheet of Brown & Brown 1086 is here chosen as lectotype. Three of the elements on this sheet have small tags with the hand-written text '1086 TYPE var. feani'; the remaining collections bearing the number '1086' have not been seen and could not be assessed as definite isoelectotypes. The paratypes, both from Hiva Oa, are: northeast slopes Mt. Timetiu, 700 m, 23 Feb 1929, Mumford & Adamson 41 (BISH, n.v.), and Teavaimatii, 800 m, 6 May 1929, Mumford & Adamson 354 [juvenile forms] (BISH, n.v.).

5. *Blechnum tovii* (E.D.Br.) T.C.Chambers, *comb. et stat. nov.*

Basionym: *Blechnum vulcanicum* var. *tovii* E.D.Br., *Bull. Bernice P. Bishop Mus.* 89: 72, 14B a, b (1931)

Type citation: 'Marquesas, Nukuhiva, Tovii, altitude 1000 meters, July [sic], 1921, Brown no. 504 A. Type.'

Type: Marquesas, Nuku Hiva, Tovii 1000 m, 15 January 1921, F.B.H. Brown & Elizabeth D.W. Brown, 504A (holotype: BISH, barcode BISH 1021170)

Local name: on the Marquesan island of Nuku Hiva this plant is referred to by its local name *au makamaka*.

Published illustration: Brown and Brown (1931: 71) fig. 14B a, b

Rhizome forming a semi-erect, short caudex to c. 12 cm long; scales on caudex and at base of stipe both concolorous and bicolorous, c. 10 mm long, 1 mm wide, composed of thin walled cells throughout. *Sterile fronds* with stipes 15–30 cm long, more persistently pilose towards the base; *sterile lamina* 13–21 cm long, 3.5–8 cm wide, deltoid to slightly ovate, pinnatifid to pinnatisect; *sterile segments* adnate, obtuse to slightly acuminate, rhachis and veins pilose on abaxial surface, basal pair of segments basiscopically free. *Fertile frond* shorter than the sterile frond; stipes 9–13 cm long, lamina 8–10 cm long and 4.5–5 cm wide; *fertile segments* 2–3 cm long, 0.4–0.5 mm wide, linear and falcate, dilated at the adnate junction with the rhachis. *Spores* c. 67 × 56 μm (Brown and Brown 1931: 72).

Distribution: From the limited information available, this species is endemic to the Marquesan island of Nuku Hiva.

Specimens examined: MARQUESAS: île Nuku Hiva; Toovii, NW de la Haute, Taipivai [8° 51' S, 140° 08' W], 870 m, 10 Mar 1986, *J. Florence 7503* (P); Piste de Hanamenu, 29 Jul 1988, *J. Florence et al. 9622* (US).

Etymology: The epithet is indeclinable as it is taken from the name of a central plateau of Nuku Hiva with an average altitude of 800 m. The area is currently known as the Toovii Plateau, but the original spelling of the epithet should not be changed.

Notes: 1. Brown & Brown (1931) report that this taxon is confined to the island of Nuku Hiva and consistently different to, and geographically isolated from, what is here recognised as *B. feani*. It is distinguished from the latter by the long stipes, the mixture of concolorous and bicolorous basal stipe scales and the relatively slender fertile lamina, and also has much larger spores.

2. Specimen details of Brown's paratypes are as follows: *F.B.H. & E.D.W. Brown 504B, 504C, & 504D* (BISH, barcodes BISH 1021150, BISH 1021149 & BISH 1021151 respectively). Note that all original material was collected by the Browns on 15 January 1951, so the published date of July 1951 is an error.

3. Wagner and Lorence (1997) made critical comments on the quality of F. Brown's taxonomic work. However, in the present paper, the two Marquesan varieties in Brown & Brown (1931) are provisionally raised to species rank in view of the clear statement that all the specimens of *B. vulcanicum* var. *tovii* collected on Nuku Hiva "are quite distinct from the specimens [of *B. vulcanicum* var. *feani*] collected on Hivaoa" (Brown and Brown 1931: 72).

4. Unfortunately, when the senior author visited the Marquesas he was unable to land at Nuku Hiva.

6. *Blechnum nukuhivense* E.D.Br., *Bull. Bernice P. Bishop Mus.* 89: 69, figs 13a–h (1931)

Type citation: 'Marquesas, Nuku Hiva, Tovii, 1000 meters, July, 1921 Brown no. 529 A and B.'

Type: Marquesas: Nuku Hiva: *E.D. Brown 529A* (lectotype here designated: BISH 496201)

Published illustration: Brown and Brown (1931: fig. 13a–h)

Rhizome erect or semi-erect up to at least 10 cm long and 1.5 cm diameter, the apex densely scaly, the *scales* slender, linear, acuminate, up to 7 mm long, 0.5–0.6 mm wide, entire, dark brown. *Sterile fronds* with stipes 25 or more cm long, slender, 1 mm diameter, pubescent but becoming glabrous on older fronds and with scales similar to those persisting at the base of the rhizome; *sterile lamina* to 35+ cm long, 2.5–8.0 cm wide, coriaceous, and usually nearly glabrous adaxially and pilose on the abaxial face; blade variable in outline from entire, lanceolate, oblong-lanceolate and hastate at the base to coarsely and somewhat irregularly pinnatifid and with margins cartilaginous and often pilose, the apex acute to acuminate; in outline varying from lanceolate to somewhat irregular; usually nearly glabrous adaxially and pilose on the abaxial face. *Fertile fronds* the same length as the sterile or shorter; *fertile lamina* slender, linear ±5 mm wide often with two short fertile lobes at the base 1–2 cm long; if pinnate, these lobes short, distant and both acroscopically and basiscopically extending at the rhachis; *indusium* brown and entire at maturity. *Spores* (Brown and Brown 1931): 60 (48–72) × 49 (40–52) µm including an alate ridge ±4 µm, surface smooth; (present study, from *Quayle 1299B*, paratype): average of 10 spores 51 (44–56) × 37 (33–42) µm, with the perispore relatively thick and sometimes wrinkled but otherwise similar to those of *Blechnum vulcanicum* s.str.

Distribution: Endemic to the island of Nuku Hiva in the Marquesas in French Polynesia.

Specimens studied: Marquesas: Nuku Hiva: Toovii; Ooumu area; top of Tapueahu Valley, 20–22 Sep 1995, *Wood 4566* (BISH n.v., US); Tovii?, 800–1000 m, Oct 1922, *Quayle 1299B* (BISH, BM [barcode BM000801683]).

Typification: Brown and Brown (1931) cite both their numbers 529A and 529B as 'Type'. The first of these at BISH has a small tag reading '529A 1st Type sheet' confirming that they considered both sheets as type material. We here designate this sheet at BISH as lectotype.

Notes: 1. According to Brown and Brown (1931), the local name for this taxon on Nuku Hiva is *Pea moa huu* referring to the shape of a bird's tail.

2. The only material seen, other than those mentioned in the protologue, is *Wood 4566*. The cited specimens vary: *Brown 529B* and *Quayle 1299A* have shallowly pinnatifidly-lobed sterile and more deeply pinnatifid fertile laminae with the sorus extending for the length of the rhachis, while *Quayle 1299B* has entire sterile laminae, sometimes with lobed bases, and fertile laminae with a single pair of narrow lobes arising at the lamina base.

3. The variable outline of the sterile fronds, some with a few outgrowths and others with outgrowths along the margins and for the full length of the frond, makes this species distinct from other members of sect. *Pilosa*

and is unique in the genus. The lamina shape appears to be phenotypically variable, suggestive of underlying genetic variation, possibly indicating hybrid or mutant origin.

7. *Blechnum pilosum* (Brack.) Brownlie, Pteridophyte Flora of Fiji 320 (1977)

Basionym: *Lomaria pilosa* Brack. in Wilkes, *U.S. Expl. Exped.* 16: 125–6 (1854)

Type citation: ‘Feejee Islands: in mountain forests; rare.’

Type: Fiji: Sandalwood Bay, *Brackenridge 10* (holotype: US 00135468, image!)

Cranfillia pilosa (Brack.) Gasper & V.A.O.Dittrich, *Phytotaxa* 275(3): 208 (2016)

Published illustrations: Brackenridge (in Wilkes, *U.S. Expl. Exped. Atlas crypt.*) pl. 15 fig. 1 a–e (1855); Brownlie (1977) pl. 35, f. 2.

Rhizome forming an erect caudex densely clothed with linear acuminate shiny dark brown scales up to 1.5 cm long and 0.2 cm wide at their bases. *Sterile fronds* with stipes 10–30 cm long, often shorter than the lamina, dark-brown at the base the remainder stramineous, and with persistent scales similar to those of the rhizome at the base; *sterile lamina* to c. 35 × 15 cm, linear-triangular, pinnatisect; segment pairs adnate except for the basal 1–3 pairs which are basiscopically free, slightly spaced on the rachis and deflexed; sterile segments up to 12 × 1.5 cm linear-oblong, obtuse or acuminate, the bases variable, widened basiscopically and acroscopically; margins entire to sinuate or irregularly serrulate; at least the abaxial face of the rachis, costa and veins densely pilose; hairs relatively short, many less than 1 mm; veins mostly once furcate. *Fertile lamina* approximately similar in dimensions to the sterile lamina on any one plant but fertile segments usually shorter than the sterile, narrow, linear, adnate and often spaced on the rachis; basal pair sometimes shortly stalked and sometimes with a short wider photosynthetic area; *indusium* brown and slightly erose. *Spores* 27 (25–29) × 40 (38–42) μm.

Distribution and habitat: Previously regarded as endemic to the high islands of the Fijian archipelago growing in rainforest habitats from near sea-level to at least middle altitudes but there are similar plants also present in Samoa and on Rarotonga in the Cook Islands group.

Specimens examined: FIJI: without location, Dec. 1904, *Goddard s.n.* (NSW 416861, NSW 395327); *Walker 36* (K 000721919); Viti Levu: Hills N of Suva, 185 m, *Chambers* (NSW 383847–8). SAMOA: without location, *Rev. Powell* (NSW 367496, NSW 416863). COOK ISLANDS: Rarotonga, Maungaroa summit area 530 m, *Sykes 2604* (CHR 399961, NSW 367510).

Notes: 1. As defined here, *Blechnum pilosum* is morphologically the taxon most closely similar to the Malesian *Blechnum vulcanicum*. A more detailed study of the two species might indicate that they are very closely related and that the lowland Fijian taxon could perhaps be considered a subspecies, a view also mentioned as a possibility by Brownlie (1977).

2. In an annotated list of the Pteridophyta of the Southern Cook Group, Brownlie (1971) concluded that this group of species needed monographic revision.

3. In the present study, it is proposed that the plants in the morphological range of the type be referred to as *Blechnum pilosum*; those populations with a relatively short but very wide lamina which approach an isobilateral triangle in outline are referred to the new species, *Blechnum aequabile*. The small lowland plants reported from Fiji, which approach the morphology of the New Zealand *Blechnum deltoides*, could be interpreted as small specimens of *B. pilosum*, but confirmation of this interpretation requires more material and study in the field.

4. There is a reference in Rosenstock (*Repert. Spec. Nov. Regni Veg.* 9: 75, 1910) to ‘*Lomaria pilosa* Bak.’ as coming from Madagascar in discussion following the description of the New Caledonian species *Blechnum hirsutum*. This was almost certainly a typographic error for *Lomaria pilosa* Brack.

8. *Blechnum glabrescens* T.C.Chambers & Sykes, *Fl. Cook Islands* 68, Plate 4 (2016)

Type: COOK Is: Rarotonga: Turangi Valley, 15 Jul 1995, *Sykes 1700/CI* (holotype: CHR 282059A–C [3 sheets])

Cranfillia glabrescens (T.C.Chambers & Sykes) Gasper & V.A.O.Dittrich, *Phytotaxa* 275(3): 208 (2016)

=*Blechnum vulcanicum* var. *giganteum* Luer., *Fil. Graeff.* 137 (1871), as ‘gigantea.’

Type: Samoa: Savai [Savaii], *Graeffe 254* (lectotype here designated: BM, barcode BM 001048317, ‘ex Mus. Godeffroy Hamburgensis’). Residual syntypes: Samoa: Savaii, montane region, *Graeffe 239* (?BM); Upolu, montane region, Mt. Tofua, *Graeffe 344* (?BM).

A relatively large plant. *Rhizome* erect, forming a short caudex and with fronds usually pendulous. At maturity both the *sterile* and *fertile fronds* are almost glabrous, linear-oblong, narrowly triangular, mid-green and more chartaceous than cartilaginous, at times almost membranous; hairs white or very pale fawn, and mostly deciduous, but on mature fronds the remaining hairs are sometimes restricted to protected abaxial areas usually near the junction of the segments with the rhachis. *Sterile fronds* may exceed 1 m in length with the stramineous stipes about one third the frond length; *sterile lamina* deltoid, the base truncate and to ± 30 cm wide; *sterile segments* adnate, entire, and contiguous towards the apex and increasingly spaced (on the basal 1/3 of the lamina of a large sterile frond segments are sometimes over 2 cm distant on the rhachis) and acroscopically lobed towards the base; on very large fronds up to 5 pairs of basal segments are free, deflexed and sessile or free on the basisopic margin; on smaller fronds one or two basal pairs of segments may be adnate on their acropetal margins. *Fertile fronds* about the same length as the sterile but the *fertile pinnae/segments* are usually longer and set at a more acute angle to the rhachis; *indusium* dark-brown and entire. *Spores* 27 (25–27) \times 38 (36–40) μm with the perispore smooth and 3–4 μm thick.

Distribution and habitat: *Blechnum glabrescens* is usually a relatively large plant. In Rarotonga it occurs in submontane and montane areas, extending from valley slopes to ridges and peaks. It is also found on Aneityum, the southernmost island of Vanuatu, and on Tutuila Is. in American Samoa, where it was found in rainforest on ridges. On the two largest islands of Western Samoa, Savaii and Upolu, it is usually found in sheltered, humid, high rainfall, sub-montane and montane forested areas (300–1400 m). On the island of Savaii this species has also been collected in sheltered hollows, colonising relatively young basaltic lava fields above 1200 m. One specimen, from a lowland forest habitat on the island of Viti Levu in Fiji (*Chambers s.n.*, NSW 383847–48), is provisionally placed here also.

Specimens studied: WESTERN SAMOA: Upolu: Jun 1880, *Betche s.n.* (NSW 367497); Mt Lanoto'o crater walls, 750 m, *Chambers s.n.* (NSW408713–408719); *Whitmee* 67 (BM). Savaii: Wet forest above Matavanu c. 1100 m, *Christophersen* 2163 (BM). AMERICAN SAMOA: Tutuila: Alava Ridge, 400 m, *Christophersen* 1129 (BM). VANUATU: Aneityum: S. Slopes of Inreo, southern ridge, 2° 11' S 169° 46' E, *Braithwaite RSNH 2113bis* (NSW 367500; NSW 416865). COOK ISLANDS: Rarotonga: Totokoitu stream valley, 91 m, *Chambers s.n.* (NSW 408710–12); Maungaroa Summit 530 m, *Sykes 2604* (CHR, NSW 41684); Te Maunga Ridge below the peak, *Chambers s.n.* (NSW408704–09); Te Kou Ridge, *Chambers s.n.* (NSW 383850–53); Raemaru, 350 m, *Sykes 2585/C1* (CHR); Totokoitu Valley, ridge in valley, between tributaries of Totokoitu Stream, *Cameron 1620* (AK).

Typification: Luerssen cited three syntypes under his *Blechnum vulcanicum* var. *giganteum*. Of these, only one has been unambiguously identified, *Graeffe 254* (BM 001048317); this is a good match for the protologue and is here chosen as lectotype. A second Graeffe collection, BM 000801650, is a possible syntype but the database record does not indicate a collecting number.

Notes: 1. Field study of this taxon on the steep, sheltered, forested walls above lakes in volcanic craters on the island of Upolu in Western Samoa confirmed that these large pendulous plants are typically found in montane forest areas on steep slopes in sheltered humid areas of high rainfall.

2. All the specimens examined in the field at these various sites have relatively sparse pale hairs with considerable variation in their density and distribution; the hairs are fragile and often many are lost from herbarium specimens. The lamina of the living plants is soft-chartaceous and bright mid-green; the lamina segments contiguous towards the apex and increasingly spaced towards the base with up to 5 pairs of basal segments either free or with the basisopic margin free and deflexed; the segments of the fertile fronds are longer than the sterile.

3. Plants from Rarotonga and Samoa are grouped together here. The Rarotongan plants have a slightly thicker sterile lamina that is broader in relation to the lamina length and the hairs, while sparse, are more persistent. The possibility that the Rarotongan populations of *Blechnum glabrescens* intergrade with *Blechnum aequabile* should be investigated.

9. *Blechnum hirsutum* Rosenst., *Repert. Spec. Nov. Regni Veg.* 9: 74 (1910)

Type citation: 'In declivibus humidis, umbrosis montis Tao, 500 m alt.; I. 1910, I. Franc no. 1429.'

Type: New Caledonia: Mt. Tao, 'escarpments humides forêts de Tao 500 m', *Franc 1429* (holotype: P, barcode P00627667; isotypes: NSW427102, P00627668, S-P-2165 (2 sheets), US0004879)

Cranfillia hirsuta (Rosenst.) Gasper & V.A.O.Dittrich, *Phytotaxa* 275(3): 208 (2016)

Blechnum vulcanicum auct. non (Blume) Kuhn, Jeanpert, *Bull. Mus. Natl. Hist. Nat.* 17: 575 (1911)

Rhizome an erect woody caudex which together with the bases of the stipes is densely clothed with persistent linear attenuate, entire, dark red-brown usually strongly bicolorous scales. *Sterile fronds* to 70 cm long or more; stipes stramineous to pale brown, long and 1/3–1/2 the length of the lamina; *sterile lamina* up to 20 cm wide near the lamina base, ovate, widening evenly for most of its length distal to the basal pinna/segment pair(s); characteristic hairs variable in their distribution but usually abundant on most parts, especially on the abaxial surfaces; *sterile segments* adnate except for the basiscopically free basal pair or pairs which are also markedly deflexed, and each segment up to 10 cm long, 1.5 cm wide, falcate, shortly acuminate but sometimes obtuse; towards the lamina apex, deeply pinnatifid, the apical segment lobed. *Fertile fronds* have stipes longer than those of the sterile fronds; fertile pinnae/segments are shorter than the sterile, 5–8 cm or longer on larger specimens and spaced on rhachis; indusium brown and deeply lacinate. *Spores* (Vanuatu: Espiritu Santo, *Chambers 2673 & 2691*): 29 (27–31) × 42 (40–44) μm.

Distribution and habitat: A species of open forest and sheltered escarpments formerly considered as endemic to New Caledonia but morphologically identical specimens from the Island of Espiritu Santo in northern Vanuatu, and specimens from Tonga, are now included here.

Specimens examined: NEW CALEDONIA: Plateau de Dogny, *Franc 1445A* (P); Dogny, La Foa, 900 m, *Franc s.n.* (BM 000801651, BM 000801652); Crete sud de la Table Unio, 900 m, *MacKee 13424* (P). VANUATU: Espiritu Santo: West ridge above Navaka River, track to Peak Santo, *Chambers 2673 & 2691* (BM); 3000–4000 ft [915–1200 m] Pic Santo ridge, 1700 m, Aug 1963, *Chambers s.n.* (BM 000801681, BM 000801682). TONGA: Tofua, inside crater, in low *Geniostoma* forest 400–450 m, *Buelow 2592c bis* (CHR); Tafahi, steep slope south of Piu, with scattered tree ferns and *Blechnum orientale* 530+ m, 3 Aug 1978, *Buelow 1261* (CHR 377543, NSW 924313).

Typification: Rosenstock's paper on New Caledonian ferns was prefaced with the following statement: "Die Originale dieser neuen Arten befinden sich im Herbarium Sr. Hoheit des Prinzen Roland Bonaparte in Paris." Therefore, the specimen from that herbarium (barcode P 00627667) is here considered the holotype; it bears a determination slip printed with 'Herb. Rol. Bonaparte' and bearing the new binomial in Rosenstock's hand.

Notes: 1. *Blechnum hirsutum* was for a long time referred to *B. vulcanicum* with which its sterile fronds share many characters, but the fertile fronds are distinctive, and their segments are usually but not always significantly shorter than those of the sterile fronds. Towards the base of the fertile lamina the segments are narrowed at the rhachis with a short sterile zone.

2. A relatively recent collection from Tahiti (*Dramet 9*, barcode P 00789250) keys to this species but the specimen differs from the above description by having much longer, spreading fertile segments. Tahitian populations of plants of sect. *Pilosa* clearly require further investigation.

3. The isotype at NSW (barcode NSW 127102) is a large plant and an exceptionally coarse-textured specimen. The scales at the base of the stipes and clothing the short caudex have a broad black central region and very slender dark red-brown margins resulting in them appearing completely black unless viewed in strong light under a binocular microscope.

10. *Blechnum megavulcanicum* T.C.Chambers, *sp. nov.*

Diagnosis: Rhizome a slender caudex up to 60 cm tall with scales tending to become bicolorous; sterile lamina linear triangular to linear-ovate up to at least 65 cm long, 34 cm broad and with 24 pairs adnate segments and up to 4 basal pairs spaced 2–3 cm and sessile to semi-adnate; fertile lamina with over 21 pairs segments with hastate bases in the basal half of the lamina, those towards apex basiscopically adnate or semi-adnate and without hastate bases.

Type: SOLOMON ISLANDS: Santa Ysabel: Summit ridge Mt Sasari near Maringe Lagoon 1097 m, 26 Oct 1963, *T.C. Whitmore BSIP 2393* (holotype: K 000754243; isotype: L 3516913)

Rhizome a slender caudex up to at least 60 cm tall; scales at the base of the stipe dark-brown with the mid region slightly darker tending to become bicolorous in most specimens. *Sterile fronds* large, often over 1 m in length; *stipes* usually shorter than the lamina, stramineous to pale brown with small dark scars where scales have been shed towards the base, otherwise glabrous and shiny; *sterile lamina* linear-triangular to linear-ovate and up to at least 65 cm long, 34 cm wide towards the base; *sterile segments* 8 cm or more long, 1.8 cm wide, up to 29 pairs of adnate, contiguous or slightly spaced pairs except for the 4 basal pairs which are 2–3 cm apart on the rhachis and either sessile or semi-adnate and deflexed with the basiscopic margin free; the remaining sterile segments towards the apex, adnate, lanceolate, acuminate to attenuate, often falcate, at maturity glabrous on the adaxial surface but densely pilose on the abaxial face, most segments are clearly separated on the rhachis by up to 1 cm, costal hairs (to 2.5 mm) while those arising from the veins and between the veins are shorter (to 1.5 mm); lateral veins only conspicuous on the abaxial surface. *Fertile fronds* with more than 21 pinnae or

segment pairs; each pinna in the lower half of the lamina with a variably hastate or small sterile leafy area at the base and those in the upper half are adnate segments without hastate lobes; *indusium* dark red-brown to almost black, ± entire at maturity.

Distribution and habitat: initially this taxon was regarded as endemic to the Solomon Islands and Bougainville, where it is present in both primary and secondary rainforest from lowland to montane habitats and develops into the largest plants within the Section *Pilosa*. However, the senior author has more recently seen Samoan specimens at Kew from the islands of Upolu and Savaii collected by Reinecke in 1895 & 1897 which although fragmentary appear to match *Blechnum megavulcanicum*.

Specimens examined: PAPUA NEW GUINEA: Bougainville: S rim of lake, Loloru crater, 20 miles N of Buin, Craven 327 & Schodde (CANB 148958–59; BM 000801665–66). SOLOMON ISLANDS: New Georgia Group, Kolombangara Is.: West Coast inland from Merusu Cove 1200 m, Whitmore & Grubb 2097 (K 000754244, L); SW Irii, ridge-top 1500–1600 m, Glenny 2377 (WELT); Mt Veve 1380 m, Glenny 3139 (WELT 3 sheets); S. Kolombangara summit 1627 m, Braithwaite RSS 4382 (CANB 469578, K 000754240–42); Ghizo I. 130 m, Glenny 2414 (WELT); Guadacanal: Mt Chonapau [Jonapau], 1230 m, Glenny 3552 (WELT); Mt Popomanatseu, 1810 m, Braithwaite 4732 (CANB 469577; K 000754247–249); Jonapau 910 m, E.S. Brown 2452 (BM); Mt Jonapau 1261 m, G.F.C. Dennis 6 (BM).

SAMOA: Savaii: Mangaloa, Reinecke 162 (K 000672934); Upolu: Vaipuna, Reinecke s.n. May 1895 (K 000672936); Savaii, above Aopo 1902 larva field 1200–1400 m, Christophersen 899 (K 000672935).

11. *Blechnum phanerophlebium* Baker ex C.Chr., *Bull. Misc. Inform. Kew* 1939: 28 (1939)

Type: Fiji: Viti Levu, sources of the Wai ni malu, 1877–78, Horne 939 (holotype: K 000721923)

? *Blechnum vulcanicum* var. *lobatum* Luer., *Fil. Graeff.* 137 (1871) as ‘lobata’

Type citation: ‘Viti-Inseln. Ovalau: Graeffe unter no. 102!’

Type: Fiji: Ovalau: Graeffe 102 (n.v.)

Rhizome erect or sub-erect with scales dark mahogany-red to dark-brown, lanceolate acuminate and entire. *Sterile fronds* with similar scales persisting at the base of the stipe the remainder of which is 15–20 cm long, stramineous and glabrous; *sterile lamina* linear-triangular to ovate-lanceolate, 25–30 × 15–20 cm, pinnate chartaceous and with very few of the characteristic hairs which at least on mature specimens are confined to the more protected abaxial surfaces; *sterile segments* 10–12 cm long, 1.0–1.2 cm wide, 10 or more pairs, opposite, sub-opposite to alternate and spaced 1–3 cm on the rhachis, acuminate, entire, adnate but towards the lamina base increasingly constricted at the rhachis; the basal pair or pairs of pinnae are slightly hastate and sub-petiolate; towards the apex segments adnate and reduced in length, the terminal segment pinnatifidly lobed at its base and significantly longer than the sub-terminal pairs. *Fertile fronds* sometimes longer and with longer stipes; *fertile segments* adnate grading to shortly petiolate towards the lamina base; *indusium* dark-brown with a crenate margin. Spores 31(29–33) × 41 (38–44) µm; perine 3–4 µm thick and scaberulous; exine smooth.

Distribution and habitat: The senior author has not seen live specimens in the field, but several collectors describe the habitats from which this species has been collected as very damp, in some cases dark and in others collected on the forest or woodland margins. The few herbarium specimens observed in the present study come from Fiji and Vanuatu, with a possible record from the Solomons (see note 4 below).

Specimens examined: VANUATU: Erromanga: Nouankau River Bridge, 17 km west of Ipota, 140 m, Braithwaite RSNH 2264 (NSW 367499). FIJI: Viti Levu: Nanua River between Uiwai and Laselase, Namosi about 1000 ft (300 m), 1877–78, J. Horne 812 (K 000721922).

Notes: 1. A rarely collected taxon that was not recorded in the recent revised checklist of Fijian ferns and lycophytes (Brownsey and Perrie 2011). The species has very few of the diagnostic hairs but there are sufficient (only found by careful searching) to indicate that it belongs to sect. *Pilosa*.

2. The specimens grouped here differ from all other taxa in sect. *Pilosa* in that almost all segments of sterile fronds are spaced, sometimes up to 3 cm apart towards the base of the lamina and up to 1 cm apart towards the distal region. Also, in some specimens, the lowermost 3 pairs are shortly stalked.

3. The few plants observed lack the scars from the deciduous scales on the otherwise typical stramineous stipes.

4. A specimen from the Solomon Islands (Guadacanal, E.S. Brown 2452, BM 000801687) is possibly a large specimen of *Blechnum phanerophlebium* possessing a number of matching characters including sparse hairs, the relatively narrow width and some spacing of the sterile segments; however the sterile lamina is more linear

than specimens from Fiji and the persistent scales at the base of the stipe are not as dark; fertile segments are much longer and the indusium is not as dark brown but its margin is crenate.

5. Luerssen's short description of *B. vulcanicum* var. *lobatum* contains insufficient detail to confidently identify it as this taxon. However, since the description of the lowermost sterile pinnae as not (or little) deflexed seems to rule out both *B. aequabile* and *B. pilosum*, this name is tentatively considered a likely synonym of *B. phanerophlebium*.

12. *Blechnum venosum* Copel., *Occas. Pap. Bernice Pauahi Bishop Mus.* 14: 62, pl. 15 (1938)

Type: TUBUAI (Austral Is.): Rapa: Taratika, east side Mount Perahu, moist bank in rainforest, 550 m, *St. John, Fosberg & Maireau 15651* (holotype: *n.v.*, specimen matching plate 15 not located; isotypes: MICH 1191204 (*ex herb.* Copeland), GH 00112368, UC 542551, US 00135472, K 000754215, BISH 496204 *n.v.*, BISH 496205 *n.v.*)

Rhizome forming a relatively massive erect or sub-erect caudex, 20 cm in height and 8 cm diameter; *scales* at the apex entire, linear, aciculate, 17 mm long, 1.5 mm wide, shiny red-brown. *Sterile fronds* with stipes (15–20 cm) usually shorter than the lamina (20–30 cm) and densely clothed throughout with similar persistent scales becoming shorter up the stipe and where they have shed leaving raised brown scars on the stramineous surface; *rhachis* similarly persistently clothed, the scales decreasing in size towards the apex; sterile lamina pinnate to pinnatifid, texture very coriaceous, veins conspicuous and costae deeply incised on the adaxial face; lateral veins very prominent on the abaxial surfaces; the characteristic hairs of sect. *Pilosa* are also present on abaxial surface of the segments, costae, and veins; *sterile segments* acuminate to attenuate 6–12 cm long, 1.2–2.2 cm wide, margins entire and sometimes revolute, adnate, the basal pair are free on their basicopic margin. *Fertile fronds* with *segments* slender, linear up to 10 cm long, 0.15–0.35 cm wide, not widely spaced on the rhachis, the sori occupying the whole of the abaxial face; hairs present but not dense on the stramineous abaxial costa; *indusium*, red-brown, papery and deeply lacerate at maturity.

Distribution and habitat: At present *Blechnum venosum* is only recorded with certainty from the Marquesas just south of the equator in eastern Polynesia and on Tubuai in the Austral Islands south of the Tropic of Capricorn in the south-central Pacific. The specimens are all reported to have come from humid rain forest environments. It is unexpected to find that, coming from such a habitat, they are so extremely coriaceous in texture.

Specimens examined: MARQUESAS: Nuku Hiva: Etoovii, épaulement SE du Mt. Tekao 1050 m, 8°51'S 140°10'W, 28 May 1983, *Florence 6813* (P 00717314).

TUBUAI (Austral Is.): Rapa: Crête S du Mt. Mamuere, 450 m, 27°36'S 144°22'W, 6 Feb 1984, *Florence 6496* (P 00717311).

Typification: There are numerous duplicates of the type number, *St. John et al. 15651* but none of the available images match the photograph of the holotype published with the protologue (Copeland 1938: 91, pl. 15), which shows a substantial caudex with about four attached fronds. Of the images on the Global Plants website, two show specimens with a caudex, barcodes UC 542551 and US 00135472, but neither matches the photograph exactly. The specimen from Copeland's own herbarium (MICH 1191204), and all other cited duplicates, show only detached fronds.

Notes: 1. With the limited material available, *Blechnum venosum* appears to be a distinct taxon. The fertile fronds are shorter than the sterile and the fertile lamina is approximately deltoid and only a little longer than its width at the lamina base.

2. It seems likely that further discoveries may extend the range and improve our understanding of both the morphology and ecology of this taxon.

3. The persistently scaly stipe, rhachis and costae give this plant a superficial resemblance to *Blechnum vestitum* and some other members of the *B. capense* group. However, the presence of the characteristic hairs and the raised scars on the stramineous stipes where scales have been shed, together with the basal pair of segments being falcate and basicopically free indicate that *B. venosum* is correctly grouped in sect. *Pilosa*.

4. Sterile material from Ponape I. [Pohnpei] in Micronesia, almost 6000 km north-west of the Marquesas, approaches this species in a number of characters but lacks the persistent scales. These specimens (*Takamatsu 945* and *Ledermann 13737*) are only tentatively identified as this taxon.

13. *Blechnum humile* T.C. Chambers, *sp. nov.*

Type: INDONESIA: Papua Province: between camps 11 and 12, Mt. Carstensz [Puncak Jaya], 28 Jan 1913, *C. Boden Kloss s.n.* (holotype: BM 000801696)

Diagnosis: *Rhizome* 1 cm long, 0.1–0.25 cm diameter, densely scaly with red-brown shiny, acuminate scales 2.5–3.5 mm long and less than 1 mm wide at their bases. *Sterile fronds* up to at least 7 cm long with stipes densely pilose with white to pale fawn hairs. Sterile lamina 4–5 cm long with 16–18 pairs of *segments*, acuminate to obtuse, strongly revolute, acuminate to obtuse 6 cm long and the *pinnae* very shortly stalked towards the lamina base with the segments adnate towards the lamina apex and pinnatifid.

Rhizome slender, semi-erect, 1 cm long and 0.1–0.25 cm diameter, densely scaly; the slender part of the rhizome giving rise to fronds at intervals and the thicker terminal region with a small crown of four fronds; *rhizome scales* red-brown, shiny, acuminate 2.5–3.5 mm long and less than 1 mm wide at their base with minute, straight, colourless marginal hairs. *Sterile fronds* up to 7 cm long, with the *stipe* and *rhachis* deeply grooved on the adaxial face and densely scaly with similar but smaller paleae than those of the rhizome (some with entire margins) and also densely pilose with minute straight white to pale fawn hairs of 3 or more cells, 0.2–0.5 mm long and distributed on all surfaces; *sterile lamina* 4.0–5.0 cm long, acuminate to lanceolate in outline and with 16–18 pairs of minute segments; *sterile pinnae/segments* 0.6 cm long and shortly stalked towards the base of the lamina becoming adnate in the mid-region and pinnatifid towards the apex, the terminal segment longer than the subterminal pairs; *sterile pinnae/segments* vary from acuminate to obtuse and are very strongly revolute; the grooved costa is conspicuous on the adaxial surface but the lateral veins tend to be obscured by the presence of numerous short white hairs; the abaxial surface of the *pinnae/segments* tends to be obscured by the revolute margins; the abaxial costa is prominent and supports minute fringed red-brown acuminate scales up to 0.3 cm long and some short hairs. *Fertile fronds* not available. Figure 2.



Fig. 2. Holotype of *Blechnum humile* T.C.Chambers (BM 000801696)

Etymology: the specific epithet refers to the small size of the only specimen available.

Notes: 1. Known only from the type collection. Boden Kloss was with the Wollaston Expedition to Dutch New Guinea (also known as the Utakwa Expedition). The expedition set out from base camp on the Utakwa River in December 1912, started their ascent of the Carstensz Peaks on 17 January 1913 and turned back short of the summit on 30 January.

2. The label merely states “11–12 28.1.13” and this is interpreted as indicating that the specimen was collected between camps 11 and 12. This was possibly just beyond the treeline since Kloss (in Ridley 1916: 5–6) noted that “above Camp XI the broad stony bed of the river was first followed and, when this was left, an open treeless

slope densely clad with scrub was traversed to the comb of the ridge” and “the first naturally open country met with was between Camps XI and XII.”

3. The pilose covering very strongly suggests the Section *Pilosa* but some of the hairs are short and relatively thick for their length. However, more complete material is required to finalise the placement of this taxon, so its placement in the sect. *Pilosa* should be considered provisional.

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