

1 **Revision of subgeneric classification in *Astelia* Banks & Sol. ex R.Br.**
 2 **(Asteliaceae)**

3
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13
 14 **Abstract**

15 Systematic investigations and phylogenetic analyses (Birch 2011, Birch et al. 2012)
 16 have indicated that *Astelia*, as currently circumscribed (Skottsberg 1934), is
 17 paraphyletic, with *Collospermum* nested within it. Further, subgenus *Astelia* is
 18 polyphyletic, and subgenera *Asteliopsis* and *Tricella* are paraphyletic, as currently
 19 circumscribed (Skottsberg 1934). Revision of the subgeneric classification of *Astelia*
 20 is warranted to ensure classification accurately reflects the evolutionary history of
 21 these taxa. *Collospermum* is relegated to synonymy within *Astelia*. *Astelia* is
 22 dioecious or polygamodioecious, with a superior ovary, anthers dorsi- or basifixed,
 23 pistillodes or pistils that have a single short or poorly defined style, a 3 lobed stigma,
 24 and fleshy uni- or trilocular fruit with funicular hairs that are poorly to well
 25 developed. Subgenus *Collospermum* Birch described. A key to *Astelia* sections is
 26 provided. Required nomenclatural revisions are presented including resurrection of *A.*
 27 *hastata* Colenso, *A. montana* Seem., and *A. microsperma* Colenso *novo parte* and the
 28 new combination *A. samöense* (Skottsberg) Birch *comb. nov.* is made.
 29

30 Keywords: Asparagales; Asteliaceae; Austral; Australia, dioecy, New Zealand,
 31 Pacific
 32

33 Introduction

34 *Astelia* Banks & Sol. ex R.Br. is the largest genus in Asteliaceae Dumort. containing
35 twenty-six species and four subspecies with an Austral-Pacific distribution. *Astelia*
36 species exhibit a range of growth forms including low, cushion-forming and tall,
37 clustered habits. *Astelia* species grow in a diverse range of habitats including coastal,
38 lowland wetlands, tropical and temperate lowland forests, tropical montane cloud
39 forests, sub-alpine heath, alpine fellfields and grasslands, and bog habitats. Many
40 *Astelia* species are facultatively epiphytic and three species are primarily epiphytic.
41 *Collospermum* Skotts. includes four species that occur in lowland forests and in
42 lowland and tropical montane cloud forests in New Zealand, the Independent State of
43 Samoa and the Republics of Fiji and Vanuatu. All species exhibit a tall, clustered
44 habit and are primarily epiphytic, although plants that fall to the ground can persist for
45 long periods.

46
47 *Astelia* and *Collospermum* share many morphological characters (Bayer et al. 1998,
48 Rudall et al. 1998). All Asteliaceae genera have branched hairs that are otherwise
49 uncommon in the Liliaceae (Bayer et al. 1998) and those of *Astelia* and *Collospermum*
50 are dense, at least in the young leaves of most species. The tomentum of *Astelia* and
51 *Collospermum* consist of a multi-celled stalk, frayed unicellular filaments that form a
52 basal wool adjacent to the stalk, and linear or ovate scales that are a single cell thick
53 (McCarthy 1928, Skottsberg 1934, L. B. Moore 1980, Rudall et al. 1998). In *Astelia*
54 the scales are linear, may be short or long, and the stalk is attached at the base of the
55 scale. In *Collospermum*, the scales are ovate, short, and the stalk is peltate. Scales
56 may be present on the adaxial and/or abaxial leaf surfaces, inflorescences, and
57 flowers. On the leaves of *Astelia* species the scales may become fused to form a
58 membranous pellicle over the leaf epidermis. *Astelia* and *Collospermum* have superior
59 ovaries that are uni- or trilocular and trilocular, respectively. Published chromosome
60 numbers for *Astelia* taxa range from $2n=60$ to $2n=210$ (Wheeler 1966, Dawson and
61 Beuzenberg 2000, de Lange et al. 2004). Darlington and Wylie (1955) proposed a
62 basic chromosome number for *Astelia* of $n=8$, but Wheeler (1966) considered the
63 basic chromosome number to be $n=5$, 7, or 35. *Collospermum hastatum* and *C.*
64 *microspermum* are the only *Collospermum* taxa for which chromosome numbers are
65 known and both have a chromosome number of $n=35$.

66
67 Skottsberg (1934) segregated *Collospermum* from *Astelia* based on the presence of
68 simple lateral racemes, dimorphism of staminate and pistillate plants, basifixed
69 anthers, long style papillae, and mucilaginous seed hairs of the former, which differ
70 from the predominantly paniculate lateral racemes, versatile anthers, and poorly
71 developed mucilaginous seed hairs of the latter (Birch 2011, Birch et al. 2012)
72 However, morphological (Bayer et al. 1998, Birch 2011), cytological (Wheeler 1966,
73 Moore 1980), and molecular (Birch 2011, Birch et al. 2012) data suggested a close
74 evolutionary relationship between these genera. Moore (1980) considered that a re-
75 evaluation of the circumscriptions of *Astelia* and *Collospermum* was warranted due to
76 the production of viable progeny from intergeneric crosses. *Collospermum*, while
77 monophyletic, was nested within *Astelia* in phylogenetic reconstructions based on
78 combined chloroplast and nuclear sequence data applying Bayesian inference,
79 maximum likelihood, and maximum parsimony criteria (Birch 2011, Birch et al.
80 2012). As a result, those authors recognized a broadly circumscribed *Astelia s.l.*,
81 including *Collospermum*.

82

83 Within *Astelia*, Skottsberg (1934) recognized three subgenera (*Astelia* Skottsbg.,
 84 *Asteliopsis* Skottsbg., and *Tricella* Skottsbg.) based on open or cushion-forming growth
 85 form, degree of tepal fusion, ovary division, and seed shape. Within these subgenera,
 86 he recognized seven sections (*Astelia* Skottsbg., *Desmoneuron* Skottsbg., *Isonuron*
 87 Skottsbg., *Micrastelia* Skottsbg., *Palaeastelia* Skottsbg., *Periastelia* Skottsbg., and
 88 *Tricella* Skottsbg.) based on leaf venation, pistillode size, seed surface features, and
 89 extent of funicle development. In phylogenetic analyses (Birch 2011, Birch et al.
 90 2012), each of Skottsberg's (1934) sections, except section *Tricella*, were
 91 monophyletic, subgenera *Astelia* and *Asteliopsis* were polyphyletic and subgenus
 92 *Tricella* was paraphyletic. A revised circumscription of *Astelia* subgenera is proposed
 93 that accurately reflects the evolutionary relationships within the genus. *CollospERMUM*
 94 is relegated to synonymy under *Astelia*. Skottsberg's sections are retained as they are
 95 monophyletic and accurately capture the extensive morphological diversity that is
 96 present within the subgenera.

97
 98 Revisions based on recognition of monophyletic taxa are proposed here. Multiple
 99 characters support the proposed circumscription of *Astelia*. All taxa are dioecious or
 100 polygamodioecious, with a superior ovary, dorsi- or basifixed anthers, pistillodes or
 101 pistils that have a single short or poorly defined style, a 3 lobed stigma, and fleshy
 102 uni- or trilocular fruit with funicular hairs that are poorly to well developed.

103

104 **Methods**

105 *Taxonomic Sampling*

106 All *Astelia* taxa (twenty-six species and three non-nominotypical varieties) and all
 107 *CollospERMUM* (four species) were included in this study. Herbarium specimens were
 108 provided to the Joseph F. Rock Herbarium (HAW) on loan from the following
 109 herbaria: Auckland War Memorial Museum (AK), Herbarium Pacificum (BISH),
 110 Allan Herbarium (CHR), Harvard University (GH), Kew Royal Botanic Gardens (K),
 111 National Herbarium of Victoria (MEL), Missouri Botanical Garden (MO), Herbarium
 112 National de Paris (P), United States National Herbarium (US), and Museum of New
 113 Zealand Te Papa Tongarewa (WELT). Type specimens were examined from BISH,
 114 MEL, P, WELT and digital images of type specimens were examined from CHR and
 115 K (Herbarium abbreviations follow Index Herbariorum (Thiers continuously
 116 updated).

117

118 *Morphological Data and Analyses*

119 Morphological data were obtained for 410 herbarium specimens (Appendix 1). Data
 120 were obtained for ten specimens per species/subspecies, including five staminate and
 121 five pistillate specimens for species with unisexual flowers. For taxa in which
 122 subspecies/morphotypes are recognized data were obtained for six specimens per
 123 subspecies, including three staminate and three pistillate specimens for subspecies
 124 with unisexual flowers. If possible, five flowers were measured per specimen, and if
 125 fewer than five flowers were present on a specimen all were measured. Measurements
 126 and scores were averaged across all specimens to give a mean value for each taxon.
 127 Flower and fruit color data were obtained from multiple sources including field
 128 observations, specimen label data, and taxon descriptions in national floras (Drake del
 129 Castillo 1893, L. B. Moore and Edgar 1976, Coode 1978, D. M. Moore 1983,
 130 Williams 1987, Wagner et al. 1999).


131

132 Morphological characters that varied at or below the genus rank were measured or


133 scored for all *Astelia* and *Collospermum* taxa in the field and/or herbarium.
134 Herbarium specimens were studied under a dissecting microscope and measurements
135 obtained using digital calipers. Pollen and seed characters were examined directly
136 from material obtained from herbarium specimens after coating with gold/palladium
137 using a Hitachi S-4800 field emission scanning electron microscope (SEM) at the
138 Biological Electron Microscope Facility, Pacific Biosciences Research Center of the
139 University of Hawai'i at Mānoa. Images were digitally processed and the final plates
140 were prepared in Photoshop 10.0.
141

142 **Taxonomic treatment**


143

144 *Astelia* Banks  l. ex R. Br. Prodr. 291. 1810. *nomen conservandum* (ref. I.C.B.N.145 (1983) No. 1111). *Type: Astelia alpina* 


146

147 *Funckia* Willd. Mag. Neuesten Entdeck. Gesamten Naturk. Ges. Naturf. Freunde148 Berlin 2: 19. 1808 149 *Hamelinia* A.Rich Voy. Astrolabe 1: 158. 1832 

150

151 Herbaceous perennials, terrestrial or epiphytic, often growing in clusters with three
 152 ramets in trigonal arrangement, some species turf-forming, rhizomatous, dioecious or
 153 polygamodioecious. Leaves: 3-ranked, caniculate, linear or ensiform; leaves usually
 154 keeled, margins erect or revolute; leaf sheath closed, with surface obscured by dense
 155 long white hairs; parallel venation, variously incrassate; tomentum composed of
 156 scales and lanate wool at base of scale stalk, scales with basal stalk or peltate.
 157 Inflorescence: a terminal panicle, sometimes reduced to a few flowers; lateral
 158 branches racemes of sub-panicles, subtended by foliaceous or membranous, linear or
 159 lanceolate spathes; peduncle tomentum composed of distinct, narrow scales with
 160 dense basal wool. Flowers: pedicillate; bracts membranous, linear or spatulate;
 161 perianth membranous or fleshy, 6 tepals in 2 series; connate at base into tube of
 162 variable length; outer tepals triangular to lanceolate, with three veins, scales present
 163 over entire surface; inner tepals linear with one midvein, scales present along midvein
 164 only. Staminate flowers: lobes recurved; stamens 6; filaments filamentous, adnate to
 165 tepals at base of tepal lobes; anthers elliptic or linear-hastate, dorsifixed and versatile
 166 or basifixed and immobile, latrorse; pistillode present, style undifferentiated or
 167 distinct; stigma not formed. Pistillate flowers: 6 reduced staminodes present, adnate to
 168 base of tepals, filament filamentous, anthers flattened, sterile; ovary superior, uni- or
 169 trilobular, placentation parietal from three placentas or axile, with subapical placentas,
 170 ovules few to many; style distinct or undifferentiated, stigmas 3. Fruit: berry, stigma
 171 typically persistent. Seeds: black, obovoid, ellipsoid, fusiform, or polygonal; testa
 172 smooth or sculptured; funicle with mucilaginous funicular hairs poorly or well
 173 developed, funicle hairs surrounding the seeds either adhering or not 

174

175 ~~*Astelia* Banks et Sol. Ex R. Br. subgenus *Astelia* Skotts. Kongl. Svenska~~
 176 ~~Vetenskapsakad. Handl. ser. 3, 14(2): 24. 1934.~~ 
 177 Flowers with a very short perianth tube (0.1–0.8 mm); anthers dorsifixed, versatile;
 178 ovary unilocular; seeds ovoid; funicle long, curved, with mucilaginous funicular hairs
 179 poorly developed that surround but do not adhere to the seed. ~~Typus: *A. alpina* R.Br.~~
 180

181 ~~section *Astelia* Skotts. Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 14(2): 26.~~
 182 ~~1934.~~

183 Low, compact; growth form (including cushion or turf forming taxa); leaves
 184 caniculate, linear, or subcylindric; reduced inflorescences bearing few flowers;
 185 staminate flowers with short filaments (0.5–1.6 mm); pistillate flowers with long
 186 outer tepals (4.5–7.0 mm); ovary unilocular, ovary height long (4.3–8.3 mm); fruit
 187 ovoid or oblong; few or many seeds per fruit (<25), seeds short and narrow; (1.1–2.0
 188 × 0.5–1.3 mm). ~~Typus: *A. alpina* R.Br.~~
 189

190 ~~Species and Distribution:~~ Australia *A. alpina* R.Br. var. *alpina*, *A. alpina* var. *novae-*
 191 *hollandiae* Skotts. Malesia *A. papuana* Skotts. New Zealand *A. linearis* Hook.f. A.
 192 *linearis* var. *novae-zelandiae* Skotts., *A. subulata* Cheeseman


193 ~~Habitat:~~ lowland (low latitudes) to sub-alpine (mid and higher latitudes) herbfields
 194 particularly on wet substrates (seeps, swamps etc.).
 195

196 **section *Palaeastelia* Skotts.** Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 14(2):
 197 24. 1934.

198 Open growth form; leaves ensiform; large inflorescences bearing many flowers;
 199 staminate flowers with intermediate length filaments (1.7–4.6 mm); pistillate flowers
 200 with short outer tepals (2.3–4.4 mm); ovary unilocular, ovary height intermediate
 201 (3.2–4.2 mm); fruit ovoid, many seeds per fruit (<20); seed intermediate length and
 202 narrow (2.4–2.9 × 1.2–1.3 mm). ~~Typus: *A. hemichrysa* (Lam.) Kunth designated here.~~
 203

204 ~~Species and Distribution:~~ Mascarene Islands, Reunion Island. *A. hemichrysa* (Lam.)
 205 Kunth

206 ~~Habitat:~~ forest.
 207

208 **Remarks:** Phylogenetic  analyses indicate that **subgenus *Astelia***, as circumscribed by
 209 Skottsberg (1934), is polyphyletic (Birch 2011, Birch et al. 2012). **Subgenus *Astelia*** is
 210 revised to include **sections *Palaeastelia*** and ***Asteliella***, which form a clade. **Section**
 211 ***Desmoneuron*** is placed in a different clade and it is excluded from **subg. *Astelia***.
 212
 213

214 ~~*Astelia* subgenus *Asteliopsis* Skotts.~~ Kongl. Svenska Vetenskapsakad. Handl. ser.
 215 3, 14(2): 46. 1934.
 216

217 Flowers with a short perianth tube (0.2–1.1 mm); anthers dorsifixed, versatile; ovary
 218 uni- (sect. ***Desmoneuron***) or trilocular (sect. ***Ison neuron***); seeds obovoid, obovoid-
 219 reniform, or turbinate-polygonal; funicle ribbed, mucilaginous funicular hairs well
 220 developed that surround but do not adhere to the seed; ~~Typus: *A. trinervia* Kirk~~
 221 designated here.
 222

223 **section *Desmoneuron* Skotts.** Kongl. Svenska Vetenskapsakad. Handl. ser. 3,
 224 14(2): 34. 1934.

225 Open growth form; leaves ensiform with a group of three subequal lateral nerves
 226 conspicuous in lower half; inflorescences bearing many flowers; staminate flowers
 227 with short filaments (0.6–2.1 mm); pistillate flowers with short outer tepals (1.9–4.2 ×
 228 0.7–1.8 mm); ovary unilocular, short (1.3–2.8 mm); fruit ampulliform, many seeds
 229 per fruit (8–32); seeds short and narrow (1.4–1.8 × 0.5–1.0 mm). *Typus*: *A. trinervia*
 230 Kirk designated here.

231

232 *Species and distribution*: New Zealand *A. solandri* A.Cunn., *A. trinervia* Kirk.

233 Society Islands, Tahiti: *A. nadeaudii* Drake & F.Br.

234 *Habitat*: Temperate forest (*A. solandri* and *A. trinervia*) and tropical montane cloud
 235 forest (*A. nadeaudii*).

236

237 **section *Isoneuron*** Skotts. Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 14(2): 51.
 238 1934.

239

240 Open growth form; leaves ensiform; inflorescences bearing many flowers; staminate
 241 flowers with short filaments (0.6–1.9 mm); pistillate flowers with short outer tepals
 242 (2.7–4.0 × 0.7–2.0 mm); ovary trilocular, intermediate length (2.2–4.4 mm); fruit
 243 ovoid, many seeds per fruit (11–18); seeds small and narrow (1.3–2.2 × 0.8–1.4 mm).
 244 *Typus*: *A. banksii* A.Cunn. designated here.

245

246 *Species and distribution* New Caledonia: *A. banksii* A.Cunn. *A. neocaledonica* Schltr.

247 *Habitat*: Lowland coastal cliffs (*A. banksii*) and lowland tropical forest (*A.*
 248 *neocaledonica*).

249

250 **Remarks**: Phylogenetic analyses indicate that subgenus *Asteliopsis*, as circumscribed
 251 by Skottsberg (1934), is polyphyletic (Birch 2011, Birch et al. 2012). **Subgenus**

252 *Asteliopsis* is revised to include **sections *Isoneuron*** and ***Desmoneuron***, which form a

253 clade. But, as **sect. *Periastelia***, is placed in a different clade, it is excluded from **subg.**

254 ***Asteliopsis***.

255

256

257 ***Astelia* subgenus *Collospermum* (Skotts.) Birch, stat. nov.**

258 Basionym: *Collospermum* Skotts. in Kongl. Svenska Vetensk. Acad. Handl. Ser. ~~III,~~
 259 ~~xiv. No. 2,~~ 73. 1934. *Typus*: *Collospermum hastatum* Colenso [Lectotypified by
 260 Moore and Edgar (1970)].

261

262 Open growth form; leaves ensiform with dark coloration at base and peltate branched
 263 hairs; inflorescences bearing many flowers; flowers with a long perianth tube (1.3–3.1
 264 mm); staminate flowers with long filaments (3.8–8.6 mm), anthers basifixed,
 265 immobile; pistillate flowers with long outer tepals (1.5–6.2 × 0.9–1.6 mm); ovary
 266 trilocular, intermediate length (2.1–4.8 mm); fruit globose or obpyriform, with many
 267 seeds per fruit (1–22); seeds ellipsoid or ovoid; small and narrow (1.3–2.1 × 0.1–1.1
 268 mm); funicle short, truncate, with well developed mucilaginous funicular hairs that
 269 adhere to the seed.

270

271 *Species and distribution*: New Zealand: *A. hastata* Colenso, *A. microsperma* Colenso

272 *pro parte*. Republic of Fiji, Viti Levu, Vanua Levu, Kandavu; Republic of Vanuatu,

273 Espiritu Santo, Tanna, Aneityum: *A. montana* Seem. Independent State of Samoa,

274 Savai'i, Upolu: *A. samoënsis* (Skotts.) Birch.

275 *Habitat*: Lowland temperate forest (*A. hastata* and *A. microsperma*) and montane
 276 tropical cloud forest (*A. montana* and *A. samoënsis*).

277

278 **Remarks**: Species ~~belonging to~~ *Collosporum* must be transferred as *Astelia* has
 279 nomenclatural priority. Synapomorphies recognized for the genus *Collosporum*
 280 (Skottsberg 1934) remain valid for **subg. *Collosporum***.

281

282

283 ***Astelia* subgenus *Tricella* Skottsberg**. Kongl. Svenska Vetenskapsakad. Handl. ser. 3,
 284 14(2): 58. 1934.

285

286 Flowers with a short (**sect. *Periastelia***) or long (**sect. *Tricella***) perianth tube (0.3–3.5
 287 mm); anthers dorsifixed, versatile; seeds ellipsoid, fusiform, or ovoid; funicle short,
 288 truncate, mucilaginous funicular hairs poorly developed; *Typus*: *A. nervosa* Banks &
 289 Sol. ex Hook.f. designated here.

290

291 **section *Tricella* Skottsberg**. Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 14(2): 58.
 292 1934.

293

294 Compact to open growth form; leaves ensiform; inflorescences bearing many flowers;
 295 staminate flowers with short or long filaments (0.8–3.5 mm); pistillate flowers with
 296 long outer tepals (2.3–5.3 × 1.2–2.6 mm); ovary trilocular, long (2.9–6.8 mm); fruit
 297 globose with few seeds per fruit (4–12); seeds long and wide (2.2–3.7 × 1.3–2.3 mm).
 298 *Typus*: *A. nervosa* Banks & Sol. ex Hook.f. designated here.

299

300 ~~*Species*~~ and distribution: Australia: *A. australiana* (J.H. Willis) L.B. Moore, *A.*
 301 *psychocharis* F. Muell. New Zealand: *A. chathamica* (Skottsberg.) L.B. Moore, *A.*
 302 *fragrans* Colenso, *A. graminea* L.B. Moore, *A. grandis* Hook.f. ex Kirk, *A. nivicola*
 303 Cockayne ex Cheeseman, *A. nivicola* var. *moriceae* L.B. Moore, *A. nervosa* Banks &
 304 Sol. ex Hook.f., *A. petriei* Cockayne, *A. skottsbergii* L.B. Moore,
 305 *Habitat*: Lowland scrub (*A. chathamica*), Temperate rainforest (*A. australiana*, *A.*
 306 *fragrans*, *A. grandis*, *A. nivicola* var. *moriceae*), sub-alpine and alpine herbfields (*A.*
 307 *graminea*, *A. nervosa*, *A. nivicola* var. *nivicola*, *A. petriei*, *A. psychocharis*, *A.*
 308 *skottsbergii*).

309

310 **section *Periastelia* Skottsberg**. Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 14(2):
 311 46. 1934.

312

313 Open growth form; leaves linear or ensiform; inflorescences bearing many flowers;
 314 staminate flowers with short or long filaments (0.9–2.8 mm); pistillate flowers with
 315 long outer tepals (2.3–5.3 × 1.2–2.6 mm); ovary trilocular, intermediate length (1.8–
 316 4.6 mm); fruit globose, few seeds per fruit (4–12); seeds long and narrow (1.8–3.6 ×
 317 0.7–1.6 mm). *Typus*: *A. argyrocoma* A. Heller & Skottsberg., designated here.

318

319 ~~*Species*~~ and distribution: Austral Islands, Rapa: *A. rapensis* Skottsberg., Marquesas
 320 Islands, Ua Pou, Nuku Hiva: *A. tovii* F. Br. USA, Hawaii: *A. argyrocoma* A. Heller &
 321 Skottsberg., *A. menziesiana* Sm. ~~var. *menziesiana*~~, *A. waialealae* Wawra.
 322 *Habitat*: lowland mesic forest (*A. menziesiana*, *A. rapensis*), tropical montane cloud
 323 forest (*A. argyrocoma* and *A. menziesiana*) and alpine swamps (*A. menziesiana* and *A.*
 324 *waialealae*).

325
 326 **Remarks:** Subgenus *Tricella* is revised to include both sections *Tricella* and
 327 *Periastelia*, which form a well supported clade in phylogenetic analyses (Birch 2011,
 328 Birch et al. 2012). Section *Periastelia* is monophyletic, however section *Tricella* is
 329 present as a grade and relationships within each of these sections remain equivocal.

330

331

332 **Incertae sedis**

333

334 **Section *Micrastelia*** Skottsbo. Kongl. Svenska Vetenskapsakad. Handl. ser. 3, 14(2):
 335 56. 1934.

336

337 Low, compact, turf forming growth form; leaves caniculate; inflorescence bearing
 338 few flowers; staminate flowers with short filaments (0.6–1.9 mm); pistillate flowers
 339 with short outer tepals (2.6–3.8 × 0.8–1.3 mm); ovary trilocular, intermediate length
 340 (2.6–3.8 mm); fruit ellipsoid, many seeds per fruit (17–24); seeds short and narrow
 341 (1.1–1.7 × 0.5–0.8 mm). *Typus*: *A. pumila* (Forst.) Gaudich. **designated here.**

342

343 *Species and distribution*: Chile, Argentina, Falkland Islands: *A. pumila* (Forst.)
 344 Gaudich.

345 *Habitat*: lowland (low latitudes) to sub-alpine (mid and higher latitudes) herbfields
 346 particularly on wet substrates (seeps, swamps etc.).

347

348 **Remarks:** The relationships of **section *Micrastelia*** are poorly resolved with alternate
 349 relationships with **subgenus *Asteliopsis*** and the clade containing subgenera ***Tricella***
 350 and ***Collosperrum*** (Birch 2011, Birch et al. 2012). **Section *Microastelia*** contains a
 351 single species, *Astelia pumila*, which is a compact, turf-forming plant and dominant
 352 component of ***Asteli*** lowland in Chile, Argentina, and the Falkland Islands. As a
 353 cushion-forming species, it is morphologically divergent from taxa in **subg.**
 354 ***Asteliopsis***, which contains species with open, spreading growth form that are
 355 epiphytic or terrestrial and primarily found of the understory in lowland to montane
 356 forests. *Astelia pumila* does share morphological features with **subgenera *Asteliopsis***
 357 (e.g. short pistillode or pistil) and, alternatively, with **subgenera *Collosperrum*** and
 358 ***Tricella*** (e.g. seeds with a short, truncate funicle). The subgeneric placement of
 359 **section *Micrastelia*** remains equivocal and the section is unplaced (*incertae sedis*).

360

361 **Synoptic Key**

362

363 1. Leaf tomentum with scales with stalk attached at base; anthers versatile; pollen
 364 densely echinate; ovary/pistillode with weakly to moderately-developed
 365 mucilaginous hairs that do not adhere to seed surface on drying 2

366 Leaf tomentum with peltate scales; anthers immobile; pollen sparsely spinulose;
 367 ovary/pistillode with well-developed mucilaginous hairs that adhere to seed
 368 surface on drying **subg. Collospermum**

369

370 2. Ovary or pistillode unilocular, placentation parietal 3

371 Ovary or pistillode trilocular, placentation axile 5

372

373 3. Plants <40 cm tall; leaves generally less than 30 cm long; compact growth form
 374 including cushion and turf forming plants; inflorescence 1–few flowered

375 **sect. Astelia**

376 Plants > 40 cm tall; leaves generally greater than 30 cm long; open growth form;
 377 inflorescence many flowered 4

378

379 4. Leaves with acute apex; outer staminate tepals lanceolate, 5.0–6.4 mm long;
 380 pistillode bottle-shaped (lageniform); ovary ovoid; funicle long and curved

381 **sect. Palaeastelia**

382 Leaves with long acuminate apex; outer staminate tepals ovate, 2.5–5.0 mm long;
 383 pistillode ovoid-conical; ovary ampulliform or obpyriform; funicle short and
 384 ribbed **sect. Desmoneuron**

385

386 5. Leaves generally < 10 cm long; compact turf forming growth form; inflorescence
 387 1–few flowered **sect. Micrastelia**

388 Leaves generally > 10 cm long; compact or open growth form, but not turf
 389 forming; inflorescence many flowered 6

390

391 6. Pistillode ampulliform, < 1.2 mm long; pistillate flowers with short outer tepals
 392 (2.7–4.0 × 0.7–2.0 mm); fruit ovoid, white, pink or maroon; seeds 1.3–2.2 mm
 393 long, 11–18 seeds per fruit; funicle ribbed **sect. Ioneuron**

394 Pistillode ovoid, >1.0 mm, long; pistillate flowers with long outer tepals (2.3–5.3
 395 × 1.2–2.6 mm); fruit globose, orange; seeds 2.0–3.6 mm long, 4–12 seeds per
 396 fruit; funicle not ribbed 7

397

398 7. Perianth tube 0.8–4.0 mm long; ovary 1.6–4.6 mm; seeds fusiform and narrow
 399 (0.7–1.6 cm) **sect. Tricella**

400 Perianth tube 0.1–0.7 mm long, ovary 2.9–6.8 mm; seeds ovate and wide (1.3–2.3
 401 cm) **sect. Periaestelia**

402

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405

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 424 Biology Program, Graduate Division, Graduate Student Organization, and the Office
 425 of Community and Alumni Relations.

426

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506

507 **Figure Legends**

508 **Figure 1.** Scanning electron micrographs of *Astelia* seeds showing size, shape, and
 509 funicle characters. A. Subgenus *Astelia* section *Astelia* (*Astelia linearis* var.
 510 *linearis*; ovoid, funicle long), B. Subgenus *Tricella* section *Tricella* (*A. petriei*;
 511 ovoid, funicle short). C. Subgenus *Tricella* section *Tricella* (*A. chathamica*;
 512 ovoid, funicle short). D. Subgenus *Asteliopsis* section *Isoneuron* (*A. banksii*;
 513 polygonal-turbinate, funicle ribbed). E. Section *Micrastelia* (*A. pumila*; ovoid,
 514 funicle short). F. Subgenus *Asteliopsis* section *Desmoneuron* (*A. solandri*;
 515 obovoid-reniform, funicle ribbed). G. Subgenus *Asteliopsis* section *Isoneuron* (*A.*
 516 *neocaledonica*; obovoid, funicle ribbed). H. Subgenus *Tricella* section *Tricella*
 517 (*A. menziesiana*; fusiform, funicle short). Scale bars = 0.5 μm . SEM images
 518 created by J.L. Birch

519

520

521 **Supplementary Data**

522 **Appendix 1.** Specimens examined for generation of morphological data. Herbarium
 523 abbreviations follow Index Herbariorum (Thiers [continuously updated]). For
 524 each specimen, the following data are provided: sampled taxa, voucher specimen
 525 information [collection location, date, collector, collection number, herbarium,
 526 and herbarium accession number]

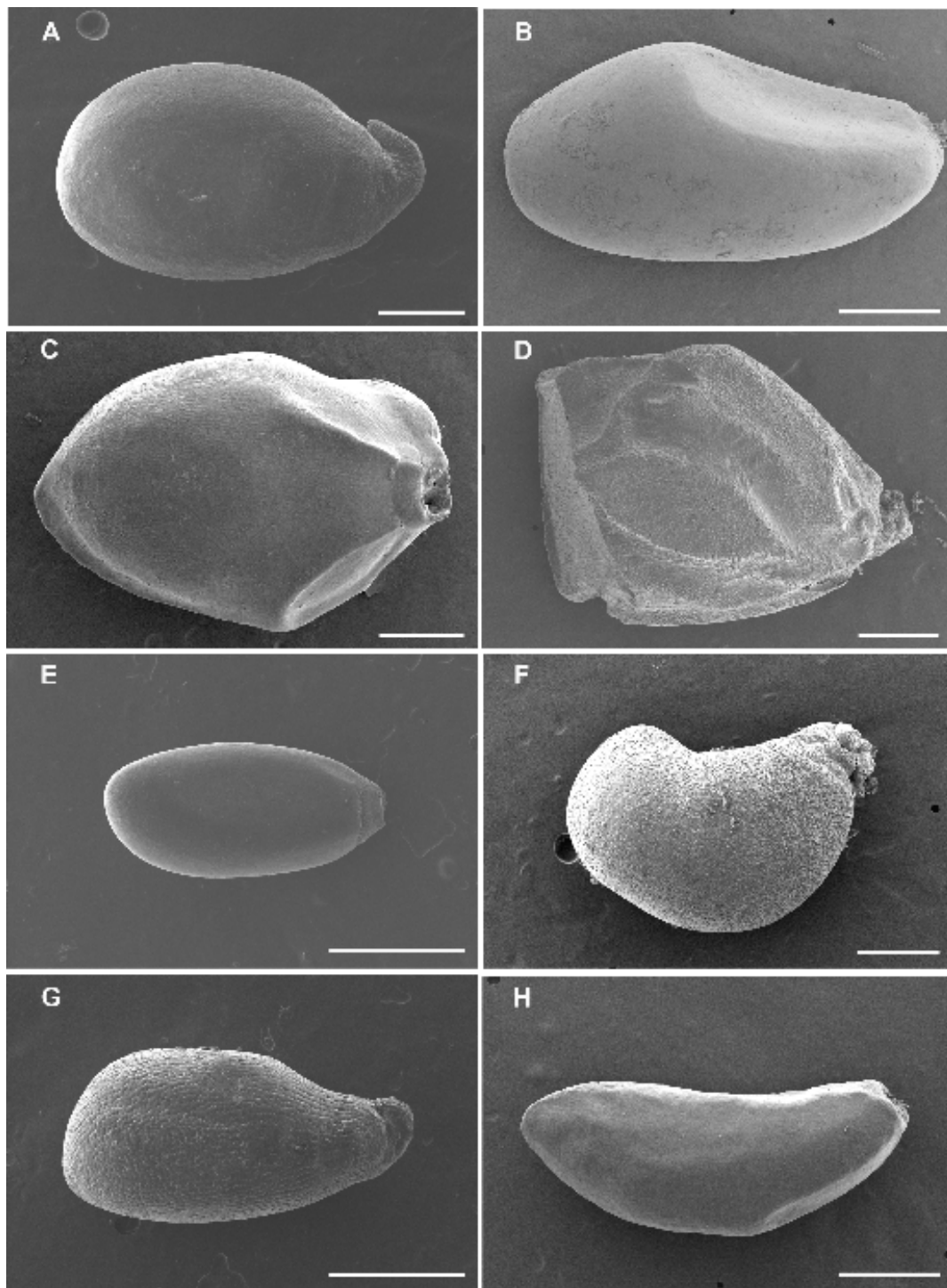
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534 **Appendix 1.**

535

536 *Astelia argyrocoma* A.Heller & Skotts. - HAWAIIAN ISLANDS. Kauai: 10-16 Sept
 537 1895, *A. A. Heller 2752* (BISH120976); Awaawaphui Trail, Honopu, 29 Dec 1956, *H.*
 538 *St. John 36004* (BISH413786); Kawaihau District, Lihue-Koloa Forest Reserve,
 539 Powerline trail from Wailua to Princeville, 27 Feb 1987, *T. Flynn 2063*, *R. Read*, *B.*
 540 *Read*, *D. Harder*, and *S. Weiss* (PTBG018401); Kawaihau District, north facing cliffs
 541 and forested slopes below Kekoiki, 9 Feb 1993, *K. R. Wood 2366*, *T. Flynn*, *D.*
 542 *Lorence*, and *S. Perlman* (PTBG014508); Na Pali-Kona Forest Reserve, Awaawapuhi
 543 Trail, 6 Dec 2007, *J. L. Birch 137*, *D. Lorence*, *K. Wood*, and *R. Aqurainja* (HAW);
 544 Na Pali-Kona Forest Reserve, Pihea Trail, 6 Dec 2007, *J. L. Birch 141*, *D. Lorence*,
 545 *K. Wood*, and *R. Aqurainja* (HAW); Koloa District, Lihue-Koloa Forest Reserve,
 546 Wahiawa Bog, 10 Apr 1987, *D. Lorence 5171*, *T. Flynn*, *R. DeLappe*, *W. H. Wagner*,
 547 *Jr.* and *F. Wagner* (PTBG018403); Koloa District, Lihue-Koloa Forest Reserve,
 548 Wahiawa Mountains, jeep road to microwave towers on Mt. Kahili, 2 Mar 1987, *D.*
 549 *Lorence 5105* and *T. Flynn* (PTBG018404); Na Pali-Kona Forest Reserve, N. W. end
 550 of Alakai Swamp, 27 Dec 1930, *H. St. John 10768* (BISH120985); Pihea trail, on the
 551 flats above Lehua maka noe, 30 Jul 1963, *W. Takeuchi 140a* (BISH507424);
 552 Wahiawa Mts., Aug 1909, *C.N. Forbes 280K* and *J. M. Lydgate* (BISH120978);
 553 Waimea Drainage Basin, west side, 3-18 Jul 1917, *C.N. Forbes 849K* (BISH120969).

554

555 *A. alpina* R.Br. **var. alpina** - AUSTRALIA. Tasmania: 1844, *M. Verreaux s.n.*
 556 (P00614764); Table Mountain, *R. Brown 5652* (K000524938); *R. Brown s.n.*
 557 (P00614768); Table Mountain, *R. Brown s.n.* (MEL727772); *R. Brown s.n.*
 558 (P00614766); *F. v. Mueller s.n.* (K000524934); Mt. Field National Park, Mt Field
 559 East, 1876, *F. v. Mueller s.n.* (K00524936); 24 Jan 1983, *S. J. Forbes 1277*
 560 (MEL1523734); 14 Feb 1989, *N. G. Walsh 2300* (MEL1577414); Mt. Field National
 561 Park, Mt. Rodway tow, 8 Jan 2009, *J. L. Birch 369* (HAW); Mt. Field National Park,
 562 Mt. Rodway tow, 8 Jan 2009, *J. L. Birch 370* (HAW); Mt. Field National Park,
 563 Uraquat Trail, 8 Jan 2009, *J. L. Birch 372* (HAW); Mt. Field National Park, Uraquat
 564 Trail, 8 Jan 2009, *J. L. Birch 373* (HAW); Cradle Mountain-Lake St. Clair National
 565 Park, Marian's Lookout trail, 11 Jan 2009, *J. L. Birch 379* (HAW); Southwest
 566 National Park, Mt. Eliza Plateau, 13 Jan 2009, *J. L. Birch 387* and *A. Buchanan*
 567 (HAW); Tasmania: Southwest National Park, Mt. Eliza Plateau, 13 Jan 2009, *J. L.*
 568 *Birch 388A* and *A. Buchanan* (HAW); Southwest National Park, Mt. Eliza Plateau, 13
 569 Jan 2009, *J. L. Birch 389* and *A. M. Buchanan* (HAW); Southwest National Park, Mt.
 570 Eliza Plateau, 13 Jan 2009, *J. L. Birch 390* and *A. M. Buchanan* (HAW).

571

572 *A. alpina* **var. novae-hollandiae** Skotts. - AUSTRALIA. Victoria: Mt. Baw Baw,
 573 1863, *B. F. v. Mueller s.n.* (P00614770); Mt. Baw Baw Alpine Resort, between
 574 summit t-bar and Painted Run t-bar, 18 Dec 2008, *J. L. Birch 343* (HAW); Mt. Baw
 575 Baw Alpine Resort, between summit t-bar and Painted Run t-bar, 18 Dec 2008, *J. L.*
 576 *Birch 344* (HAW); Mt. Baw Baw Alpine Resort, between summit t-bar and Painted
 577 Run t-bar, 18 Dec 2008, *J. L. Birch 345* (HAW); Mt. Baw Baw Alpine Resort, Village
 578 Trail, 18 Dec 2008, *J. L. Birch 346* (HAW); Mt. Buffalo National Park, Lyrebird
 579 Plains, 19 Dec 2008, *J. L. Birch 347* (HAW); Mt. Buffalo National Park, Bogong
 580 Plains, 19 Dec 2008, *J. L. Birch 348* (HAW); Mt. Buffalo National Park, Bogong
 581 Plains, 19 Dec 2008, *J. L. Birch 349* (HAW); Alpine National Park, Big River Fire
 582 trail, 20 Dec 2008, *J. L. Birch 350* (HAW); Alpine National Park, Big River Fire trail,

583 20 Dec 2008, *J. L. Birch 351* (HAW). New South Wales: Kosciuszko National Park,
 584 Kosciuszko summit trail, 30 Dec 2008, *J. L. Birch 357 and A. Beehag* (HAW).

585

586 *A. australiana* (J.H.Willis) L.B.Moore - AUSTRALIA. Victoria: Beenak, 20 Dec
 587 1970, *A. C. Beaglehole and B. A. Fuhrer ACB38542* (MEL534348); Beenak, 10 May
 588 1984, *N. G. Walsh 1244* (MEL662242); Eastern Highlands, 11 Jul 1981, *N. G. Walsh*
 589 *s.n.* (MEL 599643–44); Eastern Highlands, 18 Mar 1967, *J. H. Willis s.n.*
 590 (MEL224481–3, MEL235432); Great Otway National Park, Brown Town Track, 22
 591 Dec 2008, *J. L. Birch 352 and S. McDougall* (HAW); Otways, c. 150 m along Brown
 592 Town track from the Lavers Hill-Beech Forest road (just into State Forest on right
 593 hand side of Brown Town track), 6 Apr 1990, *R. Robinson s.n.* (MEL1581443–44);
 594 Otway Range, Browntown Road, Weeaprounah (head of a tributary of Youngs Creek),
 595 22 Nov 1990, *G. Beilby s.n.* (MEL227997–8); Pioneer Creek, +/- 4 miles S.E. of
 596 Powelltown, 22 Nov 1969, *J. H. Willis s.n. and A. Morrison* (MEL224479); Yarra
 597 State Forest, 16 Dec 2008, *J. L. Birch 342 and J. Downe* (HAW).

598

599 *A. banksii* A.Cunn. - NEW ZEALAND. *E. Cosson s.n.* (P00614762-3). Little Barrier
 600 Island: South of Parihakoakoa Stream, base of cliffs above shore, *R. Melville 6573*
 601 *and E. H. Godley* (CHR129107). North Island: Auckland, cliffs at Takapuna Beach,
 602 Apr 1887, *D. Petrie s.n.* (SP084324); Auckland, *T. Kirk s.n.* (MEL5315); Auckland
 603 Ecological Region, Awhitu Ecological District, Matakawau, end of Hatton Road,
 604 sandstone cliffs bordering Manakau Harbour, 20 Apr 2001, *P. A. Aspin s.n.*
 605 (AK253724); Omaha Islets, Eastern Northland and Islands Ecological Region and
 606 District, south end Oakura Bay, top E. side of W. islet, 26 Apr 2003, *E. K. Cameron*
 607 *11668* (AK280946, AK280988); Opotiki, Hukutaia Domain, 15 Jun 1962, *N. Potts*
 608 *s.n.* (CHR132070); Waitakere Ranges, Piha Beach, low cliff adjacent to trailhead to
 609 Laird Thomson trail, 16 Dec 2007, *J. L. Birch 228* (HAW); Waitemata, *T. Kirk s.n.*
 610 (SP084485). Poor Knights Islands: Tawhiti Rahi Island, Whangarei County, near
 611 campsite in Landing Bay, 22 Mar 1984, *A. E. Wright 6337* (AK166389, AK166423).
 612 Rakitu (Arid) Island: Hauraki Gulf, west of Te Akau Point, 6 Jan 1981, *E. K.*
 613 *Cameron A183* (AK268645).

614

615 *A. chathamica* (Skotts.) L.B.Moore - NEW ZEALAND. Chatham Islands: *J. D.*
 616 *Hector M.D. s.n.* (SP030867); Oct, *Travers 48* (MEL5298); F. v. Mueller
 617 (MEL5297); Chatham Island, *H. Travers s.n.* (SP034015A–B); *H. N. Travers s.n.*
 618 (SP033784); Chatham Islands source (cultivated at 17 Holmwood Road,
 619 Christchurch), 8 Apr 1966, L. B. Moore *s.n.* (CHR150989A–C); Chatham Islands
 620 source (cultivated at 17 Holmwood Road, Christchurch), 7 Nov 1967, L. B Moore *s.n.*
 621 (CHR181613A–D); *W. M. Martin s.n.* (SP080105A–B); Chatham Islands source (G.
 622 W. Ramsay) (cultivated in Botany division garden), 29 Feb 1972, *L. B. Moore s.n.*
 623 (CHR233293A–B). Chatham Island: 8 Sept 1966 (SP030867C,G,H); Tuku Valley,
 624 Timihunga, 19 Oct 1980, *A. M. Ringer s.n.* (AK170715). Pitt Island: Canister Cove, 5
 625 Jan 1970, *N. C. Simpson s.n.* (SP0 42759).

626

627 *A. fragrans* Colenso - NEW ZEALAND. North Island: Bay of Islands County, Puketi
 628 Forest, side ridge south of Bramley's Ridge, north of Waikape Stream, 12 Oct 1984,
 629 *P. J. Bellingham s.n.* (AK170933); Kahikatea bush, Elsthorpe Scenic Reserve,
 630 Hawkes Bay (near Otane), 28 Oct 1963, *I. M. Morice 41* (CHR146207A–B); Egmont
 631 National Park, Curtis Falls Track, *J. L. Birch 205* (HAW); Smith's Creek, Kaitoke, 19
 632 Oct 1964, *L. B. Moore s.n.* (CHR141163); South Auckland Land District, Ikawhenua

633 Ranges, Galatea, near Hikurangi Trig, 28 Dec 1993, *K. A. Ford 6/94* (CHR507187A–
 634 B). South Island: Haast side of Grassy Creek (ca. 2 miles), 3 Dec 1962, *I. M. Morice*
 635 *s.n.* (CHR133152A–C); Kahurangi National Park, Heaphy Track, 3 Jan 2008, *J. L.*
 636 *Birch 243* and *K. E. Brown* (HAW); Karamea bluffs, Plot 2, 9 Jan 1985, *P. Wardle*
 637 *s.n.* (CHR419194A–C); Kohaihai River (1 mile south of river); Murchison, 12 Oct
 638 1965, *L. B. Moore and J. Clarke s.n.* (CHR159055); Pelorus River Bridge,
 639 Marlborough, 12 Oct 1965, *J. B. Irwin s.n.* (CHR159046A–B), Resolution Bay,
 640 Marlborough Sounds, 18 Oct 1965, *J. B. Irwin s.n.* (CHR159046A–B); Taumarunui
 641 Co., Scenic Reserve at Moerangi, 21 Nov 1981, *R. O. Gardner 3165* (AK158745); W.
 642 Nelson, 1 Jan 1964, *I. M. Morice 81* (CHR146986A–E). Stewart Island: Northeastern
 643 Long Island, off Stewart Island, 8 Nov 1968, *J. Dugdale s.n.* (CHR188040).

644

645 *A. graminea* L.B.Moore - NEW ZEALAND. South Island: E Nelson, Bryant Range,
 646 5 km. S. W. of Mt. Duppa, Nov 1982, *A. P. Druce* (CHR393919); Mt. Richmond
 647 Forest Park, Dun Saddle, Maungatapu Track, 18 Jan 2008, *J. L. Birch 271* (HAW);
 648 Mt. Richmond Forest Park, Dun Saddle, Maungatapu Track, 18 Jan 2008, *J. L. Birch*
 649 *272* (HAW). NW Nelson, Boulder Lake Basin, near Darby Pond and Owen Creek, 10
 650 Apr 1966, *I. M. Morice 327* (CHR170909); NW Nelson, Douglas Range, Jan 1966, *K.*
 651 *H. Marshall s.n.* (CHR141454); NW Nelson, Gouland Downs, (grown in shade house
 652 at Lincoln), 26 Apr 1968, *J. Clarke s.n.* (CHR182561); NW Nelson, Mt. Arthur
 653 summit trail, 15 Jan 2008, *J. L. Birch 257*, *S. Courtney*, and *R. Gaskill* (HAW); NW
 654 Nelson, Mt. Arthur summit trail, New Zealand, 16 Jan 2008, *J. L. Birch 259*, *S.*
 655 *Courtney*, and *R. Gaskill* (HAW); Nelson, Granity Pass, Mt. Owen, 11 Jan 1983, *K.*
 656 *H. Platt s.n.* (CHR520447); Nelson, Travers Range, Third Basin, 23 Apr 1962, *L. B.*
 657 *Moore s.n.* (CHR125634B); Nelson, Travers Range, Third Basin, 24 Apr 1962, *L. B.*
 658 *Moore s.n.* (CHR129010A–B).

659

660 *Astelia grandis* Hook.f. ex Kirk - NEW ZEALAND. North Island: Dairy flat,
 661 Waitemata Co. 16 Dec 1963, *C. Earwaker s.n.* (CHR146924A–B); Junction of
 662 Puketaha Road/Gordontown Road, Hamilton, 14 Dec 2007, *J. L. Birch 223* (HAW);
 663 Egmont National Park, Potaema Track, 11 Dec 2007, *J. L. Birch 201A–B* (HAW);
 664 North Cape, North Cape Scientific Reserve, Ngaroku Stream, 29 Dec 1986, *R. E.*
 665 *Beever 87003* (AK176615); Northland, Karikari, Tokerau Beach, Hector Busby
 666 property, 17 Oct 2006, *M. E. Young and L. J. Forster s.n.* (AK297667–70); South
 667 Auckland province, Whanganui, 15 Oct 1895 (SP084426); W Hokio, west of Levin,
 668 Oct 1967, *A. P. Druce s.n.* (CHR179566); Waitomo Co., Waitanguru, 15 Feb 1967, *R.*
 669 *Bell and N. Potts s.n.* (CHR174847A–B). South Island: Lake Ianthe (cultivated at
 670 Lincoln), 10 Nov 1966, *J. Clarke s.n.* (cultivated) (CHR566424A–B); Moeraki
 671 Valley, South Westland, 3 Apr 1978, *P. Wardle s.n.* (CHR321183A–C); Te Kinga
 672 near Lake Brunner, 14 Nov 1965, *N. Lambrechtsen s.n.* (CHR168155A–C).

673

674 *A. hastata* Colenso - NEW ZEALAND. 1875, *M. Filhol s.n.* (P00614792). North
 675 Island: Atuanui State Forest, 6 Apr 1969, *R. E and J. Beever 236* (CHR 195414A–B);
 676 Auckland Ecological Region, Awhitu Ecological District, Pollok, S off Barthow
 677 Road, Craig's Bush, lower part eastern end, 9 Jun 2005, *P. A. Aspin s.n.* (AK294016–
 678 7); Auckland Ecological Region, Hunua Ecological District, Hunua Range,
 679 Mangatangi Kauri area, 4 Feb 1971, *I. L. Barton* (AK208895); Egmont National Park,
 680 Stony River, May 1961, *A. P. Druce s.n.* (CHR129729); Rotorua County, Lake
 681 Rotoehu, 29 Jan 1963, *R. Mason 100059* (CHR140253A–C); South Manukau,
 682 Mauku, Jun 1901 (AK222913); Tainui Ecological Region, Kawhia Ecological

683 District, Mount Pirongia, Ruapane, 13 Feb 1999, *P. J. de Lange* 3801 (AK237952);
 684 Takaka, Rameka Gorge, 22 Feb 1964, *V. M. Scott s.n.* (CHR148397); Waikanae,
 685 Wellington, 5 Feb 1966, *I. M. Morice* 312 (CHR150828A–D); Wairoa, Hawkes Bay,
 686 Jan 1886, *A. Hamilton s.n.* (AK3191); Whangarei, Maungatapere, Aug 1989, *H.*
 687 *Carse s.n.* (AK3228). Poor Knights Islands: Motukapiti Island, (summit) Nature
 688 Reserve, 20 Nov 1984, *A. Penniket s.n.* (CHR418304A-B).

689

690 *A. hemichrysa* (Lam.) Kunth - MASCARENE ISLANDS. Reunion Island: Forêt de
 691 Bébour, 26 Mar 1973, *D. O. Lorence s.n.* (MO2232208); Forêt de Bébour, 23 Feb
 692 1979, *D. O. Lorence* 2422 and *T. Cadet* (MO 2715190); Plateau de Belouve, 1956, *J.*
 693 *Bosser* 9462 (P00636603); Mozue du Tatates à Durand (?), 18 Mar 1974, *J. Bosser*
 694 *21,643* (P00636604); *I. M. Morice* P619 (CHR182114). Mauritius: Pétrin Nature
 695 Reserve, 3 Feb 1973, *D. Lorence* M53 (MO222048); Pétrin Nature Reserve, 8 Oct
 696 1978, *D. Lorence* 2100 (MO2715777).

697

698 *A. linearis* Hook.f. **var. linearis** - NEW ZEALAND. South Island: NW Nelson, Lake
 699 Sylvester, 28 Mar 1964, *L. B. Moore s.n.* (CHR148475); Lake Sylvester above Cobb
 700 Dam, 9 Jan 1961, *P. Hynes* 70325 (AK70325); Boulder Lake, Jan 1957, *A. E. Esler*
 701 *s.n.* (AK216795); Southland, Longwood Range, Bald Hill, 22 Jan 2008, *J. L. Birch*
 702 *279* and *P. Michel* (HAW); Southland, Longwood Range, Bald Hill, 22 Jan 2008, *J.*
 703 *L. Birch* 281 and *P. Michel* (HAW); Southland, Longwood Range, Bald Hill, 22 Jan
 704 2008, *J. L. Birch* 276 and *P. Michel* (HAW); Westland, 3 Nov 1985, *P. N. Johnson*
 705 *469* and *P. Wardle* (CHR420097); Denniston, near Westport, 5 Aug 1942, *I. A.*
 706 *McNeur* 25407(CHR25407); Port Pegasus, Stewart Island, *G. M. Thomson s.n.*
 707 (SP084464).

708

709 *A. linearis* **var. novae-zelandiae** Skotts. - NEW ZEALAND. North Island: *W.*
 710 *Colenso* 1587 (K000524926); Wellington Land District, Southern Ruahine Range,
 711 Mar 1971. *A. P. Druce s.n.* (CHR245761). South Island: Southland, Longwood
 712 Range, Bald Hill, 21 Jan 2008. *J. L. Birch* 280 and *P. Michel* (HAW); Fiordland
 713 National Park, Borland Saddle/Mt. Burns track, 24 Jan 2008, *J. L. Birch* 290 and *P.*
 714 *Michel* (HAW); Fiordland National Park, Borland Saddle/Mt. Burns track, 24 Jan
 715 2008, *J. L. Birch* 289 and *P. Michel* (HAW); Westland Land District, S. W. of Lewis
 716 Pass, 27 Dec 1962, *D. R. Given s.n.* (CHR142821); Wilberg Range, 27 Apr 1993, *P.*
 717 *Wardle s.n.* (CHR499828); Mt. Davy. *W. R. B. Oliver s.n.* (SP010664). Stewart
 718 Island: Port Pegasus, Bald Cove, Apr 1981. *I. M. Ritchie s.n.* (CHR372824); Rakiura
 719 National Park, Mt. Anglem, 26 Jan 2008. *J. L. Birch s.n.* (HAW); Rakiura National
 720 Park, Mt. Anglem summit, 26 Jan 2008, *J. L. Birch* 300 and *J. Blyth* (HAW).

721

722 *A. menziesiana* Sm. - HAWAIIAN ISLANDS. *J. F. Rock* 8415 (BISH121100).
 723 Hawai'i Island: ca. 0.5 miles east of National Park Road junction, 04 Aug 1964, *J. M.*
 724 *R. Crosby* and *W. R. Anderson* 1972 (BISH121099); Hawaii Volcanoes National
 725 Park, Kilauea Research Center, 13 Aug 2009, *J. L. Birch* 391 (HAW); Kau Forest
 726 Reserve, near boundary of Kapapala Forest Reserve, 1 Jul 1981, *J. Davis* 560
 727 (BISH657788); Kealakekua Ranch, S. Kona, 2 Apr 1980, *J. Davis* 274
 728 (BISH656028); Saddle Road, Kipuka No. 9. 27 July 1983, *T. Flynn* 494
 729 (PTBG019408); Olaa Forest Reserve, road from Hilo to Kulani Prison, 31 Oct 1950,
 730 *W. H. Hatheway* 441 (BISH121085); South Kohala District, Umipoho Gulch area
 731 above Koia sanctuary, 16 Oct 1995, *K.R. Wood* 4676 (PTBG033654); Waiakea
 732 mauka, July 1986, *W. Takeuchi* and *K. Shimabukuro* 2699 (BISH503251); East Maui:

733 Haleakala, upper Keanae valley, 19 Jul 1927, *O. Degener 4057* (BISH121037); Hana
 734 District, Hana Forest Reserve, above N rim of Kipahulu, 1974, *B. Harrison 395*
 735 (BISH429287); Hana District, E Haleakala, 2 mi N. E. of Paliku Cabin, N facing
 736 slope above Wai Anapanapa, *J. Henrickson and R. Vogl 3556* (BISH35823);
 737 Rainforest SW of Kaunuohua, 20 May 1982, *J. Davis 759* (BISH657637); Ukulele,
 738 1919, *C. N. Forbes s.n.* (BISH121031); West Maui: 20 Jul 1964, *M. R. Crosby and W.*
 739 *R. Anderson 1864* (BISH121024); Puu Kukui Watershed Preserve, along boardwalk
 740 to summit at mile marker 2300, 31 Oct 2007, *J. L. Birch 154, R. Bartlett, D. Cole, L.*
 741 *Dunn, and D. Tanaka* (HAW); Puu Kukui Watershed Preserve, forest below bog, 31
 742 Oct 2007, *J.L. Birch 158, R. Bartlett, D. Cole, L. Dunn, and D. Tanaka* (HAW); Puu
 743 Kukui Watershed Preserve, forest below bog, 31 Oct 2007, *J.L. Birch 159, R. Bartlett,*
 744 *D. Cole, L. Dunn, and D. Tanaka* (HAW); Molokai: Waikolu Valley, head of valley,
 745 15 Mar 1952, *O. Degener 22160 and C. Tousley* (BISH10425); between Waikolu
 746 Valley and N. Puu Alii, 10 Apr 1928, *O. Degener 4065* (BISH121013); Pepeopae
 747 Bog, 25 m after end of boardwalk through bog, 22 Jun 2007, *J. L. Birch 149 and C.*
 748 *W. Morden* (HAW); ridge E of Mapulehu Valley, 29 Dec 1932, *H. St. John 12840 and*
 749 *F. Fosberg* (BISH121017); Kawele, ridge to Pelekunu Pali, 17 Mar 1910, *J. F. Rock*
 750 *6095* (BISH121053); Oahu. Waianae Range: Mt. Kaala, 14 Sept 2007, *J. L. Birch 179*
 751 (HAW); Mt. Kaala summit trail (Waianae access), 26 Sept 2009, *J. L. Birch 393*
 752 (HAW); Mt. Kaala summit, 24 Nov 1929, *H. St. John 10071* (BISH121055);
 753 Kaukawahua gulch, N. fork, 15 May 1909, *J. F. Rock 4005* (BISH121110); Pukaloa
 754 gulch, above Schofield, off ridge trail to Puu Kalena, near Kumakalii, 16 Apr 1987, *S.*
 755 *Perlman 5640 and B. Hill* (BISH617222); Puu Hapapa, northeast ridge, 7 May 1939,
 756 *O. Degener 12382* (AK71043); Puu Hapapa, 16 Mar 1930, *E. Christopherson 1288B*
 757 (BISH121111); Puu Hapapa, 16 Mar 1930, *E. Christopherson 1288A* (BISH121113);
 758 Ridge between Puu Kanehoa and Puu Kaua, 23 Jun 1940, *O. Degener 12966*
 759 (BISH121146). Koolau Range: Kuliouou Valley, summit, 23 Jun 1935, *O. Degener*
 760 *10471, K. Park, and D. Topping* (BISH121114); N Kaaawa, 12 Apr 1931, *E. P. Hume*
 761 *189* (BISH121171).

762

763 *A. microsperma* Colenso - NEW ZEALAND. North Island: Auckland Ecological
 764 Region, Rodney Ecological District, Mt. Tamahunga, 28 Feb 1993, *M. E. Young s.n.*
 765 (AK212022); Blue Mountains, near Pinehaven, Hutt Valley, 1 Jan 1963, *I. M. Morice*
 766 *s.n.* (CHR132056A–C); Kaimai Mamaku Forest Park, Mt. Te Aroha, 13 Dec 2007, *J.*
 767 *L. Birch 248, C. Gemmill, E. Grove, and N. Wakefield* (HAW); Mangonui County,
 768 Maungataniwha Range, Feb 1908, *H. Carse 516/1* (CHR328214 A–B); Mt. Egmont,
 769 near Puniho Hut, 20 Jan 1963, *I. M. Morice s.n.* (CHR132058); Ohakune, Mt. Road,
 770 13–14 Dec 1962, *J. M. Wheeler s.n.* (CHR141652); Originally from Ruahine Range,
 771 west Tamaki River (cultivated in shade house at Lincoln), 2 Jan 1968, *J. Clarke s.n.*
 772 (CHR182141); Pureora State Forest Park, West Taupo, 26 Jan 1982, *J. E. Braggins*
 773 *97* (AK270463); Tararua Forest Park, trail to Mt. Holdsworth, 12 Jan 2008, *J. L.*
 774 *Birch 244 and S. J. Birch* (HAW); Tongariro National Park, road between Ohakune
 775 and Turoa, 17 Mar 1999, *L. Perrie and L. Sheppard s.n.* (SP083500).

776

777 *A. montana* Seem. - VANUATU ISLANDS. Aneityum: crête du Nezwon
 778 Netounemla, 21 Jul 1971, *J. Raynal and M. Schmid RSNH 16129* (CHR 298987;
 779 P00636616); Mt. Inréro, peak south of mountain, 21 Jul 1971, *P. S. Green in RSNH*
 780 *1149* (P00636643). Espiritu Santo: Mt. Tabwemasana, 17 Aug 1985, *P. Cabalion*
 781 *2816* (P000636609); Mt Tabwemasana, 2–8 Sept 1971, *C. Wee-Lek RSNH 249*
 782 (P00636644). Tanna: Mt. Toukosméreu, 29 Jul 1971, *P. S. Green 1244* (P00636642).

783 FIJIAN ISLANDS. Viti Levu: Water reserve near Suva, Jul 1965, *J. W. Dawson s.n.*
 784 (CHR170581, SP85966A–B). Vanua Levu: Thakaundrove, Natewa Peninsula,
 785 Uluingala, 15 Jun 1934, *A. C. Smith 1978* (P00636610). Kandavu: Mt. Mbuke Levu
 786 summit, 6 Sep 1860, *B. Seemann 641* (GH00029835).

787

788 *A. nadeaudii* Drake & F.Br. - SOCIETY ISLANDS. Tahiti: Mt. Aorai, 27 Apr 1858,
 789 *J. Nadeaud 250* (P0636625-28); Mt. Aorai, trail to summit from Fare Rau Ape, above
 790 Papeete on ridge east of Fautaua Valley, slopes of Rocher du Diable, 30 Mar 1973, *F.*
 791 *R. Fosberg 54,701 and M.-H. Sachet* (US2680616, US 2680617); Mt. Aorai, 14 Dec
 792 2006, *J. Meyers s.n.* (HAW); Mt. Aorai, 14 Dec 2006, *J. Meyers s.n.* (HAW); Mt.
 793 Aorai, sentier de l'Aorai, entre Fare Ata et le sommet, 15 Feb 1983, *J. Florence 4545*
 794 (P00636605); Mt. Marau, sentier du Pic. Vert., 28 Jan 1982, *J. Florence 2307*
 795 (P00636617, US3186926); Mt. Orohena, crête ouest de la Papenoo, sentier de
 796 l'Orohena, 20 Oct 1982, *J. Florence 3992* (P00636618); Tahiti, 1847, *M. J. Lépine*
 797 *s.n.* (P00636635); Tahiti, *J. Nadeaud 250* (P00636622-24). Raiatea: Mt. Toomaru,
 798 Tevaitoa, crête sommitale N. du Mt. Toomaru, 27 Nov 1987, *J. Florence 8936*
 799 (P00636640).

800

801 *A. neocaledonica* Schltr. - NEW CALEDONIA. 1868-1870, *M. Balansa 950*
 802 (P00636652); 19 Apr 1910, *M and Mme Le Rat 2874* (P00636651); *I. Franc 3125*
 803 (MO977220, MEL600656). Grande Terre: Forêt de Sailles, 5 Dec 2001, *J. Muzinger*
 804 *1244, B. Suprin and F. Carriconde* (MO5839966); Mt. Koghi, Mar 1929, *M. Franc*
 805 *2325* (P00636650); Mt. Mandjélia, 24 May 1980, *J. W. Dawson s.n.* (SP085969); Mt.
 806 Mandjélia, below radio tower ca. 5 air-km of Pouébo, 11 Apr 1980, *G. McPherson*
 807 *2531* (NTBG023027-8); Mt. Mandjélia, below radio tower ca. 5 air-km of Pouébo, 11
 808 Apr 1980, *G. McPherson 2532* (MO2922540); Mt. Mau, crête sommitale, 21 Aug
 809 1940, *M. R. Virot 284* (P0636648); Province Nord, Mont Görö Até, 19 Nov 2002, *F.*
 810 *Tronchet 469 and J. Munzinger, D. and I. Létocart, J.-P. Butin, A. Oddi, and A. Obry*
 811 (MO4781294); Province du Nord, upper Amoa River Valley, trail from Alain Obry
 812 property to Görö Até, 23 Apr 2002, *I. Létocart 5644, P. Lowry II, G. D. McPherson,*
 813 *F. Carriconde, and D. Létocart* (MO5666374).

814

815 *A. nervosa* Banks & Sol. ex Hook.f. - NEW ZEALAND. North Island: Coromandel
 816 County, Moehau summit, 2 Nov 1980, *R. O. Gardner 2763* (AK153040); Kokianga
 817 Co., Waima Forest, ridge between summit of Mount Misery and "highest point in
 818 Northland", 16 Jan 1990, *A. E. Wright 9684* (CHR192727); Egmont National Park,
 819 Ski field Road, 11 Dec 2007, *J. L. Birch 207* (HAW); Kaimai Mamaku Forest Park,
 820 Mt. Te Aroha, Waikato, *J. L. Birch 220, C. Gemmill, E. Grove, and N. Wakefield*
 821 (HAW); Otorohanga County, Ranginui summit, Rangitoto Range, 16 Dec 1981, *R. O.*
 822 *Gardner 3209* (AK158716); Table Mountain, Kauaeranga Valley, Coromandel
 823 Range, 10 Apr 1971, *I. M. Morice 484B* (CHR208245); Thames County, Lookout
 824 rocks, inland from Taran, 10 Dec 1986, *R. O Gardner 5049* (CHR484212); Tongariro
 825 (grown in cultivation at Lincoln), 10 Nov 1966, *J. Clarke s.n.* (CHR566443A–B);
 826 Waitemata County, Albany Scenic Reserve, valley lying east of Lonely Track Road,
 827 Wright's Road intersection, 6 Oct 1979, *R. O. Gardner s.n.* (AK150794); Wellington
 828 District, Tongariro National Park, ca. 1.5 km N. W. of Chateau Tongariro, nr. road to
 829 Chateau, Whakapapanui Track, 24 Mar 1970, *P. J. Edwards 74* (AK129710). South
 830 Island: Marlborough Land District, Mt. Stokes, Marlborough Sounds, Mar 1977, *A.P.*
 831 *Druce s.n.* (CHR310138); Mt. Stokes, *T. Kirk s.n.* (SP030865); Mt. Stokes Scenic
 832 Reserve, Mt. Stokes summit, Marlborough Sounds, 14 Jan 2008, *J. L. Birch 251 and*

833 *J. Little* (HAW); Mt. Stokes Scenic Reserve, Mt. Stokes summit, Marlborough
 834 Sounds, 14 Jan 2008, *J. L. Birch 252 and J. Little* (HAW); Nelson Land District,
 835 Nelson, Aniseed Valley Scenic Reserve, 1972, *G. C. and D. Kelly s.n.* (CHR230190).
 836 Arthur's Pass, Bealey Track near Margaret's Tarn, 29 Nov 1961, *R. Melville 5478*
 837 (CHR129127, AK156821); Kahurangi National Park, Heaphy Track, 31 Dec 2007, *J.*
 838 *L. Birch 237 and K. E. Brown* (HAW); Kahurangi National Park, Heaphy Track, 2 Jan
 839 2008, *J. L. Birch 240 and K. E. Brown* (HAW); Kahurangi National Park, Heaphy
 840 Track, James Mackay Hutt, 2 Jan 2008, *J. L. Birch 241 and K. E. Brown* (HAW);
 841 Kahurangi National Park, Heaphy Track, trail to Goulund Downs Hut, ca. 1 mile from
 842 Percy Hut, *J. L. Birch 238 and K. E. Brown* (HAW); NW Nelson, Mt. Arthur, 16 Jan
 843 2008, *J. L. Birch 263* (HAW); Mt. Arthur, 16 Jan 2008, *J. L. Birch 267* (HAW); NW
 844 Nelson, Boulder Lake, Orater Creek, 11 Apr 1966, *I. M. Morice 344* (CHR170919);
 845 Cobb Valley, Lake Sylvester, just above forest hut, 31 Mar 1964, *L. B. Moore s.n.*
 846 (CHR148498A–B); trail to Mt. Arthur, 15 Jan 2008, *J. L. Birch 258, S. Courtney, and*
 847 *R. Gaskill* (HAW); Mt. Arthur trail to Gordon's Pyramid, 16 Jan 2008, *J. L. Birch 260*
 848 (HAW); Takaka Hill, on road to Canaan, 11 Jan 1964, *I. M. Morice 106*
 849 (CHR146995); Nelson Lakes National Park, Ridge to Mole Tops, 14 Feb 1964, *M. J.*
 850 *A. Simpson 4115* (CHR148394); North Canterbury, Upper Clarence Valley, Mt. St.
 851 Patrick, 14 Jan 1972 (CHR 228672); Canterbury Land District, Deer Spur Walk, Peel
 852 Forest Park, Stop 5, 29 Oct 1970, *B. P. J. Molloy* (CHR212134); West Coast, Paparoa
 853 Range, Croesus track, 19 Jan 2008, *J. L. Birch 274* (HAW); Oparara Arch, 22 Jan
 854 1985, *P. Wardle s.n.* (CHR574281); St. Arnaud Range, 11 Dec 1950, *W. R. B. Oliver*
 855 *s.n.* (SP010631). Fiordland, Dec 1966, *P. K. Dorizac s.n.* (CHR174065); Fiordland,
 856 Mt. Gray, 14 Feb 1959, *M. J. A. Simpson 1154* (CHR111751); Fiordland, Secretary
 857 Island, Feb 1967, *P. Wardle (3)* (CHR 566430); Fiordland National Park, Hollyford
 858 Valley, 31 Jul 1965, *K. Dorizac s.n.* (CHR141436); Homer, Dec 1943, *J. Salmon s.n.*
 859 *with R. Forster* (SP084347); Milford Sound, Sinbad Gulley, 27 Feb 1975, *P. N.*
 860 *Johnson s.n.* (CHR 261738); Pigeon Saddle, Oct 1957, *A. Esler s.n.* (SP085190);
 861 Track from Key Summit to road, 16 Dec 1962, *I. Morice s.n.* (CHR133242); Track
 862 from Key Summit to road, 16 Dec 1962, *I. Morice s.n.* (CHR133243).

863

864 *A. nivicola* Cockayne ex Cheeseman **var. nivicola** - NEW ZEALAND. South Island:
 865 Fiordland, Hunter Mts., east of summit of unnamed peak north of Green Lake, 9 Jan
 866 1967, *D. Given 69043* (CHR193928); Fiordland, Key Summit, between upper bog
 867 and track upwards, *P. K. Dorizac (=IMM 474/2)* (CHR191766A–B); Fiordland
 868 National Park, Borland Saddle/Mt. Burns track, 24 Jan 2008, *J. L. Birch s.n. and P.*
 869 *Michel* (HAW); Marlborough, Richmond Range, Mt. Richmond, 23 Nov 1961, *J. I.*
 870 *Townsend s.n.* (CHR366690); Mt. Ollivier, Sealey Range, 12 Feb 1919, *L. Cockayne*
 871 *1272* (AK3224); NW Nelson, Mt. Centre, Jan 1977, *A. P. Druce s.n.* (CHR310405,
 872 CHR310406); Nelson Land District, NW Nelson, Mt. Centre, Jan 1977, *A. P. Druce*
 873 *s.n.* (CHR310406); Southland, Longwood Range, Bald Hill, 21 Jan 2008, *J. L. Birch*
 874 *277 and P. Michel* (HAW).

875

876 *A. nivicola* ~~Cockayne ex Cheeseman~~ **var. moriceae** L.B.Moore - NEW ZEALAND.
 877 South Island: Collected from Wilmot Pass, (grown in Bot. Div. shadehouse), 5 May
 878 1970, *L. B. Moore s.n.* (CHR199865); Fiordland, near Henry Saddle on George Sound
 879 track, 16 Jan 1966, *P. K. Dorizac s.n.* (CHR150752, CHR150753); Nelson, Flora
 880 track, head of Pearse River (type locality), 16 July 1964, *L. B. Moore s.n.* (CHR
 881 151212); Nelson, Flora track, halfway between Flora saddle and Flora Hut, 26 Dec
 882 1964, *D. R. Given 64410* (CHR144190A–B); Paparoa Range, above Roa Mine, 18

883 Dec 1965, *L. B. Moore, s.n., J. Clarke, and I. Robins* (CHR168145A–C); On E side
 884 15 minutes from Wilmot Pass, 14 Dec 1962, *I. Morice s.n.* (CHR133164A–C); Track
 885 to Boulder Lake, The Pulpit, 6 Jan 1964, *I. M. Morice 92* (CHR146984A–C); Nelson,
 886 track to Mt. Arthur, 13 Apr 1963, *I. M. Morice 12* (CHR 144249).

887

888 *A. papuana* Skotts. - PAPUA NEW GUINEA. Central Highlands, Mt. Wilhelm, 25
 889 Aug 2011, *W. R. and M. N. Philipson 3493* (CHR198540), Eastern Highlands
 890 province, Kainantu sub-province, Mt. Piora, 9 Jan 1975, *M. J. S. Sands 1604, G. A.*
 891 *Pattison, and J. J. Wood* (US3248428); Goilala sub-district, Mt. Dickson, 11 Feb
 892 1964, *T. G. Hartley 12985* (US3485933); Mt. Wilhelm, Lake Aunde, 22–26 Sep 1962,
 893 *F.W. Went 223* (MO1806059); South Highland district, Tari sub-district, Mt. Ambua,
 894 29 July 1966, *W. Vink 17287* (MO2322009); Western Highlands district, Hagen sub-
 895 district, Mt. Hagen, 2 July 1967, *J. M. Wheeler ANU 6385* (US3321035); West
 896 Highlands, Mt. Kegum, 8 Apr 1977, *J. F. Veldkam 7598 and A. Vinas* (MO2682556);
 897 West Sepik district, Telefomin sub-district, Star Mountains, Mt. Scorpion, 25 May
 898 1975, *J.R. Croft and G.S. Hope LAE 68018* (US 2895090); West Sepik district,
 899 Telefomin sub-district, Mt. Capella north of east summit, 18 Apr 1975, *W. R. Barker*
 900 *LAE 67438 and T. Umba* (MO3270313).

901

902 *A. petriei* Cockayne - NEW ZEALAND. South Island: Arthur's Pass, Temple Basin,
 903 8 Dec 1963, *B. H. MacMillan 3* (CHR146933); Fiordland National Park, Gertrude
 904 Saddle track, 23 Jan 2008, *J. L. Birch 287 and P. Michel* (HAW); Fiordland National
 905 Park, Gertrude Saddle track, 23 Jan 2008, *J. L. Birch 286 and P. Michel* (HAW);
 906 Fiordland National Park, Borland Saddle/Mt. Burns track, 24 Jan 2008, *J. L. Birch*
 907 *291 and P. Michel* (HAW); Molesworth Ecological Region, Balaclava Ecological
 908 District, Island Saddle just north of road summit, 4 Jan 2002, *E. K. Cameron 10684*
 909 (AK255636); N. Canterbury, Upper Clarence Valley, Mt. St. Patrick, 14 Jan 1972
 910 (CHR228674); NW Nelson, Mt. Arthur, 15 Jan 2008, *J. L. Birch 254, S. Courtney,*
 911 *and R. Gaskill* (HAW); NW Nelson, Mt. Arthur, 15 Jan 2008, *J. L. Birch 255, S.*
 912 *Courtney, and R. Gaskill* (HAW); Otago Province, Lake Harris Saddle (cultivated in
 913 Dunedin), 1923, *W. A. Thomson s.n.* (SP085977); Westland National Park, Fox
 914 Glacier, Chancellor Hut, 2 Feb 1973, *P. Wardle s.n.* (CHR218793A–B).

915

916 *A. psychrocharis* F.Muell. - AUSTRALIA. New South Wales: Mt. Kosciuszko, 19
 917 Feb 1990, *M. G. Corrick 10668* (MEL1578958); Mt. Kosciuszko, June 1901, *C. H.*
 918 *Grove s.n.* (MEL 2213620); Kosciuszko National Park, Mt. Kosciuszko, 30 Dec 2008,
 919 *J. L. Birch 359 and A. Beehag* (HAW); Kosciuszko National Park, Mt. Kosciuszko,
 920 30 Dec 2008, *J. L. Birch 360 and A. Beehag* (HAW); Kosciuszko National Park, Mt.
 921 Kosciuszko, 31 Dec 2008, *J. L. Birch 361 and A. Beehag* (HAW); Kosciuszko
 922 National Park, Mt. Kosciuszko, 31 Dec 2008, *J. L. Birch 362 and A. Beehag* (HAW);
 923 Kosciuszko National Park, Southern Tablelands, near end of Mt. Blue Cow,
 924 "Snowtube", 31 Jan 1990, *J. H. Willis s.n.* (MEL 2117076).

925

926 *A. pumila* (Forst.) Gaudich. - ARGENTINA. Tierra del Fuego: Isla de los Estados,
 927 Bahia San Antonio, Puerto Hoppner, 8 Nov 1971, *T. R. Dudley, R. N. P. Goodall, and*
 928 *G. Crow 1596* (MO2300439); Northwest side of Bahia Thetis, 14 Nov 1969, *R. N. P.*
 929 *Goodall 2248* (US2626023). CHILE. Chiloé Island: River Toigoi, Chepu, 26 Oct
 930 1958, *E. J. Godley 349a* (CHR 547077B); River Toigoi, Chepu, 26 Oct 1958, *E. J.*
 931 *Godley 348* (CHR 55303). Magallenes y de la Antártica Chilena: Churucca, 30 Jan
 932 1879, *Lud Savatier 189* (P00614743); Déroit de Magellan-Port Famine. *M. le*

- 933 *Guillou* 188 (P00614753). Riesco Island: Peninsula Cordova, Pto. Condor, 29 Aug
 934 1970, *E. Pisano* V. 2639 (MO2384477). FALKLAND ISLANDS. [Iles Maclovian]
 935 1825, *Gaudichaud s.n.* (P00614740); [Iles Maclovian] 1825, *Gaudichaud s.n.*
 936 (P00614741).
 937
- 938 *A. rapensis* Skotts. - AUSTRAL ISLANDS. Rapa: Kaimaru, south ridge of Mt.
 939 Perahu, 13 Jul 1934, *H. St. John and J. Maireau* 15,513 (BISH509590, P00636647).
 940
- 941 *A. samoëense* (Skotts.) Birch - SAMOAN ISLANDS. Savai'i: Cloud forest near Mt.
 942 Silisili, 17 June 1992, *A. Whistler* 8861 (housed at HAW); Mata-ole-afi cinder cone,
 943 29 May 1975, *A. Whistler* W2492 (housed at HAW); Matavanu Crater, 24 July 1931,
 944 *E. Christophersen and E. Hume* 2130 (MO1631444); Mt. Silisili, 30 May 1975, *A.*
 945 *Whistler* W2518 (housed at HAW). Upolu: 22 Nov 1973, *A. Whistler* AW1172
 946 (housed at HAW); between Mt. Lepu'e and Mt. Fito, 15 Oct 2008, *A. Whistler* 12035
 947 (housed at HAW); Lake Lano, 6 Aug 1971, *A. Whistler* W270 (housed at HAW);
 948 Laka Lanoto'o, 15 Aug 1970, *A. Whistler* W2177 (housed at HAW); Mt. Siga'ele, 19
 949 July 1973, *A. Whistler* W358 (housed at HAW); Mt. Lepu'e east of Tiavi, 7 Dec 1973,
 950 *A. Whistler* W1251 (housed at HAW).
 951
- 952 *A. skottsbergii* L.B.Moore - NEW ZEALAND. South Island: Douglas Range, 15 May
 953 1963, *K. H. Marshall s.n.* (CHR146875A-D); NW Nelson, Boulder Lake, Brown
 954 Cow Saddle, 12 Apr 1966, *I. M. Morice* 350 (CHR170925); NW Nelson, Douglas
 955 Range, 1 Jun 1964, *K. Marshall s.n.* (CHR151057); NW Nelson, Mt. Domett, Jan
 956 1977, *A. P. Druce s.n.* (CHR311624); NW Nelson, Mt. Goul, 19 Jan 1973, *M. J. A.*
 957 *Simpson* 7215 (CHR278243); Mt. Arthur Plateau, Gordon's Pyramid, 26 Feb 1965, *R.*
 958 *Macfarlane s.n.* (CHR141321); Kahurangi National Park, Mt. Arthur, 16 Jan 2008, *J.*
 959 *L. Birch* 261 (HAW); Kahurangi National Park, Mt. Arthur, 16 Jan 2008, *J. L. Birch*
 960 262 (HAW); Waingaro Peak, where Douglas and Lockett Ranges meet, on North
 961 facing slope, 16 Jan 1970, *I. M. Morice s.n.* (CHR199791); Wangapeka, Mt. Luna, 23
 962 Jan 1971, *I. M. Moore s.n.* (CHR215917A-B).
 963
- 964 *A. solandri* A.Cunn. - NEW ZEALAND. Little Barrier Island: North Auckland Land
 965 District, 24 Oct 1965, *R. Melville* 6672 (CHR129112). North Island: Anatoki Valley,
 966 9 Jan 1964, *I. M. Morice* 100 (CHR147598); Auckland, 1875, *M. Filhol s.n.*
 967 (P00614785); Auckland Ecological Region, Awhitu Ecological District, Matakawau
 968 Reserve, south of Matakawau Road, 23 Apr 2001, *P. A. Aspin s.n.* (AK 253912,
 969 AK254486); Coromandel, Dec 1905, *D. Petrie s.n.* (SP85958); Egmont Ecological
 970 Region and District, Mt. Egmont, Aug 1958, *A. E. Esler s.n.* (AK219600); Hunua,
 971 Dec 1868, *T. Kirk s.n.* (SP84518); Hunua, Dec 1868, *T. Kirk s.n.* (SP084519); Kaimai
 972 Mamaku Forest Park, Mt. Te Aroha summit trail, 13 Dec 2007, *J. L. Birch* 219, *C.*
 973 *Gemmill, E. Grove, and N. Wakefield* (HAW); Mauku, Franklin County, 5 May 1901,
 974 *H. Carse s.n.* (CHR328230); Egmont National Park, Potaema Track, 11 Dec 2007, *J.*
 975 *L. Birch* 202 (HAW); Egmont National Park, road below Dawson Falls, 20 Jan 1964,
 976 *I. M. Morice* 119 (CHR 148342); Mt. Wellington lava fields near Auckland, Apr
 977 1897, *D. Petrie s.n.* (SP084507); Mt. Wellington, Auckland, 4 Apr 1922, *H. Carse*
 978 *s.n.* (CHR292211); North Tararua Range, Makotukutuku St. near Mt. Kaiparoro, Jan
 979 1977, *C. Ogle s.n.* (CHR286974); Orotere, south of Kaeo, 26 Aug 1965, *R. Cooper*
 980 *s.n.* (AK 118465); Tararua Forest Park, Mt. Holdsworth, 12 Jan 2008, *J. L. Birch* 250
 981 *and S. J. Birch* (HAW). South Island: Nelson (SP08453). Poor Knights Islands:
 982 Whangarei County, Aorangi Island, 31 Aug 1984, *A. E. Wright* 6564 (AK169414).

- 983 Rangitoto Island: North Auckland Land District, 13 Feb 1965, *I. M. Morice s.n.* (CHR
984 566383).
985
- 986 *A. subulata* Cheeseman - NEW ZEALAND. Campbell Island: Homestead Ridge, 26
987 Dec 1998, *C. D. Meurk s.n.* (CHR537469); Tucker Cove, 14 Jan 1947, *W. B. Brockie*
988 *s.n.* (CHR 223725). South Island: Paparoa Range, Westland, 14 Jan 1967, *L. B.*
989 *Moore s.n.* and *J. Clarke* (CHR174718). Stewart Island: Table Hill, 12 Jan 1940, *L. B.*
990 *Moore s.n.* (CHR24184); Rakiura National Park, Mt. Anglem, 26 Jan 2008, *J. L.*
991 *Birch s.n.* and *J. Blythal*, (HAW); Rakiura National Park, Mt. Anglem, 26 Jan 2008,
992 *J. L. Birch 299* and *J. Blythal*, (HAW); Rakiura National Park, Mt. Anglem, 26 Jan
993 2008, *J. L. Birch 301* and *J. Blythal* (HAW).
994
- 995 *A. tovvii* F.Br. - MARQUESAS ISLANDS. Nuku Hiva: Summit of the ridge south of
996 Tekao, between the new airport road at peak #1227 M. and Tekao, the main ridge
997 above Toovii, 25 Sept 1995, *S. Perlman 15,055* (BISH660310, MO5601362,
998 NTBG021995); Mt. Tapuaooa, about 2 km. from the Tapuaooa shelter and 3 km. W
999 of Mt. Ooumu, 10 Jul 1970, *G. W. Gillett 2166* (US 3485393, P00636646); Toovii,
1000 épaulement SE du Mt. Tekao, 28 May 1984, *J. Florence 6818* (P00636614); Tovii,
1001 ridge above L'Économie Rurale to Ooumu, 17 Jul 1988, *W. L. Wagner, D. Lorence, J.*
1002 *Florence, and S. Perlman 6119* (MO4330721, NTBG 008791, P00636608,
1003 US3206556); Toovii Plateau, trail behind L'Économie Rurale toward Ooumu peak,
1004 near summit crest, 16 Jul 1988, *S. Perlman 10,127* (NTBG008286).
1005
- 1006 *A. trinervia* Kirk - NEW ZEALAND. North Island: Auckland Ecological Region,
1007 Awhitu Ecological District, Matakawau Reserve, south of Matakawau Road, 23 Apr
1008 2001, *P. A. Aspin s.n.* (AK 253912); Eastern Northland Ecological Region, Eastern
1009 Northland & Islands Ecological District, Orotere, south of Kaeo, 26 Aug 1965, *R. C.*
1010 *Cooper s.n.* (AK 118465); North Auckland Land District, Franklin Co., Mauku, 5
1011 May 1901, *H. Carse s.n.* (CHR328230); North Auckland, Hunua, Wairoa [Hunua]
1012 Falls, Dec 1868, *T. Kirk s.n.* (SP084519); North Auckland Land District, Mt.
1013 Wellington, Auckland, lava field, 4 Apr 1922, *H. Carse s.n.* (CHR292211); North
1014 Auckland, Auckland City, Mt. Wellington lavafield, Apr 1897, *D. Petrie s.n.*
1015 (SP084507). Little Barrier Island: North Auckland Land District, summit, 9 Mar
1016 1962, *R. Melville 6672* (CHR129112). Rangitoto Island: North Auckland Land
1017 District, 13 Feb 1965, *I. M. Morice s.n.* (CHR 566383).
1018
- 1019 *A. waialealae* Wawra - HAWAIIAN ISLANDS. Kaua'i: Alakai Swamp, transect
1020 across Sincock Bog, Bog 1, 13 Feb 1989, *S. Perlman 10,641, T. Pratt, and J. Lepson*
1021 (PTBG011706); Alakai Swamp, 1 Sep 1977, *P. van Royen 11716* and *J. Davis, S.*
1022 *Perlman* (BISH419748A); Waialealae, 23 Sep 1909, *J. F. Rock 5041* (BISH121147);
1023 Waialealae, 20 Oct 1911, *J. F. Rock 8878* (BISH121150); Waimea District, Sincock
1024 Bog, Halehaha area, *S. Perlman and K. Wood 3395* (NTBG019596).

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