**Supplementary file 2: Results**

List of genera investigated for the analysis including information on generic distribution, coding and references to the literature used. Datasets sorted: Tropical Afroalpine, Hawaii, Tropical Páramo and Mt. Kinabalu.

**Tropical** **Afroalpine**

List of genera investigated for the tropical **Afroalpine** region including information on family, genus, number of species and distribution of the genus (Mabberley 2008 and references as given at the end). Number of species in sub-Saharan Africa, in Tropical Africa (African Plant Database), number of species in the tropical Afroalpine as defined here (Hedberg 1957; Cable & Cheek 1998; Flora of Ethiopia and Eritrea; Flora of Tropical East Africa). Coding scheme: maximum and minimum number of in situ speciation events (ISS), colonisation events from other alpine-like and tropical climate regions and other biomes, number of not coded species and citation. Abbreviations: Afr=Africa; Am=America(s); Aus=Austarlia; C=Central; Dom Rep= Dominican Republic; E=East(ern); end=endemic; esp= especially; Eur=European; Euras=Eurasian; excl=excluding; Madagas=Madagascar; Mal=Malasia; Med= Mediterranean; Mts= Mountains; N=North(ern); NG=New Guinea; Nht=Northern hemisphere temperate; NT= Neotropical; NZ=New Zealand; OW=Old World; S=South(ern); Sht=southern hemisphere temperate; temp= temperate both hemispheres; trop=tropical; US= United States of America; W=West(ern); Ww=worldwide

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| family | genus | genus size | genus distribution | spp in sub-Saharan Africa | spp in Tropical Afr. | spp Afroalpine | ISS max | ISS min | alpine max | alpine min | tropical max | tropical min | biome max | biome min | not coded | citation |
| Apiaceae | ***Afroligus-ticum*** | 13 | Afr. Mts | 13 | 9 | 1 |  |  |  | 1 |  |  | 1 |  |  | Winter et al. 2008 |
| Apiaceae | ***Afrosciadium*** | 18 | Afr. Mts | 18 | 15 | 2 |  |  |  |  |  |  | 2 | 2 |  | Winter et al. 2008 |
| Apiaceae | ***Haplo-sciadium*** | 1 | Afr. Mts | 1 | 1 | 1 |  |  | 1 |  |  |  |  | 1 |  | Hedberg 1957 |
| Apiaceae | ***Heracleum*** | 65 | Eur., trop. Mts | 65 | 3 | 1 |  |  |  | 1 |  |  | 1 |  |  | Logacheva et al. 2008 |
| Apiaceae | ***Pimpinella*** | 200 | Euras., Afr. | 48 | 42 | 2 | 1 | 1 |  |  |  |  | 1 | 1 |  | Magee et al. 2010 |
| Astera-ceae | ***Anthemis*** | 195 | Med. | 5 | 3 | 2 |  |  |  |  |  |  | 1 | 1 |  | Lo Presti et al. 2010 |
| Astera-ceae | ***Artemisia*** | 450 | N. temp. (Eur. 55, China 170 N. Am. 50) W.S. Am., S. Afr | 8 | 5 |  |  | 1 |  |  |  |  | 1 |  |  | Tkach et al. 2008 |
| Astera-ceae | ***Carduus*** | 91 | Euras. (Eur. 48) Med., E. Afr. Mts | 13 | 11 | 3 | 1 |  |  |  |  |  | 1 |  | 2 | Barres et al. 2013 |
| Astera-ceae | ***Cineraria*** | 15-20 | Trop. & (esp.) S. Afr., Madagascar, SW. Arabia | 20 | 11 | 4 | 2 |  |  |  |  |  | 3 | 1 |  | Cron et al. 2008; Cron et al. 2009; Pelser et al. 2007 |
| Astera-ceae | ***Conyza*** | 25-40 | sub-Saharan Africa | 40 | 25 | 3 | 1 | 1 |  |  |  |  | 2 | 2 |  | Noyes 2000; Sancho et al. 2010 |
| Astera-ceae | ***Crepis*** | 200 | Eur. 70 N. Am. 24 S. Afr., S. Am. | 15 | 6 | 2 | 2 | 2 |  |  |  |  |  |  |  | Enke & Gemeinholzer 2008; Enke et al. 2011 |
| Astera-ceae | ***Dendro-senecio*** | 12 | Afr. Mts | 12 | 12 | 7 | 6 | 2 |  |  |  |  | 5 | 1 |  | Knox and Palmer 1995; Knox 2004; Pelser et al. 2007 |
| Astera-ceae | ***Erigeron*** | 390 | Esp. N. Am. & C. Am. (234) with OW 100, Eur. 15 | 4 | 4 | 1 |  |  | 1 | 1 |  |  |  |  |  | Noyes 2000 |
| Astera-ceae | ***Euryops*** | 97 | Mostly S. Afr. | 97 | 10 | 3 | 1 |  | 1 | 1 |  |  | 2 | 1 |  | Devos et al. 2010 |
| Astera-ceae | ***Haplocarpha*** | 10 | Afr. Mts | 9 | 5 | 1 |  |  |  |  |  |  | 1 | 1 |  | McKenzie & Barker 2008 |
| Astera-ceae | ***Helichrysum*** | 500 | esp. S. Afr. (Cape 81) | 300 | 151 | 9 | 6 | 3 | 1 |  |  |  | 7 | 3 |  | Bergh & Linder 2009; Galbany-Carals et al. 2009; Smissen et al 2011; Galbany-Carals et al. 2014 |
| Astera-ceae | ***Senecio*** | 1000 | Eur. 60, Afr. 350, Cape 110, N. Am. 55, S Am. 500 exc. Antartica | 473 | 156 | 12 | 7 | 4 | 1 |  |  |  | 8 | 4 |  | Pelser et al. 2013 |
| Astera-ceae | ***Sonchus*** | 62 | Macaronesia: Eur. 9 to Australasia & trop. Afr. (30 in Macaronesia) | 27 | 15 | 2 | 2 | 2 |  |  |  |  |  |  |  | Kim et al. 2007 |
| Boragi-naceae | ***Myosotis*** | 100 | Eur. | 9 | 4 | 1 |  |  | 1 |  |  |  |  | 1 |  | Winkworth et al. 2002; Cheek and Becker 2004 |
| Brassica-ceae | ***Arabidopsis*** | 11 | Eur. | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  |  | Shimizu et al. 2008a,b |
| Brassica-ceae | ***Arabis*** | 100 | Eur. 35, N. Am. 15, Med to trop. Mts | 2 | 2 | 1 |  |  |  |  |  |  | 1 | 1 |  | Assefa et al. 2007; Koch et al. 2006 |
| Brassica-ceae | ***Barbarea*** | 22 | Eur. | 2 | 2 | 1 |  |  |  | 1 |  |  |  | 1 |  | Mummenhoff et al. 2005 |
| Brassica-ceae | ***Oreophyton*** | 1 | E. & NE Afr. Mts | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  |  | Couvreur et al. 2010 |
| Brassica-ceae | ***Subularia*** | 1-few | Eur. | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  |  | Couvreur et al. 2010 |
| Brassica-ceae | ***Thlaspi*** | 17 | most N. Am. | 2 | 1 | 1 |  |  |  | 1 |  |  | 1 |  |  | Koch & Mummenhoff 2001 |
| Campa-nulaceae | ***Lobelia*** | 300 | worldwide esp. Am. | 142 | 91 | 6 | 3 | 2 |  |  |  |  | 4 | 3 |  | Antonelli 2009; Knox & Palmer 1998 |
| Campa-nulaceae | ***Wahlenbergia*** | 260 | Eur. 2, trop. & S. Afr. 39, Madag. 51, St. Helena 4, Aus. 26, NZ 10, | 200 | 44 | 1 |  |  |  |  |  |  | 1 | 1 |  | Prebble et al. 2011 |
| Caprifo-liaceae | ***Valeriana*** | 200 | temp. Eurasia, Africa, N. Am. and S. Am. | 3 | 3 | 1 |  |  |  |  |  |  | 1 | 1 |  | Bell & Donoghue 2005 |
| Caryo-phyll-aceae | ***Cerastium*** | 100 | Eur. 58 , N. Am. 27 | 8 | 5 | 1 |  |  |  | 1 |  |  | 1 |  |  | Scheen et al. 2004 |
| Caryo-phyll-aceae | ***Paronychia*** | 110 | Esp. Medit., Turkey, N. Am. & Peru to Bolivia | 8 | 7 | 1 |  |  |  |  |  |  |  |  | 1 | Greenberg and Donoghue 2011 |
| Caryo-phyll-aceae | ***Sagina*** | 15-20 | Eur. 12, N. Am. 10, trop. Mts | 6 | 4 | 2 | 1 | 1 |  |  |  |  | 1 | 1 |  | Schaefer et al. 2011; Dillenberger & Kadereit 2014 |
| Crassula-ceae | ***Afrovivella*** | 1 | Afr. | 1 | 1 | 1 |  |  |  |  |  |  | 1 | 1 |  | Puff & Nemomissa 2005 |
| Crassula-ceae | ***Sedum*** | 534 | Eur. 53, trop. Mts, Madagas., Mex. | 9 | 9 | 4 | 4 | 3 | 1 |  |  |  | 1 | 1 |  | Mayuzumi Ohba 2004; Carrillo-Reyes 2009; Mort et al. 2002 |
| Crassula-ceae | ***Umbilicus*** | 14 | Eur. (6) & Medit. to Iran & Afr. Mts | 5 | 5 | 1 |  |  | 1 | 1 |  |  |  |  |  | Mayuzumi Ohba 2004; Carrillo-Reyes 2009; Mort et al. 2002 |
| Cypera-ceae | ***Carex*** | 2000 | cosmopol., mainly N. hem. | 85 | 48 | 2 | 1 | 1 | 1 | 1 |  |  |  |  |  | Gehrke & Linder 2009 |
| Ericaceae | ***Erica*** | 860 | Afr. (Cape), E. Euras. | 600 | 27 | 2 |  |  | 1 | 1 |  |  | 1 | 1 |  | Pirie et al. 2011 |
| Eriocau-laceae | ***Eriocaulon*** | 400 | esp. N. (173) & C. Am. (234) With OW 100 (not Aus.) | 105 | 90 | 1 |  |  |  |  |  |  | 1 | 1 |  | Gomes de Andrade et al 2010 |
| Fabaceae | ***Trifolium*** | 238 | Eur. 99 & subtrop. excl. Aus. | 60 | 46 | 1 |  |  |  |  |  |  | 1 | 1 |  | Watson et al. 2000; Liston et al. 2006 |
| Gentia-naceae | ***Swertia*** | 150 | Eur. 1, Afr. & Mal. Mts | 33 | 32 | 6 | 4 | 3 | 1 | 1 |  |  | 2 | 1 |  | von Hagen and Kadereit 2001; Cassot et al. 2001 |
| Gerania-ceae | ***Geranium*** | 260 | Eur. 38, montane trop. (Mal. 15, Hawaii 7) | 51 | 16 | 1 |  |  |  |  |  |  | 1 | 1 |  | Fiz et al. 2008 |
| Iridaceae | ***Romulea*** | 90 | Eur. (8) & Med., Socotra & Afr. Mts (Sub-Sahara 76) | 83 | 5 | 1 |  |  |  |  |  |  | 1 | 1 |  | Mabberley 2002 |
| Junca-ceae | ***Luzula*** | 108 | Eur. 31, Aus. 15, N. Am. 23 | 5 | 5 | 2 |  |  | 2 |  |  |  | 2 |  |  | Zaveska Drabkova & Vlcek 2010 |
| Lamia-ceae | ***Clinopodium*** | 100 | subcosmopolitan | 9 | 8 | 1 |  |  |  |  |  |  | 1 | 1 |  | Ryding 2006; Bräuchler et al. 2010 |
| Lamia-ceae | ***Stachys*** | 450 | Eur. 58, Turkey 72 & warm excl. Australasia, trop. Mts | 76 | 23 | 1 |  |  |  |  |  |  | 1 | 1 |  | Salmaki et al. 2013; Roy et al. 2013 |
| Lamia-ceae | ***Thymus*** | 220 | Eur. 66 | 3 | 3 | 1 |  |  |  |  |  |  | 1 | 1 |  | Puff & Nemomissa 2005 |
| Oroban-chaceae | ***Hedbergia*** | 1 | Afr. End. 🡪 ***Bartsia*** | 1 | 1 | 1 |  |  |  |  |  |  | 1 | 1 |  | Scheunert et al. 2012 |
| Plantag-inaceae | ***Callitriche*** | 50 | Eur. 11 with 2 N. Am. | 9 | 7 | 3 | 3 |  |  |  |  |  | 3 |  |  | Philbrick & Les 2000 |
| Plantagi-naceae | ***Veronica*** | 450 | 90 Australasia (*Hebe*), S. Am., 450 N. temp., trop. Mts | 19 | 15 | 2 | 1 | 1 | 1 | 1 |  |  |  |  |  | Albach & Meudt 2009 |
| Poaceae | ***Agrostis*** | 200 | Eur. 25, Am. 67, trop. Mts | 42 | 16 | 4 |  |  |  |  |  |  |  |  | 4 | Mabberley 2002 |
| Poaceae | ***Aira*** | 8 | 8 Eur & Med., weeds | 7 | 1 | 1 |  |  |  |  |  |  | 1 | 1 |  | Saarela et al. 2014 |
| Poaceae | ***Alopecurus*** | 36 | N. temp. (Eur. 14), S. Am | 2 | 1 | 1 |  |  |  | 1 |  |  |  | 1 |  | Phillips 1986 |
| Poaceae | ***Andropogon*** | 120 | Eur. 1, N. Am. | 66 | 55 | 2 |  |  |  |  |  |  | 2 | 2 |  | Mathews et al. 2002 |
| Poaceae | ***Anthoxanthum*** | 50 | Eur. 13, Artic, trop. Mts N & C Am. (5) | 8 | 3 | 2 | 1 | 1 | 1 | 1 |  |  |  |  |  | Pimentel et al. 2013 |
| Poaceae | ***Calamagrostis*** | 260 | Eur. 14, Am. 132 | 4 | 4 | 1 |  |  |  | 1 |  |  |  | 1 |  | Wolk et al. 2014 |
| Poaceae | ***Colpodium*** | 17 | Euras. and Afr. | 2 | 2 | 2 | 1 | 1 |  |  |  |  | 1 | 1 |  | Hoffmann et al. 2013 |
| Poaceae | ***Deschampsia*** | 30 | Temp, esp. N. (Eur. 6, N.Am. 7) | 4 | 4 | 3 | 2 | 1 | 1 | 1 |  |  | 1 | 1 |  | Masao et al. 2013 |
| Poaceae | ***Festuca*** | 450 | China 55, Am. 209, trop. Mts | 28 | 20 | 7 |  |  |  |  |  |  |  |  | 7 | Catalan 2006a,b |
| Poaceae | ***Koeleria*** | 35 | Eur. 13 | 1 | 1 | 1 |  |  |  |  |  |  | 1 | 1 |  | Masao et al. 2013 |
| Poaceae | ***Pentameris/ Pentaschistis*** | 68 | Esp. S. Afr., trop. Afr. to Yemen, Madagas. | 74 | 6 | 4 | 3 | 2 |  |  |  |  | 2 | 1 |  | Galley & Linder 2007 |
| Poaceae | ***Poa*** | 500 | world. esp. temp. | 20 | 13 | 5 |  |  |  |  |  |  |  |  | 5 | Hoffmann et al. 2013 |
| Poaceae | ***Merxmuellera*** | 15 | Africa | 4 | 4 | 1 |  |  |  |  |  |  | 1 | 1 |  | Humphreys et al. 2010 |
| Poaceae | ***Tenaxia*** | 7 | Africa and Asia | 4 | 4 | 1 |  |  |  |  |  |  | 1 | 1 |  | Humphreys et al. 2010 |
| Portula-caceae | ***Montia*** | 12 | Eur. 1, Aus. 2 | 1 | 1 | 1 |  |  |  | 1 |  |  | 1 |  |  | Nyffeler & Eggli 2010 |
| Primula-ceae | ***Primula*** | 430 | Eur. 34, E Himal. 225, N. Am. 20, trop. Afr. Mts to Java & NG, S.S. Am | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  |  | Schmidt-Lebuhn et al. 2012 |
| Ranun-culaceae | ***Ranunculus*** | 600 | esp. N. temp. & boreal | 23 | 18 | 4 | 1 | 1 |  |  |  |  | 3 | 3 |  | Gehrke and Linder 2008 |
| Rosaceae | ***Alchemilla/ Aphanes*** | 20 | Am., Aus., W & C Euras., Ethiopia | 1 | 1 | 1 |  |  |  |  |  |  | 1 | 1 |  | Gehrke et al. 2008 |
| Rosaceae | ***Alchemilla*** | 1000+ | Afr. Mts and temp. areas | 50 | 20 | 11 | 7 | 7 |  |  |  |  | 4 | 4 |  | Gehrke et al. 2008 |
| Rubia-ceae | ***Galium*** | 400 | Eur. 145, Turkey 101 | 40 | 25 | 2 | 2 | 1 |  |  |  |  | 2 | 1 |  | Soza & Olmstead 2010 |
| Santala-ceae | ***Thesium*** | 300 | Eur. 25, Cape 81 | 247 | 80 | 1 |  |  |  |  |  |  | 1 | 1 |  | Moore et al. 2010 |
| Saxifra-gaceae | ***Saxifraga*** | 440 | esp. Eur. 123, Himal. & E. As. few S. to Thailand, Ethiopia | 1 | 1 | 1 |  |  | 1 | 1 |  |  |  |  |  | Prieto et al. 2013 |
| Scroph-ularia-ceae | ***Limosella*** | 15 | Afr. 10, Eur. 3 | 13 | 7 | 2 | 1 | 1 |  |  |  |  | 1 | 1 |  | Kornhall & Bremer 2004 |

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**Hawaii:**

List of genera investigated for the tropical high alpine parts of **Hawaii** including information on family, genus, number of species and distribution of the genus (Mabberley 2008 and references as given at the end) and Hawaiian tropical alpine species. Number of species in the genus on Hawaii, number of species in the tropical alpine-like of Hawaii (Skottsberg C 1931; Wagner 1990; Wagner et al. 1999). Coding scheme: maximum and minimum number of in situ speciation events (ISS), colonisation events from other alpine-like and tropical climate regions and other biomes, number of not coded species and citation. Abbreviations for generic distribution: Am=America(s); Aus=Australia; C=Central; Eur=European; Hem=hemisphere; Is=Island(s); Mal=Malesia; Mts= Mountains; N=North(ern); NZ=New Zealand; Pac=Pacific; S=South(ern); trop=tropical; temp= temperate both hemispheres.

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| family | genus | size | genus distribution | species | Hawaii | alpine-like | ISS max | ISS min | alpine max | alpine min | tropical max | tropical min | biome max | biome min | not coded | citation |
| Poaceae | *Agrostis* | 200 | Eur. 25, Am. 67, trop Mts | *A. sandwicensis* | 5 | 1 |  |  | 1 |  |  |  | 1 |  |  | Skotsberg 1931; Wagner 1990 |
| Poaceae | *Trisetum* | 70 | Widespread, mostly temp., subarctic, and alpine | *T. glomeratum* | 2 | 1 |  |  |  |  |  |  |  |  | 1 | Skotsberg 1931; Wagner 1990 |
| Asteraceae | Silver-sword alliance | 50 | Hawaii | *Dubautia menziesii, Argyroxiphium sandwicense* | 50 | 2 |  |  |  |  |  |  | 2 | 2 |  | Baldwin et al. 1990; Baldwin & Wessa 2000 |
| Asteraceae | *Tetramo-lopium* | 37 | New Guinea, Hawaii, Cook Is. (1) | *T. humile* | 11 | 1 |  |  |  |  |  |  | 1 | 1 |  | Karaman-Castro & Urbatsch 2009 |
| Ericaceae | *Vaccinium* | 450 | Temp. N. Hem., C.&S. Am. Madagascar, Hawaii | *V. peleanum*,  *V. berberifolium* | ~35 | 2 |  |  |  |  |  |  | 2 | 2 |  | Powell & Kron 2002 |
| Fabaceae | *Sophora* | 45 | S. Euras., Australasia, Pac. Is., Am. | *S. chrsophylla* | 1 | 1 |  |  |  |  |  |  | 2 | 2 |  | Hu et al. 2013 |
| Lamiaceae | *Stenogyne* | 21 | Hawaii | *S. microphylla* | 21 | 1 |  |  |  |  |  |  | 1 | 1 |  | Roy et al. 2013 |
| Gerania-ceae | *Geranium* | 260 | Eur. 38, montane trop. (Mal. 15, Hawaii 7) | *G. cuneatum, G. multiflorum* | 7 | 2 |  |  |  |  |  |  | 2 | 2 |  | Fiz et al. 2008 |
| Ericaceae | *Lepte-cophylla* | 13 | S. Aus., New Guinea, NZ, Pac. Is. | *L. tameiameiae* syn. *Styphelia douglasii* | 1 | 1 |  |  |  |  |  |  | 1 | 1 |  | Quinn et al. 2003 |

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**Tropical Páramo:**

List of genera investigated for the tropical high alpine parts of **Andean Páramo** including information on family, genus, number of species and distribution of the genus. Number of species in the genus in Páramo according to Lutyen 1999 and adapted according to literature as given. Coding scheme: maximum and minimum number of, in situ speciation events (ISS), colonisation events from other alpine-like and tropical climate regions and other biomes, number of species not coded and citation. Abbreviations: Afr=Africa; Am=America(s); Aus=Austarlia; C=Central; Dom Rep= Dominican Republic; E=East(ern); end=endemic; esp= especially; Eur=European; Euras=Eurasian; excl=excluding; Madagas=Madagascar; Mal=Malasia; Med= Mediterranean; Mts= Mountains; N=North(ern); NG=New Guinea; Nht=Northern hemisphere temperate; NT= Neotropical; NZ=New Zealand; OW=Old World; S=South(ern); Sht=southern hemisphere temperate; temp= temperate both hemispheres; trop=tropical; US= United States of America; W=West(ern); Ww=worldwide

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| family | genus | genera size | generic distribution | Páramo s.l. | alpine Páramo | lineage origin | ISS max | ISS min | alpine max | alpine min | tropical max | tropical min | biome max | biome min | not coded | other comment |
| Alstroem- eriaceae | *Bomarea* | 122 | C Am, Mex and the West Indies, mostly Andes | 22 | 4 | NT | 3 | 0 |  |  |  |  | 4 | 1 | 0 | Sanso & Xifreda 2001 |
| Amaran- thaceae | *Alternanthera* | 80-200 | most species in Trop Am, also Asia, Afr, and Aus | 2 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Sánchez-Del Pino et al. 2012 |
| Apiaceae | *Arracacia* | 41 | Am (Mex, C. Am, Peru, Ecuador and Bolivia) | 4 | 2 | NT | 1 | 0 | 1 | 0 |  |  | 2 | 1 | 0 | Spalik et al. 2004; Sun et al. 2004; Danderson 2011 |
| Apiaceae | *Azorella* | 70 | S Am, NZ, islands of S Ocean | 9 | 8 | Sht | 7 | 6 | 2 | 2 |  |  |  |  | 0 | Nicolas et al. 2011 |
| Apiaceae | *Bowlesia* | 16 | S Am | 2 | 1 | NT |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Nicolas & Plunkett 2009 |
| Apiaceae | *Cotopaxia* | 2 | Ecuador and Colombia | 2 | 2 | end | 1 | 1 | 1 | 0 |  |  | 1 | 0 | 0 | Danderson 2011 (Ph.D. thesis) |
| Apiaceae | *Eryngium* | 230 | most species rich in S Am but distributed in warm areas ww | 2 | 2 | NT |  |  |  |  |  |  | 2 | 2 | 0 | Calvino et al. 2008 |
| Apiaceae | *Lilaeopsis* | 15 | bipolar and amphiantarctic: Am, Aus, NZ, S Pacific | 2 | 2 | Sht |  |  |  |  |  |  | 2 | 2 | 0 | Bone et al. 2011 |
| Apiaceae | *Myrrhiden-dron* | 5 | NS Am | 5 | 2 | end | 1 | 0 | 1 | 0 |  |  | 2 | 0 | 0 | Davidse et al. 2009 |
| Apiaceae | *Niphogeton* | 15 | mostly andean Páramo | 13 | 9 | NT | 8 | 6 | 1 | 0 |  |  | 1 | 0 | 0 | Danderson 2011 (Ph.D. thesis) |
| Apiaceae | *Oreomyrrhis* | 25 | C and S Am, S Pacific Basin, NZ, SE Aus, Tasmania, NG, Borneo and Taiwan | 1 | 1 | Sht |  |  | 1 | 1 |  |  |  |  | 0 | Chung et al. 2007 |
| Apiaceae | *Ottoa* | 1 | S Am | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Davidse et al. 2009 |
| Apiaceae | *Perissocoe-leum* | 4 | NS Am | 4 | 1 | end |  |  |  |  |  |  | 1 | 1 | 0 | Davidse et al. 2009 |
| Apocy- naceae | *Cynanchum* | 200-300 | Ww | 7 | 2 | Ww | 0 | 1 |  |  |  |  | 2 | 1 | 0 | Rapini et al. 2007 |
| Aralia- ceae | *Hydrocotyle* | 75 | mostly Trop regions | 12 | 3 | Ww |  |  | 1 | 0 |  |  | 3 | 2 | 0 | Nicolas & Plunkett 2009 |
| Aralia- ceae | *Oreopanax* | 80-150 | C and S Am | 14 | 4 | NT | 3 | 0 |  |  |  |  | 4 | 1 | 0 | Li & Wen 2013 |
| Astera- ceae | *Achyrocline* | 32 | Afr, Madagascar and S Am | 10 | 4 | T | 3 | 0 |  |  |  |  | 4 | 1 | 0 | Galbany-Casals et al. 2014 |
| Astera- ceae | *Ageratina* | 250-290 | warmer Am and West Indies. >150 native to Mex | 38 | 7 | NT |  |  |  |  |  |  |  |  | 7 | Luteyn 1999; Ito et al. 2000 |
| Astera- ceae | *Alloispermum* | 16 | S Am and Mex | 3 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Luteyn 1999 |
| Astera- ceae | *Antennaria* | 45 | temp&cold regions, NAm (34), Mex, S Am, Eurasia | 1 | 1 | Nht |  |  | 1 | 1 |  |  |  |  | 0 | Freire et al. 2015 |
| Astera- ceae | *Aphanactis* | 9 | C and NS Am | 7 | 7 | NT | 6 | 5 | 1 | 0 |  |  | 0 | 1 | 0 | Luteyn 1999 |
| Astera- ceae | *Ascidiogyne* | 2 | end to NE Peru | 2 | 1 | end |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Cuatrecasas 1965; Luteyn 1999 |
| Astera- ceae | *Baccharis* | 360 | Am mostly Mex to S Am mainly warm-temp | 47 | 18 | NT |  |  |  |  |  |  |  |  | 18 | Sundberg & Bogler 2006 |
| Astera- ceae | *Barnadesia* | 19 | S Am, mostly Andes | 3 | 2 | NT | 2 | 1 |  |  |  |  | 1 | 2 | 0 | Gruenstaeudl et al. 2009 |
| Astera- ceae | *Belloa/ Luciliocline* | 14 | S Am | 7 | 5 | NT | 2 | 0 | 3 | 2 |  |  | 4 | 1 | 0 | Freire et al. 2015 |
| Astera- ceae | *Bidens* | 250 | Trop and warm temp ww | 5 | 3 | Ww | 2 | 0 |  |  |  |  | 3 | 1 | 0 | Kim et al. 2001 |
| Astera- ceae | *Blakiella* | 1 | Colombia and Venezuela | 1 | 1 | end | 1 | 0 | 1 | 0 |  |  |  |  | 0 | Vargas and Madriňán 2012 |
| Astera- ceae | *Chaptalia* | 20-35 | S US to SS Am, West Indies | 6 | 2 | NT | 1 | 0 | 1 | 0 |  |  | 2 | 1 | 0 | Nesom et al. 1995; Baird et al. 2010 |
| Astera- ceae | *Chersodoma* | 10 | S Am (Peru to Argentina) | 1 | 1 | NT |  |  | 1 | 1 |  |  |  |  | 0 | Dillon & Sagástegui-Alva |
| Astera- ceae | *Chionolaena* | 19 | Am, high elevation from Mex to S Brazil | 2 | 2 | NT |  |  | 2 | 2 |  |  |  |  | 0 | Freire 1993; Freire et al. 2015 |
| Astera- ceae | *Chrysactinium* | 7 | S Am (Andes) | 5 | 3 | NT | 2 | 0 |  |  |  |  | 3 | 1 | 0 | Funk et al. 2012 |
| Astera- ceae | *Chuquiraga* | 23 | Andean of Chile and Argentina to Colombia | 3 | 2 | NT | 1 | 0 |  |  |  |  | 2 | 1 | 0 | Ezcurra 2002; Padin et al. 2015 |
| Astera- ceae | *Conyza* | 50 | Ww | 14 | 5 | T |  |  |  |  |  |  |  |  | 5 | Nesom 1990; Sancho et al. 2010 |
| Astera- ceae | *Cotula* | 200 | mostly Southern Hemisphere | 3 | 1 | Sht |  |  |  |  |  |  | 1 | 1 | 0 | Jakubowsky & Mucina 2007 |
| Astera- ceae | *Cuatrecasas-iella* | 2 | S Am | 1 | 1 | NT |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Freire et al. 2015 |
| Astera- ceae | *Diplostephium* | 111 | S Am (Costa Rica to N Chile) | 69 | 32 | NT | 22 | 12 |  |  |  |  | 20 | 10 | 0 | Vargas and Madriňán 2012 |
| Astera- ceae | *Dorobaea* | 3 | S Am | 2 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Pelser et al. 2007 |
| Astera- ceae | *Erigeron* | 458 | Ww with a centre of species diversity in N Am | 10 | 5 | Nht | 4 | 0 |  |  |  |  | 5 | 1 | 0 | Noyes 2000 |
| Astera- ceae | *Espeletia s.l.* | 140 | end to the N Andes | 61 | 18 | end | 18 | 11 |  |  |  |  | 14 | 7 | 0 | Rauscher, 2002 |
| Astera- ceae | *Floscaldasia* | 2 | S Am (N Andes) | 2 | 1 | end | 1 | 0 | 1 | 0 |  |  |  |  | 0 | Karaman-Castro & Urbatsch 2009 |
| Astera- ceae | *Gnaphalium* | 107 | widespread | 18 | 6 | temp | 3 | 0 |  |  |  |  | 6 | 3 | 0 | Freire et al. 2015 |
| Astera- ceae | *Gynoxys* | 126 | S Am | 48 | 14 | NT |  |  |  |  |  |  |  |  | 14 | Pelser et al. 2007 |
| Astera- ceae | *Hieracium* | 1400 | Ww | 13 | 2 | temp | 1 | 0 | 1 | 0 |  |  | 2 | 0 | 0 | Fehrer et al. 2009; Krak et al 2013 |
| Astera- ceae | *Hinterhubera* | 11 | N Andes and Chile | 8 | 8 | end | 8 | 8 |  |  |  |  |  |  | 0 | Karaman-Castro & Urbatsch 2009 |
| Astera- ceae | *Hypochaeris* | 100 | mostly S Am, some in Eurasia and N Afr. | 11 | 5 | Nht | 4 | 0 | 1 | 0 |  |  | 5 | 1 | 0 | Enke et al. 2012 |
| Astera- ceae | *Jalcophila* | 4 | S Am (Bolivia, Colombia, Ecuador, Peru) | 2 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Freire et al. 2015 |
| Astera- ceae | *Jungia* | 23 | S Am to Mex | 6 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Katinas et al. 2008 |
| Astera- ceae | *Lasiocephalus* | 18 | S Am (Andes) | 14 | 11 | NT | 10 | 5 |  |  |  |  | 6 | 1 | 0 | Duskova et al. 2010 |
| Astera- ceae | *Loricaria* | 20 | S Am (Andes) | 15 | 10 | NT |  |  |  |  |  |  |  |  | 10 | Freire et al. 2015 |
| Astera- ceae | *Lucilia* | 12 | S Am | 3 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Freire et al. 2015 |
| Astera- ceae | *Mniodes* | 1 | Peru | 1 | 1 | NT | 1 | 1 |  |  |  |  |  |  | 0 | Freire et al. 2015 |
| Astera- ceae | *Munnozia* | 37 | S Am | 7 | 1 | NT |  |  | 0 | 1 |  |  | 1 | 0 | 0 | Kim et al. 2003 |
| Astera- ceae | *Mutisia* | 55 | S Am (especially Argentina) | 10 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Ortiz et al. 2013 |
| Astera- ceae | *Myriactis* | 14 | Asia (especially SE Asia), Costa Rica, Panama and Venezuela | 5 | 1 | Sht |  |  |  |  |  |  | 1 | 1 | 0 | Sancho et al. 2015 |
| Astera- ceae | *Noticastrum* | 18 | S Am | 2 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Karaman-Castro & Urbatsch 2009 |
| Astera- ceae | *Novenia* | 1 | S Am (Peru, Bolivia, Argentina) | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Freire et al. 2015 |
| Astera- ceae | *Oritrophium* | 19 | C and S Am | 16 | 6 | NT |  |  |  |  |  |  |  |  | 6 | Cross et al. 2002 |
| Astera- ceae | *Oxylobus* | 6 | Mex to Guatemala | 1 | 1 | NT |  |  | 1 | 1 |  |  |  |  | 0 | Turner and Kerr 1985 |
| Astera- ceae | *Paranephelius* | 6 | S Am | 5 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Funk et al. 2012 |
| Astera- ceae | *Pentacalia* | 210 | C and S Am | 89 | 26 | NT |  |  |  |  |  |  |  |  | 26 | none |
| Astera- ceae | *Perezia* | 30-35 | S Am, especially C and S Andes | 3 | 2 | NT | 0 | 1 |  |  |  |  | 2 | 1 | 0 | Simpson et al. 2009 |
| Astera- ceae | *Plagiocheilus* | 5 | S Am (Paraguay, Argentina) | 3 | 3 | NT | 2 | 2 | 1 | 0 |  |  | 0 | 1 | 0 | Karaman-Castro & Urbatsch 2009 |
| Astera- ceae | *Raouliopsis* | 2 | S Am (Venezuela, Colombia) | 2 | 2 | end | 1 | 1 |  |  |  |  | 1 | 1 | 0 | Freire et al. 2015 |
| Astera- ceae | *Sabazia* | 16 | Colombian and C Am | 4 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Urbatsch & Turner 1975 |
| Astera- ceae | *Scrobicaria* | 3 | S Am | 2 | 1 | NT |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Díaz-Piedrahita & Correa 2002 |
| Astera- ceae | *Selloa* | 5 | S Am | 2 | 1 | NT |  |  |  |  |  |  |  |  | 1 | none |
| Astera- ceae | *Senecio* | 1000 | Ww | 68 | 37 | temp |  |  |  |  |  |  |  |  | 37 | Pelser et al. 2007 |
| Astera- ceae | *Smallanthus* | 23 | Am (mostly NS Am) | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Rauscher et al. 2002 |
| Astera- ceae | *Stevia* | 240 | Am | 12 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Ito et al. 2000 |
| Astera- ceae | *Werneria* | 15 | S Am | 5 | 4 |  | 3 | 2 |  |  |  |  | 2 | 1 | 0 | Luteyn 1999 |
| Astera- ceae | *Xenophyllum* | 21 | S Am (Bolivia , Ecuador) | 6 | 6 | NT | 6 | 4 |  |  |  |  | 2 | 0 | 0 | Funk 1997 |
| Berberi- daceae | *Berberis* | 400-600 | S Am, Afr and Asia also Europe and N Am | 32 | 3 | Nht | 1 | 0 | 1 | 0 |  |  | 3 | 1 | 0 | Adhikari et al. 2015 |
| Boragi- naceae | *Hackelia* | 40 | N Am and SE Asia | 3 | 1 | Nht |  |  |  |  |  |  | 1 | 1 | 0 | Weigend et al. 2013 |
| Boragi- naceae | *Moritzia* | 3 | S Am (Brazil and Andes) | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Weigend et al. 2010 |
| Brassica- ceae | *Brayopsis* | 8 | S Am | 1 | 1 | NT |  |  | 1 | 1 |  |  |  |  | 0 | Salariato et al. 2015 |
| Brassica- ceae | *Cardamine* | 227 | Ww | 11 | 3 | temp | 2 | 0 | 1 | 0 |  |  | 3 | 0 | 0 | Bleeker et al. 2002; Carlsen et al. 2009 |
| Brassica- ceae | *Descurainia* | 40 | Ww temp | 1 | 1 | temp |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Goodson et al. 2011 |
| Brassica- ceae | *Draba* | 390 | Ww temp | 47 | 36 | Nht |  |  |  |  |  |  |  |  | 36 | Jordon-Thaden et al. 2013 |
| Brassica- ceae | *Eudema* | 4 | S Am | 3 | 3 | NT | 2 | 2 | 1 | 0 |  |  | 1 | 0 | 0 | Salariato et al. 2015 |
| Brassica- ceae | *Lepidium* | 153 | widely distributed in the Am, Afr, Asia, Aus and Europe | 3 | 2 | temp |  |  |  |  |  |  |  |  | 2 | Mummenhoff et al. 2001; Mummenhoff et al. 2009 |
| Bromelia- ceae | *Greigia* | 32 | C and S Am | 6 | 2 | NT |  |  |  |  |  |  | 2 | 2 | 0 | Will and Zizka 1999 |
| Bromelia-ceae | *Puya* | >200 | S Am (Andes) | 45 | 5 | NT | 3 | 2 |  |  |  |  | 5 | 2 | 0 | Jabaily and Sytsma 2013 |
| Bromelia- ceae | *Tillandsia* | >500 | Am | 7 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Garcia-Cruz et al. 2008 |
| Cactaceae | *Opuntia/ Austrocylin-dropuntia* | 11 (75) | S Am | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Majure et al. 2012 |
| Calceola- riaceae | *Calceolaria* | 388 | C Mex to Patagonia, distribution centre in Andean | 65 | 21 | Sht |  |  |  |  |  |  |  |  | 21 | Cosacov et al. 2009 |
| Campa-nulaceae | *Lobelia* | 360–400 | Ww mostly Trop | 3 | 1 | Ww |  |  |  |  |  |  | 1 | 1 | 0 | Antonelli et al. 2009; Lagomarsino et al. 2014 |
| Campa-nulaceae | *Lysipomia* | 40 | S Am, predominantly in Páramo | 27 | 9 | NT | 5 | 2 | 2 | 1 |  |  | 6 | 2 | 0 | Lagomarsino et al. 2014 |
| Campa-nulaceae | *Siphocampylus* | 236 | Am | 11 | 2 | NT | 1 | 0 |  |  |  |  | 2 | 1 | 0 | Lammers 1998; Antonelli et al. 2009; Lagomarsino et al. 2014 |
| Caroyphyllaceae | *Arenaria* | 210 | widespread, mostly cool-temperate areas of the N Hem | 14 | 11 | temp |  |  |  |  |  |  |  |  | 11 | Sadeghian et al. 2014 |
| Caroyphyllaceae | *Cerastium* | 100 | widespread, mostly cool-temperate areas of the N Hem | 18 | 15 | Nht | 14 | 9 | 5 | 1 |  |  | 3 | 0 | 0 | Scheen et al. 2004 |
| Caroyphyllaceae | *Silene* | 700 | widespread, mostly cool-temperate areas of the N Hem | 1 | 1 | Ntp |  |  | 1 | 1 |  |  |  |  | 0 | Popp & Oxelman 2007 |
| Caroyphyllaceae | *Stellaria* | 109 | Ww | 6 | 2 | temp |  |  |  |  |  |  |  |  | 2 | none |
| Caroyphyllaceae | *Colobanthus* | 25 | S Hem, mostly NZ, Aus and S Am) | 1 | 1 | Sht |  |  | 1 | 1 |  |  |  |  | 0 | Dillenberger and Kadereit 2014; Greenberg and Donoghue 2011 |
| Clethra- ceae | *Clethra* | 65 | Am, Asia, N Atlantic Islands (Madeira) | 5 | 1 | T |  |  |  |  |  |  | 1 | 1 | 0 | Fior et al. 2003 |
| Columel- liaceae | *Columellia* | 2 | N Andes | 2 | 1 | NT |  |  |  |  |  |  |  |  | 1 | none |
| Crassula- ceae | *Crassula* | 200 | Ww mostly Afr esp. S. Afr. | 2 | 1 | temp |  |  |  |  |  |  |  |  | 1 | none |
| Crassula- ceae | *Echeveria* | 150 | Mex and S Am | 4 | 2 | NT |  |  |  |  |  |  |  |  | 2 | Carrillo-Reyes et al. 2008 |
| Crassula- ceae | *Villadia* | 21 | Am (Texas to Peru) | 1 | 1 | NT |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Carrillo-Reyes et al. 2008 |
| Cunonia-ceae | *Weinmannia* | 150 | S Hem temp | 15 | 1 | Sht |  |  |  |  |  |  | 1 | 1 | 0 | Bradford 1998 |
| Cypera- ceae | *Carex* | 1000 | Ww especially N Hem | 32 | 15 | temp |  |  |  |  |  |  |  |  | 15 | none |
| Cypera- ceae | *Eleocharis* | 250 | Ww | 11 | 2 | Ww |  |  |  |  |  |  | 2 | 2 | 0 | Roalson wt al. 2010 |
| Cypera- ceae | *Isolepis* | 69 | widespread, mostly cool-temp S Hem | 2 | 2 | temp |  |  | 2 | 2 |  |  |  |  | 0 | Muasya et al. 2001 |
| Cypera- ceae | *Oreobolus* | 14 | C and S Am, S Hem | 5 | 3 | Sht | 2 | 1 | 1 | 1 |  |  | 1 | 0 | 0 | Chacon et al. 2006 |
| Cypera- ceae | *Rhynchospora* | 250-300 | most diverse in T Am | 12 | 1 |  |  |  |  |  |  |  | 1 | 1 | 0 | Thomas et al. 2009 |
| Cypera- ceae | *Trichophorum* | 10 | widespread cool temp | 1 | 1 | Nht |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Leveille-Bourret et al. 2014 |
| Cypera- ceae | *Uncinia/Carex* | 54 | S Hem | 7 | 7 | Sht | 6 | 4 |  |  |  |  | 3 | 1 | 0 | Starr & Ford 2009 |
| Elatina- ceae | *Elatine* | 25 | Ww | 6 | 4 | temp |  |  |  |  |  |  |  |  | 4 | none |
| Ericaceae | *Bejaria* | 14 | Ams | 5 | 1 | NT |  |  | 1 | 1 |  |  |  |  | 0 | Kron and Gillespie 2013 |
| Ericaceae | *Cavendishia* | 130 | Ams | 2 | 1 | NT |  |  | 1 | 1 |  |  |  |  | 0 | Kron and Gillespie 2013; Pedraza-Penalosa et al. 2015 |
| Ericaceae | *Ceratostema* | 23 | Ams | 2 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Pedraza-Penalosa et al. 2015 |
| Ericaceae | *Disterigma* | 37 | C and S Am | 8 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Pedraza-Penalosa et al. 2010 |
| Ericaceae | *Gaultheria* | 134 | Ww | 19 | 6 | Sht | 4 | 2 |  |  |  |  | 4 | 2 | 0 | Powell and Kron 2001 |
| Ericaceae | *Macleania* | 37 | Ams | 2 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Kron and Gillespie 2013; Pedraza-Penalosa et al. 2015 |
| Ericaceae | *Pernettya* | 170-180 | Asia, N and S Am, Australasia | 2 | 1 | Sht |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Kron and Gillespie 2013; Pedraza-Penalosa et al. 2015 |
| Ericaceae | *Vaccinium* | 140 | widespread | 24 | 1 | Nht |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Kron and Gillespie 2013; Pedraza-Penalosa et al. 2015 |
| Eriocau-laceae | *Eriocaulon* |  |  | 1 | 1 | T |  |  |  |  |  |  |  |  | 1 | none |
| Eriocau-laceae | *Paepalanthus* | 380 | S Am | 26 | 3 | T |  |  |  |  |  |  | 3 | 3 | 0 | Trovo et al. 2013 |
| Fabaceae | *Astragalus* | 1000 | Ww mainly N Hem temp | 3 | 1 | Nht |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Amirahmadi et al. 2014 |
| Fabaceae | *Lathyrus* | 160 | Ww temp | 2 | 1 | Nht |  |  |  |  |  |  | 1 | 1 | 0 | Kenicer et al. 2005 |
| Fabaceae | *Lupinus* | 220 | Afr, Am | 66 | 29 | Nht | 21 | 10 | 1 | 1 |  |  | 18 | 7 | 0 | Drummond et al. 2012; |
| Gentia-naceae | *Gentiana* | 361 | widespread, temp | 3 | 1 | temp |  |  |  |  |  |  | 1 | 1 | 0 | Mishiba et al. 2009 |
| Gentia-naceae | *Gentianella* | 200 | widespread, temp | 48 | 27 | temp | 20 | 12 | 4 | 1 |  |  | 11 | 6 | 0 | von Hagen and Kadereit 2001 |
| Gentia-naceae | *Halenia* | 68 | high-altitude areas of Asia and Am | 43 | 21 | NT | 10 | 8 | 4 | 1 |  |  | 12 | 7 | 0 | von Hagen and Kadereit 2003; Kadereit & von Hagen 2003 |
| Gerania- ceae | *Geranium* | 260 | widespread, temp | 45 | 18 | temp | 12 | 4 | 0 | 2 |  |  | 14 | 4 | 0 | Fiz et al. 2008 |
| Grossul-ariaceae | *Ribes* | 200 | N Hem and S Am | 12 | 8 | Ntp | 4 | 2 | 2 | 0 |  |  | 6 | 2 | 0 | Schultheis and Donoghue 2004 |
| Halora-gaceae | *Gunnera†* | 40 | S Hem | 11 | 1 | Sht |  |  | 1 | 1 |  |  |  |  | 0 | Wanntorp and Wanntorp 2003 |
| Halora-gaceae | *Myriophyllum* | 45 | Ww | 2 | 1 | Ww |  |  |  |  |  |  | 1 | 1 | 0 | Moody and Les 2007 |
| Hydro-charita-ceae | *Elodea* | 6 | Am | 2 | 2 | temp |  |  |  |  |  |  |  |  | 2 | none |
| Hydro-phylla- ceae | *Phacelia* | 100 | Am, mostly N Am | 1 | 1 | Ntp |  |  |  |  |  |  |  |  | 1 | none |
| Hyperi- caceae | *Hypericum* | 370 | Ww mostly temp | 65 | 25 | temp | 15 | 0 |  |  |  |  | 25 | 10 | 0 | Nürk et al. 2013 |
| Hypoxi- daceae | *Hypoxis* | 90 | mostly S Hem | 2 | 1 | T |  |  | 0 | 1 |  |  | 1 | 0 | 0 | Kocyan et al. 2011 |
| Irida- ceae | *Orthrosanthus* | 10 | Aus, C and S Am | 4 | 1 | Sht |  |  |  |  |  |  |  |  | 1 | none |
| Irida- ceae | *Sisyrinchium* | 140 | Am | 11 | 5 | temp | 3 | 2 | 2 | 0 |  |  | 2 | 0 | 0 | Alves et al. 2011; Karst and Wilson 2012 |
| Junca- ceae | *Distichia* | 3 | Andes | 2 | 2 | NT | 1 | 0 | 2 | 1 |  |  |  |  | 0 | none |
| Junca- ceae | *Juncus* | 300 | nearly Ww | 17 | 6 | temp | 4 | 0 | 2 | 4 |  |  | 4 | 2 | 0 | Drabkova et al. 2006; Zaveska Drabkova & Vlcek 2010 |
| Junca- ceae | *Luzula* | 115 | Ww | 5 | 3 | temp | 2 | 0 | 2 | 1 |  |  | 1 | 0 | 0 | Drabkova et al. 2006; Zaveska Drabkova & Vlcek 2010 |
| Junca- ceae | *Rostkovia* | 2 | S Hem | 1 | 1 | Sht |  |  |  |  |  |  |  | 0 | 1 | none |
| Juncagi- naceae | *Lilaea* | 1 | monotypic, throughout Am | 1 | 1 | Sht |  |  | 1 | 1 |  |  |  |  | 0 | Balslev et al. 1979 |
| Lamia- ceae | *Salvia* | 500 | widespread | 15 | 4 | Nht | 1 | 0 |  |  |  |  | 4 | 3 | 0 | Will et al. 2015; Jenks et al. 2013 |
| Lamia- ceae | *Stachys* | 380 | widespread | 7 | 3 | Nht |  |  |  |  |  |  |  |  | 3 | none |
| Lentibu- lariaceae | *Pinguicula* | 85 | Eurasia, Am | 5 | 2 | temp |  |  |  |  |  |  |  |  | 2 | Cieslak et al. 2005; Degtjareva et al. 2006 |
| Lorantha- ceae | *Gaiadendron* | 1 | C and S Am | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Wilson and Calvin 2006 |
| Malva- ceae | *Acaulimalva* | 20 | S Am | 10 | 7 | NT | 6 | 0 |  |  |  |  | 7 | 1 | 0 | Tate et al. 2011 |
| Malva- ceae | *Nototriche* | 100 | Andean (Ecuador to Argentina) | 7 | 7 | NT | 6 | 0 | 7 | 1 |  |  |  |  | 0 | Tate and Simpson 2003 |
| Melasto- maceae | *Brachyotum* | 71 | trop Am | 22 | 6 | NT |  |  |  |  |  |  |  |  | 6 | Michelangeli et al. 2013 |
| Melasto- maceae | *Chaetolepis* | 11 | trop Am, W Afr (1) | 8 | 2 | NT |  |  |  |  |  |  | 2 | 2 | 0 | Kriebel 2015 |
| Melasto- maceae | *Miconia* | 700 | warm temp to trop Am | 54 | 4 | NT | 2 | 0 |  |  |  |  | 4 | 2 | 0 | Goldberg et al. 2008 |
| Melasto-mataceae | *Castratella* | 2 | Andes | 2 | 1 | end |  |  |  |  |  |  | 1 | 1 | 0 | Michelangeli et al. 2013 |
| Myrtac-eae | *Myrteola* | 3 | S Am and Falkland Islands | 3 | 1 | Sht |  |  |  |  |  |  |  |  | 1 | none |
| Nyctagi- naceae | *Colignonia* | 6 | Andes | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Bohlin 1998 |
| Onagra- ceae | *Epilobium* | 160-200 | widespread, temp | 1 | 1 | temp |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Baum et al. 1994 |
| Onagra- ceae | *Oenothera* | 245 | Am | 4 | 2 | Nht |  |  |  |  |  |  |  |  | 2 | Evans et al. 2005 |
| Orchida- ceae | *Aa* | 25 | S Am, mainly mountains | 12 | 7 | NT |  |  |  |  |  |  |  |  | 7 | none |
| Orchida- ceae | *Elleanthus* | 112 | Mex, C and S Am, West Indies | 8 | 2 | NT |  |  |  |  |  |  |  |  | 2 | none |
| Orchida- ceae | *Epidendrum* | 1000 | Am, mostly trop | 28 | 4 | NT |  |  |  |  |  |  |  |  | 4 | none |
| Orchida- ceae | *Lepanthes* | 800-1000 | Mex, S Am and Antilles | 31 | 2 | NT | 1 | 0 |  |  |  |  | 2 | 1 | 0 | Pridgeon et al. 2001 |
| Orchida- ceae | *Maxillaria* | 570 | mostly trop Am | 5 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Whitten et al. 2007 |
| Orchida- ceae | *Myrosmodes* | 13 | S Am | 6 | 6 | NT | 5 | 5 | 1 | 0 |  |  | 1 | 0 | 0 | Szlachetko et al. 2014 |
| Orchida- ceae | *Odontoglossum* | 300 | S Am | 11 | 2 | NT |  |  |  |  |  |  |  |  | 2 | none |
| Orchida- ceae | *Pachyphyllum/Fernandezia* | 41 | S Am, C Am, and S Mex | 7 | 3 | NT | 2 | 0 |  |  |  |  | 3 | 1 | 0 | Christenson 2008 |
| Orchida- ceae | *Trichosalpinx* | 110 | N Mex to Bolivia, West Indies | 2 | 1 | NT |  |  |  |  |  |  |  |  | 1 | none |
| Oroban- chaceae | *Bartsia* | 49 | mostly S Am, also Afr, Eurasia (but see Scheunert et al. 2012) | 21 | 13 | Nht | 7 | 3 |  |  |  |  | 10 | 6 | 0 | Scheunert et al. 2012 |
| Oroban- chaceae | *Castilleja* | 210 | Am to the Andes and N Asia | 15 | 9 | Nht | 8 | 6 |  |  |  |  | 3 | 1 | 0 | Tank & Olmstead 2009 |
| Oroban- chaceae | *Lamourouxia* | 26 | N Mex to C Peru | 2 | 1 | NT |  |  |  |  |  |  |  |  | 1 | none |
| Phytolac- caceae | *Phytolacca* | 25-35 | subtrop and trop ww | 4 | 1 | T |  |  |  |  |  |  |  |  | 1 | none |
| Pipera- ceae | *Peperomia* | >1500 | (sub-)trop ww, highest species richness C and NS Am | 17 | 4 | T | 2 | 0 |  |  |  |  | 4 | 2 | 0 | Samain et al. 2009 |
| Plantagi- naceae | *Aragoa* | 19 | Colombia and Venezuela, mostly Páramos few forest | 19 | 4 | end | 3 | 0 |  |  |  |  | 3 | 1 | 0 | Bello et al. 2002 |
| Plantagi- naceae | *Callitriche* | 50 | Afr , S Am, Europe | 4 | 4 | temp |  |  | 4 | 1 |  |  |  |  | 0 | Philbrick and Les 2000 |
| Plantagi- naceae | *Plantago* | 160-200 | Ww | 10 | 7 | temp |  |  |  |  |  |  |  |  | 7 | Ronsted et al. 2002 |
| Poaceae | *Aciachne* | 3 | S Am, high Andes, N Argentina to Costa Rica | 3 | 3 | NT | 2 | 2 | 1 | 0 |  |  | 1 | 0 | 0 | Romaschenko et al. 2012 |
| Poaceae | *Aegopogon* | 3 | S US to Argentina | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Peterson et al. 2010 |
| Poaceae | *Agrostis* | 175 | temp, mostly N hem | 26 | 10 | temp |  |  |  |  |  |  |  |  | 10 | none |
| Poaceae | *Alopecurus* | 35 | N. Hem. Temp. | 1 | 1 | temp |  |  | 1 | 1 |  |  |  |  | 0 | Grebenstein et al. 1998 |
| Poaceae | *Aphanelytrum* | 17 | W trop S Am | 1 | 1 | NT |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Hoffmann et al. 2013 |
| Poaceae | *Bromus* | 120-140 | Ww with a centre of diversity in temp Eurasia (>80 spp.) | 4 | 2 | temp | 1 | 0 |  |  |  |  | 2 | 1 | 0 | Saarela et al. 2007 |
| Poaceae | *Calamagrostis* | 290 | Ww | 33 | 29 | temp |  |  |  |  |  |  |  |  | 29 | Wolk and Roser 2014 |
| Poaceae | *Chusquea* | 140+21 | C and S Am (mostly SE Brazil and the Andes) and the West Indies | 20 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Fisher et al. 2014 |
| Poaceae | *Cortaderia* | 25 | S. Am., NZ (49, New Guinea (1) | 6 | 2 | Sht |  |  | 1 | 0 |  |  | 2 | 1 | 0 | Barker et al. 2003; Linder et al. 2010 |
| Poaceae | *Dissanthelium* | 15 | S. Am esp Andes | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Refulio-Rodriguez et al. 2012 |
| Poaceae | *Elymus* | 150 | Eurasia, Ams esp. N. hem. Temp | 1 | 1 | temp |  |  | 1 | 1 |  |  |  |  | 0 | Gao et al. 2015 |
| Poaceae | *Festuca* | 200 | Ww | 36 | 24 | temp | 3 | 0 |  |  |  |  | 4 | 1 | 0 | Diaz-Perez et al 2014; Inda et al. 2008 |
| Poaceae | *Muhlenbergia* | 74 | E Aus, N to S Am (Andes) | 11 | 3 | Nht |  |  |  |  |  |  |  |  | 3 | Columbus et al. 2010 |
| Poaceae | *Nassella* | 116 | S Am | 5 | 3 | NT | 1 | 1 | 1 | 0 |  |  | 2 | 1 | 0 | Cialdella et al. 2014; Romaschenko et al. 2014 |
| Poaceae | *Ortachne* | 8 | S Am | 1 | 1 | NT |  |  | 1 | 0 |  |  | 1 | 0 | 0 | Cialdella et al. 2010 |
| Poaceae | *Paspalum* | 350 | widespread Afr, Asia, Aus, and Am; many (sub)trop | 7 | 1 | T |  |  |  |  |  |  | 1 | 1 | 0 | Scataglini et al. 2014 |
| Poaceae | *Poa* | 500 | Ww | 21 | 11 | temp |  |  |  |  |  |  |  |  | 11 | Hoffmann et al. 2013 |
| Poaceae | *Polypogon* | 25 | warm-temp and trop mountains | 2 | 1 | temp |  |  |  |  |  |  | 1 | 1 | 0 | Hoffmann et al. 2013 |
| Poaceae | *Stipa* | 250 | Ww | 4 | 1 | temp |  |  |  |  |  |  | 1 | 1 | 0 | Cialdella et al. 2014; Romaschenko et al. 2014 |
| Poaceae | *Neurolepis* | 14 | S Am (Venezuela to Peru) | 10 | 4 | end | 3 | 1 |  |  |  |  | 3 | 1 | 0 | Fisher et al. 2009; Fisher et al. 2014 |
| Polygona- ceae | *Muehlenbeckia* | 20 | S hem esp S Am, Papua New Guinea, Aus and NZ | 4 | 2 | Sht | 0 | 1 |  |  |  |  | 2 | 1 | 0 | Schuster et al. 2011; Schuster et al. 2013 |
| Polygona- ceae | *Rumex* | 200 | Ww, mainly N Hem | 6 | 1 | temp |  |  |  |  |  |  | 1 | 1 | 0 | Schuster et al. 2011; |
| Portula- caceae | *Calandrinia* | 150 | Am, Aus | 2 | 1 | Sht |  |  |  |  |  |  | 1 | 1 | 0 | none |
| Potamo- getona- ceae | *Potamogeton* | 94 | Ww | 3 | 3 | temp |  |  |  |  |  |  |  |  | 3 | Lindqvist et al. 2006 |
| Ranun- culaceae | *Anemone* | 150 | N Hem and mountainous and cooler S Hem | 1 | 1 | temp |  |  | 1 | 1 |  |  |  |  | 0 | Meyer et al. 2010 |
| Ranun- culaceae | *Caltha* | 12 | Ww, temp | 1 | 1 | temp |  |  | 1 | 1 |  |  |  |  | 0 | Hörandl et al. 2011 |
| Ranun- culaceae | *Laccopetalum* | 1 | S Am (high Andes) | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Hörandl et al. 2011 |
| Ranun- culaceae | *Oreithales* | 1 | S Am (high Bolivia and Peru) | 1 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Meyer et al. 2010 |
| Ranun- culaceae | *Ranunculus* | 400 | Ww mostly temp | 16 | 9 | temp | 7 | 5 | 1 | 0 |  |  | 4 | 1 | 0 | Hörandl et al. 2011 |
| Rosaceae | *Acaena* | 60 | S hem, notably NZ, Aus and S Am, few N Hem | 6 | 5 | Sht | 4 | 0 | 2 | 0 |  |  | 5 | 2 | 0 | Marticorena et al. 2006 |
| Rosaceae | *Aphanes* | 12 | Euras, S Am, Afr (Ethiopia) | 1 | 1 | temp |  |  | 1 | 1 |  |  |  |  | 0 | Gehrke et al. 2008 |
| Rosaceae | *Holodiscus* | 10 | Am | 2 | 1 | NT |  |  |  |  |  |  | 1 | 1 | 0 | Gehrke et al. 2008 |
| Rosaceae | *Lachemilla* | 80 | N Mex to S Am, one in the Dom Rep (2200–5000) | 34 | 23 | NT | 17 | 10 | 1 | 1 |  |  | 12 | 6 | 0 | Gehrke et al. 2008 |
| Rosaceae | *Polylepis* | 28 | Trop Andes: mid- and high-elevation | 11 | 3 | NT | 2 | 1 |  |  |  |  | 2 | 1 | 0 | Schmidt-Lebuhn et al. 2010 |
| Rosaceae | *Potentilla* | 300-500 | mostly N hem | 2 | 2 | Nht |  |  | 2 | 2 |  |  |  |  | 0 | Dobes and Paule 2010 |
| Rosaceae | *Rubus* | >300 | Ww mostly temp | 24 | 1 | temp |  |  |  |  |  |  | 1 | 1 | 0 | Sochor et al. 2015 |
| Rubia- ceae | *Arcytophyllum* | 18 | NS Am (high elevations from Costa Rica to Bolivia) | 14 | 6 | NT | 13 | 13 |  |  |  |  | 1 | 1 | 0 | Andersson et al. 2001; Andersson et al. 2002; Groeninck et al. 2009 |
| Rubia- ceae | *Galium* | 400 | temp Ww | 9 | 5 | temp | 3 | 0 |  |  |  |  | 5 | 2 | 0 | Soza and Olmstead 2010 |
| Rubia- ceae | *Manettia* | 205 | Am, Trop | 2 | 1 | NT |  |  |  |  |  |  |  |  | 1 | none |
| Rubia- ceae | *Nertera* | 26 | widespread | 2 | 1 | Stp |  |  |  |  |  |  | 1 | 1 | 0 | Soza and Olmstead 2010 |
| Scrophu- lariaceae | *Ourisia* | 28(-59) | Sub(alpine) S Am, NZ and Tasmania | 2 | 2 | Stp | 1 | 0 | 1 | 1 |  |  | 1 | 0 | 0 | Meudt and Simpson 2006 |
| Solana- ceae | *Cestrum* | 175 | Am | 3 | 2 | NT | 2 | 0 |  |  |  |  | 3 | 1 | 0 | Montero-Castro et al. 2006 |
| Solana- ceae | *Nicotiana* | 45 | Am, Aus, SW Afr and S Pacific | 1 | 1 | Ww |  |  |  |  |  |  | 1 | 1 | 0 | Kelly et al. 2010 |
| Solana- ceae | *Salpichroa* | 31 | S Am, mostly Andes | 3 | 2 | NT | 1 | 0 |  |  |  |  |  |  | 0 | none |
| Solana- ceae | *Solanum* | 1400 | Ww | 43 | 5 | NT | 2 | 0 |  |  |  |  | 5 | 3 | 0 | Anderson et al. 2015 |
| Symplo- caceae | *Symplocos* | 250-300 | Asia, Aus and the Am | 1 | 1 | T |  |  |  |  |  |  | 1 | 1 | 0 | Wang et al. 2004 |
| Urtica- ceae | *Urtica* | 30 | Ww mostly temp | 4 | 3 | temp |  |  |  |  |  |  |  |  | 3 | none |
| Valeria-naceae | *Valeriana* | 217-300 | Ww, mostly temp | 51 | 28 | temp | 27 | 24 |  |  |  |  | 2 | 1 | 0 | Gonzalez and Bell 2015; Bell et al. 2012 |
| Verbe-naceae | *Verbena* | 74(-250) | Ww | 3 | 1 | Nht |  |  |  |  |  |  |  |  | 1 | Yuan et al. 2010 |
| Viola- ceae | *Viola* | 580-620 | esp. temp N Hem, also Hawaii, Australasia, and the Andes | 17 | 5 | temp |  |  |  |  |  |  |  |  | 5 | Ballard et al. 1998; Marcussen et al. 2015 |

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**Mt. Kinabalu:**

List of genera investigated for the tropical high alpine parts of **Mt. Kinabalu** including information on family, genus, number of species and distribution of the genus (Mabberley 2008 and references as given at the end). Number of species in the genus on Mt. Kinabalu, number of species in the tropical alpine of South East Asia (Smith, 1975; Smith 1977; Royen von 1979; Smith 1980; Govaerts et al. 2010; Nooteboom et al. online). Coding scheme: maximum and minimum number of, in situ speciation events (ISS), colonisation events from other alpine-like and tropical climate regions and other biomes, number of species not coded and citation. Abbreviations: Afr=Africa; Am=America(s); Aus=Austarlia; C=Central; Dom Rep= Dominican Republic; E=East(ern); end=endemic; esp= especially; Eur=European; Euras=Eurasian; excl=excluding; Hem=hemisphere; Madagas=Madagascar; Mal=Malasia; Med= Mediterranean; Mts= Mountains; N=North(ern); NG=New Guinea; Nht=Northern hemisphere temperate; NT= Neotropical; NZ=New Zealand; OW=Old World; S=South(ern); Sht=southern hemisphere temperate; temp= temperate both hemispheres; trop=tropical; US= United States of America; W=West(ern); Ww=worldwide

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| family | genus | size | generic distribution | area | alpine | species in the tropical alpine-like | distribution | ISS max | ISS min | alpine max | alpine min | tropical max | tropical min | other max | other min | not coded | citation |
| Apiaceae | *Oreomyrrhis/Chaero-phyllum* | 25 | Southern Hemisphere, excl. Africa, Madagascar | 1 | 1 | *O. borneensis* | End. |  |  | **1** | **1** |  |  |  |  |  | Chung & Schaal 2007 |
| Asterac-eae | *Keysseria* | 12 | Indonesia (9 spp. NG, Celebes, and Borneo) & Hawaiian Is (3 spp.), later a distinct subsp. | 1 | 1 | *K. gibbsiae* (Merr.) Cabrera ex Stehen | NG |  |  |  |  |  |  | **1** | 1 |  | Nicolas & Plunkett 2009 |
| Boragina-ceae | *Trigonotis* | 50 | E. Eu. (1), C. AS. (39 China, 34 end.) to NG, often Mts | 1 | 1 | *T. borneensis* (Stapf) I.M. Johnst. | End. | **1** | **0** |  |  |  |  | **1** | 0 |  | Weigend et al. 2013 |
| Centro-lepida-ceae | *Centrolepis* | 26 | SE As., Mal. Mts, Aus., NZ | 1 | 1 | *C. philippinensis* Merr. | Phil.,  Sul., NG |  |  | **1** | **0** |  |  | **1** | 0 |  | Cook 1992 |
| Cyperac-eae | *Oreobolus* | 14 | Pacific wet alpine & subarctic | 1 | 1 | *O. ambiguus* Kük. & Steenis | NG, Sul. |  |  |  |  |  |  | **1** | 1 |  | Viljoen et al. 2013 |
| Cypera-ceae | *Carex* | 2000 | cosmopolitan, main distribution N. hem. | 9 | 2 | *C. breviculmis* R.Br., *C. capillacea* Boott var. s*achalinensis* (F.Schmidt) Ohwi | Asia to NZ |  |  |  |  |  |  | **2** | 2 |  | Govaerts et al. 2010 |
| Ericaceae | *Gaultheria* | 120 | N.-S. Am., India, S.-E. Asia, Austral., NZ, Himalaya, Japan; temp. | 28 | 1 | *G. borneensis* Stapf | Phil. and Taiwan |  |  | **1** | **1** |  |  |  |  |  | Fritsch et al 2011; Fritsch & Busch 2011 |
| Ericaceae | *Trochocarpa* | 12 | Mal., E. Aus. (7-8) | 1 | 1 | *T. celebica* (J.J.Sm.) Steenis | Sul. |  |  |  |  |  |  | **1** | 1 |  | Sleumer 1964 |
| Eriocaula-ceae | *Eriocaulon* | 400 | esp. N. Am. & C Am. With OW (not Aus.) esp. N Am (173) & C Am (234) with OW 100 | 2 | 1 | *E. kinabaluense* P.Royen | End. |  |  | **1** | **1** |  |  |  |  |  | deAndrade et al. 2010 |
| Myrta-ceae | *Lepto-spermum* | 85 | SE Asia to NZ (Aus. 82-80 end.) | 2 | 1 | *L. recurvum* Hook.f. | Sul. |  |  |  |  |  |  | **1** | 1 |  | Ando et al. 2013; Lee & Lowry 1980 |
| Poaceae | *Anthoxan-thum* | 50 | Eur. 13, Artic, trop. Mts, N & C Am (5); mostly temp. climate | 1 | 1 | *A. horsfieldii* (Benn.) Reeder | Mts SE Asia to India |  |  | **1** | **1** |  |  |  |  |  | Pimentel et al. 2013 |
| Poaceae | *Bromus* | 150 | Eur. 37, China 55, N. Am 28, trop Mts; mostly temp. Climate | 1 | 1 | *B. formosanus* Honda | Tai-wan |  |  | **1** | **1** |  |  |  |  |  | Saarela et al. 2007 |
| Poaceae | *Avenella/ Deschampsia* | 30 | temp & cool esp. N. (eur. 6, N Am 7) | 1 | 1 | *A. flexuosa* (L.) Drejer var. *ligulata* (Stapf.) Veldk. | wide |  |  |  |  |  |  | **1** | 1 |  | Chiapella et al. 2011; Saarela et al. 2010 |
| Poaceae | *Poa* | 500 | temp & cold (Eur. 45, China 81, Mal. 34, Aus. 36, NZ 34, Am. 175 | 4 | 2 | *P. epileuca* (Stapf) Stapf, *P. papuana* Stapf | Sul., NG |  |  |  |  |  |  |  |  | 2 | Hoffmann et al. 2013 |
| Ranuncu-laceae | *Ranunculus* | 600 | temp, incl. trop. Mts | 1 | 1 | *R. lowii* Stapf. | End. | **1** | **1** |  |  |  |  |  |  |  | Hörandl & Emazade 2011 |
| Rosaceae | *Potentilla* | 330 | Eur. 79 & boreal, few S temp. | 3 | 2 | *P. polyphylla* Wall.  ex Lehm. var. *kinabaluensis* (Stapf) Kalkm. |  |  |  | **2** | **2** |  |  |  |  |  | Ikeda & Ohba 1998; Smith 1980 |
| Rubia-ceae | *Phyllocrater* | 1 | Borneo | 1 | 1 | *P. gibbsiae* Wernham | End. |  |  | **1** | **0** |  |  |  |  |  | Wernham 1941 |
| Urtica-ceae | *Pilea* | 650 | trop & warm, except Austalasia | 9 | 1 | *P. johniana* Stapf |  |  |  |  |  |  |  | **1** | 1 |  | Monro 2006 |

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