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The Flora of the Fuego-Patagonian Cordilleras: its Origins and Affinities*

Flora de las cordilleras de Tierra del Fuego y de la Patagonia: sus orígenes y afinidades

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ABSTRACT

The cordilleras of Tierra del Fuego and southern Patagonia contain floristic elements which reflect both their histories and present conditions. The mountains to the west and south of the zone, representing the southernmost extension of the Andes, are the wettest and highest of the region and their species show some Antarctic affinities. The other Fuego-Patagonian mountains are lower and drier, with their plants demonstrating many affinities with lowland Patagonia and the eastern Andes and precordilleras further north. Nevertheless, the large number of orophytic species which occur at lower elevations testifies to the youth of the southern montane floras, which have moved upwards during the 16,000 years since the last glaciation. The endemic species and genera in these zones indicate that they have immigrated to these areas from the south, from the east and from the north.

Key words: Floras, Fuego-Patagonia, orophytic species, post-glacial.

RESUMEN

Las cordilleras de la Tierra del Fuego y de la Patagonia austral comprenden elementos que reflejan sus historias y, también, las condiciones actuales. Las sierras al oeste y al sur de esta zona, que representan el extremo más austral de la Cordillera de los Andes, son las más húmedas y las más altas de la región y sus especies ostentan afinidades antárticas. Las otras sierras fueguino-patagónicas son más bajas y secas, y sus plantas muestran relaciones con las floras de la meseta patagónica y con la precordillera más al norte. Sin embargo, el gran número de especies orofíticas que crecen en elevaciones más bajas demuestra la juventud de la flora de todas las cordilleras del sur que han migrado hacia arriba durante los 16.000 años después de la última glaciación. Las especies y géneros presentes en estas zonas indican que ellas inmigraron desde el sur, el este y el norte.

Palabras claves: Floras, Tierra del Fuego, Patagonia, especies orofíticas, post-glácial.

INTRODUCTION

Although the origin of the Cordillera de los Andes and its attendant mountain ranges may be traced back some 100 million years to the Cretaceous period, they did not attain their present altitude until the Upper Pliocene, about 2 million years ago (Brüggen 1950, Harrington 1956). Subsequent to that the southern cordilleras, our concern here, were subjected to the Pleistocene glaciations which covered all the mountains and much of the lower ground south of 44° S lat., at least west of the Andes (Brüggen 1950, Vuillemier 1971). Such cover was intermittent, since the glaciers advanced and retreated four times; the most recent retreat, in the aftermath of which we now live, began about 16,000 years ago. However, the persisting glaciers in Fuegia (Cordillera Darwin and Isla Santa Inés, for example) and the extensive icefields of the Hielo Patagónico Sur serve as a reminder that the glacial retreat is still not complete in these regions.

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The southernmost parts of the Andes, which attain maximum altitudes of about 3300 m in southern Patagonia and about 2500 m in Tierra del Fuego, constitute a barrier to the moisture-laden winds which prevailingly blow from the south and west. As a result of this there is very much more precipitation to the west and south of these mountains, while the lower ranges lying in the rain shadow to the east of the main cordillera in Patagonia and to the north in Tierra del Fuego are much drier.

In addition to the differences, already noted, in altitude and precipitation between the Andes and the ranges of the Marginal Cordilleras (Kranck 1932) in their rain shadow, there are also geological differences of importance to the plant-life. The main mass of the southern Andes is composed of strongly deformed and metamorphosed Palaeozoic to Jurassic mica- and quartz-schists, penetrated in many places by lower Tertiary granites and granodiorites, and flanked by dark slates (greywackies), marls and quartz-porphyries. West and south of these the Jurassic-Lower Cretaceous igneous greenstones and the Jurassic 'Andean diorites' form the Fuegian and western Patagonian archipelagos. All these rocks weather rather slowly to give only skeletal lithosols initially. In contrast, the 'Marginal Cordilleras' are largely composed of Cretaceous sediments –sandstones, clay-slates, marls and conglomerates– which are strongly folded, with the beds often vertical. These softer rocks erode to give deeper, clayey soils, which are very subject to solifluction at higher elevations.

Although not entirely satisfactory, the delimitation of an orophytic flora and vegetation in most Fuego-Patagonian mountains can be achieved by basing it on the upper limit of the forests (Moore 1975). The timberline, usually comprising a dense belt of 'Krumholz' formed by *Nothofagus*, commonly, but by no means always. *N. antarctica*, lies at an average altitude of about 550-600 m in Tierra del Fuego, though it may be lower on the smaller drier sierras and higher (up to 700 m) on the larger mountain masses. North of the Estrecho de Magallanes the situation is somewhat more varied. Along the flanks of the Cordillera de los Andes the tree-line lies at about 640-750 m, though it may be greatly depressed under the influence of the Hielo Patagónico Sur and the glaciers to which it gives rise. To the west of the cordillera, on the islands of the west Patagonian channels, the tree-line becomes increasingly lower and ill-defined under the effects of the exposed, oceanic conditions so that towards the outer parts of the Chilean archipelago trees are largely confined to well-drained coastal sites and sheltered valleys. The drier mountains of the 'Marginal Cordillera' along the Argentinian-Chilean frontier to the east of Ultima Esperanza have a tree-line at about 600-800 m in their southern part (e.g. Sierra Dorotea, Sierra del Cazador). However, further north, in the region of the Sierra Baguales-Sierra Vizcachas, there are no forests and the transition to an orophytic zone is marked by less obvious changes in the structure and floristic composition of the vegetation.

THE VEGETATION

The orophytic zones of Fuego-Patagonia, as circumscribed above, contain a relatively small number of vegetation-types; however, they intergrade so frequently that it is often difficult to obtain a clear picture, particularly in view of the numerous local variants. Nevertheless, by considerable simplification, 6 principal structural types of community can be seen to form the basis of the montane vegetation in these austral regions –cushion heath, grass/cushion heath, dwarf-shrub heath–, montane meadows and two quite different kinds of feldmark or 'desierto andino', depending upon the substrate.

Cushion Heath. Throughout much of Tierra del Fuego, except the southern and western parts of the archipelago, and in the southern parts of the 'Marginal Cordillera' in Patagonia, a cushion heath dominated by *Bolax gummifera* is common at, and extending some distance above, timberline. Since this formation is rather frequent at lower elevations, it is not surprising to find that it contains many widespread species, both cushion-forming (e.g. *Abrotanella emarginata, Azorella lycopodioides, Colobanthus subulatus* and *Drapetes muscosus)* and not (e.g. *Acaena magellanica, Empetrum rubrum, Festuca contracta, Luzula alopecurus, Lycopodium magellanicum* and *Pernettya*

pumila). This community provides a habitat for the endemic *Tetrachondra patagonica* ssp. *fueguina* and *Onuris alismatifolia* in Tierra del Fuego, while such relatively restricted Fuego-Patagonian species as *Saxifragodes albowiana* and *Acaena tenera* are also largely confined to it.

Grass/Cushion Heath. In the northern parts of the South Patagonian 'Marginal Cordillera', the Sierra Baguales-Sierra Vizcachas region, where there is no forest, the lowest orophytic vegetation constitutes a grass/cushion heath. In this, *Festuca gracillima,* which dominates the grassland prevalent at lower altitudes, is associated with *Bolax gummifera.* Such communities also replace the cushion heath above timberline in several areas further south in the 'Marginal Cordillera', as on Cerro Solitario and Cerro Castillo, and also further west on the mountains of Península Antonio Varas. Amongst the most common and conspicuous of the communities included in the grass/cushion heath may be noted *Acaena magellanica, A. pinnatifida, Azorella fuegiana, A. lycopodioides, Colobanthus subulatus, Draba magellanica, Erigeron myosotis, Hypochoeris incana, Luzula alopecurus, Nassauvia abbreviata, Perezia recurvata* and *Thlaspi magellanicum.*

Dry Feldmark (Desierto Andino). In the 'Marginal Cordilleras' of Fuego-Patagonia both the cushion heath and the grass/cushion heath, already referred to, can give way to deep, open, sparsely vegetated soils, especially on steep slopes. These areas are perhaps most aptly termed Desierto Andino (Pisano 1974), but their very sparse vegetation is structurally similar to a typically drier type of feldmark (Moore 1975). A few species of the open facies of the cushion and grass/cushion heath, such as *Calandrinia caespitosa, Hamadryas delfinii, Luzula chilensis, Oxalis enneaphylla, Nassauvia pygmaea, Senecio alloeophyllus* and *S. magellanicus* are able to withstand the rather unstable soil conditions of this vegetation-type, which provides the principal habitat for such species as *Menonvillea nordenskjoldii, Perezia megalantha, Phaiophleps biflora* ssp. *lyckholmi, Tristagma ameghinoi* and *T. nivalis.*

Dwarf-Shrub Heath. In most of the Fuego-Patagonian mountains, communities in which *Empetrum rubrum* and, to a lesser extent, *Pernettya pumila,* are important occur widely in the orophytic zone, especially where the soils are relatively shallow and well-drained with adequate available moisture. Such communities intergrade in a complex fashion with the various facies of the cushion heaths referred to earlier and with the true feldmark to be mentioned next. In the higher rainfall zone of the Cordillera de los Andes and on the mountains of the canales and archipelago further to the west, various communities of the dwarf-shrub heath occur immediately above the timberline and, indeed, where this is ill-defined or non-existent, grade into the non-montane vegetation in which *Empetrum rubrum* is also frequently important (Moore 1979). The dwarf-shrub heath is probably richer in species and includes more communities than any other physiognomic vegetation-type present in the montane zones of the Fuego-Patagonian mountains. It is, of course, impossible to detail here all this variation, but some examples should suffice. Whilst the cushion-heath, dominated by *Bolax gummifera,* already described, intergrades with the dwarf-shrub heath, an important facet in which *Adesmia salicornioides* is a co-dominant should be mentioned here. Furthermore, communities in which *Empetrum rubrum* is associated with such taxa as *Leucheria hahnii, Nassauvia juniperina* and *Berberis empetrifolia* occur rather commonly north of the Estrecho de Magallanes.

Feldmark. On the wetter mountains of the Central Cordillera of Tierra del Fuego and of the Cordillera de los Andes in southern Patagonia, as well as on the higher summits of the archipelagos further to the south and west, the uppermost vegetation constitutes a true feldmark, with frequent evidence of frost polygons and other periglacial phenomena. Here, the extensive areas of open rock fragments or exposed mineral soil support a sparse vegetation in which several species of the more open facies of the dwarf-shrub and cushion heaths figure, such as *Abrotanella emarginata, Acaena magellanica, Colobanthus subulatus, Hypochoeris incana, Luzula alopecurus, Nassauvia pygmaea* and *Polystichum andinum.* These areas also provide the principal or sole habitats for such species as *Moschopsis*

rosulata, Nassauvia lagascae, the Fuegian endemic *Nassauvia latissima, Saxifragella bicuspidata* and *Valeriana magellanica.* Lichens, such as *Usnea* spp., form dense communities on the rocks in the feldmark.

Alpine 'meadow'. Where streams or seepage areas, derived in many cases from the glaciers or slow-melting snow patches, occur in montane areas a rather distinctive and often quite rich, vegetation is found to which the rather misleading term 'meadow' has been applied. Wet areas in which there is some development of soil or peat frequently support mats or hummocks of such species as *Abrotanella linearifolia, A. trichoachaenia, Caltha appendiculata, C. dioneifolia* and *Plantago barbata,* on and amongst which grow, for example, *Acaena antarctica, Caltha sagittata, Hierochloë redolens, Lagenifera nudicaulis, Ourisia breviflora, Oxalis magellanica, Primula magellanica, Tapeinia obscura* and *Viola commersonii.* Where the substrate is of coarse gravel or rocky, *Cardamine glacialis, Epilobium nivale, Eudema hauthalii, Hamadryas magellanica, Viola tridentata* and others become prominent. Bryophytes are common in these sites and in the wetter mountains of the western archipelago form substantial 'banks' or cushions which provide a habitat for a few of the above species, most notably *Tapeinia obscura* and *Viola commersonii.* Moist, sheltered more or less level sites can often support a graminoid vegetation in which species such as *Carex magellanica, Carpha alpina, Cortaderia pilosa, Juncus scheuchzerioides, Orthachne rariflora, Rostkovia magellanica, Schoenus andinus* and *Uncina kingii* are variously present to give a sward having many of the characteristics of lowland bogs, particularly those in the south and west of the region.

THE FLORA

As far as we know at present the native vascular flora of southernmost South America, from about 51° S lat. southwards to the archipelago of Cabo de Hornos, totals some 650 species (Boelcke et al, unpub., Moore 1974, 1983). Of these, about 28% occur in the orophytic habitats referred to earlier. Interestingly, this percentage is exactly the same when Tierra del Fuego and southernmost Patagonia north of the Estrecho de Magallanes are considered separately, even though the former area has only 2/3 of the total flora of the latter. This reflects the comparable conditions and age of the Fuego-Patagonian mountains when compared with, for example, the more oceanic and species-poor Falkland Islands (Islas Malvinas), where the wider ecological amplitude of the species results in about 38% of the total flora occurring in the montane zones (Moore 1968), most of them also growing at lower altitudes.

Distribution of the montane flora

Table 1 list all the species of the Fuego-Patagonian cordilleras known with certainty to occur in the orophytic zones as defined earlier in this account. Whilst there are certainly omissions and inaccuracies of detail in the list, it shows clearly that over 80% of the species also occur at lower altitudes in the region; only 42 species (marked with full stars in Table 1), or about 18% of the total, seem to be restricted to the montane areas.

Dealing first with the species occurring in both lowland and higher elevation habitats it can be seen that they fall into 3 more or less well-defined categories. The first and much the smallest group of species comprises those which occur more or less ubiquitously in the Fuego-Patagonian mountains –*Acaena magellanica, Empetrum rubra, Festuca pyrogea, Perezia pilifera* and *Phleum alpinum*– thus stressing the wide variety of montane conditions which few species have the capacity to cope with. This is further emphasised by the remaining two groups of species which occur either on the drier, eastern Marginal Cordillera or on the main cordillera and westwards in southern Patagonia.

Twenty four species occur in montane habitats only on the wetter, central and western Patagonian cordilleras. Most of these have a generally western and southern distribution in lowland Fuego-Patagonia –*Bolax caespitosa, Caltha dioneifolia, Donatia fascicularis, Gaimardia australis, Lycopodium alboffii, L. confertum, Oreobolus obtusangulus, Orthachne rariflora, Phyllachne uliginosa, Senecio kingii, Tribeles australis, Uncinia kingii, Viola commersonii,* and *V. tridentata,* while almost all the others have a wider range but only in moist habitats –*Drapetes muscosus,*

Marsippospermum grandiflorum, Perezia lactucoides, Pernettya pumila, Rostkovia magellanica, Senecio acanthifolius and *Serpyllopsis caespitosa.* The three remaining species in this group –*Escallonia serrata, Grammitis magellanica* and *Nothofagus antarctica*– serve to emphasise the poor development of a distinct orophytic flora in the severe environmental conditions of the area west of the Cordillera de los Andes, conditions also reflected in the impoverished flora of this region as indicated in Table 1.

Much the largest group of species, totalling 115, of those present both in montane and lowland areas, is that in which the mountain occurrences are only on the drier marginal cordilleras. As might be expected, virtually all these species are present in the Patagonian Lowlands eastwards from the cordilleras to the Atlantic coast. The comparative floristic richness of the marginal cordilleras underlines their generally more favourable environmental conditions, with protection from the westerly tempests prevalent in those latitudes and their generally deeper, better developed soils which are more conducive to plant growth than the rather skeletal soils at high elevations on the western mountains. A contributory factor is also the large pool of species in the adjacent lowlands and this seems to be supported by the differences, shown in Table 1, between the southern and more northerly parts of the marginal cordilleras. The northern mountains (Sierra Baguales, Sierra Vizcachas), which lack forest at lower elevations, have a much richer orophytic flora than those further south which are forested. It is at least arguable that the gradual transition from lowland steppe to montane habitats permits a much easier migration of suitable plants to higher altitudes than is the case when a forest barrier has to be traversed.

The species distributions in the Fuegian mountains generally mirror those just described, though the floristic dissimilarity between the northern marginal and more southerly Central Cordilleras is not so great (Moore 1975). This undoubtedly reflects the reduced environmental differences between the systems and also the much smaller pool of potential immigrants in lowland Fuegia.

Strictly montane species. Out of the total orophytic flora of Fuego-Patagonia only 40 species (*c.* 18%) are restricted to montane habitats though a few, such as *Adesmia salicornioides* and *Phaiophleps biflora* ssp. *lyckholmi,* occasionally occur at lower altitudes in Tierra del Fuego. More than half (27) the species occur only in the Marginal Cordillera of southern Patagonia while the 12 of these species that reach Fuegia are generally present only in the northern mountains or the drier parts of the Central Cordillera along the Canal Beagle, though *Saxifragella bicuspidata* is a conspicuous exception being widespread on the wetter Fuegian mountains as well. The majority of the species belong to genera such as *Benthamiella, Eudema, Menonvillea, Moschopsis, Onuris, Tristagma* and *Xerodraba* that are well diversified in the drier parts of the Cordillera de los Andes and adjacent ranges further north, while others are in more widely distributed but essentially Andean genera (e.g. *Nassauvia, Perezia*). On the other hand, the species of *Adesmia, Astragalus, Phaiophleps, Senecio* and *Silene* have obvious links with lowland members of their genera.

Only 6 orophytic species are restricted to the wetter main or central cordilleras of Fuego–Patagonia. This reflects the relative impoverishment of the floras of these mountains referred to earlier. There is another parallel in that although five of the six genera involved have a strong 'Andean' base, there is a definite circum-Antarctic tendency as shown by *Azorella selago,* present on several subantarctic islands, and *Ourisia breviflora,* member of a genus which is well-developed in New Zealand as well as in southern South America. Furthermore, the closest relative of *Tapeinia obscura* is the only other member of the genus, *T. pumila,* which is prominent in the lowland communities of the southern and western parts of the Fuego-Patagonian archipelago.

The 7 orophytic endemics of Tierra del Fuego reflect the relationships referred to above. As Moore (1975) has discussed, *Nassauvia latissima* illustrates the central Andean connection, *Onuris alismatifolia* the affinities with the drier eastern cordilleras further north, *Polystichum andinum* those with lowland Fuego-Patagonia, *Tetrachonda patagonica* ssp. *fuegiana* belongs to a sub-andean species but has many features of the New Zealand *T. hamiltonii* Petrie. This circum-Antarctic tenden-

cy is further emphasised by *Ourisia fuegiana,* belonging to a genus referred to above, and *Epilobium conjungens* which is the only South American member of the genus having close relationships with the distinctive New Zealand species (Skottsberg 1906, Solomons 1981). The final species in this group, *Saxifragodes albowiana,* is the only member of a dependant genus of *Saxifraga.* In truth, these Fuegian orophytic endemics encapsulate the problems concerning the origins of the Fuego-Patagonian montane flora, which will now be considered.

Origins of the montane flora

With over 80% of Fuego-Patagonian orophytic species present also in the lowlands, it is clear that the colonisation of the mountains is still in an active phase following their partial emergence from the Pleistocene ice-cover over the past few thousand years. In addition to the environmental factors referred to earlier, the richer flora of the Marginal Cordilleras may suggest that they have been longer ice-free and consequently available for colonisation. For the majority of these species we have few detailed data on their variation patterns in relation to their migration from lower to higher altitudes. Thus, whilst *Oxalis enneaphylla,* for example, is very variable no correlation has yet been discerned with its altitudinal distribution; again, *Empetrum rubrum* shows no comprehensible pattern in its morphological variation, though in its chemical constituents various trends have been described (Moore et al. 1970). However, there are strong suggestions (Moore 1975) that species such as *Cerastium arvense* and *Leucheria hahnii* have evolved distinctive montane ecotypes, while the widespread *Phaiophleps biflora* contains a distinctive montane element, ssp. *lyckholmi,* in the drier Fuego–Patagonian cordilleras (Moore et al. 1982).

A rather similar example to that of *Phaiophleps* is shown by *Tetrachondra patagonica,* in which ssp. *patagonica,* at middle altitudes to the east of the Patagonian cordilleras, is complemented by the orophytic Fuegian endemic ssp. *fuegiana.* Interestingly, however, this latter subspecies seems to have some tendencies towards the other, New Zealand, species of the genus, *T. hamiltonii* (Moore 1970a). This amphi-antarctic relationship in the Fuego-Patagonian mountain flora reflects an intriguing aspect of the biogeography of the whole austral American flora. Whilst the distribution of genera such as *Nothofagus* can be traced back to the mid-Cretaceous break-up of Gondwanaland (e.g. Moore 1972, Humphries 1981), this is probably not true for any of the orophytic taxa, with the possible exception of *Ourisia* mentioned earlier. Certainly, *Epilobium conjungens* is the solitary South American representative of a primarily Australasian part of the genus (e.g. Solomons 1981), which has traversed the southern oceans by long-distance dispersal, for which it is well-adapted. Although *Azorella selago* reaches Macquaire Island, in the New Zealand biological region, the presence of all its congeners in southern South America argues for west to east distance migration, though its dispersive capability is by no means clear. The Antarctic affinities in these austral cordilleras are demonstrated by other examples, such as *Acaena tenera* and *Colobanthus quitensis,* members of basically circum-Antarctic genera, which have probably relatively recently migrated from southern South American to, respectively, the Falkland Islands and South Georgia, and Antarctica. The colonising ability of the latter species is also attested by its migration northwards along the Andes to Peru, and even beyond to Mexico (Moore 1970b).

Examples of even more distant affinities of the Fuego-Patagonian flora are shown by those species which have arrived by long-distance dispersal from the Northern Hemisphere (e.g. Raven 1963, Moore 1975). The most impressive of these in relation to the montane floras being considered here is *Koenigia islandica* first discovered by Dusén (1900), and described as *K. fueguina,* in lowland Tierra del Fuego but now known from the Central Cordillera of the Isla Grande. Morphologically and cytologically identical with north temperate populations, the Fuegian immigrants apparently traversed immense distances relatively recently in postglacial times.

Members of the important group of Andean genera, such as *Benthamiella, Eudema, Nassauvia, Onuris* and *Perezia,* must be the result of migrations along the mountains from the north. However,

their concentration and speciation in the southern parts of the cordillera suggests that some of the current species may well have evolved in ice-free refugia on the lowlands of what is now Argentinian Patagonia. As these areas were increasingly occupied by plants migrating from the north as conditions ameliorated, the other species may be visualised as being forced into the newly available habitats of the cordilleras. As noted by Moore (1973) a contributory factor in this speciation may well have been the 'pump action' described by Simpson (1973), in which the advancing and retreating montane glaciers of the Pleistocene alternately forced the plants from the mountains and allowed them to return in isolated pockets –*Nassauvia latissima* (Fuegia), *N. magellanica* (S. Andes) and *N. serpens* (Falkland Islands) seem to parallel the case of *Perezia* (Simpson 1973) as a pertinent example of this mode of evolution.

There remains one group of Fuego-Patagonian orophytic plants whose origins are difficult to explain with any certainty. The isolated genera of the austral mountains, such as *Saxifragella* and *Saxifragodes*, and the relatively isolated *Viola tridentata* within its genus, pose problems as to their origins. Certainly their present occurrence cannot be explained as the result of relatively recent immigrations from other areas, lowland or montane. It is possible that these taxa are the results of early evolution northwards in the Andes, or that they are members of groups evolved in the Tertiary which survived in unglaciated 'nunataks' in the Antarctic region during the Pleistocene period, as has been adduced for such disjunct austral families as the Hectorellaceae (Philipson & Skipworth 1961). Only detailed studies of the fossil floras of these austral regions might give some clue to the various possibilities. Certainly, the Fuego-Patagonian cordilleras encapsulate the problems of trying to determine the origins of modern floras from their present distributions and known biological affinities.

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TABLE 1

Species of vascular plants occurring in the Fuego-Patagonian Cordilleras, with an indication of their distribution in the principal mountain systems.
Key: ★ Restricted to the orophytic zone
† Not present in Tierra del Fuego
○ Endemic to Tierra del Fuego
‡ Not present in Patagonia
☆ Restricted to Marginal Cordillera in Tierra del Fuego.

Especies de plantas vasculares en las cordilleras Fuego-Patagónicas, con una indicación de su distribución en los sistemas montañosos principales.
Clave: ★ Restringida a la zona orofítica
† No presente en Tierra del Fuego
○ Endémica de Tierra del Fuego
‡ No presente en Patagonia
☆ Restringida a la cordillera marginal de Tierra del Fuego.

Species	Southernmost Patagonia				Tierra del Fuego	Comments (See key in legend)
	Eastern (Marginal) Cordilleras		Andean (Central) Cordillera	Western (Canales) Mountains		
	Southern, with tree-line	Northern, without tree-line				
Abrotanella emarginata (Cass. ex Gaudich.) Cass.	—	—	—	—	√	
A. linearifolia A. Gray	—	—	√	√	√	★
Acaena antarctica Hook. f.	—	—	—	—	√	
A. magellanica (Lam.) Vahl	√	√	—	√	√	
A. pinnatifida R. et P.	√	√	—	—	—	
A. pumila Vahl	—	—	—	—	√	
A. tenera Alboff	—	—	—	—	√	
Adesmia corymbosa Clos	√	—	—	—	—	†
A. lotoides Hook. f.	√	√	—	—	—	
A. parvifolia Phil.	√	—	—	—	—	†
A. pumila Hook. f.	—	√	—	—	—	
A. salicornioides Speg.	√	√	—	—	—	★
A. silvestrii Speg.	√	—	—	—	—	†
A. villosa Hook. f.	√	√	—	—	—	†
Agropyron fuegianum (Speg.) F. Kurtz	—	√	—	—	—	
A. pubiflorum (Steudel) Parodi	—	—	—	—	√	
Agrostis flavidula Steudel	√	—	—	—	—	
A. magellanica Lam.	—	—	—	—	√	
Alopecurus magellanicus Lam.	—	√	—	—	√	
Anarthrophyllum desideratum (DC.) Benth. & Jackson	—	√	—	—	—	
Antennaria chilensis Remy	—	√	—	—	—	
Arenaria serpens Humb., Bonpl. & Kunth	√	—	—	—	—	
Arjona patagonica Dcne	√	√	—	—	—	
Armeria maritima (Miller) Willd..	—	√	—	—	√	

Species	Southernmost Patagonia				Tierra del Fuego	Comments (See key in legend)
	Eastern (Marginal) Cordilleras		Andean (Central) Cordillera	Western (Canales) Mountains		
	Southern, with tree-line	Northern, without tree-line				
Astelia pumila (Forst.f.) Gaudich.	—	—	—	—	√	
Astragalus nivicola Gómez - Sosa	√	—	—	—	—	★ †
A. palenae (Phil.) Reiche	—	√	—	—	—	
A. patagonicus (Phil.) Speg.	—	√	—	—	—	†
Azorella caespitosa Cav.	√	√	—	—	√	
A. fuegiana Speg.	√	√	—	—	—	
A. lycopodioides Gaudich.	—	√	—	—	√	
A. selago Hook.f.	—	—	√	—	√	★
A. trifurcata (Gaertner) Hook.f.	—	√	—	—	—	
Benthamiella azorella (Skottsb.) Soriano	√	√	—	—	—	★ †
B. patagonica Speg.	—	√	—	—	—	★ †
B. sorianoi S. Arroyo	—	√	—	—	—	★ †
Berberis buxifolia Lam.	—	√	—	—	—	
B. empetrifolia Lam.	—	√	—	—	—	
Bolax caespitosa Hombron & Jacquinot	—	—	√	√	√	
B. gummifera (Lam.) Sprengel	√	√	—	—	√	
Bromus pellitus Hackel	√	√	—	—	—	
Calandrinia caespitosa Gill.ex Arn.	√	√	—	—	√	★ ☆
Calceolaria biflora Lam.	—	√	—	—	—	
C. palenae Phil.	—	√	—	—	—	†
C. uniflora Lam.	√	—	—	—	—	
Callitriche antarctica Engelm. ex Hegelm.	—	—	—	—	√	
Caltha appendiculata Pers.	—	—	—	—	√	
C. dioneifolia Hook.f.	—	—	√	√	√	
C. sagittata Cav.	—	√	—	—	√	
Cardamine glacialis (Forst.f.) DC.	—	√	—	—	√	
Carex banksii Boott	—	—	—	—	√	
C. caduca Boott	√	—	—	—	—	
C. capitata L.	—	√	—	—	—	
C. decidua Boott	—	—	—	—	√	
C. macloviana D'Urv.	—	√	—	—	—	
C. magellanica Lam.	—	—	—	—	√	
C. sorianoi Barros	—	√	—	—	—	
C. subantarctica Speg.	—	√	—	—	—	
Carpha alpina R. Br.	—	—	—	—	√	
Cerastium arvense L.	√	√	—	—	√	
Chiliotrichum diffusum (Forster f.) O. Kuntze	√	—	—	—	—	
Colobanthus quitensis (Kunth) Bartl.	—	√	—	—	√	
C. subulatus (D'Urv.) Hook. f.	√	√	—	—	√	

Species	Southernmost Patagonia				Tierra del Fuego	Comments (See key in legend)
	Eastern(Marginal)Cordilleras		Andean (Central) Cordillera	Western (Canales) Mountains		
	Southern, with tree-line	Northern, without tree-line				
Cystopteris fragilis (L.) Bernh.	–	√	–	–	√	
Deschampsia antarctica Desv.	–	√	–	–	–	
D. atropurpurea (Wahlenb.) Scheele	–	–	–	–	√	
D. parvula (Hook. f.) Desv.	√	√	–	–	√	
Deyeuxia erythrostachya Desv.	–	–	√	–	√	★
Donatia fascicularis Forst. Forst. f.	–	–	√	–	–	
Draba australis R. Br. ex Hook.f.	–	√	–	–	–	
D. funiculosa Hook.f.	√	√	–	–	√	
D. magellanica Lam.	√	√	–	–	√	
D. subglabrata. (Speg.) O. E. Schulz	–	√	–	–	–	†
Drapetes muscosus Banks ex Lam.	–	–	√	√	√	
Eleocharis albibracteata Nees & Meyen ex Kunth	–	√	–	–	–	
Empetrum rubrum Vahl ex Willd.	√	√	√	–	√	
Epilobium conjungens Skottsb.	–	–	–	–	√	★ ○
E. nivale Meyen	–	√	–	–	–	★
Erigeron leptopetalus Phil.	–	√	–	–	–	★ †
E. myosotis Pers.	√	√	–	–	√	
E. patagonicus Phil.	–	√	–	–	–	
Escallonia serrata Sm.	–	–	–	√	–	
Eudema hauthalii Gilg & Muschler	–	√	–	–	–	★ †
Euphorbia collina Phil.	√	–	–	–	–	
Festuca contracta T. Kirk	–	–	–	–	√	
F. gracillima Hook. f.	–	√	–	–	–	
F. magellanica Lam.	–	√	–	–	√	
F. pyrogea Speg.	√	√	√	–	√	
Gaimardia australis Gaudich.	–	–	√	–	√	
Gamocarpha selliana Reiche	–	√	–	–	–	†
Gamochaeta nivalis Cabrera	–	–	–	–	√	
G. spiciformis (Sch. Bip.) Cabrera	–	–	–	–	√	
Geranium patagonicum Hook. f.	–	√	–	–	–	
Geum magellanicum Comm. ex Pers.	–	√	–	–	–	
Grammitis magellanica Desv.	–	–	–	√	√	
Gunnera lobata Hook. f.	–	–	–	–	√	
G. magellanica Lam.	–	–	–	–	√	
Hamadryas delfinii Phil. ex Reiche	√	√	–	–	–	
H. magellanica Lam.	–	–	–	–	√	
H. kingii Hook. f.	√	√	–	–	–	★
Hieracium antarcticum D'Urv.	√	–	–	–	–	

Species	Southernmost Patagonia				Tierra del Fuego	Comments (See key in legend)
	Eastern (Marginal) Cordilleras		Andean (Central) Cordillera	Western (Canales) Mountains		
	Southern, with tree-line	Northern, without tree-line				
Hierochloe redolens (Vahl) Roemer & Schultes	—	—	—	—	√	
Hippuris vulgaris L.	—	√	—	—	—	
Hordeum comosum C. Presl	—	√	—	—	—	
Huanaca acaulis Cav.	√	—	—	—	—	
Hymenophyllum falkandicum Baker	—	—	—	—	√	
H. peltatum (Poiret) Desv.	—	—	—	—	√	
H. tortuosum Hook. & Grev.	—	—	—	—	√	
Hypochoeris incana (Hook. & Arn.) Macloskie	—	√	—	—	—	
Juncus scheuchzerioides Gaudich.	—	√	—	—	—	
Koenigia islandica L.	—	—	—	—	√	†
Lagenifera nudicaulis (Comm. ex Lam.) T. Dudley	—	—	—	—	√	†
Lathyrus magellanicus Lam.	—	√	—	—	—	
Leucheria hahnii Franchet	√	√	—	—	√	
L. leontopodioides (O. Kuntze) E. Schum.	√	—	—	—	—	†
L. purpurea (Vahl) Hook. & Arn.	√	√	—	—	—	
Luzula alopecurus Desv.	—	√	—	—	√	
L. chilensis Nees & Meyen	√	—	—	—	—	
L. racemosa Desv.	—	√	—	—	√	†
Lycopodium alboffii Rolleri	—	—	√	—	—	†
L. confertum Willd.	—	—	√	√	—	
L. magellanicum (P. Beauv.) Swartz	—	—	—	—	√	
Marsippospermum grandiflorum (L. f.) Hook. f.	—	—	√	—	√	
Menonvillea nordenskjoldii (Dusén) Rollins	√	√	—	—	—	★ †
Moschopsis rosulata (N. E. Br.) Dusén	√	√	—	—	√	★
M. trilobata Dusén	—	√	—	—	—	★ †
Mulinum valentinii Speg.	√	√	—	—	—	†
Myrteola nummularia (Poiret) Berg	—	—	—	—	√	
Nanodea muscosa Banks ex C.F. Gaertner	—	—	—	—	√	
Nardophyllum bryoides (Lam.) Cabrera	—	√	—	—	—	
N. obtusifolium Hook. & Arn.	√	—	—	—	—	
Nassauvia abbreviata (Hook. & Arn.) Dusén	√	√	—	—	—	
N. darwinii (Hook. & Arn.) O. Hoffm. & Dusén	—	√	—	—	—	
N. lagascae (D. Don) F. Meigen	√	√	—	—	√	★
N. latissima Skottsb.	—	—	—	—	√	★ ○
N. magellanica J.F. Gmel.	√	√	—	—	√	★

Species	Southernmost Patagonia				Tierra del Fuego	Comments (See key in legend)
	Eastern (Marginal) Cordilleras		Andean (Central) Cordillera	Western (Canales) Mountains		
	Southern, with tree-line	Northern, without tree-line				
N. pygmaea (Cass.) Hook f.	√	√	–	–	√	★
N. revoluta D. Don	√	√	–	–	–	
N. ulicina (Hook f.) Macloskie	√	–	–	–	–	
Nothofagus antarctica (Forst. f.) Oersted	–	–	√	–	–	
Onuris alismatifolia Gilg ex Skottsb.	–	–	–	–	√	★ ○
O. hatcheriana Boelcke	–	√	–	–	–	★ †
O. papillosa O.E. Schulz	√	√	–	–	–	
O. spegazziniana Gilg & Muschler	√	√	–	–	–	★ †
Oreobolus obtusangulus Gaudich.	–	–	√	–	√	
Oreopolus glacialis (Poeppig & Endl.) Ricardi	√	√	–	–	–	
Orthachne rariflora (Hook. f.) Hughes	–	–	–	√	√	
Ourisia breviflora Benth.	–	–	√	√	√	★
O. fuegiana Skottsb.	–	–	–	–	√	★ ○
Oxalis enneaphylla Cav.	–	√	–	–	√	
O. loricata Dusén	√	–	–	–	–	†
O. magellanica Forst. f.	–	–	–	–	√	
O. patagonica Speg.	√	√	–	–	–	†
Perezia lactucoides (Vahl) Less.	–	–	–	√	√	
P. lanigera Hook. & Arn.	–	√	–	–	–	★ †
P. magellanica (L. f.) Lag.	–	–	–	–	√	
P. megalantha Speg.	√	√	–	–	–	★ †
P. pilifera (D. Don) Hook. & Arn.	–	√	√	–	√	
P. recurvata (Vahl) Less.	√	√	–	–	–	
Pernettya pumila (L. f.) Hook.	–	–	√	–	√	
Phacelia secunda J.F. Gmel.	–	√	–	–	–	
Phaiophleps biflora ssp. *lyckholmii* (Dusén) D.M. Moore	√	√	–	–	√	★ ☆
Phleum alpinum L.	√	–	√	–	√	
Phyllachne uliginosa Forst. & Forst. f.	–	–	–	√	–	
Pinguicula antarctica Vahl	–	–	–	–	√	
Plantago barbata Forst. f.	–	√	–	–	√	
P. uniglumis Wallr. ex Walpers	√	√	–	–	–	
Poa alopecurus (Gaudich.) Kunth	√	√	–	–	√	
P. glauca Vahl	√	√	–	–	–	†
P. rigidifolia Steudel	√	√	–	–	–	
P. secunda C. Presl	–	√	–	–	–	†
Polemonium micranthum Benth.	√	–	–	–	–	
Polystichum andinum Phil.	–	–	–	–	√	★

Species	Southernmost Patagonia				Tierra del Fuego	Comments (See key in legend)
	Eastern(Marginal)Cordilleras		Andean (Central) Cordillera	Western (Canales) Mountains		
	Southern, with tree-line	Northern, without tree-line				
Primula magellanica Lehm.	—	√	—	—	√	
Ranunculus peduncularis Sm.	—	√	—	—	—	
R. sericeocephalus Hook. f.	—	—	—	—	√	
Rostkovia magellanica (Lam.) Hook. f.	—	—	√	—	√	
Satureja darwinii (Benth.) Briquet	√	√	—	—	—	
Saxifraga magellanica Poiret	√	√	—	—	√	
Saxifragella bicuspidata (Hook. f.) Engler	—	√	—	—	√	★
Saxifragodes albowiana (F. Kurtz) D.M. Moore	—	—	—	—	√	★
Schizeilema ranunculus (D'Urv.) Domin	—	√	—	—	√	
Schoenus antarcticus (Phil.) Pfeiffer	—	—	—	—	√	
Senecio acanthifolius Hombron & Jacquinot	—	—	√	—	√	
S. alloeophyllus O. Hoffm.	√	√	—	—	√	★
S. boelckei Cabrera	√	—	—	—	—	†
S. culcitenellus Cuatrec.	—	√	—	—	—	†
S. darwinii Hook. & Arn.	—	—	—	√	√	★
S. eightsii Hook. & Arn.	—	—	—	—	√	
S. humifusus (Hook. f.) Cabrera	—	—	—	—	√	
S. kingii Hook. f.	—	—	√	—	√	
S. laseguei Hombron & Jacquinot	√	√	—	—	—	
S. magellanicus Hook. & Arn.	√	√	—	—	√	
S. martinensis Dusén	—	√	—	—	—	†
S. miser Hook. f.	—	√	—	—	—	
S. patagonicus Hook. & Arn.	—	—	—	—	√	
S. tricuspidatus Hook. & Arn.	√	—	—	—	—	
S. trifurcatus (Forst. f.) Less.	—	—	—	—	√	
Serpyllopsis caespitosa (Gaudich.) C. Chr.	—	—	—	√	√	
Silene patagonica (Speg.) Bocquet	√	—	—	—	—	★ †
S. chilensis (Naudin) Bocquet	—	√	—	—	—	†
Sisymbrium magellanicum (Pers.) Hook. f.	√	—	—	—	—	
Sisyrinchium arenarium Poepp.	—	√	—	—	—	†
S. iridifolium Humb., Bonpl. & Kunth	—	√	—	—	—	†
S. junceum E. Mey. ex C. Presl.	—	√	—	—	—	†
Stipa humilis Cav.	—	√	—	—	—	
Tapeinia obscura (Cav.) D. M. Moore	—	—	√	√	√	★
Taraxacum gilliesii Hooker & Arn.	—	√	—	—	√	

Species	Southernmost Patagonia				Tierra del Fuego	Comments (See key in legend)
	Eastern (Marginal) Cordilleras		Andean (Central) Cordillera	Western (Canales) Mountains		
	Southern, with tree-line	Northern, without tree-line				
Tetrachondra patagonica ssp. *fuegiana* D.M. Moore	—	—	—	—	√	★ ○
Thlaspi magellanicum Comm. ex Poir.	√	√	—	—	—	
Tribeles australis Phil.	—	—	√	—	√	
Trisetum spicatum (L.) K. Richter	√	√	—	—	√	
Tristagma nivale Poepp.	√	√	—	—	√	★ ○
Uncinia kingii Boott	—	—	—	√	√	
U. lechleriana Steudel	—	—	—	—	√	
Valeriana magellanica Hombron & Jacquinot ex Dcne	—	√	—	—	—	
V. sedifolia D'Urv.	√	√	—	—	—	★
Verbena azorelloides Speg.	√	√	—	—	—	†
Vicia bijuga Gillies ex Hook. & Arn.	√	√	—	—	—	
Viola commersonii DC.	—	—	—	√	√	
V. tridentata Menz. ex DC.	—	—	√	√	√	
Xerodraba glebaria Skottsb.	—	√	—	—	—	★ †
X. pectinata (Speg.) Skottsb.	—	√	—	—	—	★ †