

The Flora of the New Zealand Subantarctic Islands

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The subantarctic islands include the Auckland, Antipodes, Bounty, Snares, and Campbell Islands. Geographically, these islands all lie between the subtropical convergence and the antarctic convergence. Most of the subantarctic islands were formed 1 million to 65 million years ago during the Cenozoic period.

Bounty Island (47°41'S; 179°02'E) is comprised of a cluster of weather-beaten granite rocks with no vegetation and no fresh water.

The Snares Islands (48°00'S; 166°35'E) consist of Main and Broughton Islands, some 20 to 30 seastacks and a string of rock islets (Herning, 1979).

The Antipodes Islands (49°41'S; 178°43'E) are the smallest of the New Zealand subantarctic islands. The islands consist of Antipodes Island, Bollons Island and a number of small islets and seastacks. These islands are remnants of one large and several subsidiary Pleistocene volcanic cones (Malloy and Dingwall, 1990).

The Auckland Islands (50°50'S; 166°00'E) are a small island group including Auckland Island and Adam Island. These islands were formed by Cenozoic volcanic activity associated with seafloor spreading and crustal plate movement. They are the remains of two coalesced volcanic domes.

Campbell Island (52°33'S; 169°08'E) is the most southerly of the New Zealand subantarctic islands. It is the 560 m high remnant of a miocene volcanic dome (Gamble et al., 1986).

Weather patterns of the New Zealand subantarctic region are characterised by strong, often gale-force winds, cool temperatures, infrequent sunshine, and high humidity. Rainfall occurs at 1000 to 5000 mm, 3 times per year, falling evenly throughout the year (Dawson, 1988). As a result of climatic conditions typical to the subantarctic islands wet soil conditions are prevalent. There is a slow decay of dead plant parts which forms a layer of peat that is characteristic of all the subantarctic islands.

Oceanic wet heath communities predominate on these blanket peats. These communities are characterized by dwarf shrubs, which are mostly less than 1 m tall, and tufted grasses all growing in a cryophyte or flowering plant mat (Wace, 1960).

Tussock communities are also characteristic of the subantarctic islands. *Poa* species are the most important dominants of maritime tussock. This tussock while found almost exclusively on well-drained ground close to the sea may also be seen on exposed slopes. The tussock is associated with penguin and seal habitats. The large growth form of tussock is well adapted to withstand animal movement (Wace, 1960).

Bogs are dominated by cushion-forming plants including *Gaimardia* and *Oreobolus* species. *Sphagnum* species are absent. Herbfield vegetation is dominated by large-leaved, perennial rosette plants, such as *Pleurophyllum* and *Stilbocarpa* species.

Feldmark communities of the subantarctic islands resemble the *Raoulia* and *Haastia* communities of the New Zealand Mountains. Species in these communities are either circumpolar or restricted to a small area (Wace, 1960).

The Auckland Islands are the only islands supporting forest vegetation. A narrow band of forest occurs approximately 50 m above sea level. The dominant species are *Metrosideros umbellatus*, *Dracophyllum longifolium* var. *cockayneanum* and *Pseudopanax simplex*.

A characteristic of the flora of the New Zealand subantarctic islands is the high level of endemism. Thirty-five species of flowering plants are confined to the area. This amounts to 20.3% of the total flora of seed plants (Lloyd, 1985). Endemic genera include *Pleurophyllum* and *Celmisia* (syn *Damnomenia*). The above two genera show characteristics which are typical of certain herbs found growing on the subantarctic islands. There is a tendency towards the aggregation of flowers into larger inflorescences than those characteristic of New Zealand herbs. *Anisotome*, *Pleurophyllum*, and *Bulbinella* show this characteristic (Lloyd, 1985).

Flowers are often coloured whereas mainland New Zealand species, of the same genera, have white flowers. *Hebe benthamii* and *Myosotidium capitata* have blue flowers. *Gentiana cerina* can be found growing on the Auckland Islands. Mainland gentian species have white flowers whereas *G. cerina* has red or striped flowers as well as white.

Bulbinella rossii has orange-yellow flowers. This summer green herb is dioecious whereas its relatives on the New Zealand mainland are hermaphroditic (Lloyd, 1985).

A number of subantarctic herbs have large leaves. All three species of *Pleurophyllum* are noted for rosettes—up to a metre or more across—of broad, longitudinally ribbed leaves. *Stilbocarpa* species can have leaf blades as much as 1/2 m across.

A number of theories have been advanced to account for the unique features of these herbaceous plants.

Lloyd (1985) states "Conspicuous flower displays are universally interpreted as adaptations associated with animal pollination, and unisexual plants must be cross fertilised. The occurrence of these outcrossing features on the outlying islands is puzzling in view of the low temperatures and frequent storms on these islands and their depauperate, pollinating faunas."

Lloyd (1985) suggests that the aggregation of flowers may reflect a greater reproductive expenditure for large herbs in a hyper-oceanic environment.

Wardle (1978) suggests that the coloured flowers of subantarctic species are non-adaptive, and that they represent primitive conditions in genera which have subsequently evolved white flowers on mainland New Zealand.

Godley (1979) suggests that the brightly coloured flowers, typical of some subantarctic plants, may reflect selection in an environment where every possibility of attracting insect pollinators needs to be exploited.

Because of maritime conditions, the subantarctic region was only lightly glaciated. Fleming (1976) believed that the high level of endemism is due to plants surviving throughout periods of glaciation.

Detailed studies are required, to further understand the unique features of the flora of the New Zealand subantarctic islands.

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