mainland, and yet fallen trees hundreds of years old, but not yet decayed, are frequent, and such logs are generally embraced by the composite trunk of adult kamahis (*Weinmannia racemosa*).*

(ix.) *Cyathea medullaris* (the black tree-fern).—This is confined to a very limited and narrow strip of land on the east coast, nor is it there abundant.

(x.) *Olearia angustifolia* (the teteaweka) does not occur north of Paterson Inlet, though on the mainland it is found both at the base of the Bluff Hill and Puysegur Point (T. Kirk, 58, p. 265).

(xi.) The curious little Ourisia, *O. modesta*, has only been observed in the Rakiahua Valley, and cannot be very common, yet it grows quite readily when cultivated in ordinary garden soil.

The above facts—and others could be cited—although they do not prove the absent genera or species to have inhabited Stewart Island, point out clearly enough that species may be more or less abundant and become reduced in quantity or eradicated.

It is a hard matter for a species to establish itself in a forest or any closed formation, and it is much more reasonable to conclude that the plants common elsewhere, which are rare in the district considered, are survivors there of formerly abundant individuals rather than newcomers.

The ecological conditions at the present time must not be lost sight of, nor certain facts derived from the study of the formations. The boggy condition of the mountain meadows leaves little room for other alpine plants now absent which cannot tolerate wet or sour ground, while some such are not "alpine" in Stewart Island, but have found suitable conditions in the lowlands—*e.g.*, *Celmisia rigida* (coastal cliffs), *Wahlenbergia saxicola* ("sand-slips" in the dunes), *Olearia ilicifolia* (open ground near coast-line), *Pimelea Lyallii* (dunes), *Geranium sessiliflorum* (dunes), and *Ourisia Colensoi* (river-banks). Also, there is the remarkable yellow-pine association, which clearly shows climatic plus soil effects, its moss cushions partly replacing the filmy ferns of the drier forest.

Proof of a smaller land-surface at a comparatively recent period has already been given in section D, Part I, and it seems to me from the above facts that to this subsidence may be traced the anomalies in the flora under discussion. Species can appear in abundance in the early stages of colonisation, but many must go to the wall as the formations become closed and established. With land-shrinkage species must decrease, whereas they can increase to little extent on an isolated re-expanding land-surface covered already with a close vegetation.

As for the presence of certain characteristic subantarctic plants on the mutton-bird islands, Solanders, &c., it is probable all may yet be found on Stewart Island proper. At any rate, such islands offer very special conditions through their small size, exposure to wind, and presence of sea-birds. Some of their commonest special plants occur also to a limited extent on the coast of the South Island —*e.g.*, *Stilbocarpa, Olearia angustifolia, O. Traillii.*

3. Subantarctic Relationship.

The relationship between the Stewart Island district and the subantarctic province of New Zealand is well marked, but can only be briefly touched on, since, as the facts concern the flora of New Zealand as a whole, and are not peculiar to Stewart Island, the question is too wide for a searching examination here. The number of species common to the two is about 106, most of which, however, occur also in the south floristic province generally.

Without entering into further details, the flora proper of the subantarctic province is probably the remains of a very ancient one which extended over a former extensive land-area (Hooker, 40; Engler, 33), of which the New Zealand biological region and the present antarctic continent are remnants. This flora would, at a later date, during a northern extension of the land, receive its tropical or subtropical element, the climate being then possibly warmer than at the present time.

Subantarctic herbaceous plants are specially adapted to an equable climate, with low summer temperature, little direct sunshine, and a saturated atmosphere. Cushion plants, the persistence of dead leaves, &c., turned and turning into peat, xerophytic contrivances against bog-conditions—these are characteristic of a large percentage of New Zealand alpine plants. Such plants were probably originally lowland (Cockayne, 28), and they can still enjoy lowland conditions equally with alpine. Thus in Stewart Island, in the south part of the South Island of New Zealand (Cockayne, 20), and throughout the whole subantarctic region (Schenck, 75) we see such plants—"alpine" they have hitherto been called (Petrie, 69; Kirk, 55)—at sea-level.

The boggy subalpine meadow of Stewart Island, or boggy ground in the Southern Alps, demands analogous "adaptations" as the lowland *Pleurophyllum* meadow of the Auckland and Campbell Islands, the balsam-bog (*Bolax glebaria*) association of Fuegia, or the *Azorella* formation of Kerguelen Land.

Everywhere, as has been shown for Stewart Island, in its west and south, where forest is naturally or artificially absent, the mountain vegetation of subantarctic plants takes possession (*Gaimardia ciliata, Donatia novae-zelandiae, Dracophyllum politum, D. Pearsoni, Astelia linearis*, &c.), and there is a return to a fragment of the possible primitive plant-covering, but enormously changed through the absence of species long since vanished—*Pleurophyllum*,† *Stilbocarpa, Phyllachne, Donatia, Azorella, Celmisia*, and other curious genera still surviving.

* This is also an excellent example of a radical change in a primitive plant formation apart from any geological movement, and it indicates how species may be eradicated by imperceptible climatic or ecological changes.

† This genus does not extend to Stewart Island.