

# On the Floras of Certain Islets outlying from Stewart Island (New Zealand).

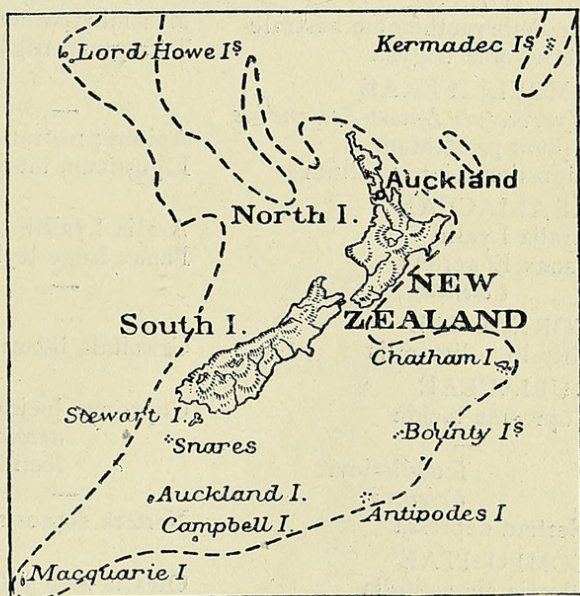
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With one Map in the Text.

AN interesting little paper by Poppelwell on the flora of Long Island, which is separated by one and a half miles of water from the south-west of Stewart Island, has called my attention to further papers on the islets which outlie from Stewart, especially the Breakseas and Solanders, the former close to the east coast of Stewart, the latter about thirty-five miles from the north-west coast and rather nearer to the South Island of New Zealand. These papers<sup>1</sup> are best considered together; they illustrate very clearly the extraordinary applicability of age and area to the New Zealand flora, and suggest a way in which it may be applied even to the flora of Great Britain, where the effects of man's occupation are now so predominant.



New Zealand and outlying islands. The dotted line is the 1,000 fathom limit.

The simplest way of dealing with the matter will probably be to first of all arrange these little floras in parallel columns, classified for convenience as in Cheeseman's 'Flora'.

<sup>1</sup> Poppelwell : Notes of a Botanical Excursion to Long Island. Trans. and Proc. N.Z. Inst., xlix, 1917, p. 167.

Notes on the Plant Covering of the Breaksea Islands, l.c., xlviii, 1916, p. 246.

Cockayne: On a Collection of Plants from the Solanders, l.c., xli, 1909, p. 404.

TABLE I.

Species in italics are peculiar to one island.

<i>Long Island.</i>	<i>Breakseas.</i>	<i>Solanders.</i>
CRUCIFERAE		
Cardamine heterophylla	Cardamine heterophylla	—
—	<i>Lepidium oleraceum</i>	—
PITTOSPORACEAE		
—	<i>Pittosporum Colensoi</i>	—
ROSACEAE		
—	<i>Rubus australis</i>	—
SAXIFRAGACEAE		
<i>Weinmannia racemosa</i>	—	—
CRASSULACEAE		
Tillaea moschata	Tillaea moschata	Tillaea moschata
DROSERACEAE		
Drosera spatulata	Drosera spatulata	—
MYRTACEAE		
Leptospermum scoparium	Leptospermum scoparium	—
Metrosideros lucida	Metrosideros lucida	—
ONAGRACEAE		
—	<i>Fuchsia excorticata</i>	—
FICOIDEAE		
Mesembryanthemum australe	Mesembryanthemum australe	Mesemb. austr.
Tetragonia trigyna	Tetragonia trigyna	—
UMBELLIFERAE		
<i>Hydrocotyle Novae-Zelandiae</i>	—	—
Apium prostratum	Apium prostratum	Apium prostratum
Ligusticum intermedium	Ligusticum intermedium	Ligust. intermedium
ARALIACEAE		
Aralia Lyallii	Aralia Lyallii	Aralia Lyallii
Panax Edgerleyi	Panax Edgerleyi	—
<i>Colensoi</i>	—	—
CORNACEAE		
Griselinia littoralis	Griselinia littoralis	—
RUBIACEAE		
Coprosma lucida	Coprosma lucida	—
—	<i>areolata</i>	—
foetidissima	foetidissima	—
<i>Colensoi</i>	—	—
Nertera depressa	Nertera depressa	—
COMPOSITAE		
Olearia angustifolia	Olearia angustifolia	—
Colensoi	Colensoi	Olearia Colensoi
—	<i>Traillii</i>	—
arborescens	arborescens	—
<i>Celmisia longifolia</i>	—	—
—	<i>Cotula coronopifolia</i> (probably introduced)	—
<i>Senecio bellidioides</i>	—	—
—	<i>Senecio lautus</i>	—
—	—	—
rotundifolius	rotundifolius	<i>Senecio Stewartiae</i>
—	<i>Sonchus littoralis</i>	rotundifolius
STYLIDIACEAE		
<i>Donatia Novae-Zelandiae</i>	—	—
—	<i>Oreostylidium subulatum</i>	—
GOODENIACEAE		
—	<i>Selliera radicans</i>	—
ERICACEAE		
<i>Gaultheria antipoda</i>	—	—

TABLE I (continued).

<i>Long Island.</i>	<i>Breakseas.</i>	<i>Solanders.</i>
EPACRIDACEAE		
Pentachondra pumila	Pentachondra pumila	—
Styphelia acerosa	Styphelia acerosa	—
<i>empetrifolia</i>	—	—
Dracophyllum longifolium	Dracophyllum longifolium	—
MYRSINACEAE		
Suttonia chathamica	—	—
—	Rapanea Urvillei	—
GENTIANACEAE		
—	Gentiana saxosa	—
BORAGINACEAE		
Myosotis albida	Myosotis albida	Myosotis albida
SCROPHULARIACEAE		
Veronica elliptica	Veronica elliptica	Veronica elliptica
<i>buxifolia</i>	—	—
PLANTAGINACEAE		
—	Plantago Raoulii	—
URTICACEAE		
Urtica australis	—	—
ORCHIDACEAE		
—	Thelymitra longiflora	—
—	uniflora	Thelymitra uniflora
—	Microtis unifolia	—
—	Prasophyllum Colensoi	—
—	Pterostylis Banksii	—
—	australis	—
—	Caladenia bifolia	—
LILIACEAE		
Phormium tenax	Phormium tenax	—
Cookianum	Cookianum	—
Enargea parviflora	—	—
Astelia linearis	—	—
nervosa	—	—
JUNCACEAE		
Luzula campestris	—	Luzula campestris
RESTIONACEAE		
—	Leptocarpus simplex	—
CYPERACEAE		
Scirpus aucklandicus	Scirpus aucklandicus	—
nodosus	—	—
—	Carpha alpina	—
Gahnia procera	Gahnia procera	—
Oreobolus pectinatus	Oreobolus pectinatus	—
strictus	—	—
Carex lucida	Carex lucida	—
trifida	trifida	Carex trifida
GRAMINEAE		
Hierochloe redolens	Hierochloe redolens	—
Microlaena avenacea	—	—
Poa foliosa	Poa foliosa	Poa foliosa
Astoni	Astoni	Astoni
CONIFERAE		
Podocarpus ferrugineus	—	—
Dacrydium intermedium	—	—
—	Dacrydium biforme	—
HYMENOPHYLLACEAE		
Hymenophyllum rufescens	—	—
CYATHEACEAE		
Dicksonia squarrosa	Dicksonia squarrosa	—
Hemitelia Smithii	—	—

TABLE I (*continued*).

<i>Long Island.</i>	<i>Breakseas.</i>	<i>Solanders.</i>
POLYPODIACEAE		
Polystichum vestitum	Polystichum vestitum	—
Asplenium obtusatum	Asplenium obtusatum	Asplenium obtusatum
scleroprium	scleroprium	—
lucidum	lucidum	lucidum
flaccidum	flaccidum	—
<i>bulbiferum</i>	—	—
Blechnum durum	Blechnum durum	Blechnum durum
capense	capense	—
Histiopteris incisa	Histiopteris incisa	Histiopteris incisa
<i>Pteridium esculentum</i>	—	—
Polypodium diversifolium	Polypodium diversifolium	—
GLEICHENIACEAE		
<i>Gleichenia circinata</i>	—	—
SCHIZAEACEAE		
<i>Schizaea fistulosa</i>	—	—
LYCOPODIACEAE		
<i>Lycopodium varium</i>	—	—
ramulosum	Lycopodium ramulosum	—

It is clear, from the fact that these islands are separated from Stewart by some breadth of water, that they must have a very old flora, older on the whole than that of Stewart itself, especially the Solanders, which are over thirty miles away, but are a little nearer to the South Island of New Zealand (so that they might contain species not known in Stewart). We shall therefore expect all their floras to be small, especially that of the Solanders. In actual fact, 73 species are recorded from Long Island, 69 from the Breakseas, and 19 from the Solanders.

One will expect, just as in the more extended case of the Kermadecs, Chathams, and Aucklands, with which this may be compared, that much of the floras will be the same in all the islands. If we take the 19 species of the Solanders, we find in fact that 16 of them also occur both in the Breakseas (on the *other* side of Stewart) and in Long Island, one occurs in Long Island only, and one in the Breakseas only. These two last quite probably occur in both these islands, but have not yet been recorded, and there remains only *Senecio Stewartiae*, which is also recorded for Herekopere Island in Foveaux Strait (as near the Solanders as Stewart itself) and the Snares.

Long and Breaksea islands have much larger floras, and we find on comparison that besides the 16 already mentioned which they have also in common with the Solanders, they have 29 in common between themselves only, making 45 in all. Long Island has 27 species not recorded from the Breakseas, and the Breakseas 23 not recorded from Long Island. These are printed in italics above. Glancing at the lists, it is fairly safe to say that about a dozen at least of those given for the Breakseas only, e. g. the orchids, ought certainly to be found also in Long Island, if it were examined at a different period of the year. On the whole, the resemblances between the floras of these three island groups are very striking. Poppelwell notes these resemblances, but puts them down to similarity of conditions, a cause which

in the light thrown upon geographical distribution by age and area can no longer be accepted as sufficient to account for such phenomena.

Just as we found the flora of Stewart, as older, to be composed of the larger (in general, older) families and genera of New Zealand proper, so here we shall expect the flora of these islands to be composed of the larger families and genera of the Stewart flora, and that of the Solanders especially so. Testing this we find that of the New Zealand families 22 are above the average in size (in New Zealand) and 69 below. Of the former 21 (95 per cent.) occur in Stewart, of the latter only 39 (56 per cent.) Of the Stewart families 15 are above the average (in Stewart) and 45 below. Of the former 13 (86 per cent.) occur in the islets, of the latter 17 (37 per cent.). Of the islet families 9 are above the average and 21 below. Of the former 6 (66 per cent.) occur in the Solanders and of the latter 4 (19 per cent.) only. It is thus clear that on the average a family is represented everywhere in proportion to its size in the neighbouring country. We may put this in another way, thus. The average size in New Zealand and the surrounding islands of a family occurring there (91 fams., 1,392 species) is 15 species. The average size in New Zealand of families occurring in Stewart is 21 species, or much higher. The average size in New Zealand of the families that occur in the islets now under consideration is 35 species (30 fams., 1,059 species). And finally, the average size in New Zealand of the families occurring in the Solanders (11 fams., 765 species) is 69 species. The figures thus form a progressive series, showing clearly that on the whole the larger in New Zealand a family is, the greater in the New Zealand area is its range.

We shall further expect that, as usual, there will be more families in proportion to genera, and more genera in proportion to species, the farther out we go from the centre of New Zealand.

TABLE II.

	<i>Fams.</i>	<i>Gen.</i>	<i>Spp.</i>	<i>Gen. per fam.</i>	<i>Spp. per gen.</i>
New Zealand	91	329	1392	3.6	4.2
Stewart	60	169	383	2.8	2.2
Islets	30	56	98	1.8	1.7
Solanders	11	13	15	1.1	1.1

The prediction is fully borne out.

As one goes outward from New Zealand in this way, the plants will on the average become steadily older, so that one will expect to find the proportion in common with the outlying islands (Kermadecs, Chathams, Auckland), which also have old floras, steadily increasing. Testing this gives

TABLE III.

<i>Occur in</i>	<i>Reach K., Ch., or Au.</i>	<i>%.</i>
New Zealand, 1301	199	15
Stewart, 383	153	40
Islets, 98	52	53
Solanders, 15	9	60

Again a steadily increasing percentage, bearing out the prediction.

Further, one will expect the proportion of wides, which on the whole are older, to increase relatively to that of endemics as one goes outwards from New Zealand to the Solanders.

TABLE IV.

<i>Occur in</i>	<i>Wides.</i>	<i>Endemic (N.Z. and Isl.).</i>
New Zealand	301 or 23 %	1000
Stewart	129 or 34 %	240
Islets	27 or 35 %	49
Solanders	6 or 40 %	9

If the ferns be included, the result is more clearly marked.

It is thus clear that for restricted areas like New Zealand and its neighbouring islands age and area can be relied upon to explain the general composition of any of the floras that occur ; and in our next paper we shall go somewhat farther afield, endeavouring to trace the invasions of New Zealand from Indo-Malaya.



Willis, J. C. 1919. "On the floras of certain islets outlying from Stewart Island (New Zealand)." *Annals of botany* 33, 479–484.

<https://doi.org/10.1093/oxfordjournals.aob.a089738>.

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