LICHENS OF SOUTH-EAST STEWART ISLAND, NEW ZEALAND

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ABSTRACT

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One hundred and ninety-nine lichen taxa from 82 genera are recorded from south-eastern Stewart Island. This adds a further 68 species and 22 genera to the recorded lichen flora of New Zealand's third largest island (298 species, 105 genera). This represents approximately 25% of the total known lichen species for all of New Zealand and 40% of the recorded genera. These south-eastern Stewart Island lichens include the first New Zealand records of the genus *Biatora*, and the species *Endococcus parietinarius* (lichenicolous fungus), *Trapeliopsis pseudogranulosa* and *Rhizocarpon distinctum*.

Lichina confinis and *Verrucaria maura* are the only intertidal lichens recorded. Maritime rocks of south-eastern Stewart Island support a diverse flora (47 spp.) dominated by *Menegazzia subpertusa, Parmelia signifera, Xanthoparmelia isidiigera, Flavoparmelia* (2 spp.), *Psoroma* (4 spp.), *Verrucaria* (3 spp.), *Rinodina thiomela, Opegrapha* (2 spp.), *Pertusaria subverrucosa, Ochrolechia parella, Lecidella* (2 spp.) and *Caloplaca* (2 spp.). A sparse lichen flora grows on the twigs of low maritime scrub, but a richer flora inhabits the ground beneath it, especially *Cladia* (3 spp.), *Cladonia* (4 spp.), *Siphula decumbens, Neophyllis melacarpa, Stereocaulon ramulosum, Sphaerophorus tener* and *Xanthoparmelia*. Lowland peat soils (1-3 m a.s.l.) support a lichen flora dominated by the subalpine lichens *Siphula decumbens* and *Coccotrema porinopsis*.

Kamahi - rimu forest (5-200 m) supports the richest and most diverse lichen flora (102 spp.) in southeastern Stewart Island. Foliose lichens dominate, especially *Pseudocyphellaria* (12 spp.), *Psoroma* (12 spp.), *Menegazzia* (8 spp.), *Sphaerophorus* (6 spp.), *Sticta* (4 spp.), *Collema* (4 spp.) and *Nephroma* (3 spp.). The most common crustose lichens are *Coccotrema* (2 spp.), *Megaloblastenia marginiflexa, Megalospora gompholoma, Thelotrema lepadinum* s.l., *Dimerella* aff. *lutea, Pyrenula* (3 spp.) and *Lecanactis* (2 spp.).

A low diversity lichen flora inhabits the damp soils of subalpine grassland between 100 and 700 m a.s.l. This flora is dominated by *Cladonia, Siphula* (2 spp.), *Sphaerophorus* (3 spp.) and *Knightiella splachnirima*. Subalpine rocks at these higher altitudes have a richer flora dominated by *Menegazzia aeneofusca, Xanthoparmelia* (3 spp.), *Sphaerophorus* (2 spp.), *Placopsis* (2 spp.), *Stereocaulon* (3 spp.) and *Parmelia signifera*.

KEYWORDS: New Zealand - Stewart Island - Port Pegasus - Tin Range - lichens - lichen ecology.

INTRODUCTION

Stewart Island is the third largest island of New Zealand and is situated 30 km south of the southern end of the South Island. The Port Pegasus area (Fig. 1) lies at the south-eastern end of Stewart Island (latitude 47°10'S, longitude 167°40'E). This area has cool temperatures, moderate rainfall (average annual 1400 mm) with snow in the high country in winter and many days with strong cold west or southwest winds sweeping in off the southern Pacific Ocean.

Most of southern Stewart Island is composed of a granite pluton with occasional roof pendants of schist forming some of the rocky knobs in the Tin Range. Port Pegasus is a large, enclosed, intricately embayed inlet on the east side of southern Stewart Island. It is surrounded by low rocky cliffs interspersed with pebbly or sandy beaches. Rock cliffs, up to 50 m high, are present on the more exposed eastern coast outside Port Pegasus (*eg.* Noble Island, Broad Bay). Kamahi-rimu for-

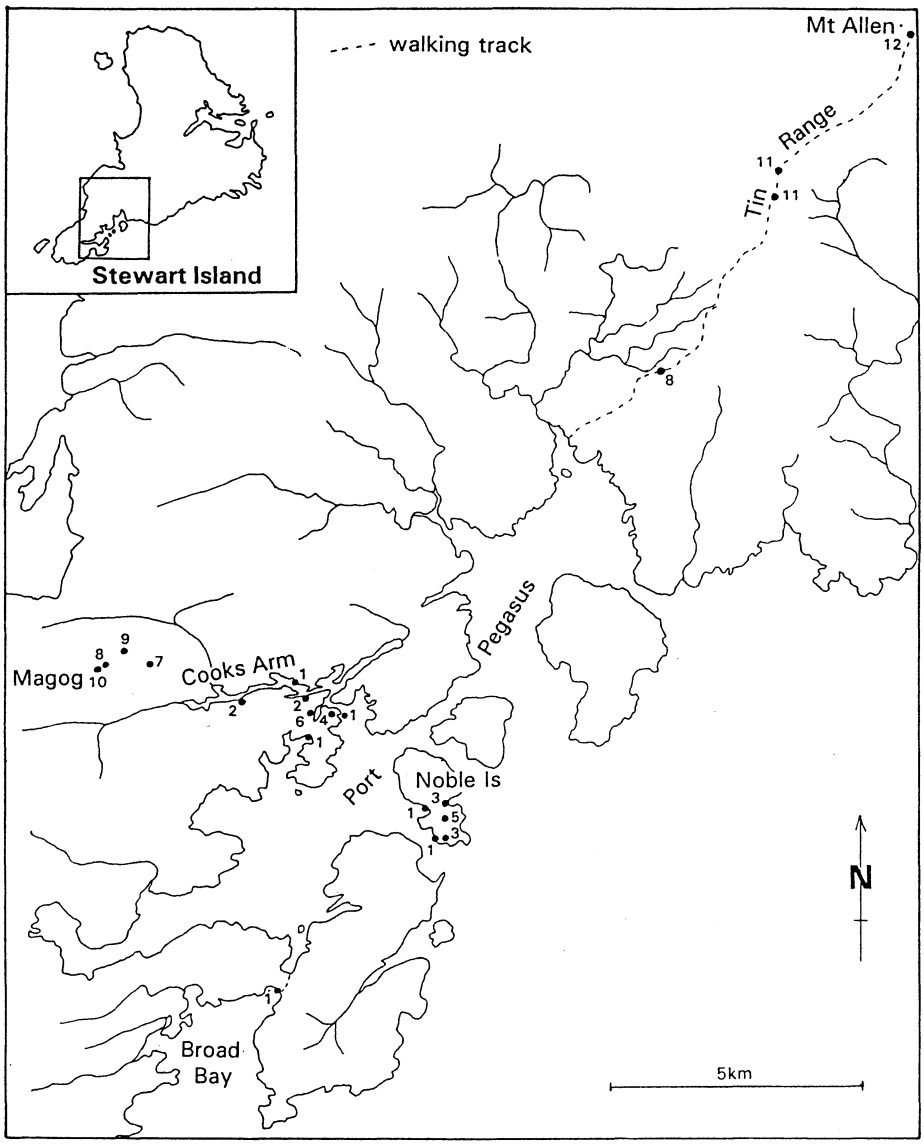

Figure 1. Map of south-eastern Stewart Island showing localities where lichens were studied and collected. Habitat numbers are: 1. Maritime rock zone (0-10 m); 2. Lowland peat soils (1-3 m); 3. Maritime scrub (*Dracophyllum-Olearia*-manuka) (5-50 m); 4. Kamahi-rimu forest (5-20 m); 5. *Olearia-Dracophyllum*-kamahi-rata forest, Noble Is (40-80 m); 6. Open manuka scrub, Cooks Arm (20-40 m); 7. Magog Ridge, subalpine grassland (100-200 m); 8. Magog slopes and Tin Range track, kamahi-rimu forest (150-220 m); 9. Magog Ridge granite knobs (180-205 m); 10. Magog, granite knobs and subalpine grass (200-260 m); 11. Tin Range, schist knobs, *Olearia*-manuka scrubland (500-650 m); 12. Mt Allen, rocky top (750 m).

est extends down almost to the high tide mark in most parts of the inlet. Several extremely narrow arms of the inlet snake inland to the east and are bordered by low manuka scrub and gently rolling country with deep peat soils (*eg.* Cooks Arm).

Further inland the land rises up to a number of rocky exfoliation domes and tors of granite (200-500 m high) surrounded by subalpine scrub and grassland (*eg.* Magog). Inland to the north of Port Pegasus, the land rises to the Tin Range (500-

750 m) which winds northwards via its highest point, Mt. Allen (750 m). The crest of the Tin Range consists of rocky granite or schist knobs separated by boulder fields, subalpine grassland and low subalpine *Olearia*-manuka scrub. Kamahi-rimu forest clothes much of the lower southern slopes of the Range up to an elevation of 300 m, where it passes into low scrub.

Lichens recorded here were collected by BWH during a 3 week visit to the Port Pegasus area of south-east Stewart Island in January and February 1989.

PREVIOUS WORK

Cockayne (1909) published a list of 15 lichen species he had collected on Stewart Island and subsequently J. Scott-Thompson made several small lichen collections from Freshwater Valley and Herekopere. In 1949, James Murray and William Martin made a collection from the Port Pegasus area, but David Galloway has made the most substantial contribution so far. In 1966 and 1967 Galloway made two lichen collecting trips to Stewart Island and recorded 95 lichen species in 35 genera from the Mt. Anglem highlands of northern Stewart Island (Galloway 1968a) and 125 species in 38 genera from four localities around Port Pegasus in the south (Galloway 1968b). These two Galloway collections have until now, formed the basis of our knowledge of the lichen flora of Stewart Island, as expressed within his "Flora of New Zealand Lichens" (Galloway 1985), where a total of 230 species in 83 genera are recorded from the island.

SPECIES LIST OF STEWART ISLAND LICHENS

Nomenclature follows Galloway (1985) except where otherwise stated.

Voucher specimens of species are held in the herbarium of Auckland Museum (AK).

KEY:

* new records for Stewart Island
\# existing records for south-east Stewart Island
= existing records for Stewart Island, but new records for south-eastern part
@ existing records from Stewart Island, not recorded in this study

Localities:
B. Broad Bay
C. Cooks Arm
I. Islet Cove
M. Magog and Magog Ridge
N. Noble Island
T. Tin Range (incl. Mt. Allen)

Habitats:
1. Maritime rock zone (0-10 m)
2. Lowland peat soils (1-3 m)
3. Maritime scrub (*Dracophyllum-Olearia*-manuka) (5-50 m)
4. Kamahi-rimu forest (5-20 m)
5. *Olearia-Dracophyllum*-rata-kamahi forest, Noble Is (40-80 m)
6. Open manuka scrub, Cooks Arm (20-40 m)
7. Magog Ridge, subalpine grassland (100-200m)
8. Magog slopes and Tin Range track, kamahi-rimu forest (150-220 m)
9. Magog Ridge granite knobs (180-205 m)
10. Magog, granite knobs and subalpine grass (200-260 m)
11. Tin Range, schist knobs, *Olearia*-manuka scrubland (500-650 m)
12. Mt. Allen, rocky top (750 m)

Substrate:
b. bark
d. decaying log
f. tree fern
i. *Lepidothamnus intermedium*
m. moss
r. rock
s. soil
t. twig

(c) = common

Species:	AK voucher
# *Alectoria nigricans*	
@ *Arthonia platygraphella*	
* *Arthonia* aff. *punctiformis* Ach. I4b	204146
* *Arthopyrenia* sp. I4b	203955
@#*Arthorhaphis alpina* (Schaerer)R.Sant.	
* *Austroblastenia pauciseptata* M8b,N5b,T8r	208229
@ *Bacidia buchananii*	
@ *Bacidia glomerulosa*	
= *Bacidia* sp. M8b	208207
@ *Baeomyces absolutus*	
@ *Baeomyces arcuatus*	
@ *Baeomyces heteromorphus*	

* *Biatora* sp. N5b 208236
? *Biatorella* sp. I4b 208186
= *Brigantiaea chrysosticta* I1r,I4b,N1r,N3b 204014
@ *Brigantiaea fuscolutea*
* *Brigantiaea tabacodes* M10r,N5b 208213
* *Buellia hypolepidna* I4bi 203957
= *Buellia* sp. N1r 204015
= *Caloplaca circumlutosa* N1r 204016
= *Caloplaca cribrosa* I1r 208195
* *Caloplaca homologa* N5b 204114
@ *Caloplaca inclinans*
@ *Caloplaca sublobulata*
* *Calycidium cuneatum* N5b 204115
@ *Candelariella vitellina*
@ *Catillaria corroborans*
@ *Catillaria kelica*
@ *Catillaria melanotropa*
@ *Catillaria subcarnea*
= *Chrysothrix candelaris* I4b 186266
Cladia aggregata C6s,I4ds,N3s,T8b 186142
= *Cladia inflata* M10s 203947
Cladia retipora C6s,M7s,N3s 186141
* *Cladia schizopora* M8b 208210
# *Cladia sullivanii* C6s(c),N3s 186155
# *Cladina confusa* C6s(c) 204087
@ *Cladina mitis*
@ *Cladonia capitellata*
# *Cladonia cervicornis verticellata* N3s 204095
# *Cladonia chlorophaea* C2s 204054
@ *Cladonia coccifera*
@ *Cladonia corniculata*
# *Cladonia crispata* C6s(c),I4ds,M7s,N3s 203924
@ *Cladonia fimbriata*
@ *Cladonia gracilis tenerrima*
# *Cladonia murrayi* T11s 203952
# *Cladonia ochrochlora* C6s,I4bs 203925
@ *Cladonia pleurota*
* *Cladonia praetermissa* I4b,N5b 204116
# *Cladonia pyxidata* C2s,C6s,I4s 203926
# *Cladonia ramulosa* I4s,N3s(c) 204095
# *Cladonia rigida* I4d(c) 204038
# *Cladonia scabriuscula* I4ds(c),N3s 203928
# *Cladonia southlandica* C6s,M7s,M9r,T7s 203207
= *Cladonia* cf. *squamosa* N1s 204599
* *Cladonia squamosula* I4d 203927
@ *Cladonia subdigitata*
@ *Cladonia subsubulata*
* *Coccocarpia erthroxyli* I4b 204149
# *Coccocarpia palmicola* I4b(c) 204117
# *Coccotrema cucurbitula* I1r,I4b,N5b,M8b,M10r 186134
# *Coccotrema porinopsis* C2s,I4b,M7t,M9r,T11rt 203937
@ *Coelocaulon aculeatum*
# *Coenogonium implexum* I4b(c),N5b 186140
* *Collema fasciculare* I4b 204614
# *Collema laeve* I4b(c),N5b 204613
@ *Collema leucocarpum*
* *Collema subconveniens* I4b(c)d 204615
* *Collema* cf. *subflaccidum* I4b 206798
@ *Cystocoleus ebeneus* (Dillwyn)Thwaites
* *Degelia duplomarginata* I4b,N5b 203958
@ *Degelia gayana*
@ *Dendriscocaulon dendriothamnodes*
@ *Dermatocarpon luridum* (With.)Laundon
# *Dimerella* aff. *lutea* I4f(c) 187063
* *Endococcus parietinarius* (Lindsay)Clanz. & Roux C1r 206792
* *Enterographa subgelatinosa* B1r 204033
= *Flavoparmelia haysomi* I1r,N5s,T11r 204628
= *Flavoparmelia* sp. C1r,I1r 204633
* *Fuscidea* sp. I1r 208190
* *Fuscoderma amphibolum* I4b 208179
* *Graphina monospora* I4b 204152
* *Graphis librata* I4b 204153
@ *Hypogymnia kosciuskoensis*
# *Hypogymnia lugubris* T11b 204100
@ *Hypogymnia subphysodes*
* *Hypotrachyna revoluta* I1r 204631
# *Knightiella splachnirima* C6s,M8s,N5s,T8s,T11s 204068
* *Lecanactis mecistophora* (Knight)Galloway I4b 208176
* *Lecanactis redingeri* I4bi 204154
* *Lecanora cyamidia* Stirton I4i 208174
* *Lecanora demersa* (Krempelh)Hertel & Rambold T11r 208226
@ *Lecanora flavopallida*
@ *Lecanora symmicta*
@ *Lecidea canorufescens*
@ *Lecidea coccodes*
@ *Lecidea conisalea*
@ *Lecidea dacrydii*
* *Lecidea irrubens* T12r 208217
@ *Lecidea laeta*
* *Lecidea lygomma* Nyl. B1r 208233
@ *Lecidea spermogoniata*
@ *Lecidea subsericea*
= *Lecidea* sp. T11r 208225
* *Lecidella schistiseda* I1r 208197
@ *Lecidella sublapicida*
= *Lecidella* sp. B1r 208232
#@*Lepraria incana*
@ *Lepraria neglecta*
@ *Leptogium azureum*
* *Leptogium laceroides* I4b 204617
# *Lichina confinis* I1r
= *Lobaria adscripta* I4b 203959
* *Megalaria grossa* M7m 208205
* *Megaloblastenia marginiflexa* I4b(c) 203960
* *Megalospora atrorubicans australis* I4b 203962
* *Megalospora campylospora* M8b 204074
= *Megalospora gompholoma* I4b(c)i 203963
* *Melaspilea subeffigurans* I4b 203965
= *Menegazzia aeneofusca* M9r(c),M10r,T11r 203942
* *Menegazzia caliginosa* I4b 204157
# *Menegazzia circumsorediata* I4i,N5b 203930
= *Menegazzia dielsii* I4b 204158
@ *Menegazzia foraminulosa*
#@*Menegazzia inflata*
* *Menegazzia lucens* I4i 204043
= *Menegazzia nothofagi* I4bi(c) 204044
Menegazzia pertransita I4i 204045
Menegazzia subpertusa I1r(c),I4b(c),N1r(c) 203966
* *Menegazzia ultralucens* I4b,M8b 203967
@ *Metus conglomeratus*
* *Micarea austroternaria* Coppins & James M8b 206787
* *Micarea isabellina* Coppins & Kantvilas M8s 206789
= *Miltidea ceroplasta* I4b,N5b 203969
* *Neofuscelia* cf. *squamans* M9r 204632

@ *Neofuscelia stygiodes*
# *Neophyllis melacarpa* C2s,N3s 204026
= *Nephroma australe* I4b(c) 203970
= *Nephroma plumbeum* I4b,N5b 203971
* *Nephroma plumbeum isidiatum* I4d 206796
@ *Neuropogon acromelanus*
@ *Neuropogon ciliatus*
@ *Normandina pulchella*
@ *Ochrolechia frigida*
@ *Ochrolechia pallescens*
= *Ochrolechia* aff. *pallescens* I4bd 204039
* *Ohrolechia parella* N1r 208191
= *Ochrolechia* aff. *parella* I1r 208200
= *Opegrapha agelaeoides* I4i 204049
* *Opegrapha diaphoriza* B1r,I1r 204062
* *Opegrapha intertexta* N5b 204030
* *Opegrapha spodopolia* B1r,I1r 204111
= *Pannaria crenulata* I4b(c) 203973
= *Pannaria hookeri* M10r 206795
Pannaria immixta I4b(c)m,N5b 203975
@ *Parmelia cunninghamii*
* *Parmelia protosignifera* M9r,T11r 204604
# *Parmelia signifera* C1r,I1r(c),M10r(c),N5s,T11r(c) 204600
* *Parmelia subtestacea* C1r 206799
@ *Parmelia tenuirima*
# *Parmeliella nigrocincta* I4b(c) 203978
#@*Parmotrema chinense* as *Parmotrema perlatum*
= *Peltigera dolichorhiza* I4b 208182
= *Peltigera nana* I4s 203979
@ *Peltula euploca*
# *Pertusaria dactylina* M9r 206788
@ *Pertusaria graphica*
* *Pertusaria novaezelandiae* I4d 208107
* *Pertusaria subverrucosa* B1r,I1r 204008
@ *Pertusaria truncata*
= *Pertusaria* sp. M10s 208202
* *Phaeographis exaltata* I4b 203980
@ *Phlyctis sordida* Knight
@ *Physcia adscendens*
@ *Physcia stellaris*
* *Physcia tribacioides* I1r,I4i 204046
@ *Placopsis cribellans*
* *Placopsis gelida* s.lat. T12r 208218
@ *Placopsis illita*
@ *Placopsis parellina*
# *Pacopsis perrugosa* T12r 208215
# *Placopsis rhodophthalma* T11m 203950
? *Poeltiaria* sp. M9r,T11r,T12r 208201
* *Porina* sp. B1r 208231
@ *Porpidia crustulata*
@ *Pseudephebe pubescens*
@ *Pseudocyphellaria argyracea*
# *Pseudocyphellaria billardierei* I4b(c),N5b 204124
@ *Pseudocyphellaria colensoi*
#@*Pseudocyphellaria coriacea*
Pseudocyphellaria coronata I4b,M8b,N5b 186271
@ *Pseudocyphellaria crocata* M8s 186143
@ *Pseudocyphellaria degelii*
# *Pseudocyphellaria dissimilis* I4b 204069
# *Pseudocyphellaria durietzii* I4b(c),N5b 204127
# *Pseudocyphellaria episticta* I4b 203981
# *Pseudocyphellaria faveolata* I4b(c),M8b(c),N5b 203982
# *Pseudocyphellaria glabra* I1r,I4b,M9r,N5b,T11bs 186123
# *Pseudocyphellaria granulata* I4b 204182
# *Pseudocyphellaria gretae* I4b 204184
#@*Pseudocyphellaria homeophylla*
#@*Pseudocyphellaria intricata*
@ *Pseudocyphellaria knightii*
* *Pseudocyphellaria lindsayi* I4b(c),N5b 204185
#@*Pseudocyphellaria lividofusca*
Pseudocyphellaria multifida I4b(c),N5b 203985
@ *Pseudocyphellaria physciospora*
# *Pseudocyphellaria pickeringii* B1b 204112
# *Pseudocyphellaria rubella* I3b,I4b(c),M8b,N1r,N5b 204131
#@*Pseudocyphellaria rufovirescens*
= *Psoroma araneosum* I4b 203986
* *Psoroma asperellum* I4b 206802
# *Psoroma athroophyllum* C6b,I1r,I4b(c) 203988
= *Psoroma caliginosum* I4b 206790
#@*Psoroma contextum*
* *Psoroma durietzii* I3b 203931
# *Psoroma euphyllum* I4b 206793
@ *Psoroma fruticulosum*
@ *Psoroma hirsutulum*
= *Psoroma implexum* I4b (c),M8b,N5b 203989
Psoroma leprolomum I1r,I3b,I4b(c),N5b 203933
= *Psoroma melanizum* I1r 208196
= *Psoroma microphyllizans* I4b(c) 203993
= *Psoroma patagonicum* I1r,I4b,N1r,N5b 203996
= *Psoroma pholidotoides* I4b 203997
Psoroma rubromarginatum T12s 192361
Psoroma sphinctrinum I4bi 204051
* *Psoroma xanthomelanum* I4b,M8b 204080
= *Psoromidium aleuroides* N5b 204135
@ *Punctelia subrudecta*
* *Pyrenula deliquescens* I4b 203999
* *Pyrenula occulta* I4bi 204053
= *Pyrenula* sp. I4b 208181
@ *Ramalina celastri*
@ *Ramalina geniculata*
* *Rhizocarpon distinctum* Th.Fr. C1r 208240
# *Rhizocarpon geographicum* T11r,T12r 204105
# *Rimelia reticulata* I1r,I3b 204605
* *Rinodina thiomela* C1r,I1r 208214
= *Roccellinastrum neglectum* I4f 206800
Sagenidium molle I4b,M8b 204081
Siphula complanata M7s 204072
Siphula decumbens C1r,C2s(c),C6s,M7s,M10s,N3s,T11s,T12s 203936
Siphula dissoluta T12s 206794
Siphula fragilis M7s 204073
#@*Siphulastrum triste*
Sphaerophorus cf. *imshaugii* I1r,I4b,M8b,N5b 204083
= *Sphaerophorus insignis* I4b 206801
* *Sphaerophorus macrocarpus* I4d 206797
# *Sphaerophorus melanocarpus* I4b(c),M8b,M9r,M10s,T11s 204009
* *Sphaerophorus microsporus* I4b 204202
= *Sphaerophorus ramulifer* N5b,T11s(c),T12s 203948
Sphaerophorus scrobiculatus M10s,T8d,T11s 203944
Sphaerophorus tener C2s,I1r,I4b(c)f,M8b,M9r,M10r,N3r,T11r 186129
#@*Spilonema dendroides*
Stereocaulon caespitosum T11r,T12r 204107
Stereocaulon colensoi M9r 203940

#	*Stereocaulon corticatulum* C6s,I1r,T11r,T12r	204108
#@	*Stereocaulon fronduliferum*	
#	*Stereocaulon gregarium* M10r	204058
#	*Stereocaulon ramulosum* C1r,M9r,N3r,T11r	203941
#@	*Stereocaulon trachyphloeum*	
#	*Sticta filix* I4b,N5b	186145
#	*Sticta lacera* I4b(c)	204003
#	*Sticta latifrons* I4b(c),N5b	204013
=	*Sticta martinii* I4b,N5b	204004
=	*Sticta subcaperata* N5b	204138
=	*Tephromela atra* T11r	208228
@	*Thamnolia vermicularis*	
*	*Thelotrema decorticans* I4s	208184
#	*Thelotrema lepadinum* s.l. I4bdi,M8b,M10s	204040
=	*Thelotrema* sp. M8m	208209
@	*Thysanophoron stereocauloides*	
@	*Toninia bullata*	
=	*Trapeliopsis colensoi* I4b	206791
@	*Trapeliopsis congregans*	
*	*Trapeliopsis pseudogranulosa* M10s	208203
=	*Turgidosculum complicatulum* I1r	208193
@	*Umbilicaria polyphylla*	
@	*Umbilicaria vellea*	
@	*Umbilicaria zahlbruckneri*	
#	*Usnea arida* I1r,N5b	
#	*Usnea articulata* I3b,N5b	203934
#	*Usnea contexta* T11b	204101
=	*Usnea inermis* I1r,I3b,I4b	204007
#@	*Usnea torulosa*	
=	*Usnea xanthopoga* M9r	203938
*	*Verrucaria* cf. *aucklandica* I1r	
=	*Verrucaria durietzii* I1r,N1r	208188
#	*Verrucaria maura* I1r	204099
*	*Verrucaria submargacea* N1r	208234
*	*Xanthoparmelia* cf. *amplexula* C1r	204635
*	*Xanthoparmelia australasica* C1r	204626
*	*Xanthoparmelia isidiigera* C1r,I1r(c),M9r	204621
*	*Xanthoparmelia* cf. *mougeotina* M9r	204636
*	*Xanthoparmelia scabrosa* M9r,N5b	204624
=	*Xanthoparmelia* sp. C3r	208242
@	*Xanthoria ligulata*	
#	*Xanthoria parietina* B1r	204034

Lichen Statistics:	Genera	Spp.
South-east Stewart Island, this study	82	199
South-east Stewart Island, total	87	215
Stewart Island, total	105	298
New records for Stewart Island	22	68
New records for New Zealand	1	3

FLORISTICS

NEW AND SIGNIFICANT RECORDS

This study adds a further 68 species and 22 genera to the known lichen flora of Stewart Island. Forty-two of these new records are from the often undercollected and easily overlooked crustose taxa. Perhaps the most significant additional records for the island are of the genus *Xanthoparmelia* (5 spp.) and script lichens (5 additional genera, 8 spp.). Among these additional records are the first record of the genus *Biatora* from New Zealand and the first New Zealand records of *Rhizocarpon distinctum* and *Endococcus parietinarius*. The latter species is a lichenicolous fungus parasitising the lichen *Xanthoria parietina*.

FLORISTIC DIVERSITY

In this paper we record 215 lichen taxa in 87 genera from south-east Stewart Island, which increases the total known lichen flora of Stewart Island to 298 taxa in 105 genera. This total for New Zealand's third largest island is approximately 25% of the current total known lichen species for all of New Zealand and 40% of the recorded genera. Further concentrated collecting, especially of crustose microlichens in the rest of Stewart Island could add perhaps another 100 species to the island's recorded lichen flora.

The recorded floristic diversity of Stewart Island (174 600 ha) is slightly greater than that of New Zealand's fourth largest island, Great Barrier (28 500 ha) with 247 taxa in 81 genera (Hayward *et al.* 1986) and a similar-sized area of inland, higher elevation country in the northern South Island - Nelson Lakes National Park (101 753 ha), with 260 taxa in 82 genera (Galloway & Simpson 1978).

BIOGEOGRAPHIC ELEMENTS IN THE LICHEN FLORA

Of the total lichen flora recorded from Stewart Island, 19% is composed of widespread cosmopolitan species of a temperate character (biogeographical terminology follows Galloway 1985). Species endemic to the New Zealand region account for 32% of the lichens, and 25% have Australasian affinities. Austral species demonstrating an austral circumpolar distribution comprise 14%, and bipolar species comprise 3%. Pantropical, paleotropical and Western Pacific taxa each comprise 2% and circum-Pacific taxa comprise 1%. In comparison with the total New Zealand lichen flora, that of Stewart Island reflects its southern location, having a significantly lower percentage of pantropical and paleotropical taxa and a slightly higher percentage of endemic, cosmopolitan and bipolar taxa.

ALTITUDINAL ZONATION

In northern New Zealand, a distinctive altitudinal zonation of common lichens is evident (Hayward *et al.* 1986, 1991), from coastal forest to subalpine scrub at elevations up to 720 m. Eleven of the twelve common lichens confined to higher altitude forest and scrub in northern New Zealand were found in south-eastern Stewart Island. Here five of these species *(Coccotrema cucurbitula, Pseudocyphellaria glabra, Siphula decumbens, Sphaerophorus* cf. *imshaugii, S. tener)* grow on maritime rocks or peat soil, no higher than 3 m a.s.l. and the other six *(Cladia sullivanii, Miltidea ceroplasta, Pseudocyphellaria faveolata, P. multifida, Sphaerophorus melanocarpus, Sticta filix)* grow in coastal scrub or forest no higher than 20 m a.s.l.

Here on south-eastern Stewart Island, many typically subalpine and alpine lichens may grow right down to sea level. Thus altitudinal zonation of lichens is less marked than elsewhere in New Zealand. There are however, many species that are confined to maritime zone rocks and/or low altitude coastal forest (see below). A few typically alpine lichens were not recorded from lower altitudes in south-eastern Stewart Island and may be truly confined to the mountains. Examples of these found only above 100 m are *Pannaria hookeri, Pertusaria dactylina, Siphula complanata, S. fragilis* and *Stereocaulon gregarium.* Typical alpine lichens not found below 500 m include *Psoroma rubromarginatum* and *Stereocaulon caespitosum.*

WIDESPREAD LICHENS

The majority of the lichens recorded here have only been found in one or a very limited number of localities. Another group occur quite commonly within a single habitat type but are rare or absent elsewhere. A final group of about 14 lichens are common and widespread through many habitats and appear to have greater tolerance to environmental variation. These are:

Brigantiaea chrysosticta - common at low altitudes (0-50 m) on maritime rocks, maritime scrub and bark in coastal forest.

Cladia aggregata - common on soil and forest bark at altitudes up to 200 m.

Coccotrema cucurbitula - common on bark and rock in the maritime zone, coastal scrub, coastal forest and subalpine zone.

Coccotrema porinopsis - occurs on soil, rock, twigs and bark in forest, scrub and open rocky situations from sea level to 650 m.

Knightiella splachnirima - grows only on soil in canopy gaps in manuka scrub, coastal forest, and subalpine scrub up to 650 m.

Menegazzia subpertusa - a very common lichen on rock in shaded situations in the maritime zone and on bark in coastal kamahi-rimu forest.

Parmelia signifera - a common lichen which grows only on rock and occasionally on soil from sea level to 650 m.

Pseudocyphellaria glabra - grows on bark, rock and soil in maritime zone, coastal forest and subalpine scrub up to 650 m.

Pseudocyphellaria rubella - common on bark and occasionally rock in maritime zone, maritime scrub and kamahi-rimu forest up to 220 m.

Psoroma leprolomum - common on bark in low altitude forest and scrub, also on maritime rock.

Siphula decumbens - widespread lichen growing on soil and occasionally rock from sea level to the top of Mt. Allen (750 m), in maritime zone, canopy gaps in scrub and forest and in subalpine grassland.

Sphaerophorus melanocarpus - common on bark, rock and sometimes soil in coastal forest to subalpine grassland, up to 650 m.

Sphaerophorus tener - extremely common and widespread on bark, soil, rock and tree fern trunks in maritime zone, maritime scrub, kamahi-rimu forest, subalpine scrub and rocky knobs up to 650 m.

Stereocaulon corticatulum - on rock and sometimes soil in the open, from sea level to top of Mt. Allen (750 m).

LICHEN COMMUNITIES AND HABITATS

MARITIME ROCK ZONE

Lichens growing on rocks in the marine and maritime zones were collected and studied around Islet Cove, Cooks Arm, Broad Bay and on Noble Island. The only intertidal lichens found were occasional patches of black, stubby *Lichina confinis* and black crustose *Verrucaria maura* around Islet Cove. Forty-seven species of lichen were recorded growing on rocks in the maritime zone. There are equal numbers of crustose and

foliose species present with fewer (5 spp.) fruticose lichens. Visually the most abundant taxa are foliose *Menegazzia subpertusa,* grey *Parmelia signifera* and yellow-green *Xanthoparmelia isidiigera.* Other prominent foliose taxa include two species of *Flavoparmelia,* four species of *Psoroma* and two additional species of *Xanthoparmelia.*

Among the crustose lichens, all four species of black *Verrucaria* are only recorded from this zone, as are *Rhizocarpon distinctum, Rinodina thiomela, Opegrapha diaphoriza, O. spodopolia, Pertusaria subverrucosa, Ochrolechia parella,* two species of *Lecidella, Lecidea lygomma, Fuscidea* sp., *Enterographa subgelatinosa, Caloplaca circumlutosa* and *C. cribrosa.* Fruticose lichens growing on rock in the maritime zone comprise two species of *Usnea,* two species of *Stereocaulon* and occasional *Siphula decumbens.*

LOWLAND PEAT SOIL

Semi-open areas on the low banks (1-3 m a.s.l.) of the sheltered Cooks Arm have peat soils and often support a dense carpet of white stubby *Siphula decumbens,* which throughout most of New Zealand occurs in subalpine habitats. Other lichens growing on these peat soils close to sea level include *Sphaerophorus tener, Neophyllis melacarpa,* two species of *Cladonia* and crustose *Coccotrema porinopsis.*

MARITIME SCRUB

Semi-open, low (1-2 m high), maritime scrub of *Dracophyllum, Olearia* and *Phormium* on south-eastern Noble Island and around parts of Islet Cove separates the maritime rocks from the kamahi-rimu forest. *Cladia retipora, C. sullivanii, C. aggregata, Cladonia ramulosa* and three other species of *Cladonia, Siphula decumbens* and *Neophyllis melacarpa* grow on soil in open patches. *Stereocaulon ramulosum, Sphaerophorus tener* and *Xanthoparmelia* spp. grow on rocks within the scrub. The stems and branches of woody scrub plants support a sparse flora comprising two species of *Usnea,* two species of *Psoroma, Pseudocyphellaria rubella* and the orange-fruited crust *Brigantiaea chrysosticta.*

KAMAHI-RIMU FOREST

The shores of Port Pegasus and some of the lower slopes (up to 300 m) of the surrounding mountains are clothed in forest dominated by kamahi *(Weinmannia racemosa)* and rimu *(Dacrydium cupressinum).* Other common higher plants include southern rata *(Metrosideros umbellata),* yellow pine *(Lepidothamnus intermedium),* and *Olearia colensoi.* This habitat supports the richest and most diverse lichen flora in the area. A total of 102 lichen species are recorded from this habitat. Foliose lichens dominate (57 spp.), especially species of *Pseudocyphellaria* (12 spp.), *Psoroma* (12 spp.), *Menegazzia* (8 spp.), *Sphaerophorus* (6 spp.), *Sticta* (4 spp.), *Collema* (4 spp.) and *Nephroma* (3 spp.). Particularly abundant on bark in lower altitude kamahi-rimu forest (below 40 m) are: *Psoroma implexum, P. leprolomum, P. athroophyllum, P. microphyllizans, Pseudocyphellaria faveolata, P. multifida, P. billardierei, P. durietzii, P. lindsayi, P. rubella, Sphaerophorus melanocarpus, S. tener, Coenogonium implexum, Collema laeve, C. subconveniens, Menegazzia nothofagi, M. subpertusa, Nephroma australe, Pannaria crenulata, P. immixta, Parmeliella nigrocincta, Sticta lacera* and *S. latifrons.* Foliose *Knightiella splachnirima* is common on soil beneath this forest type at higher altitudes.

Thirty-five crustose lichens are recorded from this habitat. The most common on bark are: *Coccotrema* (2 spp.), *Megaloblastenia marginiflexa, Megalospora gompholoma, Thelotrema lepadinum* s.l., *Dimerella* aff. *lutea* (on tree fern), *Pyrenula* (3 spp.) and *Lecanactis* (2 spp.). Eleven fruticose taxa occur in this forest type. Most of these are species of *Cladonia* growing on decaying logs, soil in canopy gaps and less frequently on the lower trunks of trees.

Seventy of these species were not found in any of the other habitats in southern Stewart Island. These forest-restricted species include *Chrysothrix candelaris, Coccocarpia* (2 spp.), 3 species of *Collema, Dimerella* aff. *lutea, Fuscoderma amphibolum, Graphina monospora, Graphis librata, Lecanactis* (2 spp.), *Leptogium laceroides, Lobaria adscripta, Megaloblastenia marginiflexa, Megalospora* (3 spp.), *Melaspilea subeffigurans,* 6 species of *Menegazzia, Parmeliella nigrocincta, Peltigera* (2 spp.), *Phaeographis exaltata,* 4 species of *Pseudocyphellaria,* 8 species of *Psoroma, Pyrenula* (3 spp.), *Roccellinastrum neglectum,* 3

species of *Sphaerophorus* and *Sagenidium molle. Cladia schizopora, Micarea austroternaria, M. isabellina* and *Megalospora campylospora* have only been recorded from the higher altitude kamahi-rimu forest.

OLEARIA-DRACOPHYLLUM-KAMAHI-RATA FOREST

A lower canopied and more mixed variety of kamahi-rimu forest than that commonly growing around the more sheltered coastline of Port Pegasus occurs on the top of southern Noble Island. It supports a rich lichen flora dominated by foliose taxa (29 spp.), especially *Pseudocyphellaria* (8 spp.), *Sticta* (4 spp.) and *Psoroma.* Foliose *Calycidium cuneatum, Psoromidium aleuroides* and *Sticta subcaperata* were found only in this locality. Only three fruticose lichen species were found here and seven crustose species, including the sole records of *Biatora, Caloplaca homologa* and *Opegrapha intertexta.*

MANUKA SCRUB

An area adjacent to Cooks Arm of Port Pegasus that was previously burned, is now covered in 1 - 3 m high manuka *(Leptospermum scoparium)* scrub. Virtually no lichens grow on the papery bark beneath the dense manuka canopy, but a rich cover, low in species diversity (11 taxa), occurs on soil in canopy gaps. Common species are *Cladonia crispata, Cladina confusa, Cladia aggregata, C. retipora* and *C. sullivanii.*

SUBALPINE GRASSLAND AND ROCKY KNOBS (100-260 M, MAGOG)

Inland from central Port Pegasus is an area consisting of a network of rounded ridges covered in subalpine grassland punctuated by numerous rocky knobs of granite. Thirty species recorded were from these habitats. Seven fruticose species (mostly *Cladonia* and *Siphula),* 2 foliose and 3 crustose species grow on the soil in the subalpine grassland. Twenty-one species were found growing on rock in this area. Foliose lichens (11 spp.) predominate, particularly the olive-brown *Menegazzia aeneofusca, Parmelia signifera,* 3 species of *Xanthoparmelia* and 2 species of *Sphaerophorus.*

Ten species were collected only from this area. *Megalaria grossa* (on moss), *Siphula complanata* and *S. fragilis* were only found in the subalpine grassland. *Pannaria hookeri, Pertusaria dactylina, Stereocaulon colensoi, S. gregarium* and *Xanthoparmelia* cf. *mougeotina* were only recorded on the rocky granite knobs, whereas *Cladia inflata* and *Trapeliopsis pseudogranulosa* were found only in pockets of soil between the rocks near the top of Magog.

SUBALPINE SCRUB, GRASSLAND AND ROCKY KNOBS (500-750 M, TIN RANGE)

Lichens growing at higher elevations in southeastern Stewart Island were studied along the ridges of the Tin Range. Here 26 species were recorded, twelve of which were not found at lower altitudes (*Cladonia murrayi, Hypogymnia lugubris, Lecanora demersa, Lecidea irrubens, Placopsis gelida, P. perrugosa, P. rhodophthalma, Psoroma rubromarginatum, Rhizocarpon geographicum, Siphula dissoluta, Stereocaulon caespitosum, Tephromela atra).*

Few lichens grow on the subalpine scrub, but a mix of foliose and fruticose species occur on the damp subalpine soil, especially *Sphaerophorus ramulifer, S. melanocarpus, S. scrobiculatus,* 2 species of *Siphula* and *Knightiella splachnirima.* The subalpine saxicolous flora consists of 9 crustose, 5 foliose and 3 fruticose species, dominated by 2 species of *Placopsis,* 3 species of *Stereocaulon, Parmelia signifera* and *P. protosignifera.*

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