

MOSSES OF WAIHEKE ISLAND, HAURAKI GULF, NORTHERN NEW ZEALAND

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SUMMARY

A total of 85 moss species from 30 families is recorded for Waiheke Island, in the inner Hauraki Gulf. These comprise a wide range of coastal and forest mosses, and include *Fissidens australiensis* which has only recently been recognised in New Zealand. If protection of existing vegetation remnants can be continued and enhanced, a diverse and rich moss flora will survive on Waiheke.

INTRODUCTION

The indigenous vegetation of Waiheke Island has had a long history of exploitation, by both Maori and pakeha (Monin 1992). The island (Fig. 1) is today just 35 minutes by commuter ferry from the centre of Auckland City, and is increasingly vulnerable to developmental pressures. However, elements of its natural character have survived, and designation of reserve status to additional areas over the last several years has given further environmental protection. Waiheke is now a key area of both its Ecological District and Region (Fitzgibbon & Slaven 1988).

An island of 9300ha lying at latitude 36° 47' S, longitude 175° 05' E in the inner Hauraki Gulf, Waiheke is mainly sedimentary in origin, with gently rolling hills rising to 231m at Maunganui. Another high point, Stony Batter (220m), has contrasting geology, with outcropping andesitic rock.

Although Waiheke has been visited by many botanists, its non-vascular plant flora is relatively unknown. Accounts of the flora and vegetation by Kirk (1878) and Fitzgibbon & Slaven (1988) do not include bryophytes. A 'Moss sp.' is listed in the Management Plan for the Te Haahi - Goodwin Reserve (Slaven 1986), and a few specimens have made their way into herbaria. Computer searches of AK and WELT revealed seven packets. Several monographic treatments of mosses cite specimens from Waiheke. A world monograph of the family Hypnodendraceae (Touw 1971) cites Waiheke specimens of *Hypnodendron colensoi* in a number of overseas herbaria (BM, H, K, NY), and a revision of the genus *Zygodon* in Australasia by Lewinsky (1990) included Waiheke material of *Zygodon minutus*. Altogether these records total only 12 species for the

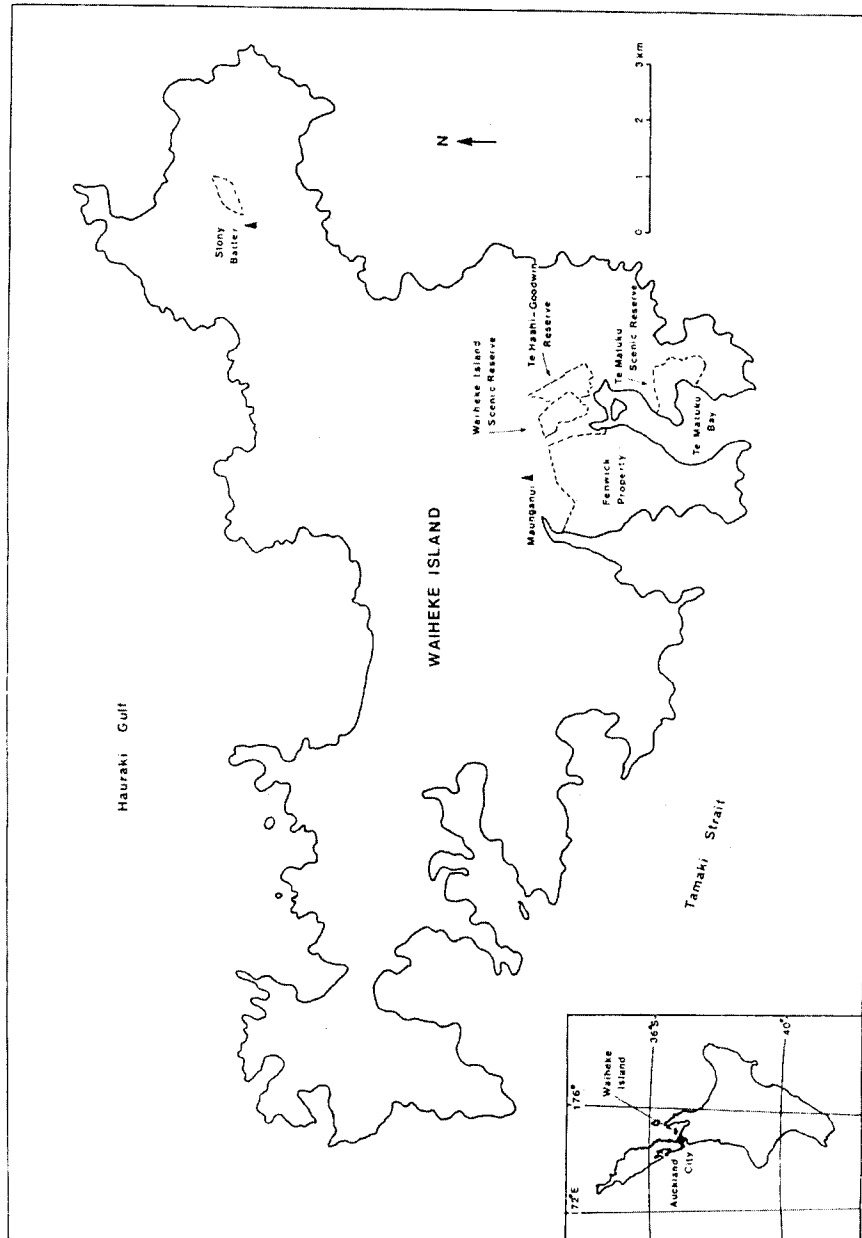


Fig. 1. Waiheke Island, showing localities mentioned in the text. Inset indicates the location of Waiheke Island in relation to the North Island of New Zealand.

island.

During an Auckland Botanical Society visit to Waiheke from 26-31 January 1994 a concentrated effort was made to record the mosses in selected areas. Field work was centered on the Te Matuku Bay catchment, an area accorded the highest priority category for environmental protection (Fitzgibbon and Slaven 1988). Mosses were recorded in several reserves: the Te Matuku Scenic Reserve and adjacent Waiheke Island Scenic Reserve to the north of Te Matuku Bay, and the Forest & Bird Society Te Haahi-Goodwin Reserve on its eastern shores, as well as on the Fenwick property on the western side of the bay. In this last locality several small coastal forest remnants are surrounded by regenerating farmland currently dominated by dense stands of woolly nightshade (*Solanum mauritianum*) and gorse (*Ulex europaeus*) in a far-sighted experimental programme of large scale passive regeneration. Records were also made at Stony Batter, where the forest remnants are the best examples of their type on the island (Fitzgibbon and Slaven 1988). Occasional collections were also made on roadsides and shorelines, mainly in the Te Matuku Bay catchment. A total of 4 days were spent recording in the field.

RESULTS

Coastal forest remnants, dominated by taraire (*Beilschmiedia tarairi*) and kohekohe (*Dysoxylum spectabile*), supported a wide variety of mosses, particularly on steep gully sides where leaf litter does not accumulate. Here the umbrella moss *Hypnodendron arcuatum*, several very small species of *Fissidens*, *F. tenellus*, *F. curvatus* (syn. *F. pungens*) and *F. linearis* var. *angustifolius*, as well as the bright yellow *Distichophyllum crispulum*, were all common on damp soil. *Thamnobryum pandum* and *Echinodium hispidum* were found on bedrock at the sides of streams, with *Fissidens rigidulus* in flowing water of small waterfalls. *Sematophyllum amoenum* was common on rotting wood, and *Pendulothecium punctatum* on exposed roots. Epiphytes were generally confined to the lower trunks and tree bases, the most common being *Hypnum chrysogaster* and *Wijkia extenuata*. Occasional epiphytes included *Dicranoloma menziesii*, *Macromitrium gracile*, *Zygodon intermedius*, *Z. obtusifolius*, *Orthorrhynchium elegans* and *Papillaria crocea*. At forest margins on the Fenwick property two introduced mosses were found in abundance: *Fissidens taxifolius* and *Pseudoscleropodium purum*.

Two species were found only in kauri forest remnants: *Hypnodendron colensoi* was very common, and *Fissidens pallidus* occasional on the forest floor. *Leucobryum candidum* was also common in this habitat, forming large clumps on the ground, but was also found occasionally in other types of vegetation,

particularly on fallen tree-fern trunks. Epiphytes were rather more common in kauri forest than in coastal forest, and included *Dicnemon calycinum*, *Macromitrium prorepens* and *Weymouthia mollis*.

The Stony Batter Historic Reserve, with its remains of World War II fortifications and adjacent forest remnants, provided a variety of habitats for mosses. The open chambers of the derelict gun emplacements supported a wealth of moss growth, with 13 species being recorded.

Another rich site for mosses was the shell bank running across the bay in the Te Matuku Scenic Reserve (Fig. 2). This reserve was recently acquired by the Department of Conservation, primarily for its sea-bird habitat, but is also invaluable for its vegetation. Six species of moss were found growing on the shell bank, exposed to varying degrees amongst grasses and sedges (*Stipa stipoides* and *Isolepis nodosa*). In greatest abundance was *Tortella rubripes*, typically a moss of coastal rock, here growing luxuriantly in extensive mats on a substrate of loose broken shell. The typical rounded cushions were also found nearby, on coastal rock at the northern end of the bay. The minute *Fissidens*, *F. australiensis* was found here, lightly shaded on a rotten log, on the steep slope at the back of the beach. This species is very similar to *F. tenellus* with which it has been confused (Stone 1990, 1994), but differs in several morphological features, particularly the failing nerve, and in substrate preference, *F. tenellus* being usually found on soil. *F. australiensis* is common in northern New Zealand as an epiphyte or on humic substrates.

In other open sites, such as on roadsides and in rough pasture, the common characteristic species *Bryum campylothecium*, *Campylopus introflexus*, *C. clavatus*, *Breutelia pendula*, *Thuidium furfurosum*, *Triquetrella papillata*, *Grimmia pulvinata*, *Ceratodon purpureus* and *Hypnum cupressiforme* were all recorded.

A total of 85 moss species from 30 families were found on Waiheke Island during the present study. Only a small fraction of the island was visited, and further exploration will no doubt add considerably to this total. Two previously recorded species were not refound, *Zygodon menziesii* and *Pytchomtrium australe*, both species of coastal rock. Since so little of this habitat was examined, their absence from the present survey is not of significance. The low elevation of the island precludes the development of the moist mossy forests found at similar latitude in the Waitakere Ranges, to the west of Auckland City. Nevertheless, the diversity of forest mosses recorded here bodes well for the survival of a relatively species-rich forest on Waiheke Island, if forest regeneration and protection continue. Likewise, remnant coastal communities on Waiheke are valuable sites for bryophyte conservation.



Fig. 2. Shell bank in Te Matuku Scenic Reserve, which harbours a rich moss flora, with coastal forest beyond, January 1994. Photo: E.K. Cameron.

MOSS SPECIES LIST

All mosses recorded during this study are listed, with presence in each major area indicated. Moss names follow Beever, Allison & Child (1992), unless authorities are given. At least one voucher specimen for each species has been lodged in the Herbarium of the Auckland Museum (AK).

* indicates that the species was seen with capsules.

	Fenwick Property	Te Matuku Scenic Reserve	Te Haahi Goodwin/ Waiheke Reserve	Stony Batter
AMBLYSTEGIACEAE				
<i>Acrocladium cuspidatum</i>				+
BARTRAMIACEAE				
<i>Breutelia pendula</i>		+		
<i>Philonotis tenuis</i>		+		+
BRACHYTHECIACEAE				
<i>Brachythecium albicans</i>				+

<i>Rhynchostegium tenuifolium*</i>	+	?	+	+
<i>Stokesiella praelonga</i>	+	+		+
BRYACEAE				
<i>Bryum argenteum</i>				+
<i>Bryum billardierei</i> var. <i>platyloma*</i>	+	+		
<i>Bryum campylothecium</i>				
<i>Bryum dichotomum*</i>		+		+
<i>Bryum microerythrocarpum*</i>				
<i>Bryum pseudotriquetrum</i>				+
<i>Bryum sauteri</i>	+	+		
<i>Leptostomum macrocarpum*</i>	+	+	+	
<i>Pohlia tenuifolia*</i>				
<i>Pohlia wahlenbergii</i>	+			
CALOMNIACEAE				
<i>Calomnion complanatum</i>	+	+	+	
CYRTOPODACEAE				
<i>Cyrtopus setosus</i>			+	
DICNEMONACEAE				
<i>Dicnemon calycinum</i>	+			
DICRANACEAE				
<i>Campylopodium medium*</i>	+			
<i>Campylopus clavatus*</i>	+	+		
<i>Campylopus introflexus*</i>	+	?		
<i>Campylopus pyriformis</i>		+		
<i>Dicranoloma billardierei</i>			+	
<i>Dicranoloma fasciatum*</i>	+		+	
<i>Dicranoloma menziesii*</i>	+	+	+	+
<i>Leucobryum candidum</i>	+	+	+	+
DITRICHACEAE				
<i>Ceratodon purpureus</i>				
<i>Ditrichum difficile*</i>		+		
ECHINODIACEAE				
<i>Echinodium hispidum</i>	+	+	+	
<i>Echinodium umbrosum*</i>	+	+	+	+
ENTODONTACEAE				
<i>Pseudoscleropodium purum</i>	+			
FISSIDENTACEAE				
<i>Fissidens australiensis*</i> Mitt.		+		
<i>Fissidens dealbatus</i>	+	+		
<i>Fissidens leptocladus*</i>	+	+	+	+
<i>Fissidens linearis</i> var. <i>angustifolius</i> (Dix.) I. G. Stone *	+	+	+	
<i>Fissidens oblongifolius</i> var. <i>capitatus*</i>			+	
<i>Fissidens pallidus</i>	+	+	+	
<i>Fissidens curvatus</i> Hornsch.*	+	+	+	+
<i>Fissidens rigidulus*</i>	+		+	

<i>Fissidens taxifolius</i>	+				
<i>Fissidens tenellus*</i>	+	+	+	+	
FUNARIACEAE					
<i>Funaria hygrometrica*</i>					
GRIMMIACEAE					
<i>Grimmia pulvinata*</i>					
HOOKERIAACEAE					
<i>Calyptrochaeta brownii*</i>		+	+		
<i>Calyptrochaeta cristata</i>		+			
<i>Distichophyllum crispulum*</i>	+	+	+		
<i>Distichophyllum microcarpum*</i>	+	+	+		
HYPNACEAE					
<i>Hypnum chrysogaster*</i>	+	+	+	+	
<i>Hypnum cupressiforme</i>		+			+
HYPNODENDRACEAE					
<i>Hypnodendron arcuatum*</i>	+	+	+		
<i>Hypnodendron colensoi*</i>	+		+		
<i>Hypnodendron spininervium</i>			+		
HYOPTERYGIACEAE					
<i>Cyathophorum bulbosum*</i>		+	+		
<i>Hypopterygium rotulatum</i>	+		+		
LEMBOPHYLLACEAE					
<i>Camptochaete angustata</i>				+	
<i>Camptochaete arbuscula</i>				+	
<i>Camptochaete gracilis</i>					+
<i>Camptochaete pulvinata*</i>			+	+	+
METEORACEAE					
<i>Papillaria crocea</i>			+		
<i>Weymouthia mollis</i>			+		
NECKERACEAE					
<i>Homalia falcifolia*</i>			+		
<i>Pendulothecium oblongifolium</i>			+		+
<i>Pendulothecium punctatum</i>			+	+	+
<i>Thamnobryum pandum</i>			+	+	+
ORTHOTRICACEAE					
<i>Macromitrium gracile</i>			+	+	
<i>Macromitrium prorepens*</i>			+		?
<i>Zygodon intermedius*</i>			+	+	+
<i>Zygodon obtusifolius*</i>				+	
PHYLLOGONIACEAE					
<i>Orthorrhynchium elegans</i>			+	+	
POLYTRICHACEAE					
<i>Pogonatum subulatum*</i>					
POTTIACEAE					
<i>Barbula torquata*</i>				+	+
? <i>Hymenostomum patulum*</i>			+	+	

<i>Tortella rubripes</i> *		+		
<i>Tortula muralis</i> *				+
<i>Tortula papillosa</i>				+
<i>Tortula princeps</i>				+
<i>Triquetrella papillata</i>				+
PTYCHOMNIACEAE				
<i>Ptychomnion aciculare</i> *	+	+	+	
RACOPILACEAE				
<i>Racopilum convolutaceum</i> *	+		+	
RHIZOGONIACEAE				
<i>Rhizogonium novae-hollandiae</i>	+			
SEMATOPHYLLACEAE				
<i>Sematophyllum amoenum</i> *	+	+	+	+
<i>Wijkia extenuata</i>	+	+	+	+
THUIDIACEAE				
<i>Thuidium furfurosus</i> *	+	+		+
<i>Thuidium sparsum</i>	+	+		+

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