EXOTIC STIPLES &C

R.O. Gardner

A. Bambusa sp. (giant thorny bamboo, cultivated Norfolk I.). Leaf base with outer rim, bristly auricles and ligule. x 1.3

B. Boehmeria dealbata (Urticaceae, cultivated Auckland ex Kermadec Is.). Shoot near tip, free stipules, x 3.5; stipule x 3.5

C. Boehmeria nivea (adventive to Norfolk I.). Shoot tip showing fused intrapetiolar stipules, x 3.5; stipule x 3.5

D. Eucalyptus obliqua (cultivated Auckland). Stipules absent; shoot apex protected by miniature leaves ("cataphylls"), x 3

E. Annona cherimoya (Custard apple family, cultivated Auckland). Buds protected by deeply-hollowed petiole base. Shoot tip x 2, details x 4

F. Sida acuta (Malvaceae, adventive to Norfolk I.). Stipules 2 per node, unequal, one narrow, the other long, broad and ribbed. x 7

E. Celtis paniculata (Ulmaceae, Norfolk I.). Stipules 2 per node, peltate. x 4

FLORA AND VEGETATION OF MOTUKARAKA (FLAT ISLAND) - BEACHLANDS, SOUTH-EAST AUCKLAND

E.K. Cameron and G.A. Taylor

INTRODUCTION

Motukaraka (6 ha) lies 500 m off Beachlands settlement on the southern shore of Tamaki Strait, Auckland (Grid ref. NZMS 260 R11 868785) (Fig.1) The island is connected to the mainland at low tide by mudflats and a shellbank spit. Foot access is possible 3 hours either side of low tide. People frequently visit the island on foot, horse or by motorbike. The general area is popular for gathering shellfish or fishing.

Motukaraka is cliff-bound on all sides, small cliff seepages are frequent and large pohutukawa (see Appendix 1 for scientific names) form a distinctive fringe around the cliff-tops. These eroding cliffs vary from bare exposed faces to being covered with the island's best native vegetation. The island has a flat summit plateau c. 15 m asl which is largely devoid of forest and is accessible via "Bank Track" - the only easy path which is on the south-east end. There is a small shellbank attached to the island at the southern end and extensive mudstone reefs surround the island and are exposed at low tide. The Waitemata sediments (sandstone/siltstone) of Miocene age are overlain with Whau Formation sediments (clay and silt with some peat) of Pleistocene age (Kermode 1975). A thick (c.40 cm) midden bed is visible at the top of the Bank Track and smaller midden beds are exposed on other cliff-tops. D.R. Simmons (pers. comm.) has informed us that the island's main use by Maori (Ngai Tai Tribe) would have been as a seasonal fishing pa and to a lesser extent as a refuge. Nearby islands were occupied for over 1000

years and possibly Motukaraka was used for a similar period.

We made six visits to Motukaraka between May 1987 and September 1989. The island is a Crown Reserve administered by Manukau City Council as a Recreation Reserve, and is also part of the Manukau City Council Domain.

A number of introduced animal species occur on the island including garden snails, rabbits, a few possums, and ship rats. The rats were trapped by us when camped overnight on the island on 10 February 1989 and two possums were seen there during that visit.

FLORA

An annotated species list is given in Appendix 1. The vascular plant flora totals 148 species and 4 hybrids of which only 41% are native. The coastal cliffs are the only area dominated by native species.

The name Motukaraka suggests that in the past, the island's plateau was dominated with stands of karaka. A few large karaka trees are present today in the south-east corner. The island was probably originally covered in tall coastal forest.

Blechnum sp. "Green Bay" is an interesting native fern which requires a legal description and name (see Brownsey & Smith-Dodsworth 1989). It is not mentioned by Gardner and Dakin (1989) in their species list of the Hunua Ranges which includes the Firth of Thames coastline from Miranda to Wairoa River, which is only 12 km away from Motukaraka. It is a common fern on Auckland's west coast and Manukau Harbour but judging from the Auckland herbaria (AK and AKU), it is rare on Auckland's east coast. Only two previous localities have had collections: Taranga (Hen) Island, A.E.Wright 2176, 1977, AK 142782 (the northern limit for this New Zealand endemic taxon?) and Birkenhead cliff, T.C. Chambers, 1954, AK 166704. Therefore, Motukaraka appears to be a local stronghold for this taxon.

A hybrid between Asplenium flaccidum and A. haurakiense (= A. flaccidum ssp. haurakiense) has never been reported (see Brownsey 1977). Our specimen is possibly this hybrid. A sterile hybrid would provide good evidence that these two taxa are distinct species (P.J. Brownsey pers. comm.), as treated by Ogle (1987). The nearest population of A. haurakiense is on Papakohatu (Crusoe) Island, 7 km to the north (pers. obs.). On any future visit to Motukaraka, we shall consider removing this plant for cultivation and study.

Centaurium tenuiflorum has rarely been found in the Auckland area, but as mentioned in the Flora of New Zealand Vol. IV (Webb et al. 1988), it is probably more widespread than is thought as it is often confused with C. erythraea, which it was growing amongst.

VEGETATION

This is discussed under the three different habitats: plateau, cliffs and shellbank.

a) Plateau

There are no large trees on the island's flat-topped plateau except pohutukawa and seven coral trees along the cliff-tops. The plateau is poorly drained and apart from privet and gorse thickets (<2 m tall) on the west side, and scattered shrubs of karamu and tree privet, the plateau is dominated by herbaceous weeds. The main species are paspalum, oxtongue, Scotch thistle, narrow-leaved plantain, lotus and Japanese honeysuckle. Locally common species included greater bindweed, bracken, creeping buttercup, Isolepis nodosa, Geranium solanderi, wire vine, Baumea juncea, Californian thistle and shrubby haloragis. The

northern part of the plateau is mainly a low browsed pasture where narrow-leaved plantain, danthonia and locally, meadow rice grass dominate. A small stand of manuka c. 2 m tall (only 2 alive) indicate what may have once been more common here. The western side of the island had been recently burnt (observed 11 June 1988). Although it was mainly gorse that burnt, several cliff-top pohutukawa trees were also killed.

Rabbit browsing is highly modifying the plateau vegetation. In several cases severely browsed plants had to be removed and cultivated off the island so that they could be identified.

b) Cliffs

The western cliffs are predominantly bare and eroding with large, discontinuous pohutukawa trees along the cliff-tops. Gorse is locally common, and occasional saplings of pohutukawa, mingimingi and tauhinu are present on the cliffs. Various grass species and I. nodosa are also occasional here.

The northern cliffs have more vegetation cover than the western cliffs but similar species. Both pampas grass species are also present. An unusual find for an island is a single tanekaha growing on top of the northern cliffs. We know of few occurrences of this species on offshore islands (pers. obs.).

The eastern cliffs have virtually continuous pohutukawa trees on cliff-tops. Locally there are shrubs of karamu, gorse, koromiko and pohutukawa. A few karo shrubs are found on this side of the island. The frequent seepages are dominated mainly with native herbaceous species, e.g., Poa anceps, maidenhair, mosses and various weeds.

The southern cliffs have large pohutukawa on cliff-tops and the upper cliffs. These trees form a continuous canopy which hangs out above the well clothed cliffs. Above the cliff-tops are several large trees of karaka, mahoe and houpara. There are occasional shrubs of houpara, tutu, karamu, kawakawa, pohutukawa and koromiko. A dense ground cover of maidenhair, P. anceps, Blechnum sp. "Green Bay", mosses and exotic grass species is locally common on the vertical banks, especially in the seepage areas. Astelia banksii is common along the cliff-tops and clumps of New Zealand flax and I. nodosa are occasional. On the non-vertical, upper slope, rabbit burrows were the most numerous that we observed.

c) Shellbank

The triangular, sandy shellbank (above the high tide line) is very small and adjoins the island on the southern side. During 1989, two thirds of the shellbank was washed away by the sea removing two species altogether (kowhai and pennyroyal) and leaving only some 65 m^2 of shellbank. Over 32 plant species were recorded on the shellbank. The following nine species were seen nowhere else; Bastard's fumitory, buck's-horn plantain, fiddle dock, field speedwell, kowhai (seedlings only), orache, pennyroyal, ragwort and tall fescue.

THE FUTURE OF MOTUKARAKA

Clearly, the high number of rabbits and the presence of possums and ship rats on the island are having a major effect on the vegetation. Palatable plant species are being eliminated or highly suppressed and less palatable species are increasing in occurrence. Fire has also modified part of the plateau.

In September 1981, a ranger from the Lands and Survey Department inspected Motukaraka and recommended that the island be added to the

Hauraki Gulf Maritime Park. Manukau City Council agreed to the transfer but the Park Board in February 1983 suggested that Manukau City Council should first bring the island up to a "reasonable standard" and then the Park Board would reconsider the situation (H.G.M.P.B. minutes). The transfer of control has now lapsed with no management taking place on the island. We believe the Hauraki Gulf Maritime Park Board was wrong in not accepting the island in 1983 just because it was scrub covered, infested with rats and had an untidy appearance (H.G.M.P.B. minutes, 15 February 1983). As reported by the ranger, the island has high recreation potential. From the top of the island, there are excellent panoramic views of the inner Hauraki Gulf and its islands. People could visit Motukaraka by boat or on foot (it would be one of only two Park Board islands accessible by foot). With the right promotion, a well formed track to the plateau and information signs (none at present), Motukaraka could become a very popular recreation reserve.

The shellbank, reefs and mudflats around the island support many seabirds including variable and South Island pied oystercatchers; godwits and pied stilts; white-faced and reef herons; pied, black, little black and little shags; white-fronted and caspian terns; black-backed and red-billed gulls; and kingfishers. Without a large cost the browsing mammals could be eliminated. The island could then, with minimal management, be assisted to regenerate back to native forest on the plateau. Thereafter, it would become quite quickly an important biological and recreational addition to the Park.

ACTION REQUIRED

The first step is to rid the island of rabbits, possums and rats. The possums could be readily removed by shooting and trapping. The rats and rabbits could be eradicated by another operation using Talon 20P anticoagulant poison. This would involve the hand-laying of 10 kg/ha of poison over the entire surface of the island (e.g., 60 kg costing c. $200) and the same operation would need to be repeated two weeks later (e.g., another 60 kg of Talon 20P poison). The island would then require monitoring at monthly intervals over the next year to check for reinvasion of animals. The operation should be supervised by trained Department of Conservation staff but poison costs could be funded by other organisations and volunteers could be used for laying the poison. Eventually, about 10 permanent poison stations could be kept on the island to prevent rats from re-establishing. Poison in these stations could be restocked about four times per year.

The animal poisoning should be carried out in conjunction with control/eradication of some of the potentially aggressive weeds present on the island, e.g., Japanese honeysuckle, kahili ginger, pampas grass species, privet, tree privet, woolly nightshade, Japanese spindle tree and evergreen buckthorn. Many of these species are present only in low numbers. Gorse should be left as it would assist regeneration back to forest but it would increase the fire risk until it is over-topped.

The animal and weed eradication should also be coordinated with planting on the plateau. The example of the fantastic voluntary help the revegetation project of Tiritiri Matangi Island received shows how planting and weeding costs can be kept to a minimum and at the same time raise the public profile of the area. Planting the open plateau area would markedly decrease the weed problem and assist the return to forest. The most suitable species for planting would be native, seral species that do not mind "wet feet" and are already on the island or on the adjacent Beachlands cliffs, e.g., flax, houpara, karamu, cabbage tree (Cordyline australis), and kawakawa. Supplementary planting or

hand-spreading seed of karaka from the local seed source would also be approriate as the island was named after this species and karaka seeds have limited means of dispersal without New Zealand pigeons. All these plant species should grow quickly and provide a food source for birds. To avoid genetic pollution and unsuitable species, the source of the plant propagation material should be confined to the island and adjacent mainland cliffs as a first preference and the Tamaki Ecological District as a less preferred option. This last option would enable locally uncommon plants such as ngaio (Myoporum laetum) to be planted on Motukaraka. In general, the priniciples outlined in the Revegetation Manual (Evans 1983) and by Wright and Cameron (in press) should be followed when re-planting on the island.

It is our hope that the Park Board (or its replacement) will reconsider this island as an addition to the Hauraki Gulf Maritime Park. Smallish islands are important in conservation terms far beyond their size because exotic animals and aggressive weeds can be eliminated from them, unlike most mainland situations. This elimination allows some of our native fauna and flora to flourish where otherwise they cannot persist. Although there is no guarantee that when the rabbits and possums are eradicated they will not reintroduce themselves, we think it is unlikely for the rabbits at least. Rabbits probably became established on the island when the adjacent mainland was farmland. Now that it is residential, the mainland rabbit numbers are presumably low. Possibly the few possums on the island are males as it is the young males that move the longest distances (Clout and Efford 1984). If the rats are eradicated as well, we would expect them to be the first species to reintroduce themselves, though the 0.5 km of tidal shellbank should deter rodents for some time. It would be an interesting experiment to see if or how long these mammals would take to re-establish.

ACKNOWLEDGEMENTS

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APPENDIX 1. Motukaraka (Flat Island) Flora.

ABUNDANCE SCALE

A=Abundant
C=Common
O=Occasional
R=Rare < 5 individuals seen
L=Local

* = adventive or planted species

AKU = University of Auckland (Botany Department) herbarium voucher number

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE	HABITAT
Ferns (13)			
Adiantum cunninghamii	maidenhair	LA	S and E forested cliffs; local N and W cliffs.
Asplenium flaccidum s.s.	-	L	S and E cliffs, epiphytic on pohutukawa and rupestral.
A. flacc. x A. haurakiense?	-	R	Single plant on E cliffs with intermediate characters of these two species. AKU 21689.
A. oblongifolium	shining spleenwort	LC	S forested cliffs; O on E cliffs. Unbrowsed.
Blechnum sp. "Green Bay"	-	LC	S-SE cliffs; local on other cliffs. AKU 21346.
Cyathea dealbata	ponga	O	On cliffs, local x4 up to 2 m tall near SE Point, others <20 cm trunks.
C. medullaris	mamaku	O	On southern cliffs, tallest ±4 m top of SE bank, several dead trunks.
Dicksonia squarrosa	wheki	R	Sporeling x2, SE and N cliffs.
Doodia media	-	L	Under pohutukawa near SE Point and single locality on E cliffs.
Phymatosorus diversifolius	hound's tongue	O-LC	S-E cliffs and cliff-tops.
Pteridium esculentum	bracken	LA	Plateau; local near Bank Track and E cliffs.
Pteris tremula	-	O	E-SE cliffs.
Pyrrosia eleagnifolia	-	LC	On pohutukawa bases and cliffs S-E.
Gymnosperms (1)			
Phyllocladus trichomanoides	tanekaha	R	Single windshorn plant 50 cm tall, appressed to cliff, open site amongst mingimingi, N cliff-top. AKU 21665.
Dicotyledons (91)			
Anagallis arvensis s.s.*	scarlet pimpernal	O-LC	Throughout including shellbank.
Apium prostratum	native celery	L	Shellbank and adjacent cliff base.
Araujia sericifera*	moth plant	R	N plateau x1, removed Feb 89.
Atriplex prostrata*	orache	R	Shellbank.
Calystegia sepium	greater bindweed	LA	Plateau; Occ. S-E cliffs and shellbank.
Cassinia leptophylla	tauhinu	O-LC	Cliffs, except E cliffs.
Centaurium erythraea*	centaury	O	Open cliffs and browsed plateau margins.
C. tenuiflorum*	-	L	Open N cliffs. AKU 21668.
Cerastium glomeratum*	annual mouse-ear	O	Cliffs.
Cirsium arvense*	Californian thistle	LC	SE plateau single patch, 50x25 m.
C. vulgare*	Scotch thistle	A	On plateau, Occ. elsewhere including shellbank.
Conyza albida*	broad-leaved fleabane	O	Throughout including shellbank.
Coprosma macrocarpa x C. robusta	-	R	SE cliff, shrubs x2.
C. robusta	karamu	O-LC	Cliffs; occ. in middle of plateau.
Coriaria arborea	tutu	LC	SE cliffs; occ. SW-E cliffs; absent N and NW cliffs.
Corynocarpus laevigatus	karaka	L	Near Bank Track cliff-tops x11. 1-7.5 m tall.
Cotoneaster glaucophyllus*	-	R	E cliff x1, 3 m; by Bank Track x1, 1 m. AKU 21688.
Crepis capillaris*	hawksbeard	O	Throughout including shellbank. AKU 22173.
Dichondra ?micrantha*	Mercury Bay weed	LC	Under W-SE cliff forest; occ. shellbank. AKU 21690.

Entelea arborescens	whau	L	SE forest x3, top of Bank Track x2 c.2 m tall, planted?
Epilobium nummulariifolia	creeping willow herb	L	SSE cliff, absent elsewhere.
E. rotundifolium	-	L	Southern cliffs. AKU 22168.
Erythrina x sykesii*	coral tree	R	7 trees, 4-7 m tall, cliff-tops above S (2) and SE (5) Points, planted?
Euonymus japonicus*	Japanese spindle tree	O	E-SE forest margins and cliffs.
Euphorbia peplus*	milkweed	O	Shellbank and cliffs.
Fumaria ?bastardii*	Bastard's fumitory	R	Back of shellbank, seedling x1, June 88, not seen again.
Galium aparine*	cleavers	O	Shellbank; S cliffs and plateau pasture.
Geniostoma rupestre	hangehange	LC	SW-SE cliff forest.
Geranium molle*	dove's foot cranesbill	O	Plateau pasture.
G. solanderi "coarse hairs"	-	LC	N plateau pasture.
Gnaphalium coarctatum*	purple cudweed	L	Bare cliffs, by Bank Track. AKU 21715.
Haloragis erecta	shrubby haloragis	LC	SE cliffs, plateau; occ. N cliffs.
Hebe stricta s.s.	koromiko	LC	Top of SE cliffs and S end of plateau; local top E and S cliffs; absent N and W cliffs. Unbrowsed.
Hypochoeris radicata*	catsear	O	On plateau and cliffs.
Leptospermum scoparium	manuka	L	NW plateau (2 alive, several dead), NW cliff-tops (occ.).
Leucopogon fasciculatus	mingimingi	O	On cliff and cliff-tops, often low and windshorn to 3 m tall.
Ligustrum lucidum*	tree privet	L	Plateau, <10 plants <4 m tall.
L. sinense*	privet	LC	Mainly with gorse in SW plateau corner; occ. to common by top of Bank Track; up to 2 m tall. Browsed.
Linum bienne*	Australian flax	O	By Bank Track.
L. trigynum*	yellow flax	LC	Open cliffs.
Lobelia anceps	shore lobelia	LC	On shellbank and adjacent cliffs; occ. on other cliffs.
Lonicera japonica*	japanese honeysuckle	O	On cliffs; LA plateau.
Lotus angustissimus*	slender birdsfoot trefoil	O	Open SE bank and N cliffs.
L. pedunculatus*	lotus	C-A	In plateau pasture.
L. suaveolens*	hairy birdsfoot trefoil	O	Shellbank and cliffs.
Macropiper excelsum	kawakawa	O	S-E cliffs and seedlings on shellbank.
Medicago arabica*	spotted bur medick	R	Base of Bank Track.
M. ?nigra*	bur medick	O	SE-E cliffs.
Melicytus ramiflorus	mahoe	L	Top of S-SE cliffs, <20 plants up to 7 m tall, one recently dead (Sept. 89), possum browsed?
Mentha pulegium*	pennyroyal	R	Shellbank, single plant recorded 4/2/89 and washed away 6 days later.
Metrosideros excelsa	pohutukawa	C	Trees on cliff-tops and seedlings on shellbank.
Muehlenbeckia complexa	wire vine	O	Cliffs and cliff-tops; L patches in E plateau pasture.
Myosotis discolor*	grassland forget-me-not	O	Shellbank, top of SW cliffs; LC in plateau pasture and top of N cliffs. AKU 21661.
Myrsine australis	mapou	L	S cliff and cliff-top forest.
Parentucellia viscosa*	tarweed	LC-O	S-E cliffs.
Phytolacca octandra*	inkweed	L	SE Point and plateau.
Picris echioides*	oxtongue	O	Shellbank, E cliffs and plateau pasture.
Pittosporum crassifolium	karo	L	Cliff forests, 5 plants only 1.7-4 m tall.
Plantago coronopus*	buck's-horn plantain	R	Shellbank Oct 88, absent Feb 89.
P. lanceolata*	narrow-leaved plantain	O	Cliffs and shellbank; LA in burnt areas on plateau.
Prunella vulgaris*	selfheal	LC	S-SE open banks.
Prunus domestica*	plum	R	Single 1 m plant top of Bank Track, planted?
Pseudognaphalium luteoalbum	Jersey cudweed	L	S-SE vertical bare cliffs. AKU 21714.
Pseudopanax crassifolius x P. lessonii	-	R	Single 3 m plant, cliff-top near SE Point.
P. lessonii	houpara	LA	S-SE cliffs.
Ranunculus parviflorus*	small-flowered buttercup	L	Top of bank track, open area. AKU 21660.
R. reflexus	-	L	S cliffs. AKU 22169.
R. repens*	creeping buttercup	O-LC	Open plateau pasture.
Rhamnus alaternus*	evergreen buckthorn	O	Single plant above SW cliffs by gorse; occ. E cliff and cliff-tops.
Rumex crispus*	curled dock	O	Plateau pasture.
Rumex pulcher*	fiddle dock	L	Shellbank. AKU 22171.
Sagina procumbens*	pearlwort	O	N cliffs.
Senecio bipinnatisectus*	Australian fireweed	L	Plateau pasture and shellbank.

S. jacobaea*	ragwort	R	Shellbank x1, removed.
S. lautus s.s.	shore groundsel	L	SE cliffs. AKU 22167.
Sherardia arvensis*	field madder	L	On margin of Bank Track.
Solanum americanum	small-flowered nightshade	O	Plateau pasture.
S. mauritianum*	woolly nightshade	R	N plateau pasture x2, SW plateau x2, all <1 m tall.
S. nigrum*	black nightshade	R	W cliffs x3.
Sonchus asper*	prickly sow thistle	C	Plateau pasture; occ. cliffs.
S. oleraceus*	sow thistle	O-LC	Cliffs throughout and shellbank.
Sophora microphylla	kowhai	R	Shellbank x2 seedlings 4/2/89, washed away 6 days later.
Trifolium dubium*	suckling clover	O	SE cliffs. AKU 21663.
T. glomeratum*	clustered clover	LC	Top of Bank Track, open area, AKU 22170.
T. repens*	white clover	L	Shellbank and top of Bank Track.
Ulex europaeus*	gorse	LC	Cliff-tops, cliffs and SW plateau corner.
Verbena bonariensis*	purple-top	L	10x10m patch. W side of plateau, absent elsewhere.
Veronica arvensis*	field speedwell	L	Shellbank.
Vicia disperma*	two-seeded vetch	L	Open S-SE cliffs.
V. sativa*	vetch	O	Plateau pasture and cliffs.
V. tetrasperma*	four-seeded vetch	O	Plateau pasture. AKU 21662.

Monocotyledons (47)

Agapanthus orientalis*	-	R	Single plant, SE cliffs.
X Agropogon littoralis*	perennial beard grass	O	Shellbank and open SE cliff.
Agrostis capillaris*	browntop	L	E plateau pasture.
Aira caryophyllea*	silvery hair grass	L	SE open bank.
Anthoxanthum odoratum*	sweet vernal	L	S-SE open cliffs.
Asparagus asparagoides*	smilax	R	Single seedling removed (Feb 89) above SW cliffs by gorse.
Astelia banksii	-	C	S-SE cliff and cliff-tops; rare N cliff-top; occ. as low epiphyte on pohutukawa.
Baumea juncea	-	LC	Open W-N cliff-tops and in adjacent plateau pasture.
Briza minor*	shivery grass	L	S-E cliffs.
Bromus diandrus*	ripgut brome	LA	S plateau; occ. on cliffs. Browsed. AKU 21360.
B. hordeaceus*	soft brome	L	Cliff by Bank Track.
B. willdenowii*	prairie grass	L	Plateau grassland and cliffs. AKU 21359.
Carex breviculmis	grassland sedge	LC	By Bank Track.
C. divulsa*	grey sedge	L	Small tussocks in plateau pasture and top of Bank Track.
C. flagellifera	-	LC-O	Cliffs (except SW) and plateau.
C. inversa	creeping lawn sedge	L	Mid-W cliff-top, burnt area.
Cortaderia jubata*	purple pampas grass	O	By Bank Track, N-W cliffs and N plateau.
C. selloana*	pampas grass	O	By Bank Track, N and W cliffs.
Cyperus ustulatus	giant umbrella sedge	O	Shellbank x1; isolated plants on plateau and cliff by Bank Track.
Dactylis glomerata*	cocksfoot	LC	Plateau and S-E cliffs.
Deyeuxia billarderei	sand-wind grass	L	Cliff by Bank Track.
Dichelachne crinita	long-hair plume grass	LC-O	Cliffs (except W).
Elymus multiflorus	-	L	At single locality on bare SE cliffs. AKU 21666.
Festuca arundinacea*	tall fescue	L	Shellbank and base of Bank Track.
Gahnia lacera	-	LC	Cliff and cliff-tops.
Hedychium gardnerianum*	kahili ginger	R	3 clumps, W (x1) and E (x2) of Bank Track.
Holcus lanatus*	Yorkshire fog	O	Shellbank, plateau pasture, and N-E cliffs.
Iris foetidissima*	stinking iris	R	Single clump by rabbit burrow, W of bank track. AKU 21664.
Isolepis nodosa	-	LC	Plateau pasture; occ. cliffs.
Juncus articulatus*	jointed rush	L	Seepage by Bank Track.
J. bufonius*	toad rush	L	Mid-E cliffs.
J. gregiflorus	leafless rush	R	By Bank Track seepage.
Lepidosperma australe	sword sedge	L	Top of SW cliffs.
Lolium perenne*	perennial ryegrass	O	Shellbank, mid-W plateau margin and S-SE cliffs.
Microlaena stipoides	meadow rice grass	L	NW plateau corner.
Narcissus sp.	-	R	2 clumps - S plateau and base of Bank Track.
Paspalum dilatatum*	paspalum	A	Plateau pasture; occ. N-W cliffs and by Bank Track.
Phormium tenax	N.Z. flax	L	W-SE cliff and cliff-tops including W burnt area, absent N and E cliffs.

Poa anceps	-	A	S-SE, and E cliffs.
Polypogon monspeliensis*	beard grass	L	Shellbank, AKU 22172.
Rytidosperma racemosum*	danthonia	LC	Along open cliff-tops, especially N and W.
R. unarede	danthonia	L	S cliffs.
Sporobolus africanus*	ratstail	O	Cliffs and plateau.
Stenotaphrum secundatum*	buffalo grass	LA	E of Bank Track. Unbrowsed.
Vulpia bromoides*	vulpia hair grass	O	S cliffs.
V. myuros*	vulpia hair grass	O	N cliffs. AKU 21667.
Uncinia uncinata	hooked sedge	R	Under forest W of Bank Track, 1x1 m area.

Bryophytes (8) (incomplete list)

Bryum erythrocarpoides	-	LC	On S-SE face. AKU 71749.
Campylopus ?clavatus	-	O	AKU 72140.
Chiloscyphus semiteres	-	O	AKU 72139.
Desmatodon lingulatus	-	LC	On S-SE face. AKU 71750.
Gymnostomum calcareum	-	O	AKU 72138.
Lunularia cruciata*	-	O	AKU 72137.
Ptychomnion aciculare	-	O	
Thuidium sp.	-	O	

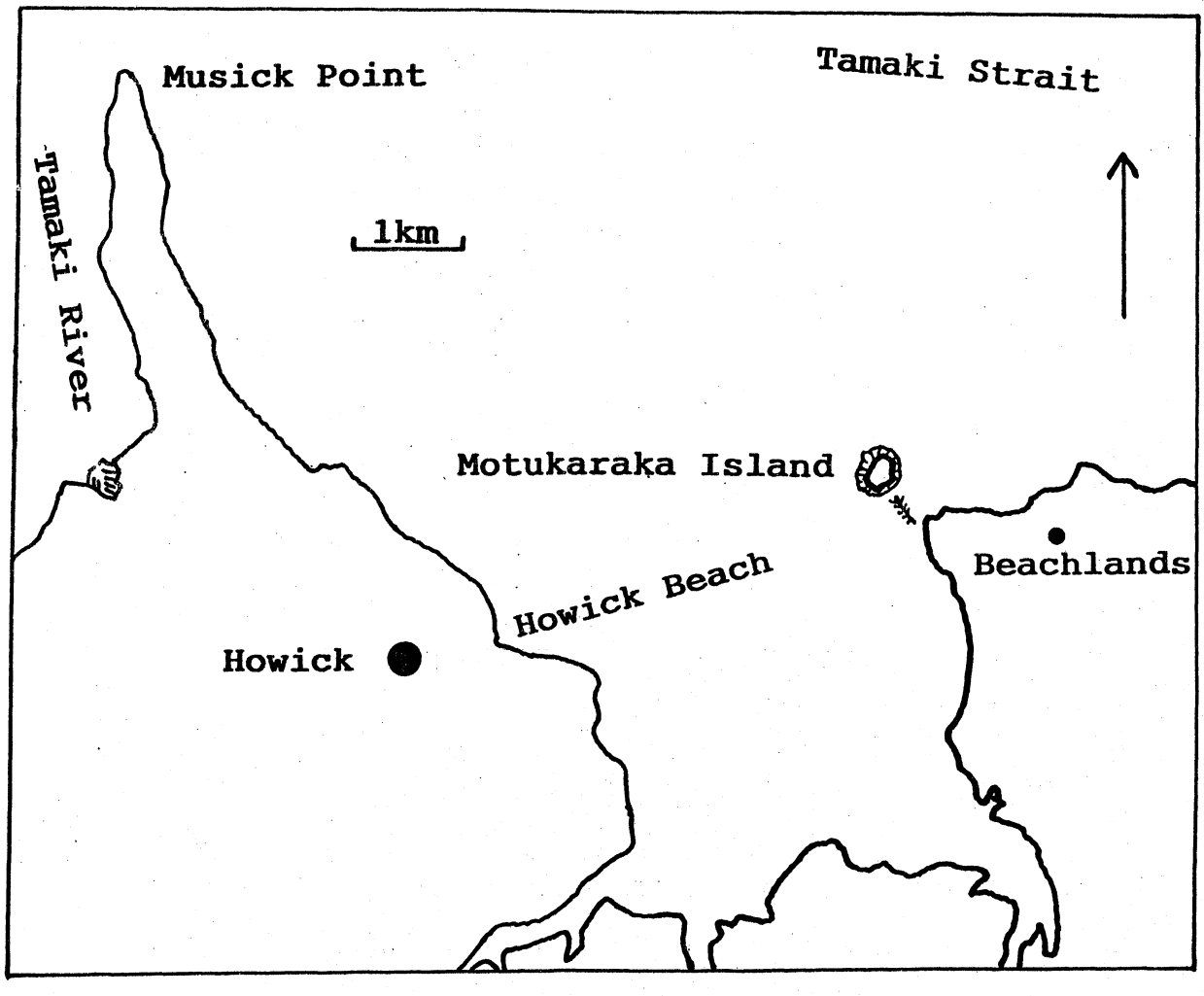

Fig. 1. Locality map for Motukaraka (Flat) Island