

The Vascular Flora of Motu Kaikoura, Fitzroy Harbour, Great Barrier Island

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After two years of lobbying by various groups and individuals to purchase the island the Conservation Minister Chris Carter announced on 7 May 2004 "Kaikoura Island is to be protected, restored and used as an area for environmental education of New Zealand youth." The Motu Kaikoura Trust was appointed to manage the island in February 2004 and the official island opening took place on 7 May 2005. At the request of the Motu Kaikoura Trust a team of six Auckland Botanical Society (ABS) members spent four days on the Motu Kaikoura (16-19 December 2006) surveying the island's vascular flora. Team members: Tricia Aspin, Ewen Cameron (leader), Geoff Davidson, Mei Nee Lee, Jeff McCauley, Maureen Young, and entomologist Aidan O'Donnell. This report is based on: the Dec 2006 survey; previous publications and collections; and some additional comments by Geoff Davidson from a visit on 20 Feb 2007; nine Auckland Regional Council (ARC) staff that spent three days weeding on the island, 21-23 Apr 2007; and eight additions from a visit by Mike Wilcox and Maureen Young in Jun 2007.

Introduction

The name Motu Kaikoura, rather than the official name Kaikoura Island, is the preferred name used by the Trust for the island after consultation with the local iwi (Ngati Rehu). Motu Kaikoura covering 535ha (Taylor 1989) is the largest island off Great Barrier Island and

lies in the mouth of the scenically spectacular Fitzroy Harbour (Fig. 1) – a drowned river system (Bruce Hayward *pers. comm.*). The island is the eroded remains of a Miocene andesitic strato volcano. Much of the island's topography is fairly gentle, but there are many inland bluffs and the highest points consist of three rocky rugged outcrops, 179-185m asl. There are a few permanent streams, which exist as small summer flows in the larger catchments. The island has been "farmed" since 1862 and has had a long history of browsing mammals, frequent fires (the last one c.1980) and bush clearances to create pasture. Today the island's vegetation is dominated by tea tree (*Kunzea* and *Leptospermum*).

Fallow deer were released on the island in the early 1930s and have severely modified the vegetation by removing most palatable species within their reach. No adequate fences exist and past deer numbers have been estimated to number as high as c.360 animals. A local shooting party had culled 44 feral deer a week before we arrived and a further 38 were culled in April 2007. Our visit therefore was timely with the deer numbers reduced, the forest understorey eaten out allowing easy access, and a good time of year for flowering and fruiting. The plant abundances recorded by our survey reflect >70 years of deer browsing, i.e. palatable plants to deer were absent or restricted to inaccessible sites.

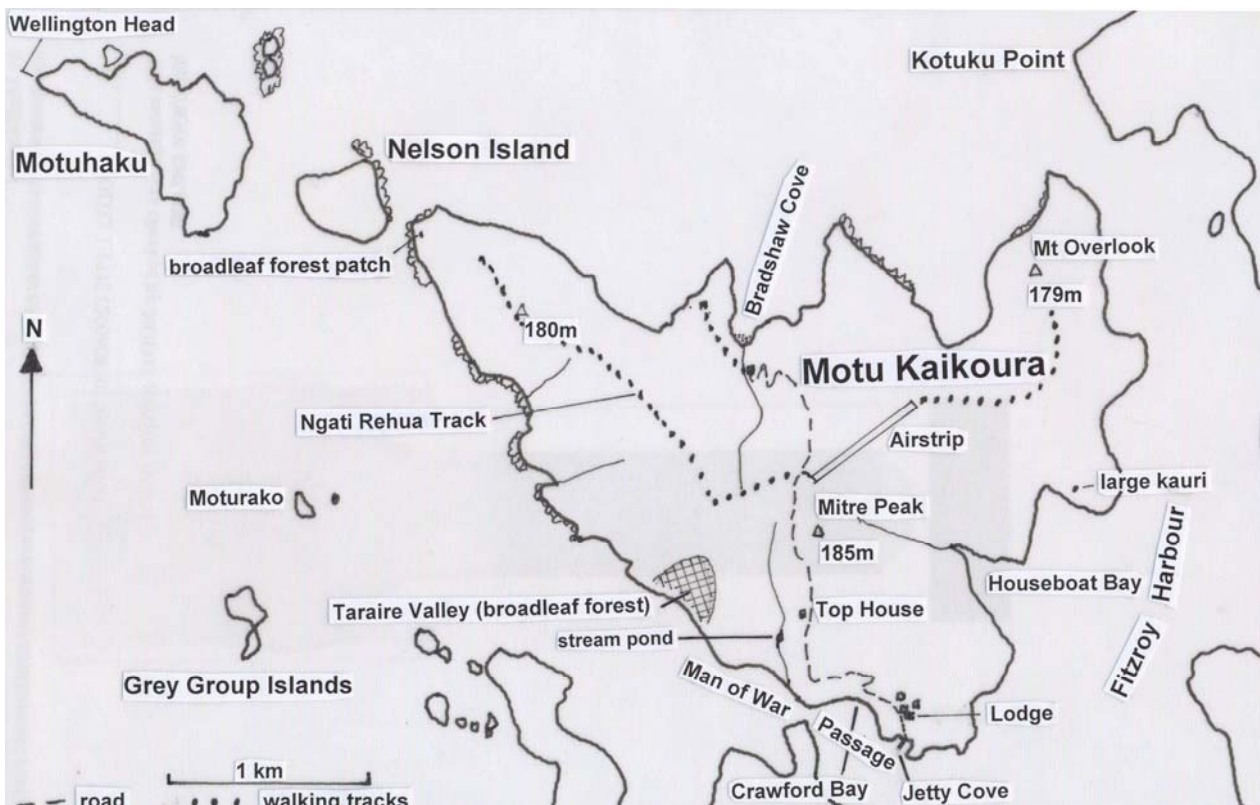


Fig. 2. Location and place names of Motu Kaikoura, western Great Barrier Island.

A few wild pigs (liberated 1980s) were still present – pig rooting was evident west of Houseboat Bay (see Fig. 2 for location of place names). Goats were released in the 1980s, most were shot around 1990 but three escaped and started breeding on Mt Overlook – when they were finally shot in 1993 they had increased to about twenty. Sheep and cattle were farmed over a long period, by the early 1990s there was just an overweight cow and a few sheep present, they were all gone by the mid 1990s. Two rabbits have recently been seen around the Top House paddocks; they were also seen here by previous caretaker/owners but haven't seemed to increase in numbers. Feral cats, ship rats and mice are present, and kiore may be present. The long-term view of the Trust is to eradicate all of these feral mammals (rodent eradication is proposed for 2008).

Until purchased by the Trust in 2004, the island was in private ownership for over 140 years and closed to the public. Although the original Crawford homestead hasn't survived, several buildings exist on the island, mainly on the south side at Jetty Cove, and a farm house (Top House) further inland. There is also a bach on the north coast at Bradshaw Cove. A north-south gravel 4WD track "the road" exists between the two coastal locations, passing by a grass airstrip (relocated there in the late 1990s), which is 500 m long, and runs NE-SW along the main central spine of the island. Walking tracks have recently been cut along the central spine from the airstrip: NE to Mt Overlook; and to the NW (Ngati Rehua Track).

History of recording the vascular flora

Until recently the island has had few botanical visitors. Thomas Kirk collected at least six herbarium specimens there during his extensive botanical survey of Great Barrier Island in 1867-68 (Kirk 1869), but he didn't specifically mention the island in his publication. One native (*Vittadinia australis*) and two exotic Kirk collections (*Eruca vesicaria* subsp. *sativa* and *Vicia narbonensis*) have not been recorded there since. Ron G Cooper collected kowhai there in 1962, and Cameron (1995) published a brief account of the vascular flora after a 3-hour visit in July 1995, recording 76 species (78% native). With the increased conservation interest in the island there have been several brief botanical surveys carried out since 2002. On 18 June 2003 Bec Stanley and Jonathan Boow (2003) visited the island and explored a small patch of pohutukawa (*Metrosideros excelsa*) forest just south of the NW tip (not visited by us), which because of the rocky nature of the coastal slope, was inaccessible to the feral deer – from here they recorded 91 vascular species (86% native). All combined the total recorded vascular flora for the island just before our visit was 248 species (Motu Kaikoura website, Dec 2006).

Areas surveyed in Dec 2006

Within the time available we tried to visit as many different habitats as possible, recording the vascular plants and noting their abundance and location.

Day 1: We arrived by plane at the airstrip (c.830 hrs) and surveyed airstrip (before being mown) and adjacent vegetation at SW end of the airstrip; then took an untracked route - skirted the north, west and south flanks of Mitre Peak, headed south along ridge south of Mitre Peak; then headed east and ended up in a forested valley coming out at Houseboat Bay; botanised the head of the bay and then headed south 20-60m asl to the Lodge (arriving c.1900hrs).

Day 2: (c.900hrs) went by *Mule* (6-seater quad bike) to the start of main NW ridge (Ngati Rehua Track) and walked following the track to the high western tip of island, including exploring the several exposed rocky outcrops along the way, returned via the same route to the last rock outcrop (S08 190557) and then scrub-bashed north to open, N-facing, "Badlands areas", botanised these open areas and then proceeded down the ridge on west side of Bradshaw Cove to WWII observation post (met a track), worked east down to NW side of Bradshaw Cove, but high tide caused us to circle back around to reach the head of bay, surveyed stream & beach near the bach while Geoff retrieved the *Mule* and gave us a lift via the road back to Lodge (c.1930hrs). The highlight of the evening was the spectacular phosphorescence at Jetty Cove.

Day 3: (c.900hrs) Will Scarlett (island caretaker) took us by boat along SW coast, out to Motuhaku, where on western side we recorded a large plant of the threatened mawhai (*Sicyos australis*), looked around west tip of Motu Kaikoura and dropped us off in two groups along SW coast; one group checked out >1km of coast, the other spent 5hrs in largest broadleaf forest on the island ("Taraire Valley") with associated rocky bluffs; all collected by boat (1600hrs) and visited steep coast by a large kauri NE of Houseboat Bay; returned to Jetty Cove by boat (1700hrs) via a "squadron" of diving gannets associated with a few common dolphin near the E end of Man of War Passage.

Day 4: Geoff dug out 18 apple of Sodom (*Solanum linnaeanum*) on small peninsular on east side of Jetty Cove. Because of indifferent weather flight departure arrangements were unsure. Time allowed for only a quick 1 hr survey of Top House area and follow the adjacent stream down to the dam (stream pond) and waterfall W of Crawford Bay. Then packed up, went to airstrip to wait for plane that finally arrived c.1300hrs.

Vegetation of broad habitats visited

Grasslands

Grasslands exist at the airstrip (mown) (Fig. 3), Jetty Cove (mown), Top House and Bradshaw Cove, and to a lesser extent along the road margins. The airstrip was dominated by grasses: bay grass (*Eragrostis brownii*), *Vulpia bromoides*, ratstail (*Sporobolus africanus*), sweet vernal (*Anthoxanthum odoratum*),

and locally, browntop (*Agrostis capillaris*), paspalum (*Paspalum dilatatum*) and patches of carpet grass (*Axonopus fissifolius*). Common associates included *Carex inversa*, *Sagina apetala*, hawkbit (*Leontodon taraxacoides*), slender bedstraw (*Galium divaricatum*), sheep's sorrel (*Rumex acetosella*), *Lotus angustissimus*, *Oxalis exilis* and *Juncus bufonius*. Most of these species were also present in other grassy areas, however, *Vulpia myuros* was one of the common grasses along the road margins and not seen in the other grasslands. An indication that the previous "pasture" areas were never of high quality is the low abundance of ryegrass (*Lolium perenne*) and clover (*Trifolium repens*) anywhere on the island. The main grass of many farmed Hauraki Gulf islands, kikuyu grass (*Pennisetum clandestinum*), was observed only as a few patches in front of the Lodge.

Extensive swards of the native grass, microlaena (*Microlaena stipoides*), were widespread mainly under the taller kanuka (*Kunzea* aff. *ericoides*) areas with virtually no understorey.

Badlands

These open areas with either red or white bare ground of hydrothermally altered andesite, were on N-facing slopes, to the SW of Bradshaw Cove (Figs. 4-6). It's a very harsh environment which limits not only the species that can grow there, but also their form and height. At the most extreme both the manuka (*Leptospermum scoparium*) and Great Barrier kanuka (*Kunzea sinclairii*) are prostrate (Fig. 7), and most of the vegetation is <2m tall. Much of the taller vegetation is windswept (leaning away from the coast). Gumland-type species dominate: manuka, Great Barrier kanuka, *Leucopogon fasciculatus*, *Morelotia affinis*, *Schoenus tendo*, *Lindsaea linearis*, *Schizaea bifida*, danthonia (*Rytidosperma* spp.), *Thelymitra* spp.; and weeds *Hakea sericea*, *H. gibbosa*, gorse (*Ulex europaeus*) and even the occasional maritime pine (*Pinus pinaster*). More locally *Gleichenia dicarpa*, *Sticherus flabellatus* (a single plant), *Ozothamnus leptophyllus*, *Celmisia major*, a single plant of *Loxosoma cunninghamii*, tussocks of *Dianella latissima* and tiny plants of *Pimelea* aff. *urvilleana*. Locally taller plants of rewarewa (*Knightia excelsa*), miro (*Prumnopitys ferruginea*) and *Pittosporum umbellatum* were present.

Scrub areas

Central upland areas are mainly covered in scrub c.2m tall which grades to the north into the open Badlands, and to the south into tall kanuka. The dominant species are manuka, kanuka (many are hybrids between the 2 kanuka species), gorse, and *Hakea* species. These areas would have been the last areas to be farmed (pre-1980).

Kanuka forest

Extensive areas of tall kanuka exist, especially on the southern side of the island (Fig. 8) – this is the main

vegetation-type on the island. Predominantly the understorey is sparse (Fig. 9), with only a few deer-browse resistant species present, e.g. *Coprosma rhamnoides*, *Lepidosperma laterale*, trunkless ponga (*Cyathea dealbata*), locally *Olearia furfuracea*, and microlaena swards as ground cover. The main vine is parsonsia (*Parsonsia capsularis*), often forming tangles on the ground, and bush lawyer (*Rubus cissoides*) is locally common.

Broadleaf forest

The only extensive broadleaf forest present is on the SW coast (Fig. 10), extending from the coast for c.300m inland and up to c.300m across near the coast. The canopy is 12-15m tall and dominated by taraire (*Beilschmiedia tarairi*) with trunk diameters 15-25cm (Fig. 11). Occasional other canopy trees are puriri (*Vitex lucens*) with trunks to 1m diameter, kohekohe (*Dysoxylum spectabile*), tawa (*Beilschmiedia tawa*, all wide-leaved form), pohutukawa, karaka (*Corynocarpus laevigatus*) few, tawapou (*Planchonella costata*) only near coast, hinau (*Elaeocarpus dentatus*) at least 4 trees away from the coast, mamaku (*Cyathea medullaris*) mainly dead standing trunks, miro at least 2 trees, wharangi (*Melicope ternata*) near coast; and single trees of mahoe (*Melicactus ramiflorus*), coastal maire (*Nestegis apetala*), rewarewa and lacebark (*Hoheria populnea*). Tall kanuka is present on the margins with an understorey of ponga. Climbers present: parsonsia, *Metrosideros perforata* (mainly over the ground), supplejack (*Ripogonum scandens*) in small patches, bush lawyer and a single *Passiflora tetrandra*. Epiphytes are not common; the main one, *Collospermum hastatum*, occurs as occasional clumps, and there are several fern species. The understorey and ground cover is virtually absent; large rocks are common, *Danhatchia australis* (Fig. 12) was present in one area. Locally there were kohekohe and mapou (*Myrsine australis*) seedlings, tiny kawakawa (*Macropiper excelsum*) seedlings (<5cm tall), and small kawakawa shrubs on steeper faces.

From the deer-free forest patch Stanley and Boow (2003) recorded many broadleaf species but few individuals: tawa (x1), coastal maire (2 trees & a sapling), ngaio (*Myoporum laetum*) (x1), mangeao (*Litsea calicaris*) (1 tree & seedlings), whau (*Entelea arborescens*) (several trees & seedlings), and a good understorey of coastal karamu (*Coprosma macrocarpa*) and kawakawa.

Currently pohutukawa exists mainly as scattered, coastal trees, and also on inland rocky outcrops (e.g. Mitre Peak). In the absence of browsing mammals pohutukawa should increase and dominate the coastal forest.

Kauri associated forest

We briefly visited a coastal slope below and up to a large kauri (*Agathis australis*) tree (c.18m tall, c.80cm dbh) east of Houseboat Bay. This area contained the

largest kauri that we saw and also saplings and seedlings (elsewhere we only saw 1 or 2 kauri together). The understorey was thick and showed little sign of any deer browsing – it was in marked contrast to the eaten out forest areas that we'd visited along the SW coast. Shrubs of *Brachyglottis kirkii* var. *angustior*, *Pimelea tomentosa* and *Hebe macrocarpa* var. *latisejala* were locally common here and not seen elsewhere. There was no obvious reason why this understorey was so intact.

Pine areas

In the SE corner of the island (east of a line south of Mitre Peak) two emergent pine species (*Pinus pinaster*, *P. radiata*) dominate the vegetation. These appear to be naturalised rather than planted. Outside of this SE corner wild pines are present but sparse. Underneath the pines usually kanuka is present and little else.

Inland bluffs

The botanically interesting bluffs formed the upper margins of the broadleaf forest in Taraire Valley and were shaded (Fig. 13). Most bluffs were vertical, 4-8m tall, and locally contained bryophyte mats with filmy ferns (*Hymenophyllum sanguinolentum* was the commonest species), other fern species (especially *Asplenium haurakiense*), rengarenga (*Arthropodium cirratum*), *Hebe pubescens* subsp. *rehuarum* and occasional large-leaved shrubs (out of deer reach).

Rocky outcrops

There are at least six exposed rocky outcrops, and these are the highest points of the island. Parts of these outcrops, especially Mitre Peak (Fig. 14), have areas out of reach of browsing deer and consequently they are habitats for many of the interesting plants. These include: *Elymus solandri*, *Celmisia major*, *Scandia rosifolia*, *Dianella latissima*, *Ophioglossum coriaceum*, and especially one of the weeds, *Erica baccans*.

Stream margins/wet areas

Our visit coincided with a seasonal drought on the island – some shrubs of koromiko (*Hebe pubescens* subsp. *rehuarum*), hangehange (*Geniostoma ligustrifolium*) and kawakawa were severely wilted. The main running streams were at Bradshaw Cove, Houseboat Bay and the valley west of Crawford Bay; also three valleys on the SW coast had small flows or disappeared into sand at the coast. Damp areas were frequent at the head of most bays along the southern coast, and locally mats of *Ranunculus acaulis* were present.

The largest wetland was part of the stream below the Top House which included a ponded area formed by an earth dam (stream pond). The pond was dominated by *Potamogeton cheesemani*, *Persicaria decipiens* and *Eleocharis acuta*. Locally present were swamp millet (*Isachne globosa*), *Carex virgata* and various rushes (*Juncus* spp.). Upstream of the pond under a manuka

canopy (c.3m tall) the fern *Diplazium australe* dominated the valley bottom.

The vascular flora

An annotated species list of 380 species (68% native) and five hybrids is provided (Appendix 1), and the totals are summarised in Table 1. Some 139 species (46% native) and two hybrids are additional to those previously recorded; the monocots show the largest percentage increase with 51% being new records. Thirty-three species and one hybrid previously recorded were not seen during the present survey, possibly because: some are locally extinct (3 of the 19th century Kirk records and some of the weeds that have already been targeted by the Trust); it was the wrong time of the year (i.e. for some orchids); different areas visited by us; and some previous records might be wrong. Eight previous records are excluded, mainly because on present evidence they appeared to be in error for a closely related species. Threatened native species and environmental weed species are discussed separately below. More fieldwork will discover additional species, but the present total is estimated to be 80-90% of the current total flora.

Threatened and Uncommon Native Vascular Species

Thirteen Nationally (cf. de Lange et al. 2004 and Heenan & de Lange 2007) and 20 Regionally (Stanley et al. 2005) threatened and uncommon native vascular species occur on Motu Kaikoura, 17 of these were recorded for the first time during the present survey.

Nationally Threatened

Nationally Data Deficient and Regionally Extinct: *Vittadinia australis* – collected by Kirk (1867-67) on Mitre Peak, at its northern geographical limit (Cameron 2005), not recorded since.

Nationally Chronically Threatened

Serious Decline: *Daucus glochidiatus*, *Pimelea tomentosa*

Gradual Decline: *Celmisia major*

At Risk

Sparse: *Blechnum norfolkianum*, *Corunastylis pumila*, *Doodia mollis*, *Scandia rosifolia*, *Sticherus flabellatus*, *Tmesipteris sigmatifolia*

Range Restricted: *Hebe pubescens* subsp. *rehuarum*, *Kunzea sinclairii*

Data Deficient: *Dianella latissima*

Regionally Threatened

Regionally Extinct: *Elymus solandri*

Regionally Endangered: *Juncus pauciflorus*, *Nestegis apetala*, *Ranunculus acaulis*

Regionally Chronically Threatened

Serious Decline: *Epilobium nerteroides*, *Senecio biserratus*

Gradual Decline: *Elymus multiflorus*, *Myoporum laetum*, *Planchonella costata*, *Trisetum arduanum*

Regionally At Risk

Sparse: *Danhatchia australis*, *Einadia triandra*, *Hymenophyllum cupressiforme*, *Ophioglossum coriaceum*, *Pelargonium inodorum*, *Psilotum nudum*, *Pteris comans*

Range Restricted: *Loxsonia cunninghamii*
Data Deficient: *Galium propinquum*, *Rytidosperma clavatum*

Plant group	Native	Naturalised	Totals
Ferns & fern allies	65	2	67
Conifers	4	3	7
Dicots	115	80	195
Monocots	75	37	112
Totals	259	122	381

Table 1. The wild vascular Flora of Motu Kaikoura in the different plant groupings, and with native and naturalised status (the 5 dicot hybrid taxa are excluded).

Special records

The record of *Rytidosperma clavatum* was the only native addition to the flora of Great Barrier Island (cf. Cameron et al. 2002) and it is also a new northern geographical limit for the species. The discovery of the presumed "Regionally Extinct" native grass *Elymus solandri* had not been collected on Great Barrier Island (or adjacent islands) since Kirk's visit nearly 140 years ago. Great Barrier also appears to be the northern geographical limit for the species – although *Elymus multiflorus* × *E. solandri* was recorded by Connor (1994) from the more northern Poor Knights Islands (voucher: CHR 21675). It was good to confirm *Celmisia major* is still present on the island where Kirk collected it in 1867-68. Until Bec Stanley discovered it on Aiguilles Island in 1999 off the northern tip of Great Barrier Island, *C. major* was suspected to be extinct on Great Barrier and its associated islands. Two of the three endemic Great Barrier Island plants (*Kunzea sinclairii*, *Hebe pubescens* subsp. *rehuarum*) are now confirmed for Motu Kaikoura. It is still possible that the third species, *Olearia allonii*, is also present on Motu Kaikoura. The threatened native carrot, *Daucus glochidiatus*, was only found on the final morning of our visit, however, its preferred dry open habitat is common on the island and it is likely that this cryptic species will be present elsewhere on Motu Kaikoura. Seedlings later found by Mike Wilcox at Bradshaw Cove appear to be this species.

Environmental Weed Species

Already managed

The Trust has already started managing some weed species, including: apple of Sodom, arum lily (*Zantedeschia aethiopica*); Cape honey flower (*Melianthus major*); Chinese privet (*Ligustrum sinense*); cotoneaster (*Cotoneaster glaucophyllus*); elephant ear (*Alocasia brisbanensis*); gorse; hydrangea (*Hydrangea macrophylla*); Madeira vine (*Anredera cordifolia*); Mexican devil (*Ageratina adenophora*); monkey apple (*Syzygium smithii*); moth plant (*Araujia sericifera*); pampas grass (*Cortaderia seloana*); passion fruit (*Passiflora edulis*); periwinkle (*Vinca major*); *Senna septemtrionalis*; smilax (*Asparagus*

asparagoides); and tuber ladder fern (*Nephrolepis cordifolia*).

Should be considered for management

Other species that should be considered for management: *Carex divulsa*, *Carex longibrachiata*, carpet grass, *Cyperus eragrostis*, stinkwort (*Dittrichia graveolens*), *Festuca rubra* subsp. *commutata*, kikuyu grass, Mexican daisy (*Erigeron karvinskianus*), peach (*Prunus persica*) tree by Lodge, pines (*Pinus pinaster* and *P. radiata*) especially the outlier populations, *Pteris cretica*, and veldt grass (*Ehrharta erecta*). Note – some of these may already be eradicated because the only known populations have been uprooted. *Hakea* spp. could be controlled in a similar way to gorse, i.e. margins of high-use areas, and *Erica baccans* in the most open sites (regeneration should smother it from other areas).

Bryophytes

These have not been systematically studied, but ones so far collected or recorded by botanists working on vascular plants are listed below (herbarium numbers cited) – identifications by JE Beever and JE Braggins.

Mosses

Bryum dichotomum (AK 283783), *B. sauteri*, *Campylopus ? introflexus* (AK 283626), *Ctenidium pubescens* (AK 298037), *Hypnodendron* sp., *Leucobryum candidum*, *Ptychomnion aciculare*, *Rhynchostegium tenuifolium* (AK 283820) and *Thuidium furfurosum*.

Liverworts

Archilejeunea olivacea, *Lepidolaena taylorii* (AK 298074), *Metzgeria ? furcata* (AK 298075) and *Plagiochila ? obscura* (AK 298038).

Birds observed during our visit

Gannet (diving near Man of War Passage), pied shag (a few nests in pohutukawa on SW coast), brown teal (a non-breeding pair on stream pond below Top House), harrier (1 bird), pheasant (heard only), banded rail (pair with 3 young by Lodge), variable



Fig. 1. Motu Kaikoura (535 ha) in the mouth of the Fitzroy Harbour; Smokehouse Bay, part of Great Barrier Island, lower foreground (looking N). All photos by author during Dec 2006 trip.



Fig. 5. Badlands, open habitats for interesting plants, including *Celmisia major*.



Fig. 3. Main grassland on the island: 500m-long airstrip (looking NNE).



Fig. 6. Badlands, open habitats for interesting plants, including Great Barrier kanuka.



Fig. 4. Badland areas: open areas of hydrothermally altered andesite, just west of Bradshaw Cove (looking NE).



Fig. 7. Prostrate Great Barrier kanuka (*Kunzea sinclairii*), on badlands; erect plants are present in the less exposed sites.



Fig. 8. The commonest vegetation: kanuka forest, SW coast from western end. Note - the 3 rocky outcrops along the main ridge (Great Barrier in background) (looking SE).



Fig. 12. *Danhatchia australis*, local in taraire litter, Taraire Valley.



Fig. 9. Kanuka forest 8m tall, *Parsonsia capsularis* on ground, NW end of Ngati Rehua Track.



Fig. 13. Inland bluff, eastern side of Taraire Valley – shaded habitat out of deer browsing reach, good habitat for tiny ferns.



Fig. 10. Upper western margin of the largest stand of broadleaf forest, Taraire Valley (looking SE).



Fig. 11. Eaten out broadleaf forest (Taraire Valley) where taraire dominates.



Fig. 14. Mitre Peak (185m asl), a steep rocky outcrop – open habitat out of deer browsing reach

oystercatcher (1 pair), spur-winged plover (pair on airstrip), black-backed gull, kereru, kaka (common), shining cuckoo (heard only), morepork, kingfisher (very common, nests frequent in banks), welcome swallow, silvereye, grey warbler, blackbird, fantail, tui, chaffinch, yellowhammer, myna and Australian magpie.

Lizards recorded during our visit

Moko skinks (*Oligosoma moco*) were widespread and seen quite often in open places. A single copper skink (*Cyclodina aenea*) was caught by Aiden.

An invertebrate recorded during our visit

Because of the presence of rats a rather surprising discovery by Aiden in Taraire Valley under several dead logs on the forest floor was the carnivorous Great Barrier paua slug (*Schizoglossa novoseelandica barrierensis*).

Conclusion

The island contains a large number of Nationally and Regionally threatened vascular plant species. All the environmental weeds on the island are quite manageable and in fact some because of recent weeding activity may already be eradicated. Apart from the pines in the SE corner the island is already dominated by native vegetation.

The future

Now that the deer numbers are reduced (and complete eradication is planned), the plant

abundances for some species should change rapidly. Species that have been suppressed by the deer but hanging on in inaccessible sites may spread quickly. For example, in the eaten out broadleaf forest in Taraire Valley there was in places tiny kawakawa and kohekohe seedlings which should quickly expand if the browsing pressure is removed. Conversely species that have had some resistance to the browsing, e.g. *Lepidosperma laterale*, should now be slowly out-competed by other species and their dominance should decrease with time.

Eradicating the introduced mammals and controlling the environmental weeds should rapidly lead to a healthy regenerating native forest in most places. The infertile Badlands will probably be the slowest areas to recover. Until the eaten out habitats thicken up they will be prone to weed invasion and it is crucial that the weeding effort continues until the habitats recover. Recording the recovery by way of monitored quadrats, field surveys for new species and abundance changes will be scientifically valuable. The birds, wind, and seawater will constantly bring new seeds from adjacent areas to the island. Some of these could be quite exciting, e.g. *Streblus banksii* is known to occur on the adjacent Nelson Island. No planting is required to aid this regeneration process, which offers a wonderful opportunity to better understand regeneration pathways after a long period of farming and seven decades of feral deer browsing.

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Appendix 1. Annotated vascular plant species list of Motu Kaikoura

Key

* = exotic species

** = cultivated species

a = abundant

c = common

o = occasional

l = local

s = scarce (<5 plants seen)

BS & JB = collected or recorded by Bec Stanley & Jonathan Boow, June 2003

N = new record for the island (at end of Comments)

herbarium voucher numbers are sighted (at the end of the Comments)

Species	Comments
Ferns & Fern Allies (65+2) (= native + naturalised totals)	
<i>Adiantum aethiopicum</i>	o-lc, open grassy areas throughout
<i>Adiantum cunninghamii</i>	o, shaded valleys & banks
<i>Adiantum diaphanum</i>	by NW point (BS & JB)
<i>Adiantum hispidulum</i>	o, small numbers on dry slopes (coast to ridge tops)
<i>Arthropteris tenella</i>	s, over rocks, broadleaf forest, Taraire Valley. N
<i>Asplenium flabellifolium</i>	l, open rocky outcrops
<i>Asplenium flaccidum</i>	o, forest epiphyte & even in pine trees
<i>Asplenium haurakiense</i>	lc, on coastal rocks & inland rocky bluffs. AK 298447
<i>Asplenium oblongifolium</i>	o, mainly as isolated plants, scrub, forest & bluffs
<i>Asplenium polyodon</i>	s, forest epiphyte (& in a pine tree), & rupestral on rocky bluffs
<i>Blechnum chambersii</i>	l, margin of a few damp streambeds, including W side Houseboat Bay
<i>Blechnum discolor</i>	s, clay bank by airstrip
<i>Blechnum filiforme</i>	o, forest areas
<i>Blechnum fluviatile</i>	on website but not seen by us
<i>Blechnum membranaceum</i>	l, margin of a few damp streambeds, including W side Houseboat Bay
<i>Blechnum norfolkianum</i>	lc, single locality, coastal cliffs, SW coast. N. AK 298328
<i>Blechnum novae-zelandiae</i>	o-lc, by streams & damp open areas (e.g. side of airstrip)
<i>Cardiomanes reniforme</i>	l, small patches in forest & on inland rocky bluffs
<i>Cheilanthes distans</i>	l, open rocky areas, usually growing with <i>C. sieberi</i> . N
<i>Cheilanthes sieberi</i>	lc, open rocky areas
<i>Ctenopteris heterophylla</i>	l, inland rocky bluffs, broadleaf forest, Taraire Valley (E side). AK 298449
<i>Cyathea cunninghamii</i>	single adult plant, with other tree ferns, above road, Crawford Bay. N
<i>Cyathea dealbata</i>	c, under tea tree & forest; in places the main understorey plant
<i>Cyathea medullaris</i>	o, tall plants in forest & gully areas
<i>Cyathea smithii</i>	single adult plant, with other tree ferns, above road, Crawford Bay
<i>Deparia petersenii</i>	l, by stream below Top House, among <i>Diplazium australe</i>
<i>Dicksonia squarrosa</i>	o, occasional in forested valleys, locally in patches
<i>Diplazium australe</i>	lc, widespread, damp shady areas, locally forming main ground cover under tea tree, e.g. below Top House by stream
<i>Doodia australis</i>	c, patches in open grassy areas & under tea tree
<i>Doodia mollis</i>	o, open grassy areas, coast to inland rocky outcrops. N. AK 289390
<i>Gleichenia dicarpa</i>	l, open areas, particularly by Badlands
<i>Gleichenia microphylla</i>	l, open clay slope by airstrip
<i>Grammitis ciliata</i>	o, inland rocky bluffs, broadleaf forest, Taraire Valley (E side); & back of Houseboat Bay & by large kauri. AK 298450
<i>Histiopteris incisa</i>	o-lc, occasional patches in scrub & scrub margins, & common along N side of airstrip
<i>Huperzia varia</i>	o, rupestral on rocky bluffs & as an epiphyte
<i>Hymenophyllum cupressiforme</i>	lc, inland rocky bluffs, broadleaf forest, Taraire Valley. AK 288049

<i>Hymenophyllum rarum</i>	s, inland rocky bluffs, broadleaf forest, Taraire Valley (E side)
<i>Hymenophyllum sanguinolentum</i>	o-lc, forested streamsides & inland shaded rock outcrops - commonest filmy fern
<i>Hypolepis ambigua</i>	lc, extensive patches in open, scrub margins; commonest fern present
<i>Lastreopsis glabella</i>	l, in small forested valleys E of Lodge
<i>Lastreopsis hispida</i>	l, in small forested valleys E of Lodge
<i>Lastreopsis microsora</i>	l, under tall kanuka, E of Lodge
<i>Lindsaea linearis</i>	lc, in open on bare ground including Badlands & under tea tree
<i>Loxsoma cunninghamii</i>	single plant in 2m tall manuka with <i>Schoenus tendo</i> , N side of main NW ridge, above Badlands. N
<i>Lycopodiella cernua</i>	s, open bank by airstrip. N
<i>Lycopodium deuterodensum</i>	on website but not seen by us
<i>Microsorium pustulatum</i>	o, terrestrial & epiphytic; tea tree & forest
<i>Microsorium scandens</i>	l, small plants on rock, broadleaf forest, Taraire Valley
<i>Nephrolepis cordifolia</i> *	single plant removed by Tim Martin from west end of airstrip, Jul 2005; not seen by us
<i>Ophioglossum coriaceum</i>	l, collected by Tim Martin Jul 2005; not seen by us (wrong season). AK 291569
<i>Paesia scaberula</i>	c, as patches in the open & under tea tree
<i>Pellaea rotundifolia</i>	l, single locality, SW coast
<i>Pneumatopteris pennigera</i>	o, widespread by shaded streams in small numbers
<i>Polystichum wawranum</i>	o, mainly as isolated plants, coastal slopes. AK 298424
<i>Psilotum nudum</i>	s, in 2m tall tea tree, ridge top W of Bradshaw Cove
<i>Pteridium esculentum</i>	lc, patches in grasslands & tea tree scrub
<i>Pteris comans</i>	l, two groups of c.10 plants & scattered younger plants closeby, SW coast. N. AK 298327
<i>Pteris cretica</i> *	single plant (uprooted), SW coast. N. AK 298329
<i>Pteris macilenta</i>	s, forest areas. N
<i>Pteris saxatilis</i>	l, small plants, broadleaf forest, Taraire Valley. AK 298435
<i>Pteris tremula</i>	o, shady open sites & under tall kanuka
<i>Pyrrhosia eleagnifolia</i>	lc, on rocky bluffs, & epiphytic in kanuka & broadleaf trees
<i>Schizaea bifida</i>	o, widespread in rather open sites by airstrip, main NW ridge & Badlands; all with unbranched stems, N. AK 298413
<i>Sticherus flabellatus</i>	single small plant in Badlands; & Geoff Davidson saw another small plant by waterfall below dam W of Crawford Bay (Feb 2007). N
<i>Tmesipteris elongata</i>	l, on tree fern trunks, forested stream margin above Houseboat Bay (W side). N
<i>Tmesipteris lanceolata</i>	l, on tree fern trunks, forested stream margin above Houseboat Bay (W side). N
<i>Tmesipteris sigmatifolia</i>	single group on mamaku trunk, forested stream margin above Houseboat Bay (W side). N. AK 298398

Gymnosperms (4+3)

<i>Agathis australis</i>	l, largest c.80cm dbh, c.18m tall, with saplings & seedlings, E of Houseboat Bay; c.10m tall tree with damaged trunk W side of Houseboat Bay, plus smaller tree; smaller tree with rather exposed roots NW end of airstrip
<i>Cupressus macrocarpa</i> *	l, 2 main small groups, Jetty Cove & bay to west, adults probably planted, wildings present close to adults
<i>Podocarpus totara</i>	l, 3-4 emergent trees, W end of island S side; not visited by us, but possibly an early planting? (G Davidson pers. comm.); only seen from distance by us
<i>Pinus pinaster</i> *	lc, adult plants SE corner of island with <i>P. radiata</i> , & scattered isolated plants elsewhere - most appeared wild. Preferred seed cones for the kaka (Mike Wilcox pers. comm.)
<i>Pinus radiata</i> *	lc, adult plants SE corner of island with <i>P. pinaster</i> , & scattered isolated plants elsewhere - most appeared wild
<i>Prumnopitys ferruginea</i>	o, mainly as saplings in damp forested valleys; a 3m tree in Badlands; & several trees (c.10m tall) by large kauri E of Houseboat Bay; 10m tree in Taraire Valley. AK 298423
<i>Prumnopitys taxifolia</i>	2 trees, by large kauri, NE of Houseboat Bay (Maureen Young pers. comm., Jun 2007). N.

Dicotyledons (119 + 80)

<i>Ageratina adenophora</i> *	I, under & margins of tea tree; sprayed by Trust below dam
<i>Anagallis arvensis</i> var. <i>arvensis</i> *	o, open areas from coast to ridge tops
<i>Anredera cordifolia</i> *	sprayed by Trust at Top House & Crawford Bay - a small piece seen at each of these sites by ARC; not seen by us
<i>Apium</i> "white denticles"	lc, back of Houseboat Bay. AK 288092
<i>Apium prostratum</i>	s, coast, frequently between rocks. AK 283601
<i>Araujia sericifera</i> *	I, c.10 seedlings in valley W side of Houseboat Bay; & 2 separate plants just E of Lodge; the Trust has already eradicated plants from near the dam, & others noted on spur west of Bradshaw Cove
<i>Aster subulatus</i> *	recorded by Cameron (1995), not seen during recent survey
<i>Atriplex prostrata</i> *	I, beach, Bradshaw Cove
<i>Avicennia marina</i>	I, E coast, c.16 plants in Houseboat Bay & a few in adjacent bay
<i>Beilschmiedia tarairi</i>	c, only in Taraire Valley as canopy trees 12-15m tall; otherwise as occasional tree or seedling in valleys
<i>Beilschmiedia tawa</i>	I, as canopy trees in Taraire Valley, otherwise scattered trees in sheltered sites; all with wider leaves than mainland <i>B. tawa</i> (= <i>B. tawaroa</i>). AK 283592
<i>Brachyglottis kirkii</i> var. <i>angustior</i>	lc, several shrubs in forested coastal slope - below large kauri (E coast)
<i>Brachyglottis repanda</i>	o, dry scrub areas & coastal slopes
<i>Cakile</i> ? <i>edentula</i> *	I, beach, Bradshaw Cove. The specimens appeared intermediate of <i>C. edentula</i> & <i>C. maritima</i> . N. AK 299889
<i>Callitriche muelleri</i>	lc, widespread, damp areas & stream margins. AK 298430
<i>Callitriche stagnalis</i> *	I, stream margin below Top House
<i>Calystegia soldanella</i>	I, single patch, SW coast. N
<i>Calystegia tuguriorum</i>	single plant, Crawford Bay. N. AK 299881
<i>Carmichaelia australis</i>	I, mainly as isolated shrubs, bush margins
<i>Celmisia major</i>	I, on two inland rocky outcrops & in the Badlands; all plants with narrow leaves; also collected by Kirk (1867-68). AK 11741
<i>Centaurium erythraea</i> *	o, dry open sites, nowhere common. N
<i>Centella uniflora</i>	I, partly open areas
<i>Cerastium fontanum</i> *	I, lawn by Lodge. N. AK 298478
<i>Cirsium vulgare</i> *	o, mainly as isolated plants in open areas
<i>Clematis cunninghamii</i>	o, shrubby open areas & banks
<i>Clematis paniculata</i>	o, forest & tea tree areas
<i>Conyza sumatrensis</i> *	o, open sites
<i>Coprosma grandifolia</i>	on website but not seen by us
<i>Coprosma macrocarpa</i>	I, mainly on steep faces - out of deer reach. AK 283588
<i>Coprosma macrocarpa</i> x <i>C. robusta</i>	I, mainly on steep faces - out of deer reach
<i>Coprosma repens</i>	o, mainly along SW coast. Collected by Kirk (WELT 51142)
<i>Coprosma rhamnoides</i>	la, under tea tree of most heights; & locally as deer-grazed hummocks in the open (W tip, N side)
<i>Coprosma robusta</i>	o, mainly on steep faces - out of deer reach
<i>Coriaria arborea</i>	on website, but not seen by us
<i>Corynocarpus laevigatus</i>	o, forest trees in Taraire Valley, otherwise as scattered small trees in sheltered sites
<i>Cotoneaster glaucophyllus</i> *	single shrub (uprooted), open ridge S of Mitre Peak; ARC killed 2 large adults & 2 seedlings, S side of island
<i>Cotula australis</i>	s, Crawford Bay; & by NW point (BS & JB). AK 299880
<i>Crassula sieberiana</i>	I, inland rock outcrops, a few plants at each locality
<i>Cucurbita maxima</i> *	ARC: single plant (uprooted), on beach below old house site, Crawford Bay. Not seen by us. N
<i>Daucus glochidiatus</i>	s, lawn by Lodge. Seedlings present in Jun 2007 at Bradshaw Cove appear to be this species. N. AK 298331 & 299890

<i>Dichondra repens</i>	lc, coastal slopes, shady banks, ledges & under tea tree throughout
<i>Disphyma australe</i>	by NW point (BS & JB); not seen by us
<i>Dittrichia graveolens</i> *	lc, road margins & SW end of airstrip (G. Davidson pers. comm., Feb 2007); possibly came in with the machinery when the airstrip was being redone in the late 1990s; not known on Great Barrier Island. N. AK 298603 & 299888
<i>Dodonaea viscosa</i>	single plant in scrub by upper road down to Bradshaw Cove
<i>Drosera auriculata</i>	o, open low scub areas
<i>Dysoxylum spectabile</i>	lc, canopy trees in Taraire Valley, otherwise as scattered trees in sheltered sites
<i>Einadia triandra</i>	l, coast, Bradshaw Cove & NW point. AK 283597
<i>Elaeocarpus dentatus</i>	l, at least 4 trees in Taraire Valley; & 1 by large kauri
<i>Entelea arborescens</i>	l, trees, saplings & seedlings (BS & JB) by NW point; not see by us. AK 283595
<i>Epilobium nerteroides</i>	lc, dampish bank, Crawford Bay. N. AK 299882
<i>Epilobium rotundifolium</i>	l, stream flush, west of Crawford Bay. N. AK299883
<i>Erechtites valerianifolia</i> *	single young plant, Crawford Bay, N. AK 299885
<i>Erica baccans</i> *	o-lc, open areas throughout, especially on rocky outcrops. AK 299146
<i>Erigeron karvinskianus</i> *	single plant (uprooted) on ridge just south of Mitre Peak. N. AK 298393
<i>Eruca vesicaria</i> subsp. <i>sativa</i> *	only known from Kirk collection (1867-68). WELT 58525
<i>Euchiton collinus</i>	o-lc, open grassy areas throughout
<i>Euchiton sphaericus</i>	l, gravel steps below Lodge. N. AK 298454
<i>Euphorbia peplus</i> *	o, open areas, coast to inland rock outcrops
<i>Galium debile</i> *	single plant by Lodge. N. AK 298409
<i>Galium divaricatum</i> *	o, throughout in dry open areas, including airstrip. N. AK 298431
<i>Galium propinquum</i>	c, throughout, dry sites under open tea tree. AK 298417
<i>Gamochoeta coarctata</i> *	o, open grassy sites, & lawn by Lodge. N
<i>Gamochoeta simplicicaulis</i> *	o, open grassy sites. N
<i>Geniostoma ligustrifolium</i>	o, forested valleys
<i>Geranium dissectum</i> *	o, rocky banks. N. AK 298414
<i>Geranium gardneri</i> *	l, rocky, grassy banks, open areas
<i>Geranium molle</i> *	s, lawn by Lodge. N. AK 298331
<i>Geranium purpureum</i> *	o, widespread in open tea tree areas, rocky outcrops, & by Lodge. N. AK 298403
<i>Glossostigma elatinooides</i>	l, single dense patch (c.1 x 2m), stream mouth, SW coast. N. AK 298479
<i>Gonocarpus incanus</i>	o-lc, widespread, dry open areas & under low tea tree
<i>Hakea gibbosa</i> *	l, central area by Badlands
<i>Hakea sericea</i> *	lc, open scrubby areas, especially by airstrip & along main E-W ridge
<i>Haloragis erecta</i>	s, open areas
<i>Hebe macrocarpa</i> var. <i>latisejala</i>	l, by large kauri tree, NE of Houseboat Bay. AK 298452
<i>Hebe pubescens</i> subsp. <i>rehuarum</i>	o, mainly on rocky bluffs - out of deer reach. AK 288127
<i>Hedycarya arborea</i>	o, saplings & trees in coastal valleys; many with large leaves (leaf blades to 145 x 65mm), reminiscence of the outer-island large-leaved form. AK 298426
<i>Helichrysum lanceolatum</i>	o, dry scrub & forest areas & coastal slopes
<i>Hoheria populnea</i>	s, Taraire Valley & valley W side of Houseboat Bay
<i>Hydrangea macrophylla</i> *	s, 2 seedlings near Top House (uprooted). N. AK 298458
<i>Hydrocotyle elongata</i>	l, patch at head of Houseboat Bay
<i>Hydrocotyle moschata</i>	lc, widespread, open & shady grassy areas
<i>Hydrocotyle tripartita</i> *	small patch, damp ground above stream pond, & in lawn by Top House. N
<i>Hypericum humifusum</i> *	l, lawn by Lodge. N. AK 298475
<i>Hypericum japonicum</i>	l, damp roadside ditch, Crawford Bay
<i>Hypochaeris glabra</i> x <i>H. radicata</i> *	o, open grassy areas & rock outcrops, usually associated with one or both parent species. N. AK 298419
<i>Hypochaeris glabra</i> *	o, open grassy areas & rock outcrops. N. AK 298437

<i>Hypochoeris radicata*</i>	o, open grassy areas & rock outcrops. N
<i>Knightia excelsa</i>	o, regenerating in tea tree areas, a few emergent ones
<i>Kunzea</i> aff. <i>ericoides</i>	a, commonest woody plant, dominating most of the vegetation, & locally forming extensive pure canopies. AK 223408
<i>Kunzea sinclairii</i>	lc, prostrate on badlands, erect on margins. AK 298033
<i>Kunzea sinclairii</i> x <i>K</i> aff. <i>ericoides</i>	lc, erect plants by Badlands & extending to airstrip, commonly 2m tall. AK 223407 & 275175
<i>Lagenifera pumila</i>	l, open forest by stream W of Houseboat Bay. N
<i>Leontodon taraxacoides*</i>	o, inland rocky outcrops, coastal slopes & airstrip
<i>Lepidium didymum*</i>	l, prostrate mats in open, Bradshaw Cove by bach & beach. N
<i>Leptocophylla juniperina</i>	o, scrub (including Badlands), & forest areas
<i>Leptospermum scoparium</i>	a, pure stands in most exposed sites & elsewhere associated with kanuka, mainly 1-5m tall, some prostrate in Badlands. AK 298465
<i>Leucopogon fasciculatus</i>	o-lc, low tea tree areas, including Badlands
<i>Leucopogon fraseri</i>	o, small patches, mainly on flanks of inland rock outcrops
<i>Ligustrum sinense*</i>	single resprouted plant c.1.2m tall, Bradshaw Cove, SW of bach. N
<i>Linum trigyna*</i>	lc, dry open grassy areas throughout
<i>Litsea calicularis</i>	single tree & seedlings (BS & JB) by NW point. AK 283600
<i>Lobelia anceps</i>	o, widespread, coastal slopes, streamsides, & lawn by Lodge
<i>Lotus angustissimus*</i>	lc, widespread, open areas including airstrip. N
<i>Lotus pedunculatus*</i>	l, rank grass areas, including by Lodge. N
<i>Lotus suaveolens*</i>	o, very small plants in open areas from coast to ridge tops
<i>Ludwigia palustris*</i>	l, stream margin below Top House by stream pond. N
<i>Macropiper excelsum</i> subsp. <i>excelsum</i>	o, understory shrub; lc, as tiny seedlings in forest. AK 283591
<i>Melianthus major*</i>	single young plant near Top House; the Trust is already controlling this species at this site. AK 298457
<i>Melicope ternata</i>	o, coastal slopes, forest & tall kanuka areas
<i>Melicytus ramiflorus</i>	o, sheltered valleys
<i>Mentha pulejeum*</i>	l, lawn by Lodge. N
<i>Metrosideros diffusa</i>	l, valley W of Houseboat Bay. N
<i>Metrosideros excelsa</i>	o, mainly as small coastal trees, also inland on outcrops; a few large forest trees
<i>Metrosideros perforata</i>	o, forest areas, mainly on the ground, & Mitre Peak (S end)
<i>Modiola caroliniana*</i>	l, airstrip & lawn by Lodge. N
<i>Muehlenbeckia complexa</i>	o, mainly small plants in open (coast to ridge tops)
<i>Muehlenbeckia complexa</i> x <i>M. australis</i>	o, large vigorous vines & scrambling over shrubs to 5m tall. N. AK 298396
<i>Myoporum laetum</i>	single tree by NW point (BS & JB). AK 283598
<i>Myosotis discolor*</i>	l, lawn by Lodge. N. AK 298456
<i>Myrsine australis</i>	o, kanuka & forest areas
<i>Nestegis apetala</i>	single tree lower Taraire Valley; also 2 trees & sapling at NW point (BS & JB). AK 283587
<i>Nestegis lanceolata</i>	s, valley W side of Houseboat Bay by a kauri, & by large kauri tree NE of Houseboat Bay
<i>Olearia furfuracea</i>	o-lc, throughout, mainly under open tea tree, scrub margins & forest
<i>Oxalis exilis</i>	o, rocky ledges, banks, lawn areas & airstrip. N. AK 298387
<i>Oxalis rubens</i>	on website, but not seen by us
<i>Ozothamnus leptophyllus</i>	o, rocky outcrops & open sites including Badlands. AK 283594
<i>Parietaria debilis</i>	l, rocky grassy banks, coast to ridge tops
<i>Parsonsia capsularis</i>	o-lc, commonest climber present, over ground under open tea tree and as a large high-climbing vines in forest. Flowers either orange or cream. N. AK 298416
<i>Passiflora edulis*</i>	s, 2 plants seen (uprooted) within 100m of Lodge (1 climbing to 10m up a pine tree); the Trust has already killed several in vicinity of Lodge; ARC killed 37 vines in catchment behind Lodge. AK 298408

<i>Passiflora tetrandra</i>	single large vine, E side of broadleaf forest, Taraire Valley. N
<i>Pelargonium inodorum</i>	l, inland rocky outcrops
<i>Peperomia urvilleana</i>	o-lc, inland rocky bluffs & coastal cliffs
<i>Persicaria decipiens</i>	lc, stream pond below Top House. N
<i>Physalis peruviana*</i>	s, open grassy areas
<i>Phytolacca octandra*</i>	o, in scub
<i>Pimelea</i> aff. <i>urvilleana</i>	l, very small plants (<5cm tall) in open sites on Badlands & by Ngati Rehua Track
<i>Pimelea tomentosa</i>	l, at least 15 plants, steep bushy slope below, and also to the west of the large kauri NE of Houseboat Bay. N. AK 298453
<i>Pittosporum crassifolium</i>	s, inland ridge S of Mitre Peak & along SW coast
<i>Pittosporum umbellatum</i>	l, by coast & single inland tree in Badlands. AK 298422
<i>Plagianthus divaricatus</i>	2-3 plants, Crawford Bay. N AK 299886
<i>Planchonella costata</i>	o, trees on N & S coast; also collected by Kirk (1867-68). AK 106020
<i>Plantago lanceolata*</i>	on website, but not seen by us
<i>Polycarpon tetraphyllum*</i>	l, open rocky outcrops. N
<i>Pomaderris amoena</i>	l, <10 scattered plants seen, low open areas
<i>Pomaderris kumeraho</i>	o, <10 widely scattered plants seen, open scrub
<i>Prunella vulgaris*</i>	l, lawn by Lodge. N
<i>Prunus persica*</i>	l, seedlings, by cultivated tree by Lodge. N
<i>Pseudognaphalium luteoalbum</i> agg.	l, coastal slopes. 283596
<i>Pseudopanax arboreus</i>	single plant in scrub by upper road down to Bradshaw Cove
<i>Pseudopanax lessonii</i>	l, single locality on SW coast
<i>Ranunculus acaulis</i>	l, Houseboat Bay, & SW coast. AK 288091
<i>Ranunculus reflexus</i>	l, forest areas & shady banks. N
<i>Ranunculus sardous*</i>	s, lawn by Lodge. N. AK 298477
<i>Rhabdothamnus solandri</i>	l, widespread in forested valleys & shaded banks
<i>Rubus cissoides</i>	lc, under open tea tree covering ground & climbing. AK 298415
<i>Rumex acetosella*</i>	o, patches in open grassy areas, including airstrip. N
<i>Rumex brownii*</i>	l, open dry sites from coast to ridge tops. N
<i>Rumex conglomeratus*</i>	l, Bradshaw Cove, near stream. N
<i>Sagina apetala*</i>	lc, rocky coast, & open grassy areas, including airstrip. N. AK 298031
<i>Sagina procumbens*</i>	l, damp areas near streams, coastal slopes & in lawn by Lodge
<i>Samolus repens</i>	by NW point (BS & JB)
<i>Sarcocornia quinqueflora</i>	o, coastal rocks
<i>Scandia rosifolia</i>	o, widespread, inland rocky bluffs & coastal cliffs
<i>Schefflera digitata</i>	on website, but not seen by us
<i>Selliera radicans</i>	l, among <i>Ranunculus acaulis</i> , Houseboat Bay. N
<i>Senecio bipinnatisectus*</i>	o, margins of open grassy areas & scrub. N
<i>Senecio biserratus</i>	lc, open margins of tea tree, along Ngati Rehua Track. N. AK 298421
<i>Senecio diaschides*</i>	l, SW end of airstrip. N
<i>Senecio hispidulus</i>	c, open areas - mainly scrub margins & rocky outcrops
<i>Senecio jacobaea*</i>	o, widespread in open areas & under tea tree
<i>Senecio lautus</i>	l, flanks of Mitre Peak, & coastal rocks
<i>Senecio minimus</i>	c, throughout usually grassy scrub margins & open tea tree areas; commonest fireweed present. AK 298467
<i>Senecio sylvaticus*</i>	lc, especially road margin down to Bradshaw Cove. N. AK 298432
<i>Senna septemtrionalis*</i>	l, by Lodge & ridge 100-200m E of the Lodge (all uprooted), some grazed by deer; ARC weed team removed 7 juveniles from behind Lodge. AK 298602
<i>Sigesbeckia orientalis*</i>	s, Ngati Rehua Track margin, NW ridge. AK 283599

<i>Solanum americanum</i>	o, widespread, open areas
<i>Solanum aviculare</i> var. <i>albiflorum</i>	l, at least 7 plants, in open 6m tall kanuka near start of Ngati Rehua Track, flowers white. AK 298324
<i>Solanum linnaeanum</i> *	l, c.18 plants (uprooted), small peninsula by Jetty Cove. N
<i>Sonchus oleraceus</i> *	o, throughout, open sites. N
<i>Sophora chathamica</i>	l, forested slopes, S & N coast. N. AK 298399
<i>Sophora chathamica</i> x <i>S. microphylla</i>	collected by Ron Cooper in Aug 1962; also recently collected on adjacent Nelson Id. AK 91952 & 255387
<i>Spergularia media</i>	by NW point (BS & JB)
<i>Stachys arvensis</i> *	s, lawn by Lodge. N. AK 298412
<i>Stellaria media</i> *	l, lawn by Lodge
<i>Taraxicum officinale</i> *	s, lawn by Lodge. N
<i>Tetragonia implexicoma</i>	on website (as <i>T. trigyna</i>), but not seen by us
<i>Trifolium dubium</i> *	o, lawn by Lodge. N
<i>Trifolium glomeratum</i> *	l, lawn by Lodge. N
<i>Trifolium repens</i> *	o, lawn by Lodge. N
<i>Ulex europaeus</i> *	o-la, widespread in shrublands with manuka & kanuka; the Trust has controls it only in high use areas (airstrip, track margins)
<i>Verbascum thapsus</i> *	on website, but not seen by us
<i>Veronica arvensis</i> *	s, in open by Lodge. N
<i>Veronica plebeia</i>	o, throughout in dry open areas. AK 298439
<i>Veronica serpyfolia</i> *	l, SW of Houseboat Bay, in a low sward of microlaena under tall kanuka. N
<i>Vicia narbonensis</i> *	known only from Kirk collection (1867-68). AK 76198
<i>Vinca major</i> *	la, extending for c.200m x 50m across, under tall kanuka, parallel with stream, lower valley, Bradshaw Cove. AK 223411
<i>Vitex lucens</i>	l, largest trees (to 1m dbh) in Taraire Valley
<i>Vittadinia australis</i>	known only from Kirk collection (1867-68) from Mitre Peak. WELT 24088
<i>Wahlenbergia violacea</i>	o-lc, open sites from coast to inland rocky outcrops
<i>Weinmannia silvicola</i>	l, adults Houseboat Bay, & by large kauri NE of Houseboat Bay; o seedlings Taraire Valley

Monocotyledons (75+37)

<i>Acianthus sinclairii</i>	on website, but not seen by us (wrong season)
<i>Agrostis capillaris</i> *	l, grassy areas, including airstrip & by Lodge. N
<i>Aira caryophyllea</i> s.str. *	la, widespread, rocky outcrops & coastal slopes. N
<i>Aira caryophyllea</i> subsp. <i>multiculmis</i> *	l, rocky outcrops. N. AK 298394
<i>Alocasia brisbanensis</i> *	l, Lodge to Crawford Bay, resprouting patch after Trust knocked it back; foliar sprayed by ARC
<i>Anthoxanthum odoratum</i> *	lc-a, open grassy areas including airstrip & lawn by Lodge. N
<i>Arthropodium cirratum</i>	o, widespread mainly on coastal & inland bluffs
<i>Asparagus asparagoides</i> *	by Top House, sprayed by Trust; not seen by us
<i>Astelia banksii</i>	o-lc, coastal cliffs, inland rocky outcrops & occasionally epiphytic. AK 283602
<i>Astelia solandri</i>	on website, but not seen by us
<i>Axonopus fissifolius</i> *	lc, patches on airstrip, lawn by Lodge & bach at Bradshaw Cove. N. AK 298476
<i>Briza minor</i> *	o, open grassy areas by coast & airstrip. N
<i>Bromus hordeceus</i> *	o, few plants, open coastal slopes. N
<i>Carex breviculmis</i>	o-lc, in open areas & under tea tree
<i>Carex divulsa</i> *	l, lower W margin of grassland by Top House. N
<i>Carex flagellifera</i>	o, coastal grassy slopes & banks
<i>Carex inversa</i>	o-lc, open dry areas, including airstrip, bush & coastal margins. AK 298383
<i>Carex lambertiana</i>	o, under tea tree & forest

<i>Carex lessoniana</i>	l, single small patch by stream Bradshaw Cove. N. AK 298428
<i>Carex longebrachiata*</i>	l, open areas by Lodge
<i>Carex pumila</i>	l, beach by stream mouth, Bradshaw Cove
<i>Carex solandri</i>	l, by watertank under pines, above Lodge. N. AK 298464
<i>Carex spinostris</i>	l, a few plants present along SW coast. N
<i>Carex virgata</i>	o, widespread, stream margins
<i>CollospERMUM hastatum</i>	l, rocky bluffs & epiphyte in tall forest
<i>Cordyline australis</i>	single plant 4-5m tall, SW coast. N
<i>Cortaderia selloana*</i>	o, widespread, controlled at some sites. In Feb 2007 G. Davidson also observed pampas with purple flowering heads, possibly <i>C. jubata?</i> - confirmation required. AK 299147
<i>Cortaderia splendens</i>	l, clumps N side of NW point; & SW coast
<i>Corunastylis nuda</i>	l, margin of airstrip. AK 299879
<i>Cyperus brevifolius*</i>	l, hollow in lawn by Lodge. N
<i>Cyperus eragrotis*</i>	l, by Lodge. N
<i>Cyperus ustulatus</i>	o, coastal slopes & by Lodge
<i>Cyrtostylis oblonga</i>	on website, but not seen by us (wrong season)
<i>Dactylis glomerata*</i>	o-lc, open grassy areas
<i>Danhatchia australis</i>	l, two small groups (7 plants) in broadleaf forest, Taraire Valley; no nikau present. N
<i>Deyeuxia avenoides</i>	o, open dry areas. N. AK 298385
<i>Dianella latissima</i>	o-lc, tussocks on inland rocky bluffs, coastal cliffs & Badlands. N. AK 298032
<i>Dianella nigra</i>	l, in tea tree & forest
<i>Dichelachne crinita</i>	o, open dry sites throughout. N
<i>Dichelachne rara*</i>	lc, open banks by airstrip & inland rocky outcrops. N. AK 298384
<i>Diplodium alobulum</i>	recorded by Maureen Young in Aug 2004 on a rocky ledge above Taraire Valley; not seen by us (wrong season)
<i>Drymoanthus adversus</i>	lc, epiphyte on kanuka with <i>Pyrrosia</i> , Ngati Rehua Track near NW point. N
<i>Earina autumnalis</i>	single patch on rock face below waterfall, Top House stream
<i>Earina mucronata</i>	o, forest epiphyte & rupestral on bluffs
<i>Echinopogon ovatus</i>	o-lc, open grassy areas from coast to ridge tops. N. AK 298438
<i>Ehrharta erecta*</i>	l, near bach, Bradshaw Cove. N. AK 299884
<i>Eleocharis acuta</i>	l, SW coast stream mouth; lc, stream pond below Top House. N
<i>Elymus multiflorus</i>	o, grassy tracksides & rocky outcrops. N. AK 298425
<i>Elymus solandri</i>	l, lower bluffs of Mitre Peak (N end). N. AK 298388
<i>Eragrostis brownii*</i>	la, main airstrip species; common open dry, open places. N
<i>Festuca rubra</i> subsp. <i>commutata*</i>	single patch by watertank above Lodge. N. AK 298462
<i>Ficinia nodosa</i>	l, coast & inland rocky outcrops
<i>Gahnia lacera</i>	l, coastal banks & lower stream margins
<i>Gahnia setifolia</i>	o, in scrub areas & open tall tea tree
<i>Ichthyostomum pygmaeum</i>	l, patches on rocky bluffs
<i>Isachne globosa</i>	l, by muddy pool in stream below Top House. N
<i>Isolepis cernua</i>	l, coastal rocks
<i>Isolepis inundata</i>	o, widespread, present along main streams. N. AK 298395
<i>Isolepis reticularis</i>	l, stream flush, west of Crawford Bay. N. AK 299887
<i>Isolepis sepulcralis*</i>	l, stream margins. N
<i>Isolepis tenellus*</i>	l, on airstrip & lower N rocky flank of Mitre Peak. N
<i>Juncus articulatus*</i>	l, open stream margins, e.g. Bradshaw Cove, & SW coast. N
<i>Juncus australis</i>	o, open grassy areas & by stream below Top House
<i>Juncus bufonius*</i>	l, small plants on airstrip

<i>Juncus edgariae</i>	l, stream margin below Top House. AK 298459
<i>Juncus effusus*</i>	l, stream margin below Top House
<i>Juncus flavidus*</i>	lc, margin of airstrip. N. AK 298386
<i>Juncus pauciflorus</i>	l, forested stream margin above Houseboat Bay (W side); & by stream pond below Top House. N. AK 298400
<i>Juncus planifolius</i>	l, open stream margins, e.g. Bradshaw Cove. N
<i>Juncus prismatocarpus</i>	l, stream margin below Top House. N
<i>Juncus sarophorus</i>	l, open areas by Lodge & stream below Top House. N
<i>Juncus usitatus</i>	l, open areas by Lodge & stream below Top House. N
<i>Lachnagrostis billardierei</i>	l, open coastal banks, N & S coasts
<i>Lachnagrostis filiformis</i>	o, rocky outcrops & grasslands
<i>Lachnagrostis littoralis</i>	l, coastal rocks. N
<i>Lepidosperma australe</i>	l, low scrub, Ngati Rehua Track margin; & track margin to Mt Overlook. N
<i>Lepidosperma laterale</i>	a, widespread in open & under low-tall kanuka
<i>Lolium perenne*</i>	o, grassy areas, including lawn by Lodge. N
<i>Microlaena polynoda</i>	by NW point (BS & JB)
<i>Microlaena stipoides</i>	a, as swards, open areas & under tea tree
<i>Morelotia affinis</i>	o-lc, widespread, open dry sites, rock outcrops & Badlands
<i>Oplismenus hirtellus</i>	l, taller forest areas
<i>Orthoceras novae-zeelandiae</i>	o, open clay areas; most flowers dark coloured. AK 298325
<i>Paspalum dilatatum*</i>	o, open grassy areas, including airstrip & by Lodge. N
<i>Pennisetum clandestinum*</i>	l, patches in lawn below Lodge. N
<i>Phormium tenax</i>	o-lc, open areas, coast to rocky outcrops
<i>Poa anceps</i>	l, coastal banks
<i>Poa annua*</i>	o, grassy areas. N
<i>Poa pratensis*</i>	o, grassy tracksides & by Lodge. N. AK 298411
<i>Polypogon fugax*</i>	l, lawn by Lodge. N
<i>Potamogeton cheesemanii</i>	lc, stream pond below Top House. N
<i>Pterostylis banksii</i>	l, by large kauri (NE of Houseboat Bay). N
<i>Rhopalostylis sapida</i>	s, adult plant, valley W side of Houseboat Bay; also at NW point (BS & JB)
<i>Ripogonum scandens</i>	l, forest areas
<i>Rytidosperma biannulare</i>	a, throughout in open areas. N
<i>Rytidosperma clavatum</i>	l, rocky ridge S of Mitre Peak. N. AK 298330
<i>Rytidosperma pilosum*</i>	o, open areas along NW ridge. N. AK 298420
<i>Rytidosperma racemosum*</i>	c, throughout in open areas
<i>Rytidosperma unarede</i>	lc, throughout in open areas. N. AK 298436
<i>Schoenus maschalinus</i>	l, stream margin below Top House. N
<i>Schoenus tendo</i>	lc, in scrub, including Badlands, & forest by large kauri
<i>Sporobolus africanus*</i>	o-lc, occasional in open dry places, common on airstrip. AK 283593
<i>Thelymitra carnea</i>	o, dried up plants appeared to be this species; open sites, NW ridge & Badlands
<i>Thelymitra longifolia</i> agg.	o, dried up plants; open sites
<i>Triglochin striata</i>	l, among Ranunculus acaulis, Houseboat Bay & SW coast
<i>Trisetum arduum</i>	l, open coastal banks, N & S coasts. N. AK 298427
<i>Uncinia banksii</i>	l, by large kauri (NE of Houseboat Bay). N
<i>Uncinia uncinata</i>	o, forest areas
<i>Vulpia bromoides*</i>	la, common open dry places, including airstrip. N
<i>Vulpia myuros*</i>	lc, open grassy areas, especially track margins. N. AK 298455
<i>Winika cunninghamii</i>	s, large clump on coastal rock outcrop by Taraire Valley
<i>Zantedeschia aethiopica*</i>	l, a few clumps by stream pond below Top House; some controlled Trust at Jetty

Cultivated only (10)

<i>Aloe ? arborescens</i> **	c.0.5m tall, on bank, Crawford house site, sprayed by Trust
<i>Erythrina ? x sykesii</i> **	x1 tree, (ring-barked), near Top House
<i>Eucalyptus macarthurii</i> *	1 small row below Top House (Mike Wilcox pers. comm.)
<i>Eucalyptus viminalis</i> **	1 small row below Top House (Mike Wilcox pers. comm.)
<i>Ficus carica</i> **	1, Bradshaw Cove, resprouting after being cut back
<i>Nerium oleander</i> **	x1, Bradshaw Cove, resprouting after being cut back
<i>Prunus persica</i> **	x2 trees by Top House
<i>Pyrus communis</i> **	x1 tree by Top House (Mike Wilcox pers. comm.)
<i>Santolina chamaecyparissus</i> **	single clump by Top House (not known to naturalise in NZ)
<i>Syzygium smithii</i> *	x1 tree by Top House, recently cut down

Excluded doubtful previous records (4+4)

<i>Carex ? ochrosaccus</i>	by NW point (BS & JB), unconfirmed by current survey
<i>Conyza bilbaoana</i> *	in error for <i>C. sumatrensis</i> ?
<i>Geranium robertianum</i> *	in error for <i>G. purpureum</i> ?
<i>Isolepis ? prolifer</i>	in error for <i>I. inundata</i> ?
<i>Nasturtium</i> sp.*	on website, not seen by us
<i>Parsonsia heterophylla</i>	in error for <i>P. capsularis</i> ?
<i>Schizaea fistulosa</i>	in error for <i>S. bifida</i> ?
<i>Sonchus ? asper</i> *	by NW point (BS & JB), in error for <i>S. oleraceus</i> ?

Kohekohe (*Dysoxylum spectabile*, Meliaceae) in flower and fruit

Rhys Gardner

Introduction

Kohekohe's (*Dysoxylum spectabile*, Meliaceae) sexual dimorphism has only recently been discovered (Braggins, *et al.* 1999). These authors found that some trees are female while others are male (or rarely, hermaphrodite). Here I report observations made in the last couple of years on trees around Auckland, particularly from Sylvan Park at Lake Pupuke, Outhwaite Park at Grafton, and Cornwall Park.

Observations

Flowering takes place in early winter, starting in late May and lasting a month or so. The previous years' fruit-capsules, which had begun to open in mid-April, are not particularly robust, and they and their orange-arillate seeds have mostly gone by flowering-time. Both kinds of flower produce nectar and give off a pleasant, not especially strong, scent of honey. They can hardly be told apart morphologically other than by their anthers, which in the females lack pollen and do not dehisce.

Braggins *et al.* (1999) note that flowering may be heavy in some years and light in others. The June

2006 flowering for the Sylvan Park trees was a heavy one. There are perhaps a hundred or more large trees here (Gardner 1986), and they were easily sampled, since nearly all had inflorescences on burrs low on the trunk (Sampling was also done from accessible parts of the crown — in no case were both sexes found on one individual).

In the Sylvan Park sample 17 trees were female, and 58 were pollen-bearing. All the latter kind were fully ovuliferous too, but I was not able to detect whether or not the trees they came from bore any fruit.

However, examination of the seven kohekohe at Outhwaite Park, and of two trees at Cornwall Park, indicate that pollen-bearing trees are not only regularly ovuliferous but (also regularly) set a low but not inconsequential number of fruit. Braggins *et al.* (1999) who investigated kohekohe throughout its geographical range, have noted this "hermaphrodite" fruit set, but say that ovules in the pollen-bearing flowers are "usually absent". This is wrong for the trees I examined, but perhaps there is a geographical gradient here to be investigated.

References