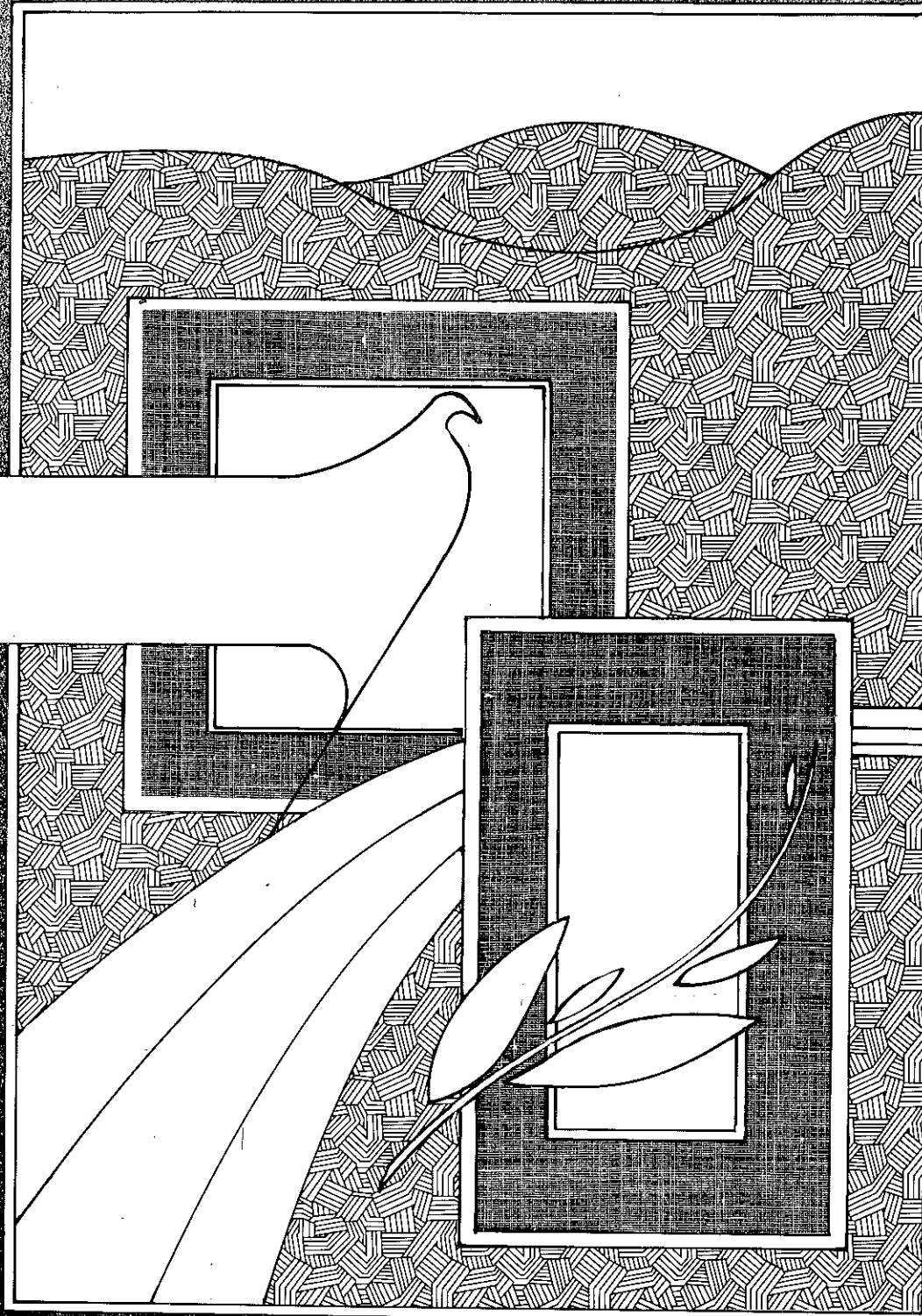


Auckland Conservancy

DEDICATED AREAS REPORT Number 7



# Moehau Ecological Area



MOEHAU ECOLOGICAL AREA



NZ FOREST SERVICE  
AUCKLAND CONSERVANCY  
CPO BOX 39  
AUCKLAND

(This is an unpublished internal report)

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February 1985

## MOEHAU ECOLOGICAL AREA

<u>Contents</u>	<u>Page No.</u>
Location	1
Access	1
History of Gazettal	1
Rationale and Objectives of Designation	2
Climate	2
Topography	3
Geology	3
Pedology and Erosion	4
Vegetation	9
Native Fauna	13
Introduced Animals and Forest Condition	14
Presence of Exotic Plants	15
Human History and Influence	15
Recreational Facilities and Opportunities	16
Summary, Discussion and Recommendations	17
Acknowledgements	19
Appendix 1 : Botanical Species List - Moehau Ecological Area	20
Appendix 2 : Wildlife of the Moehau Ecological Area	27
References	29

### Location (Figure 1)

The Moehau Ecological Area occurs at the northernmost tip of the Coromandel Peninsula, 27 km south-west of Coromandel township (mid-point at map ref. NZMS1 N39 896994). It lies within the Colville Ecological District (Simpson 1982, BRC 1983). The reserve covers most of the Moehau Range, including several high peaks of which the highest is Mt. Moehau. The summit, in earlier maps named Te Moehau is 892 m in altitude. Total area of the reserve is 3633 ha, encircling a 61 ha tract of maori land (Ngatihi-O-Moehau) around the summit of Mt. Moehau. This Ecological Area, together with a small forest remanant further south, forms the Moehau Block of the Coromandel State Forest Park. The reserve is bounded by pasture, further forest and small patches of manuka scrub. Most of the adjoining land is privately owned, apart from land to the north-west and north-east which is administered by the Department of Lands and Survey as the Cape Colville Farm Park.

The most recent aerial photo's were flown on the 16th November 1983. They are survey no. 8163 photo numbers 2-6 of both run B and C. (NZAM 1983, scale = 1:25,000).

### Access

A single track (track 16, N.Z.F.S. 1983) traverses Mt. Moehau leading from Stony Bay in the north up to the summit trig point and then down to Hope Stream in the south. Thus there are two points of walking entry to the reserve. At Stony Bay the track begins at the end of Stony Bay Road, crossing a section of the Cape Colville Farm Park as it leads up a well-defined spur between Stony Creek and Doctors Creek. The Hope Stream access leads off the Cape Colville - Port Jackson Road and crosses 3.2 km of private land (owned by Ms. Theodora Ward) before entering the Ecological Area. The track across private land is well marked and signposted with stiles over fences. The landowner requires that visitors strictly adhere to this route.

### History of Gazettal

The unique character of the Moehau region has made it the subject of reserve proposals for many years. As early as 1957, B.J. Guthrie (N.Z.F.S.) proposed that the forest on Moehau above the 2,000 ft. contour be proclaimed a forest sanctuary (Auckland Conservancy file 34/1/32). The emergence in the early 1970's of the 'designated area' reserve type (1973, 1976 Forests Amendment Acts) was considered a more appropriate status for the Moehau forest. The proposal for designating Moehau as an ecological area came in June 1976, from John Nicholls (scientist, F.R.I.). Final gazettal took place on the 17th March 1977 (Gazette reference no. 31, p. 631, March 1977) and the reserve became one of the first of its kind gazetted anywhere in New Zealand.

### Rationale and Objectives of Designation

Ecological areas, such as Moehau, are reserves of forest land set aside to :

1. understand and explain natural processes;
2. maintain bench-marks for measuring change on initially comparable developed land;
3. maintain genetic diversity of plants and animals; and
4. preserve rare plants, native fauna, archaeological or other historic sites, particular topographical features and geological and soil sites.  
(N.Z.F.S. 1977).

The qualities desirable in a reserve have been listed by the Scientific Co-ordinating Committee (1980) (now the State Forests Scientific Reserves Advisory Committee). The Moehau Ecological Area has many of the qualities described. It is a large compact reserve encompassing the entire Moehau Range and the upper reaches of numerous catchments. It represents a large range of land forms and vegetation sequences of the region (except coastal below 150 m altitude) and is unroaded. However, a criterion which is not met is that the boundaries should be clearly defined by natural features.

According to the management plan for the Coromandel State Forest Park (N.Z.F.S. 1978) the purpose of the Moehau Ecological Area is:

'to reserve the only complete sequence of mainly undisturbed forest from near the coastline to an altitude of 900 m containing the formerly typical kauri-podocarp-hardwood forest complex of the northern Coromandel Peninsula and a unique high-altitude forest.'

The reserve has been given an IUCN\* classification of IV (Nature Conservation Reserve). IUCN management objectives of this type of reserve allow the application of manipulative management techniques to assure the survival of certain species of plants and animals. Scientific research, environmental monitoring and educational use are the primary activities associated with this category (IUCN 1978).

### Climate

The closest weather recording station to the Moehau Ecological Area is at Coromandel township. This station has not been operating for long and few records are available. In 1981 the station recorded a total rainfall of 2042 mm with a mean daily maximum temperature of 19.6°C and a mean daily minimum of 11.0°C (NZMS 1981).

However, this station is near sea level (43 m a.s.l) and the climate actually experienced in the reserve will be subject to the effects of altitude and local exposure. Mt. Moehau is subject to rapid changes of weather. It's height exposes it to the full force of the prevailing

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\* IUCN = International Union for the Conservation of Nature and Natural Resources.

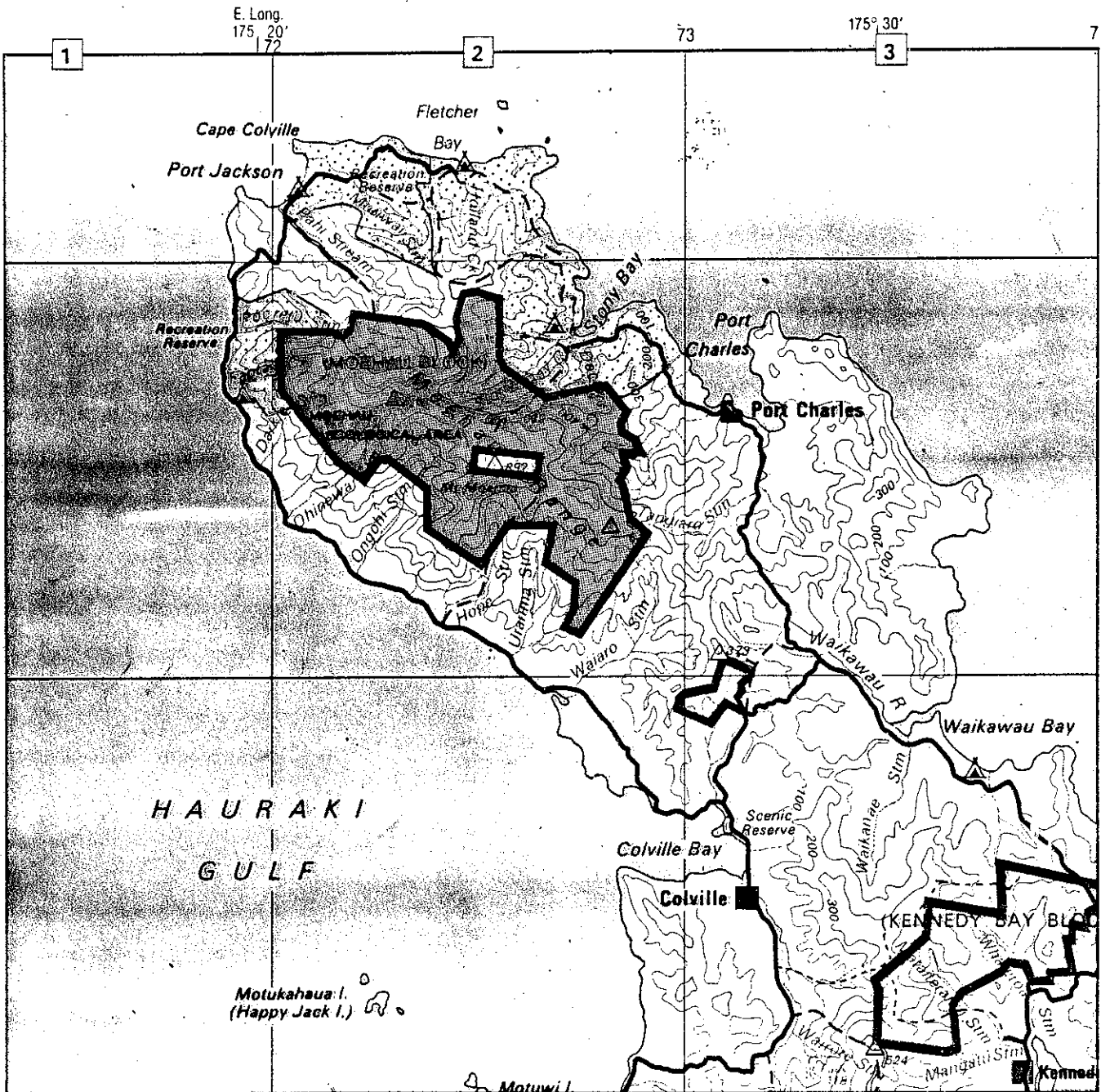
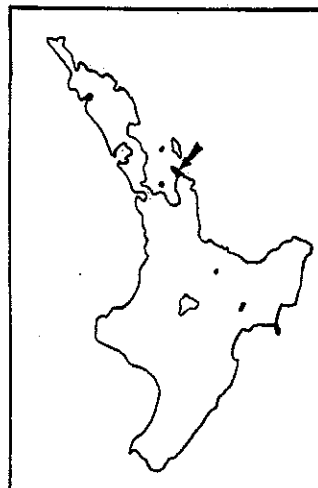


Fig 1 : Location Diagram : Moehau Ecological Area

(Based on NZMS 274/1 Coromandel State Forest Park, 2nd Edition 1983, NZFS, Government Printer)

- Ecological Area
- Cape Colville Farm Park
- State Forest Park Boundary

Scale 1 : 150,000



south-west winds and to the less frequent but often more violent north-east storms. The subalpine vegetation of the summit bears testimony to the harsh conditions experienced there. Cranwell and Moore (1936) comment on : 'the cloud-cap that envelops the summit for days and even weeks ...'

Further discussions of climate on the Coromandel Peninsula are given in Burns (1983) and Maunder (1974).

### Topography

The reserve has an altitudinal range from 90 m to the summit of Mt. Moehau at 892 m. It is bisected by the Moehau Range running from north-west to south-east. Long ridges with sharp truncating spurs and funnel-like gullies radiate from the main divide to the coast on the northern, eastern and western sides. The terrain is often precipitous (slopes often  $>35^\circ$  especially in the Stony Bay catchment), containing numerous streams running through steep-walled gorges. Slopes become more moderate ( $16-25^\circ$ ) nearer the summit ridge. (Water and Soil Division, MOWD, 1975). The summit itself consists of two peaks on a rounded mass some 60 m above the rest of the main ridge, and with gradual slopes.

### Geology

The geology of the Moehau Ecological Area is the result of the drowning of a faulted block of greywacke which has then been covered by a thick pile of young volcanic rock. A tilting of the northern end of the peninsula relative to the south has caused the exposure of the basement greywackes (Manaia Hill Formation) and the earliest of the volcanic eruption deposits (Port Charles Andesites). The peak of Little Moehau (second highest of the range and adjacent to Mt. Moehau) exposes this volcanic rock type (Skinner 1981). In the south of the Ecological Area is a small deposit of coaly and calcareous Torehina Formation (Skinner 1975).

The Manaia Hill Formation is of Jurassic age and consists of interbedded sandstones, lithic volcanic greywackes, siltstones and argillites. Port Charles Andesites are of mid-Miocene age and are the base of the volcanic succession in the Coromandel region consisting of some 1,000 m of andesite flows and largely marine tuffs and breccias resting directly on an eroded Manaia Hill Formation surface. Scattered as small dikes throughout the Moehau region are Kai-iti porphyrites. These are mostly hydrothermally altered rocks consisting of augite-hypersthene and augite-hypersthene-hornblende andesites, quartz andesites and dacites. (Black 1972).

Of greater interest to geologists though is the so-called Paritu pluton, a cooled originally sub-volcanic magma reservoir which has been exposed mainly in the south-west of the Moehau region. This structure is unique in the volcanic regions of New Zealand (Skinner 1981, Thompson and Kermode 1965). Exposures of this formation occur on the western coastline (outside the Ecological Area) between Fantail Bay and Darkie Stream and between Ohineawai and Ongohi Streams, and around the summit of Mt. Moehau. Skinner (1981) recommends that these outcrops are

significant enough in their own right for the surrounding areas to be designated as geological areas.

The reaction of the Paritu pluton with the surrounding rocks is also of interest.

'The reaction of the pluton with the cooler greywacke, Kai-iti porphyrites and the Port Charles Andesite of Little Moehau has produced a metamorphic aureole up to 900 m from the contact in which new medium to high temperature minerals have grown and the country rocks have been converted to a rock called hornfels. The new metamorphic rock minerals are quartz, orthoclase, albite, epidote, biotite, hypersthene, hornblende, actinolite, magnetite, almandine, garnet and tourmaline. On Mt. Moehau an actual mixture of the quartz diorite and volcanic andesite has produced a new hybrid rock called agmatite.

No such intrusive and metamorphic sub-volcanic rock association occurs anywhere else in New Zealand. The agmatite on Mt. Moehau and the coastal section from Fantail Bay to Darkie Stream provide unique opportunities to study the geological environments that probably also occurred deep beneath other parts of the Coromandel Peninsula.' (Skinner 1981).

K-Ar dates for mineral samples from the Paritu plutonics gave an age of 16 million years b.p. for the period of plutonism and metamorphism (Richards et al. 1966).

No major ore deposits are known in the Moehau region although small quartz veins are common containing small quantities of lead, zinc and copper sulphides and silver and gold (Skinner 1981). Overlay 3 of figure 2 shows the distribution of rock types throughout the reserve.

Other geological references are MacLaren (1898), Black (1967) and Skinner (1962, 1975).

### Pedology and Erosion

The Moehau Ecological Area contains predominantly Te Ranga steep-land soils. These are derived from a greywacke parent material, are related to yellow-brown earths and are of low to medium natural fertility. Many slopes on granite however, bear little soil; the slopes are composed largely of unstable rock scree.

Surrounding the pluton regions within the reserve are Moehau steep-land soils. These are derived from weathered and fresh granodiorite and are of medium nutrient status. Associated with the Port Charles Andesite occurring around the peak of Little Moehau are Rangiora hill soils. These are strongly leached brown granular clays, derived from andesite of low to very low natural fertility (Water and Soil Division, MOWD, 1975; Eyre 1977).

Slight debris avalanche type erosion, occurs throughout the reserve. High rainfall, wind, steep slopes and instability of the soils would suggest that the area is prone to erosion though this is not evident. Obviously revegetated slip scars are present.



TABLE I : GENERALISED STAND STRUCTURE FOR LOW TO MID-ALTITUDE PODOCARP -

## HARDWOOD FOREST WITH RARE KAURI IN STANDS

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT			rimu northern rata		kauri pukatea Hall's Totara
CANOPY		tawa	towai rewarewa kohekohe	fivefinger pukatea northern rata hinau mahoe <i>Cyathea smithii</i>	*kauri
SUB-CANOPY			mahoe kohekohe towai rangiora <i>Cyathea smithii</i> rewarewa	ponga kiekie tawa nikau heketara fivefinger	lancewood kanono Hall's totara hutu *tanekaha
SHRUB 2m to 0.5m height		<i>Cyathea smithii</i> kiekie	ponga rangiora kohekohe mahoe nikau	wheki hutu heketara fivefinger tawa horopito	* <i>Dracophyllum adamsii</i>
GROUND- COVER 0.5m to 0m		bush rice grass <i>Uncinia uncinata</i>	kiekie <i>Blechnum fraseri</i> <i>B. fluviatile</i> hard fern kohekohe seedlings	<i>Blechnum filiforme</i> <i>Uncinia banksii</i> Rangiora seedlings	
EPIPHYTES AND LIANES			kiekie	supplejack <i>Collospermum hastatum</i> <i>Metrosideros diffusa</i> <i>Astelia solandri</i> <i>Senecio kirki</i> kidney fern	

**DISTRIBUTION:** Occurs up to approximately 650 m over the majority of the Ecological Area.

**NOTES:** Included in this type are small stands of kauri (plotted as subtype 1a on overlay 1, figure 2). Species found mostly restricted to these kauri sites are marked \*, however the total composition of these sites did not differ substantially from the surrounding type.

TABLE II : GENERALISED STAND STRUCTURE FOR MID-ALTITUDE PODOCARP-HARDWOOD

## FOREST WITH RARE KAURI

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT				rimu	miro kauri
CANOPY			towai toro rimu miro	tawheowheo tawari tawa broadleaf <i>Dracophyllum traversii</i>	
SUB- CANOPY			tawheowheo towai toro Hall's totara tawari	toatoa broadleaf <i>Cyathea smithii</i> hutu rimu miro	
SHRUB 2m to 0.5m height			toro towai tawheowheo horopito <i>Cyathea smithii</i>	kiekie korokia <i>Coprosma foetidissima</i>	
GROUND- COVER 0.5m to 0m			bush rice grass	<i>Blechnum fraseri</i> <i>B. capense</i> <i>Uncinia banksii</i> <i>Astella trinervia</i> <i>Blechnum fluviatile</i> mosses	
EPIPHYTES AND LIANES				<i>Astelia solandri</i> <i>Hymenophyllum</i> spp. <i>Metrosideros</i> spp.	

**DISTRIBUTION:** Between approximately 650 m and 800 m altitude surrounding the main range.

**NOTES:** Includes a high altitude stand of kauri with some unusual prostrate forms on plateau area to northeast of Mt. Moehau summit.



TABLE IV : GENERALISED STAND STRUCTURE FOR LOW ALTITUDE MANUKA SCRUB

TIER	← INCREASING DOMINANCE →				
	HEIGHT (m)	ABUNDANT	FREQUENT	OCCASIONAL	RARE
EMERGENT				rewarewa	kauri
CANOPY variable height			manuka	fivefinger mamangi rewarewa kanuka mapou	tawaroa
SUB- CANOPY 2 m to 0.5 m height				rangiora <i>Cyathea smithii</i> fivefinger mingimangi mamangi ponga	
SHRUB				rewarewa Hall's totara heketara manuka tawa towai mahoe	
GROUND- COVER 0.5 m to 0 m			<i>Uncinia</i> spp.	hard fern turutu bush rice grass <i>Blechnum fraseri</i> <i>Gahnia</i> spp.	
EPIPHYTES AND LIANES				bush lawyer <i>Metrosideros</i> <i>perforata</i> mangemange	

**DISTRIBUTION:** In small pockets around the boundaries of the Ecological Area.

**NOTES:** This is an extremely variable type and only the more common species have been recorded.

The area has been classified as class VIIe and VIIIe land (Water and Soil Division, MOWD, 1975). These are land use capability classes based on an eight-class system where class VIII land has the greatest limitations to productive use. The 'e' associated with these classes indicates that potential erosion is the major limitation.

### Vegetation

The vegetation of the Moehau Ecological Area has a number of features which make it botanically unique and valuable. The Moehau Range can be considered floristically insular in character (Moore 1973) with vegetation types from coastal through sub-tropical forest to an area of sub-alpine scrub around the summits. Of these the Moehau Ecological Area reserves all but coastal forest (an omission it would be valuable to repair).

This description is based on 53 Forest Survey Tally Sheets (N.Z.F.S. 1947, 1948), sixteen Ecological Forest Survey Tally Sheets (N.Z.F.S. 1966) and five days field work in the area (3rd, 4th May 1983 and 11th-13th September 1984).

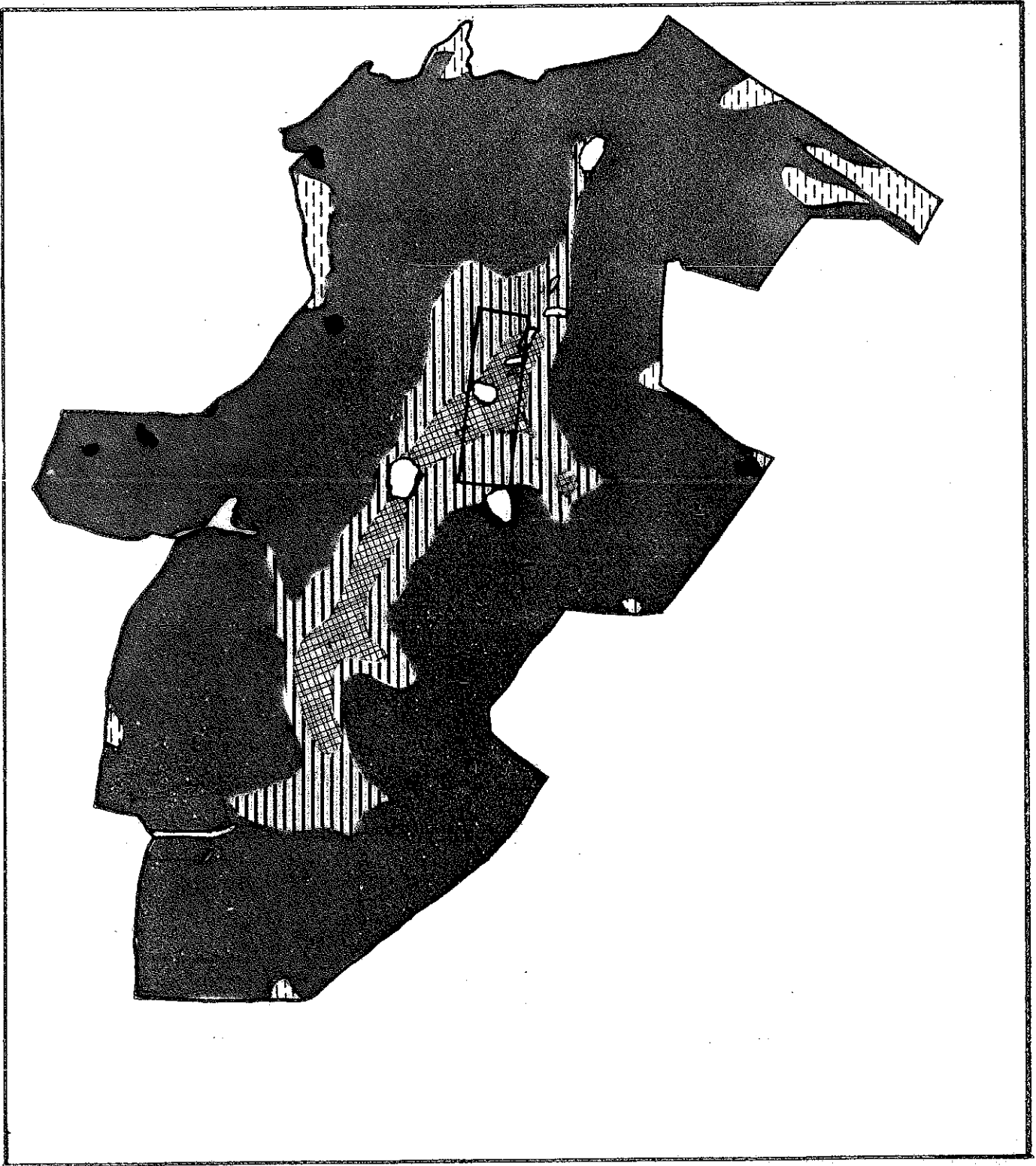
The method used to describe the vegetation is a modified recce-type description in which the vegetation is recorded in a number of tiers. The five tiers used are canopy emergents, canopy, subcanopy (from beneath canopy height down to 2 m), shrub (2 m down to 50 cm) and groundcover (50 cm to groundlevel). Site descriptions are grouped subjectively into types based as closely as possible on those classified by Nicholls (1976). Further discussion of this technique is given in Burns (1983).

I have classified the vegetation into five general types :







1. low to mid-altitude podocarp-hardwood forest (type B5, Nicholls 1976) with kauri occurring in stands;
2. mid-altitude podocarp-hardwood forest with rare kauri (close to type G7, Nicholls 1976);
3. high altitude kaikawaka-podocarp-hardwood forest;
4. manuka scrub; and
5. high altitude 'meadow' vegetation.

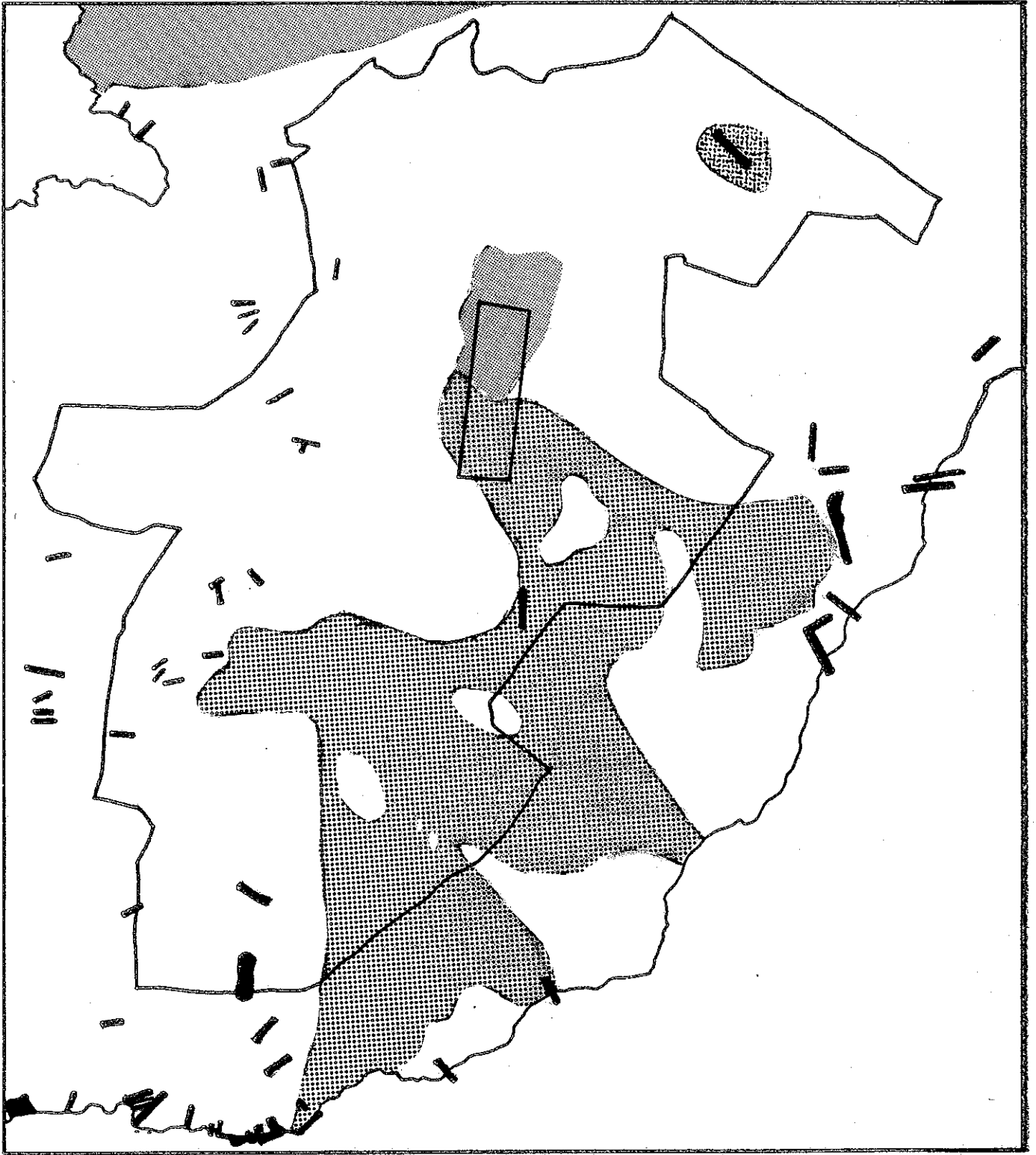
The extent of these types is shown on overlay 1 of figure 2. A botanical species list, derived from several sources, is presented as appendix 1, giving both scientific and common names.

1. The first type is a low to mid-altitude (less than approximately 650 m) podocarp-hardwood forest type with rare kauri stands (generalised stand structure, table 1). It is the most extensive forest type present gradually changing with increasing altitude.








Overlay 1 : Forest Types

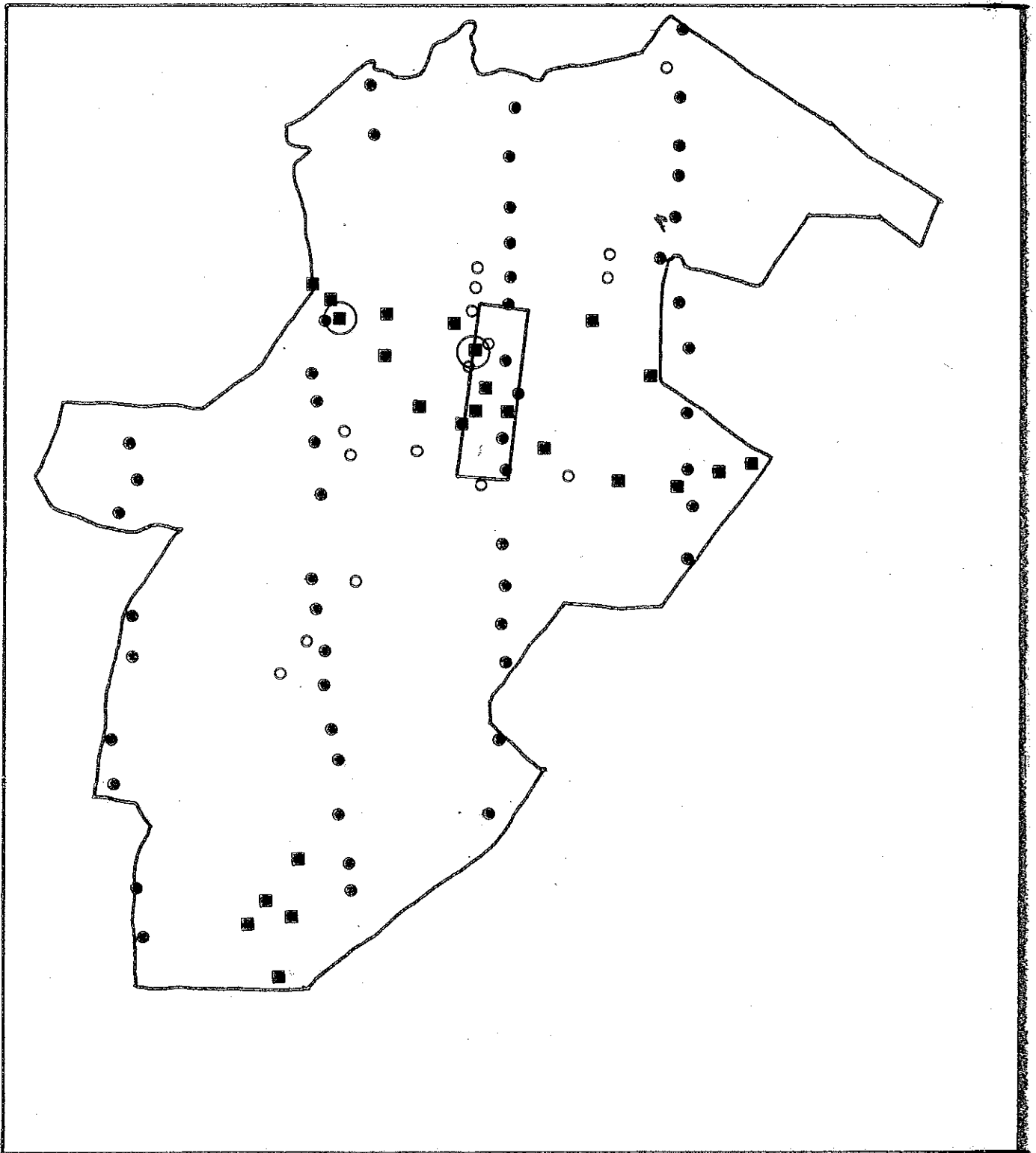
- 
 1. low to mid-altitude podocarp hardwood
- 
 1a. - with kauri stands
- 
 2. mid altitude podocarp-hardwood with kauri
- 
 3. high altitude kaikawaka-podocarp-hardwood
- 
 4. manuka scrub
- 
 5. high altitude 'meadow' vegetation



Overlay 3 : Geology of Moehau Region

- |   |                       |   |                      |
|---|-----------------------|---|----------------------|
|  | Kai-iti Porphyrites   | ) |                      |
|  | Paritu Plutonics      | ) | Lower to mid Miocene |
|  | Port Charles Andesite | ) |                      |
|  | Torehina Formation    | - | Oligocene            |
|  | Manaia Hill Group     | - | Jurassic             |

Quaternary deposits not shown (based on Skinner 1975)



Overlay 2 : Position of Vegetation Descriptions

- NZFS 1947, 1948
- NZFS 1966
- Burns 1983-1984
- Palmer 1982



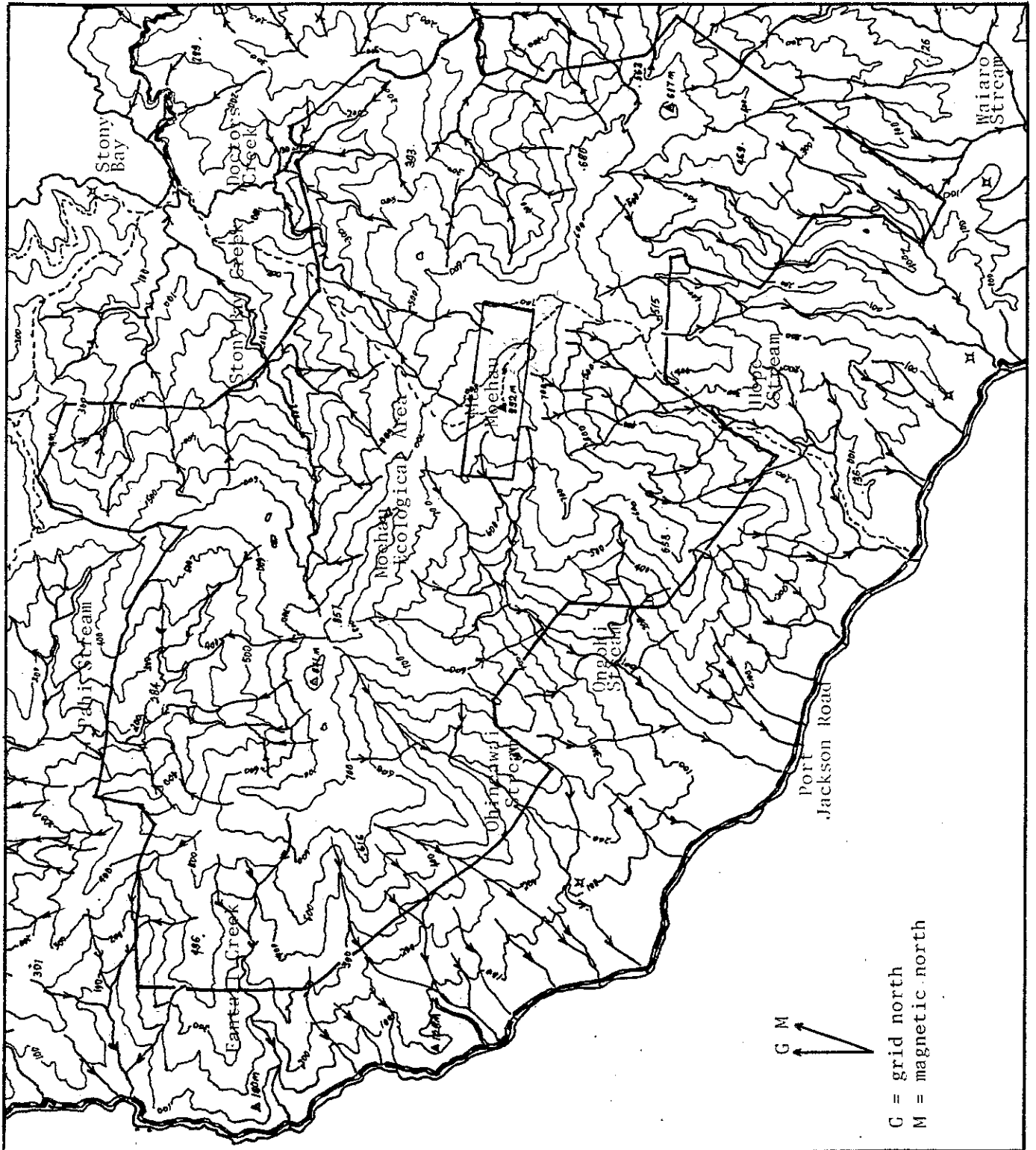


Figure 2 : Moehau Ecological Area

- 100 — 100 m interval contours
- Ecological Area boundary
- — — — — metalled road
- — — — — streams
- ▲ ▲ trig. station beacons, unbaconed
- X historic pa site

Scale = 1:50,000.

(based on Department of Lands & Survey (1983):  
 NZMS 260 S10 Hauraki Gulf Edition 1)

Rimu and northern rata are characteristic emergents with rare pukatea, Hall's totara and kauri. The canopy is dominated by tawa, particularly at lower altitudes with frequent towai, rewarewa and kohekohe. Towai gains greater importance in the canopy as one ascends. Other occasional elements of the canopy are fivefinger, pukatea, northern rata, hinau, mahoe and *Cyathea smithii*. Abundant in the shrub layer are *C. smithii* and kiekie whilst *Uncinia uncinata* and *Microlaena avenacea* are abundant as groundcover. The groundcover and shrub tiers are however noticeably sparse in this type.

Included in this type are small groups of kauri (plotted as a subtype on overlay 1 of figure 2). Although several species were found mostly restricted to these kauri dominated sites, e.g. tanekaha, *Dracophyllum adamsii*, the composition of these sites was still mostly similar to the surrounding forest and they have therefore not been separated as a district type.

2. The second forest type is a mid-altitude (between approximately 650 m and 800 m) podocarp-hardwood forest with rare kauri (generalised stand structure, table 2). This occurs as a narrow altitudinal band fringing the stunted wind-exposed vegetation of the Mt. Moehau summit and on a plateau area north-east of the summit. Rimu is occasionally emergent with rarer miro. The plateau area is notable for denser rimu and kauri including several 'prostrate' kauri. These trees have fallen probably by windthrow, but their roots have remained in contact with the ground. Thus they have continued growth from a prone position. The resulting forms are unusual (Cranwell and Moore 1936, Palmer 1982). Frequent canopy trees are towai, toro, rimu and miro with occasional tawheowheo, tawari, tawa, broadleaf and *Dracophyllum traversii*. Interesting subcanopy plants are horopito (*Pseudowintera colorata*), hutu and *Coprosma foetidissima*. To my knowledge, hutu is restricted to Moehau alone on the Coromandel Range. Horopito and *C. foetidissima* are shrubs associated with colder, exposed high altitude ridges and are also uncommon on the Coromandel Range. The groundcover is predominantly bushrice grass with occasional *Blechnum fraseri*, *B. capense*, *B. fluviatile*, *Uncinca banksii* and *Astelia trinervia*.
3. Surrounding the summit above 750 m a.s.l. is a botanically fascinating high altitude kaikawaka-podocarp-hardwood forest and scrub (generalised stand structure, table 3). Many plants found in this association are considered subalpine and are not found further north. Also they do not reoccur until Mt. Hikurangi 270 km to the south-east (Hackwell 1980). Dominant as a 3-4 m emergent is kaikawaka with abundant kaikawaka, towai, toro and tawheowheo in a 1-2 m canopy. The first record of a trip to the summit of Moehau is Adams (1888). He does not mention the presence of kaikawaka. The current predominance of young seedlings and saplings implies that this species may have actively invaded over the last century and be continuing to establish. Fifty-two cores of kaikawaka were taken in January 1978 from the north-east side of the summit, but no chronology was arrived at (La Marche et al. 1979). Further examination of these cores, now held at the Laboratory of Tree Ring Research, University of Arizona, may give evidence for the population history of kaikawaka on Moehau. Other canopy species are

mountain toatoa, korokia, broadleaf, *Dracophyllum traversii*, toatoa, tawari, rimu, southern rata and *Coprosma foetidissima*. Of interest but rare in the canopy is a snow totara - Hall's totara hybrid (*Podocarpus nivalis* x *halli* - Hair and Beuzenberg 1958 referred to in Moore 1973).

The soils of this area are always wet and boggy and winds blast the summit from all directions. Also as a result, approximately 30% of the ground surface supports little more than a subalpine herb community. Plants of subalpine zones that can be found here are *Drapetes dieffenbachii* (a type of vegetable sheet), *Rtidosperma setifolium*, *Pentachondra pumila*, *Cyathodes empetrifolia*, *Oreobolus pectinatus*, *Carpina alpina*, and *Aporostylis bifolia*. *Celmisia incana* and *Ourisia colensoi* are subalpine herbs represented by small populations which only occur around the rock outcrop of Little Moehau.

4. At the lowest margins of the Moehau Ecological Area are small zones of manuka scrub (generalised stand structure table IV). This is a variable type as the stands represent different stages of regeneration. Occasionally emergent are rewarewa over a canopy dominated by manuka with occasional fivefinger, mamangi, rewarewa, kanuka and mapou. Tawaroa, a recently described species of *Beilschmiedia* (*B. tawaroa*, Wright 1984) was also found. A wide range of species occurs in the lower tiers.
5. Possibly as a result of browsing pressure by goats and cattle (Moore and Cranwell 1934), areas on high altitude sites are covered in a meadow-like vegetation. *Microlaena avenacea* is the outstandingly dominant species but introduced grasses, e.g. sweet vernal, also occur. *Dracophyllum traversii* stand as solitary individuals amidst the grass. Small apparently 'chewed off' seedlings of many species were also present e.g. *Hebe macrocarpa*, towai, rimu, horopito, and korikia. Herbs, both native and introduced are also common e.g. *Acaena anserinifolia*, dandyion and *Gonocarpus montanus*.

The Moehau Ecological Area contains a large number of locally rare plant species. These are: *Cyathodes empetrifolia*, *Drapetes dieffenbachii*, kaikawaka, *Pentachondra pumila*, *Celmisia incana*, *Oreobolus pectinatus*, *Dacrydium biforme*, *Elaeocarpus hookerianus* (only seedlings found), *Metrosideros albiflora*, *Podocarpus hallii* x *nivalis*, *Ourisia colensoi*, *Pseudopanax simplex* var. *sinclairii*, *Ascarina lucida* and *Coprosma dodonaeifolia* (appendix 13, N.Z.F.S. 1978). Braggins et al. (1983) have compiled lists of species with distributional significance on the Coromandel Peninsula. Thirty of the eighty species listed occur in the Moehau Ecological Area including *Pittosporum virgatum*, listed in the Red Data Book of New Zealand as vulnerable (Williams and Given 1981).

Hayward et al. (1975) have recorded lichens from the northern Coromandel Peninsula including those occurring on Mt. Moehau. On the summit of Mt. Moehau are three subalpine lichen species; *Siphula decumbens*, *S. fragilis* and *S. mooreae*, however, many alpine and subalpine lichens are absent.

Palmer (1982) used two stands of kauri on Moehau for a dendrochronological study. These two sites are marked on overlay 2 of figure 2. He took cores and established a chronology for kauri. He also carried out measurements of stem density and basal area around each site using a point-centred-quarter method (Cottam and Curtis 1956, Mark and Esler 1970). His high altitude site positioned in my type 2 (Table II) gave a density of 841 trees/ha. and a basal area of 43.55 m<sup>2</sup>/ha. In comparison his low altitude site, positioned in my type 1 (Table I) gave a density of 758 trees/ha and a basal area of 74.99 m<sup>2</sup>/ha.

### Native Fauna

A list of wildlife recorded in Moehau is given as Appendix 2. The Moehau Block of the Coromandel State Forest Park which largely consists of the Moehau Ecological Area has an 'outstanding' wildlife rating (Anderson 1983). Three species of native bird are present which have limited distributions in New Zealand. These are the North Island kaka, North Island brown kiwi and the New Zealand falcon. The presence of falcon is only based on a single sighting by Mr P. Novis (hunter, N.Z.F.S.). However, Anderson (1983) reports that:

'reasonably good numbers (of kaka) were found in Moehau and it is highly probable that this latter population is bolstered by trade between Moehau and Great Barrier Island.'

The northern part of the Coromandel Range including Moehau is the only area in New Zealand where two of the three native *Leiopelma* frogs occur together. Hochstetter's frog has a range extending from East Cape, Coromandel and the Waikato District north to near Whangarei. Archey's frog occurs only in the Moehau and Colville Ranges (Williams and Given 1981). On Moehau it has been recorded at densities as high as 15 per ha. in high marshy areas (Bell 1978). Both species are listed as 'rare' in the Red Data Book of New Zealand (Williams and Given, 1981).

A native land snail survey by Goulstone (1980) resulted in the identification of 53 species present on Mt. Moehau including three rare on the Coromandel Peninsula. Two of these found near the top of the range, *Geminoropa* cf. *microrrhina* and *G. hutoni*, are probably also rare in New Zealand. The locally rare *Loama pirongiaensis* was found at about 250 m a.s.l.

The large, flightless stagbeetle *Dorcus auriculatus*, was thought to be extinct until 1974 when Dr B. Bell collected a specimen at a height of 600 m a.s.l. on Moehau where several others were sighted (Hackwell 1980). Moehau is the only known locality of this species. Subsequent search efforts by DSIR entomologist were unsuccessful apart from a single elytron (discarded outer skin) found by Dr B Holloway in 1978 (Auckland Conservancy file 6/149/19/4). Dr Holloway noted considerable ground damage caused by pig rooting and expressed concern at the effects pigs might be having on beetle numbers. *D. auriculatus* is listed in the first schedule of the Wildlife Act 1979. This gives the species full legal protection under the Act.

Two other species of stagbeetle also occur on Moehau; *Lissotes planus* and *L. stewarti*. As well, two species of carabid beetle found on Moehau have distributions worthy of note. *Mecodema* spp. are restricted to the Coromandel Peninsula and *Megodromus capito* has a disjunct distribution with the nearest other population being in the

Gisborne area. An as yet un-named species of stick insect (*Micrachus* sp.) also occurs on Moehau. Once named, Moehau will be its type locality (Hackwell 1980).

#### Introduced Animals and Forest Condition

Moehau has a long history of interference by goats, cattle and pigs. MacLaren (1898) was the first to record that wild cattle were 'abundant' on Moehau. By 1934, Moore and Cranwell (1934) estimated that goats and pigs had been active for fifty to sixty years. They suggest that the progressive action of these animals caused the deterioration of the summit vegetation from the dense scrub described in Adams (1888) to grassland dominated by *Microlaena avenacea*. Moore (1973) notes that mobs of goats were seen right up to the summit in 1971 and that the signs of pigs and cattle were also evident. Possums were not present in 1971.

During the 1983-1984 field work, of 160 circular 4 m<sup>2</sup> plots examined throughout the Ecological Area, intact goat pellets were present in 14 (8.8%) with intact possum pellets present in 2 (1.3%). Browse by goats was recorded on many species with fivefinger, rangiora, hook grass, kiekie, *Blechnum fraseri*, *B. fluviatile*, and lancewood the most apparently affected. Disturbance of the ground surface by pigs (pig rooting) was extensive over most of the lower altitude forest. Cattle droppings were observed on one ridge. Occasional possums have been seen around the Cape Colville coast for the last twenty years. It is only in the last 4-5 years that they have invaded the inner forests although they are still in small numbers (P. Novis, personal communication).

An instantaneous assessment of forest condition can do no more than identify probable indicators of future change in the forest composition, structure and biomass.

Possible indicators are :

1. the presence of seedlings and saplings of canopy species;
2. the openness of the vegetation as a whole and in different tiers; and
3. the presence of dead or dying individuals.

Relevant observations are recorded below.

I was impressed by the stature and health of northern rata and fuchsia trees throughout the reserve compared to other areas in the Coromandel e.g. the Motutapere Ecological Area (Burns 1985). The observation correlates with the low possum density.

The shrub and groundcover tiers are often markedly open, particularly on lower altitude sites. There are a number of factors which could be suggested for the apparent paucity of cover in these tiers. Past browsing by goats and pigs could be a factor as well as the extensive pig rooting observed. Another possible cause is the difficulty of seedling establishment on the loose unstable scree substrate which covers many slopes of the reserve.



Photo 1 : Pittosporum virgatum in flower (photo by F. Deuss)



Photo 2 : Kaikawaka near summit of Moehau (photo by F. Deuss)

Seedlings and saplings of canopy trees are present to frequent with kaikawaka seedlings abundant above 700 m a.s.l. I saw few dead or dying trees.

Extensive areas on ridges near the summit have a meadow-like vegetation cover dominated by bushrice grass. Their presence poses a number of questions on the processes of vegetation change occurring on Moehau. Are these areas maintained by goat and cattle grazing? Would they revert to forest cover were the population of introduced mammals substantially reduced? Are they doing so now?

#### Presence of Exotic Plants

There are few introduced plants within the reserve. They mainly occur in the high-altitude meadow-like vegetation. Here introduced pasture grasses, e.g. sweet vernal, have invaded as well as dicotyledonous herbs e.g. dandelion. On the lowest banks of the Hope Stream, just outside the reserve boundary, mist flower (*Eupatorium riparium*) is abundant. No exotic plant poses any perceived threat to the integrity of the reserve.

#### Human History and Influence

The coastline surrounding the Moehau reserve contains evidence of almost continuous maori occupation extending from after the arrival of the Europeans back into the archaic period of New Zealand pre-history. For example, bone material from the Port Jackson area has been radiocarbon dated at  $658 \pm 59$  years b.p. (Furey 1982). The lower altitude areas between the Ecological Area boundary and the coast were the sites of intensive maori settlement with horticulture and utilisation of marine resources (Pierce and Olsen 1981).

'The Moehau hinterland, besides having been a major burial area, would undoubtedly have been used for hunting and foraging of birds, berries and other foods. In addition it may have provided access routes between the coastal settlement areas, as well as being a landmark for travellers by land or sea. Timber resources such as kauri and totara for canoes, may also have been obtained from the forest.'  
(Pierce and Olsen 1981).

There are extensive maori traditions associated with Moehau and these are excellently summarised in Pierce and Olsen (1981). Mt. Moehau is, and has been, a sacred mountain to the local maoris. The summit of Mt. Moehau is the traditional burial place of Tama-te-kapua, captain of the Arawa canoe which sailed from Hawaiki during the Great Migration (c. 1350 A.D.). The name 'Moehau' is a contraction of 'Te Moe Nga Hau O Tama-te-kapua' (translated as 'the sleep of Tama-te-kapua amid the winds', Isdale 1981). Isdale (1981) also recognises Moehau as a former dwelling place of the mythical Turehu or Urukehu; a small, light-skinned 'fairy' people.

Pierce and Olsen (1981) conducted an archaeological survey of the Moehau Ecological Area. They found two possible storage pits (N 35-36/247\* and N39/381) and two possible terrace sites (N39/382, 383). As well, they give recommendations for further archaeological survey and research.

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\* refers to New Zealand Archaeological Association site numbers

More recent human influence to the reserved area has been through logging, fire and mineral exploration. European occupation of the Moehau region occurred in various stages during the early 1800's. Upon their arrival they began the exploitation of kauri throughout the forest which continued into the 1900's (Pierce and Olsen 1981). The Bronlund family settled around Stony Bay in 1841 and proceeded to 'work the kauri out' on the northeastern side of the range. The Ward family settled near Ongohi in the 1880's and also extracted some kauri. Their descendants still farm most of the land adjacent to the Ecological Area. Cut stumps and old kauri crowns can be found on some ridges (e.g. above Doctor's Creek, Pierce and Olsen 1981). The archaeological survey of these authors discovered the remains of a kauri timber driving dam on Doctor's Creek (N35-46/248) and a log jam, consisting of five kauri logs, in two waterfalls in Stony Bay Creek (N35-36/246).

Moore (1973) noted that a fire or fires had occurred on the summit of Moehau.

'A boggy slope on the eastern face of the trig peak had obviously been burnt. We were told by Mr Bronlund, who had lived within sight of it at Stony Bay since about 1895, that the only fire he had ever seen there was one "lit by Bill Wharfe in a dry summer" about 1899'

No mining has occurred within the Ecological Area. A small goldmine, the Eva, was worked near the lower reaches of Sandy Bay Creek (Port Charles) in 1887 and 1888. It produced 13.4 kg of bullion from 1 ton of quartz. In addition a silver-bearing vein was worked on three levels in the Tangiaro Stream (Port Charles) also outside the reserve (Downey 1935).

Occasional exploration for minerals has occurred within the Ecological Area since 1970. During that year the Mitsui Mining and Smelting Company confirmed copper mineralisation in the Ongohi Stream catchment. Southern Cross/Fletchers Mining also carried out a sampling programme at this time, discovering a further copper anomaly at Stony Bay and carrying out greater evaluation of the Ongohi Stream copper. They found the latter to be sub-economic.

In 1973 and 1976 Southern Cross Minerals Exploration Limited applied for prospecting licences over parts of the Ecological Area. Both were declined.

In 1981, major prospecting licences covering the majority (3246 ha) of the Ecological Area (P.L. 31930 and 31931) were applied for by Otter Minerals Exploration Limited. Gold, silver and copper were to be the principal metals sought with the emphasis on copper. After an extensive environmental assessment (N.Z.F.S. 1981) the Coromandel State Forest Park Advisory Committee recommended that the applications be declined. The applications were subsequently withdrawn (Johnston 1982).

#### Recreational Facilities and Opportunities

The Moehau Ecological Area is traversed by a single track leading from Te Hope Stream across the summit and down to Stony Bay (see 'Access'). This track is well used with, over the summer period, visitors almost every day. Use of the track is increasing (T. Ward, personal communication.) The track is easily followed apart from two sections. The initial stage of the track at Stony Bay is poorly marked until it reaches the forest boundary. As well, parts of the track near the



summit are vague and cross boggy and unstable land.

Private hunting for pigs and goats occurs. The N.Z.F.S. issues hunting permits for this activity. However, adjacent landowners have complained of problems with hunter's dogs and firearms as they cross to the forest boundary. Dogs are banned as a condition of access because of this. Holder et al. (1983) recommend encouragement of recreational hunting to help control the goat population.

No huts or other recreational facilities occur within the Ecological Area. However, the Cape Colville Farm Park occurs around parts of the reserve offering sites for camping and a beautiful coastal walkway.

### Summary, Discussion and Recommendations

The Moehau Ecological Area covers 3633 ha of forest and scrub around the Moehau Range at the northern end of the Coromandel Peninsula. It forms the majority of the Moehau Block of the Coromandel State Forest Park and lies within the Colville Ecological District. The summit of Mt. Moehau occurs in a 61 ha block of maori land (Ngatihi-O-Moehau) at the centre of the Ecological Area. The terrain is often precipitous containing numerous streams running through steep-walled gorges. Slopes become more moderate nearer the summit and the associated ridge.

The geology of the Moehau Ecological Area is the result of the drowning of a faulted block of greywacke which was subsequently covered by a thick pile of young volcanic rock. The majority of the Ecological Area has a bedrock of greywacke (Manaiia Hill Formation) with exposures of Port Charles Andesite around the peak of Little Moehau. Of greater interest to geologists is the Paritu pluton, a cooled originally sub-volcanic magma reservoir which has been exposed mainly in the south-west of the Moehau region. This structure is unique in the volcanic regions of New Zealand.

Soils of the Ecological Area are predominantly Te Ranga steepland soils associated with the greywacke parent material. However, many slopes bear little soil, being composed largely of unstable rock screes. Moehau steepland soils are derived from the pluton regions whilst Rangiuuru hill soils are associated with the Port Charles Andesite deposits. Only slight debris avalanche type erosion occurs through the reserve.

The geographic position of the Moehau Range, surrounded by the sea on three sides and connected to the mainland by a relatively narrow and low isthmus, gives the Moehau region an essentially insular character. This is reflected in its climate and its diverse and unique biota.

The slopes of Mt. Moehau are exposed to winds from all directions and the harsh conditions experienced on the summit have often been noted. The subalpine plants of the summit bear testimony to these conditions. I have classified the vegetation into five general types : low to mid-altitude podocarp-hardwood forest with rare kauri stands; mid-altitude podocarp-hardwood forest with rare kauri; high altitude kaikawaka-podocarp-hardwood forest; manuka scrub and high altitude 'meadow' vegetation. The reserve contains fourteen locally rare plant species and thirty with distributional significance including *Pittosporum virgatum* listed in the Red Data Book of New Zealand as vulnerable.

The Moehau Ecological Area has an 'outstanding' wildlife rating. Three species of rare native bird are present as well as two species of rare native frog. The invertebrate fauna is also interesting, with several rare native land snails present and a large flightless stagbeetle, *Darcus auriculatus*, previously thought extinct but rediscovered on Moehau in 1974.

A brief inspection of this type cannot be conclusive about animal numbers. However Moehau has a long history of interference by goats, cattle and pigs and there is evidence that wild animals have and are jeopardising vegetation values. P. Novis (hunter, N.Z.F.S.) is currently carrying out control operations against these animals on Moehau. To date, he has been successful in retaining co-operation with the local landowners who are sensitive to the use of hunting dogs and the carrying of firearms over their properties.

It is only in the last 4-5 years that possums have invaded the forests of the Moehau region. Their presence within the Ecological Area is a serious problem. The northernmost tip of the Coromandel Peninsula was one of the last places in New Zealand where possums were absent and because of this the forest acted as a 'benchmark' to assess possum damage elsewhere and as a refugium for species highly palatable to possums. For example, northern rata are of exceptional stature and health compared to others on the Coromandel. It is my opinion that Moehau has a high enough ecological value nationally to warrant the effort required to regain its former almost possum-free status. This may require poisoning from the air as has been carried out over parts of Pureora Forest and is being considered for Waipoua Forest (Thomas 1984).

The Moehau region has a long history of maori and european occupation. Mt. Moehau has associated with it a number of maori traditions. One of these is that it is the burial place of Tama-te-kapua, captain of the Arawa canoe. Several archaeological sites occur within the Ecological Area. More recent human influence has been through logging for kauri, fire and mineral exploration.

The Ecological Area is traversed by a single track leading from Stony Bay crossing the summit and leading down to the coast beside the Hope Stream. At Stony Bay it crosses the Cape Colville Farm Park before reaching the forest boundary. This initial part of the track is poorly marked. Parts of the track near the summit (here the track crosses maori land) are also inadequately marked and cross boggy and unstable land. A network of tracks is developing here as visitors attempt to avoid the bog patches or where they lose the track and seek to rejoin it. As recreational use is increasing, the potential for damage to this unusual and fragile high altitude community is high. With the consent of the maori landowners, a short boardwalk could be constructed over parts of this track and better marking carried out.

To the south of the peak of Little Moehau is a small area with the sole Moehau populations of two subalpine herbs; *Celmisia incana* and *Ourisia colensoi*. The track passes beside and through this susceptible site. A better marked track could lead visitors away from this area. Again this site is within maori land.

Over the last century changes to the vegetation of Moehau have been noted. Moore and Cranwell (1934) wrote of the development of grasslands on the mountain. There is evidence that kaikawaka is undergoing a population

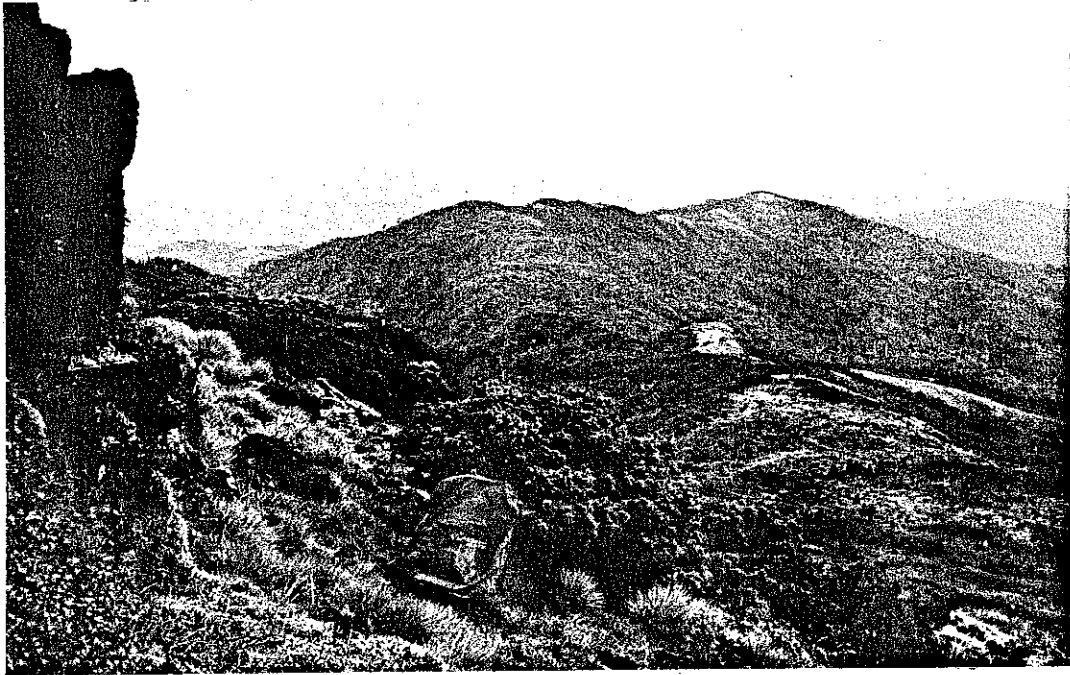


Photo 3 : View from summit of Little Moehau looking southeast (photo by F. Deuss)

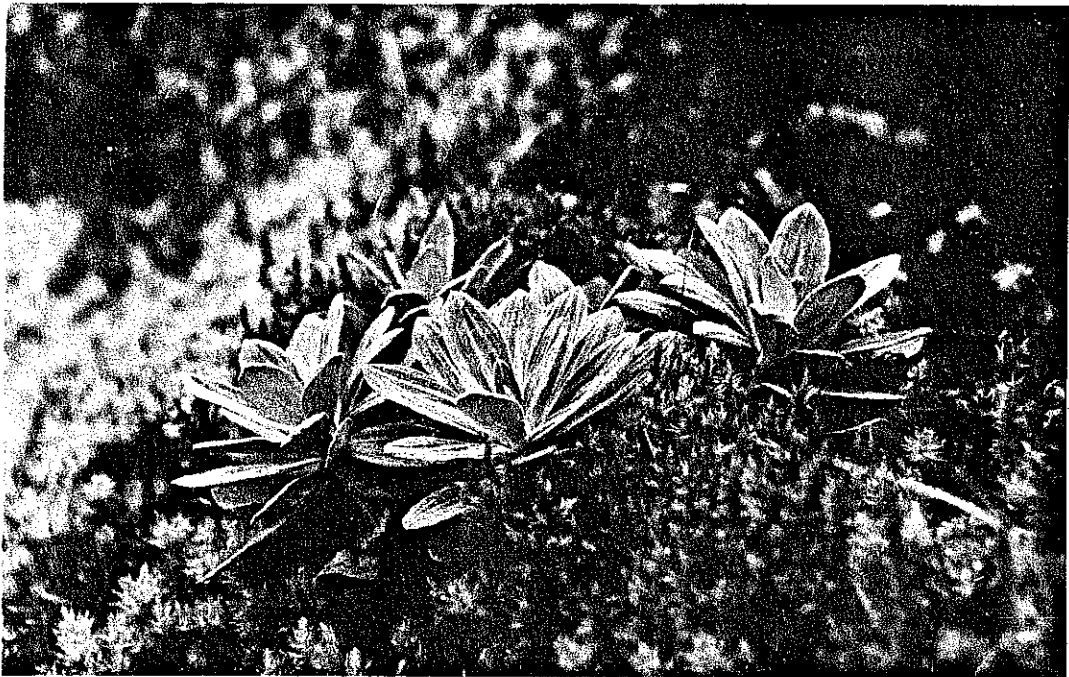


Photo 4 : Celmisia incana growing on Eucamptodon inflatus (moss) (photo by F. Deuss)

expansion near the summit. The summit vegetation is certainly different from that described by Adams (1888). Research into the processes of vegetation change occurring on Moehau could assist future management.

The catchment of Fantail Stream provides a continuous sequence of forest cover from the coast to the top of the Moehau Range. This is one of the few places on the Coromandel Peninsula where forest cover occurs from sea to mountain top and as such provides a valuable ecological continuum. The lower sections of Fantail Stream exist in the Cape Colville Farm Park and the Lands and Survey Department should be approached to ensure that the conservation value of this sequence is recognised.

Recommendations in order of priority are :

1. that N.Z.F.S. eliminate as far as practical possums from the Moehau Ecological Area;
2. that N.Z.F.S. reduce the goat, pig and wild cattle populations to the lowest practical level;
3. that with the consent of the appropriate landowners, the track across Moehau be upgraded, certain sections be more accurately marked, a boardwalk built over extremely boggy patches and the track led around sensitive subalpine herb populations.
4. that N.Z.F.S. encourage and/or instigate research into the vegetation processes occurring on Moehau; and
5. that the N.Z.F.S. ensure that Lands and Survey recognise the conservation value of the forested lower reaches of the Fantail Stream catchment in the management of Cape Colville Farm Park.

#### Acknowledgements

I would like to thank Rhys Gardner and Freek Deuss for their help with the field work, Freek also for his assistance in editing and proofreading and Suzanne Clegg for her help with the text and diagrams.

## Appendix 1 : Botanical Species List - Moehau Ecological Area

(based on + Gardner and Smith Dodsworth 1983  
 o Esler 1972  
 □ Burns 1983-1984  
 \* Others as indicated)

+ o □ *	<u>Ferns</u>	
X	<i>Adiantum cunninghamii</i>	maidenhair fern
X	<i>A. diaphanum</i>	
X	<i>A. fulvum</i>	
X	<i>A. viridescens</i>	
X X	<i>Anarthropteris lanceolata</i>	
X X X	<i>Asplenium bulbiferum</i>	hen and chicken fern
	<i>ssp bulbiferum</i>	
X X X	<i>A. flaccidum ssp flaccidum</i>	hanging spleenwort
X	<i>A. lamprophyllum</i>	
	<i>A. oblongifolium</i>	shining spleenwort
X X X	<i>A. polyodon</i>	
X X X	<i>Blechnum capense</i> (forma a)	kiokio
X X X	<i>B. capense</i> (forma b : ' <i>Lomaria latifolia</i> ')	
X X	<i>B. chambersii</i>	
X X X	<i>B. colensoi</i>	
X X X	<i>B. discolor</i>	crown fern
X X X	<i>B. filiforme</i>	
X X X	<i>B. fluviatile</i>	
X X X	<i>B. fraseri</i>	
X X	<i>B. membranaceum</i>	
X X X	<i>B. nigrum</i>	
X	<i>B. vulcanicum</i>	
X X X	<i>Ctenopteris heterophylla</i>	
X	<i>Cyathea cunninghamii</i>	
X X X	<i>C. dealbata</i>	ponga
X X X	<i>C. medullaris</i>	mamaku
X X X	<i>C. smithii</i>	
X	<i>Dicksonia fibrosa</i>	wheki-ponga, kuripaka
X	<i>D. lanata</i>	
X X X	<i>D. squarrosa</i>	wheki
X X	<i>Doodia media ssp media</i>	
X X X	<i>Gleichenia cunninghamii</i>	umbrella fern
X X X	<i>G. dicarpa</i>	swamp umbrella fern
X	<i>G. microphylla</i>	
X X X	<i>Grammitis billardieri</i>	
X	<i>G. ciliata</i>	
X	<i>G. magellanica ssp nothofageti</i>	
X	<i>G. pseudociliata</i>	
X X X	<i>Histiopteris incisa</i>	water fern
X	<i>Hymenophyllum armstrongii</i>	filmy fern
X X X	<i>H. demissum</i>	filmy fern
X X X	<i>H. dilatatum</i>	filmy fern
X X X	<i>H. ferrugineum</i>	filmy fern
X X X	<i>H. flabellatum</i>	filmy fern

+ o □ \*

X	X		<i>H. flexuosum</i>	filmy fern
X			<i>H. lyallii</i>	filmy fern
X	X	X	<i>H. multifidum</i>	filmy fern
X	X		<i>H. rarum</i>	filmy fern
X	X	X	<i>H. revolutum</i>	filmy fern
X	X	X	<i>H. sanguinolentum</i>	filmy fern
X	X	X	<i>H. scabrum</i>	filmy fern
X			<i>H. villosum</i>	filmy fern
X	X		<i>Hypolepis rufobarbata</i>	
X			<i>H. tenuifolia</i>	
X			<i>Lastreopsis glabella</i>	
X	X	X	<i>L. hispida</i>	
X	X	X	<i>Leptopteris humenophylloides</i>	heruheru
X		X	<i>Lindsaea trichomanoides</i>	
X	X	X	<i>Lygodium articulatum</i>	mangemange
X	X	X	<i>Paesia scaberula</i>	hardfern or ring fern
X	X	X	<i>Phymatosorus diversifolius</i>	fragrant fern
X	X	X	<i>P. scandens</i>	
X	X	X	<i>Pneumatopteris pennigera</i>	
X	X		<i>Pteridium aquilinum</i>	bracken
			var. <i>esculentum</i>	
X			<i>Pyrrosia serpens</i>	
X	X	X	<i>Rumohra adiantiformis</i>	
X			<i>Schizaea fistulosa</i>	
X		X	<i>Trichomanes elongatum</i>	
X			<i>T. endlicherianum</i>	
X	X	X	<i>T. reniforme</i>	kidney fern
X			<i>T. strictum</i>	
X	X		<i>T. venosum</i>	

Fern Allies

X	X	X	<i>Lycopodium billardieri</i>	
X	X	X	<i>L. deuterodensum</i>	
X	X		<i>L. laterale</i>	
X	X	X	<i>L. scariosum</i>	
X	X	X	<i>L. volubile</i>	
X			<i>Tmesipteris elongata</i>	
X			<i>T. lanceolata</i>	
X			<i>T. sigmatifolia</i>	
X	X	X	<i>T. tannensis</i>	

Gymnosperms

X	X	X	<i>Agathis australis</i>	kauri
X			<i>Dacrycarpus dacrydioides</i>	kahikatea
X	X	X	<i>Dacrydium cupressinum</i>	rimu
X	X		<i>Lagarostrobos bififormis</i>	pink pine
X			<i>Lepidothamnus intermedius</i>	yellow silver pine
X	X	X	<i>Libocedrus bidwillii</i>	kaikawaka
X	X	X	<i>Phyllocladus aspleniifolius</i>	mountain toatoa
			var. <i>alpinus</i>	
X	X	X	<i>P. glaucus</i>	toatoa
		X	<i>P. trichomanoides</i>	tanekaha
X	X	X	<i>Podocarpus hallii</i>	Hall's totara

+ o □ \*

X	X	X	X	<i>P. hallii</i> x <i>nivalis</i> (Moore 1973)	
X	X	X		<i>Prumnopitys ferruginea</i>	miro
X				<i>P. taxifolia</i>	matai

Dicot. Trees and Shrubs

X		X		<i>Alectryon excelsus</i>	titoki
X	X	X		<i>Alseuosmia macrophylla</i>	karapapa
X	X	X		<i>Aristotelia serrata</i>	wineberry
X	X	X		<i>Ascarina lucida</i>	hutu
	X	X		<i>Beilschmiedia tarairi</i>	taraire
X	X	X		<i>B. tawa</i>	tawa
		X		<i>B. tawaroa</i>	tawaroa
X			X	<i>Brachyglottis myrianthos</i> (Adams 1888)	
X	X	X		<i>B. repanda</i>	rangiara
X	X	X		<i>Carpodetus serratus</i>	putaputaweta
X	X	X		<i>Coprosma arborea</i>	mamangi
X	X	X		<i>C. colensoi</i> ( <i>banksii</i> )	
X		X		<i>C. dodonaeifolia</i>	
X	X	X		<i>C. foetidissima</i>	
X	X	X		<i>C. grandifolia</i>	kanono
X	X	X		<i>C. lucida</i>	karamu
X	X	X		<i>C. rhamnoides</i>	
X	X	X		<i>C. spathulata</i>	
X		X		<i>Coriaria arborea</i>	tutu
X	X	X		<i>Corokia buddleoides</i> var. <i>linearis</i>	korokia
X	X	X		<i>Corynocarpus laevigatus</i>	karaka
X	X	X		<i>Cyathodes empetrifolia</i>	
X	X	X		<i>C. fasciculata</i>	mingimingi
X		X		<i>C. juniperina</i>	mingimingi
X		X		<i>Dracophyllum adamsii</i>	
X	X	X		<i>D. latifolium</i>	neinei
X	X	X		<i>D. traversii</i>	mountain neinei
X	X	X		<i>Dysoxylum spectabile</i>	kohekohe
X	X	X		<i>Elaeocarpus dentatus</i>	hinau
X	X	X		<i>E. hookerianus</i> (juveniles only)	pokaka
X	X	X		<i>Fuchsia excorticata</i>	kotukutuku
X		X		<i>Gaultheria antipoda</i>	
X	X			<i>G. depressa</i> var. <i>novae-zelandiae</i>	
	X	X		<i>Geniostoma rupestre</i> var. <i>crassum</i>	hangehange
X	X	X		<i>Griselinia littoralis</i>	broadleaf
X	X	X		<i>G. lucida</i>	shining broadleaf
X	X	X		<i>Hebe macrocarpa</i>	
X	X	X		<i>Hedycarya arborea</i>	pigeonwood
X	X	X		<i>Ilex brexioides</i>	tawari
X	X	X		<i>Knightia excelsa</i>	rewarewa
X	X	X		<i>Laurelia novae-zelandiae</i>	pukatea
X	X	X		<i>Leptospermum ericoides</i>	kanuka
X	X	X		<i>L. scoparium</i>	manuka
X	X	X		<i>Litsea calicaris</i>	mangaao
X	X	X		<i>Lophomyrtus bullata</i>	ramarama
X	X	X		<i>Macropiper excelsum</i>	kawakawa
X	X	X		<i>Melicope ternata</i>	wharangi
X	X	X		<i>Melicytus ramiflorus</i>	mahoe

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X	X	X	<i>Metrosideros robusta</i>	northern rata
X	X	X	<i>M. umbellata</i>	southern rata
X	X	X	<i>Myrsine australis</i>	mapou
X	X	X	<i>M. salicina</i>	toro
	X		<i>Nestegis cunninghamii</i>	black maire
X	X	X	<i>N. lanceolata</i>	white maire
X		X	<i>N. montana</i>	
X	X	X	<i>Olearia furfuracea</i>	
X	X	X	<i>O. rani</i>	heketara
X	X	X	<i>Pentachondra pumila</i>	
X		X	<i>Phebalium nudum</i>	mairehau
X	X	X	<i>Pittosporum cornifolium</i>	
X		X	<i>P. kirkii</i>	
	X	X	<i>P. tenuifolium</i>	
X		X	<i>P. virgatum</i>	
X	X		<i>Pseudopanax anomalus</i>	
X	X	X	<i>P. arboreus</i>	fivefinger
X	X	X	<i>P. colensoi</i>	
X	X	X	<i>P. crassifolius</i>	lancewood
X	X	X	<i>P. edgerleyi</i>	
X	X		<i>P. laetus</i>	
X		X	<i>P. simplex</i>	
X	X	X	<i>Pseudowintera axillaris</i>	horopito
X	X	X	<i>P. colorata</i>	horopito
X	X	X	<i>Quintinia serrata</i>	tawheowheo
X	X	X	<i>Rhabdothamnus solandri</i>	
X	X	X	<i>Schefflera digitata</i>	pate
X	X	X	<i>Senecio kirkii</i> var. <i>kirkii</i>	Kirk's daisy
X			<i>S. kirkii</i> var. <i>angustior</i>	Kirk's daisy
X	X	X	<i>Toronja toru</i>	toru
X	X	X	<i>Vitex lucens</i>	puriri
X	X	X	<i>Weinmannia silvicola</i> var. <i>betulina</i>	towai

Dicot. Lianes

X	X	X	<i>Clematis paniculata</i>	puawhananga
X	X	X	<i>Metrosideros albiflora</i>	climbing rata
X	X	X	<i>M. diffusa</i>	climbing rata
X	X	X	<i>M. fulgens</i>	climbing rata
X	X	X	<i>M. perforata</i>	climbing rata
X	X	X	<i>Muehlenbeckia australis</i>	
	X		<i>M. complexa</i>	
X	X		<i>Parsonsia</i> spp.	
X	X	X	<i>Rubus australis</i>	bush lawyer
X	X	X	<i>R. cissoides</i>	bush lawyer

Mistletoes and other Saprophytes and Parasites

X		X	<i>Dactylanthus taylori</i> (Cheeseman 1925)	
X			<i>Peraxilla tetrapetala</i>	



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Dicot. Herbs

X	X	X	<i>Acaena anserinifolia</i>	
		X	<i>A. novae-zelandiae</i>	
X	X		<i>Callitriche muelleri</i>	
X	X	X	<i>Celmisia incana</i>	
X	X	X	<i>Centella uniflora</i>	
		X	<i>Dichondra repens</i>	
X	X	X	<i>Drapetes dieffenbachii</i>	
X	X		<i>Drosera peltata</i> ssp. <i>auriculata</i>	
X			<i>Epilobium alsinoides</i> ssp. <i>alsinoides</i>	
X	X		<i>E. brunnescens</i> ssp. <i>brunnescens</i>	
		X	<i>E. pedunculare</i>	
X			<i>E. rotundifolium</i>	
		X	<i>Erichtites minima</i>	
X		X	<i>Galium propinquum</i>	
		X	<i>Geranium solandri</i>	
		X	<i>G. potentilloides</i>	
		X	<i>Gnaphalium collinum</i>	
X			<i>G. gumnocephalum</i>	
X		X	<i>G. keriense</i>	
		X	<i>Gonocarpus montanus</i> ( <i>Haloragus procumbens</i> )	
X			<i>Hydrocotyle americana</i>	
X	X		<i>H. moschata</i>	
X	X		<i>Hypericum japonicum</i>	
X	X		<i>Lagenifera pumila</i>	
		X	<i>Mentha</i> spp.	
X	X	X	<i>Nertera depressa</i>	
X	X	X	<i>N. dichondraefolia</i>	
X	X	X	<i>Ourisia colensoi</i>	
		X	<i>Oxalis exilis</i>	
		X	<i>Ranunculus hirtus</i>	
X			<i>Senecio minimus</i>	
		X	<i>Taraxacum officinale</i>	dandy lion
X	X		<i>Viola filicaulis</i>	
X			<i>Wahlenbergia</i> spp.	

Grasses

		X	<i>Anthoxanthum odoratum</i>	
X	X	X	<i>Microlaena avenacea</i>	bush rice grass
X	X		<i>M. stipoides</i>	
X	X		<i>Oplismenus hirtellus</i>	
X			<i>Poa anceps</i>	
X			<i>P. colensoi</i> var. <i>breviligulata</i>	
		X	<i>Rytidosperma clavatum</i>	
X	X		<i>R. gracile</i>	
		X	<i>R. racemosa</i>	
X	X		<i>R. setifolium</i>	

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Orchids

X	X		<i>Acianthus fornicatus</i> var. <i>sinclairii</i>
X			<i>Aporostylis bifolia</i>
X		X	<i>Bulbophyllum pygmaeum</i>
X	X		<i>Caladenia carnea</i>
X	X		<i>Chiloglottis cornuta</i>
X			<i>Corybas aconitiflorus</i>
X	X		<i>C. oblongus</i>
X	X	X	<i>C. rivularis</i>
X			<i>C. trilobus</i>
X	X	X	<i>Dendrobium cunninghamii</i>
X	X	X	<i>Drymoanthus adversus</i>
X	X	X	<i>Earina autumnalis</i>
X	X	X	<i>E. mucronata</i>
		X	<i>Microtis unifolia</i>
X			<i>Prasophyllum colensoi</i>
X	X		<i>Pterostylis banksii</i>
X			<i>P. trullifolia</i>
X		X	<i>Thelymitra longifolia</i> (Cranwell and Moore 1936)
X			<i>T. venosa</i>

Other Monocots

X	X		<i>Astelia banksii</i>	
X	X		<i>A. nervosa</i>	
X		X	<i>A. solandri</i>	
X	X	X	<i>A. trinervia</i>	kauri grass
X	X		<i>Baumea rubiginosa</i>	
X	X		<i>B. teretifolia</i>	
X			<i>B. tenax</i>	
X	X	X	<i>Carex dissita</i>	
X	X		<i>C. lambertiana</i>	
X	X	X	<i>Carpha alpina</i>	
X	X	X	<i>Collospermum hastatum</i>	
X	X		<i>C. microspermum</i>	
X		X	<i>Cordyline banksii</i>	
X		X	<i>C. indivisa</i> (Moore 1973)	
X	X	X	<i>Dianella nigra</i>	blue-berry
	X	X	<i>Freycinetia baueriana</i> spp. <i>banksii</i>	kiekie
X	X	X	<i>Gahnia lacera</i>	
X	X	X	<i>G. pauciflora</i>	
X			<i>G. setifolia</i>	
X			<i>G. xanthocarpa</i>	
X			<i>Juncus ?gregiflorus</i>	
X			<i>J. novae-zelandiae</i>	
X	X		<i>J. pallidus</i>	
X	X		<i>J. pauciflorus</i>	
X	X		<i>J. planifolius</i>	
X		X	<i>Lepidosperma australe</i>	square-stemmed sedge
X	X		<i>Libertia grandiflora</i>	
X			<i>L. isioides</i>	
X	X	X	<i>L. pulchella</i>	

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X	X		<i>Luzuriaga parviflora</i>	
X	X		<i>Oreobolus pectinatus</i>	
X	X	X	<i>Phormium cookianum</i> ssp. <i>hookeri</i>	mountain flax
X	X	X	<i>Rhopalostylis sapida</i>	nikau
X	X	X	<i>Ripogonum scandens</i>	supplejack
X	X		<i>Schoenus maschalinus</i>	
X	X		<i>S. inundatus</i>	
X			<i>S. reticularis</i>	
X	X	X	<i>Uncinia banksii</i>	
X	X		<i>U. rupestris</i>	
X		X	<i>U. uncinata</i>	hookgrass
X	X	X	<i>U. zotovii</i>	

Lichens

List in Hayward et al. (1975)

Appendix 2 : Wildlife of the Moehau Ecological Area

after Anderson (1983) unless otherwise stated

Native Birds

<i>Anthornis melanura</i>	bellbird
<i>Anthus novaeseelandiae</i>	N.Z. pipit
<i>Apteryx australis</i>	N.I. brown kiwi
<i>Chalcites lucidus</i>	shining cuckoo
<i>Circus approximans</i>	harrier hawk
<i>Eudynamis taitensis</i>	long-tailed cuckoo
<i>Falco novaeseelandiae</i> (P. Novis - personal communication to Wildlife Service)	N.Z. falcon
<i>Gerygone igata</i>	grey warbler
<i>Halycon sancta</i>	kingfisher
<i>Hemiphaga novaeseelandiae</i>	N.Z. pigeon
<i>Nestor meridionalis</i>	N.I. kaka
<i>Ninox novaeseelandiae</i>	morepork
<i>Petroica macrocephala</i>	piebald tit
<i>Phalacrocorax varius</i>	piebald shag
<i>Prothemadera novaeseelandiae</i>	tui
<i>Rhipidura fuliginosa</i>	fantail
<i>Tadorna variegata</i>	paradise duck
<i>Zosterops lateralis</i>	silveryeye

Introduced Birds

<i>Carduelis carduelis</i>	goldfinch
<i>Fringilla coelebs</i>	chaffinch
<i>Lophortyx californicus</i>	Californian quail
<i>Phasianus colchicus</i>	pheasant
<i>Platycercus eximius</i>	eastern rosella
<i>Prunella modularis</i>	dunnock
<i>Turdus merula</i>	blackbird

Native Insects

<i>Dorcus auriculatus</i>	stag beetle
<i>Lissotes planus</i> (Hackwell 1980)	stag beetle
<i>L. stewarti</i> " "	stag beetle
<i>Mecoderma</i> spp. " "	carabid beetle
<i>Megodromus capito</i> " "	carabid beetle
<i>Micrachus</i> sp. " "	stick insect

Amphibians

<i>Leiopelma archeyi</i>	Archey's frog
<i>L. hochstetteri</i>	Hochstetter's frog

Reptiles*Naultinus elegans*

green arboreal gecko

Molluscs*Rhytida greenwoodi**Schizoglossa worthyae*

paua slug

(and numerous small land snails recorded  
in Goulstone 1980)

Introduced Mammals*Bos taurus**Capra hircus**Sus scrofa**Trichosurus vulpecula*

cattle

goat

pig

possum

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