ECOLOGICAL REGIONS AND DISTRICTS OF NEW ZEALAND

THIRD REVISED EDITION IN FOUR 1:500 000 MAPS

Booklet to accompany SHEET 1:
descriptions of Districts in the
northern North Island, from
Kermadec to Mayor.

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NEW ZEALAND BIOLOGICAL RESOURCES CENTRE
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Part 1

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ABSTRACT

New Zealand's 268 ecological districts in 85 ecological regions are listed and an introduction describes the concept, definitions, the districts shown on each of the four map sheets, the format and content of the prescriptions (printed on the maps), descriptions of each district and acknowledgements to the large number of contributors of scientific information. A glossary defines certain words and abbreviations used in the text and lists common plant and animal names used, together with their scientific names. Ecological descriptions of the districts shown on each map sheet are given in the booklet accompanying that sheet.

Keywords: New Zealand; maps; ecological districts; ecological regions; topography; geology; climate; soils; vegetation; flora, fauna.

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ECOLOGICAL DISTRICT DESCRIPTIONS

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LIST OF ECOLOGICAL REGIONS AND DISTRICTS OF NEW ZEALAND
AND THEIR CODE NUMBERS
DECEMBER 1986

Region	District	Code
KERMADEC	Kermadec	01.01
THREE KINGS	Three Kings	02.01
TE PAKI	Te Paki	03.01
AUPOURI	Aupouri	04.01
WESTERN NORTHLAND	Maungataniwha	05.01
	Hokianga	05.02
	Tutamoe	05.03
	Tangihua	05.04
EASTERN NORTHLAND	Eastern Northland and Islands	06.01
	Taranga	06.02
POOR KNIGHTS	Poor Knights	07.01
KAIPARA	Kaipara	08.01
AUCKLAND	Rodney	09.01
	Waitakere	09.02
	Tamaki	09.03
	Rangitoto	09.04
	Inner Gulf Islands	09.05
	Awhitu	09.06
	Manukau	09.07
	Hunua	09.08
COROMANDEL	Little Barrier	10.01
	Great Barrier	10.02
	Colville	10.03
	Mercury Islands	10.04
	Thames	10.05
	Tairua	10.06
	Waihi	10.07
	Te Aroha	10.08
	Mayor	10.09
WAIKATO	Meremere	11.01
	Hapuakohe	11.02
	Hauraki	11.03
	Hamilton	11.04
	Hinuera	11.05
	Maungatautari	11.06
	Waipa	11.07
TAINUI	Raglan	12.01
	Kawhia	12.02
	Herangi	12.03

NORTHERN VOLCANIC PLATEAU	Motiti	13.01
	Tauranga	13.02
	Otanewainuku	13.03
	Rotorua	13.04
	White Island	13.05
WHAKATANE	Te Teko	14.01
	Taneatua	14.02
	Opotiki	14.03
WESTERN VOLCANIC PLATEAU	Ranginui	15.01
	Pureora	15.02
	Tokoroa	15.03
CENTRAL VOLCANIC PLATEAU	Atiamuri	16.01
	Taupo	16.02
EASTERN VOLCANIC PLATEAU	Kaingaroa	17.01
	Whirinaki	17.02
TONGARIRO	Tongariro	18.01
RAUKUMARA	Waioeka	19.01
	Motu	19.02
EAST CAPE	Pukeamaru	20.01
	Waiapu	20.02
	Turanga	20.03
UREWERA	Waimana	21.01
	Ikawhenua	21.02
	Waikaremoana	21.03
WAIROA	Tiniroto	22.01
	Mahia	22.02
	Waihua	22.03
KING COUNTRY	Waitomo	23.01
	Taumarunui	23.02
TARANAKI	North Taranaki	24.01
	Matemateaonga	24.02
EGMONT	Egmont	25.01
MOAWHANGO	Moawhango	26.01
KAIMANAWA	Kaimanawa	27.01
RUAHINE	Ruahine	28.01
HAWKES BAY	Maungaharuru	29.01
	Heretaunga	29.02
RANGITIKEI	Rangitikei	30.01
MANAWATU	Manawatu Plains	31.01
	Foxton	31.02

MANAWATU GORGE	Manawatu Gorge North	32.01
	Manawatu Gorge South	32.02
PAHIATUA	Woodville	33.01
	Puketoi	33.02
EASTERN HAWKES BAY	Eastern Hawkes Bay	34.01
EASTERN WAIRARAPA	Eastern Wairarapa	35.01
WAIRARAPA PLAINS	Wairarapa Plains	36.01
AORANGI	Aorangi	37.01
TARARUA	Tararua	38.01
SOUNDS-WELLINGTON	Wellington	39.01
	Cook Strait	39.02
	Sounds	39.03
	D'Urville	39.04
RICHMOND	Pelorus	40.01
	Para	40.02
	Fishtail	40.03
WAIRAU	Blenheim	41.01
	Wither Hills	41.02
	Grassmere	41.03
	Flaxbourne	41.04
	Hillersden	41.05
INLAND MARLBOROUGH	Waihopai	42.01
	Medway	42.02
	Bounds	42.03
	George	42.04
MOLESWORTH	Sedgemere	43.01
	Balaclava	43.02
	Miromiro	43.03
CLARENCE	Tapuaenuku	44.01
	Dillon	44.02
	Manakau	44.03
KAIKOURA	Kekerengu	45.01
	Aniseed	45.02
	Kowhai	45.03

NORTH-WEST NELSON	West Whanganui	46.01
	Wakamarama	46.02
	Golden Bay	46.03
	Totaranui	46.04
	Heaphy	46.05
	Wangapeka	46.06
	Arthur	46.07
	Karamea	46.08
	Matiri	46.09
NELSON	Motueka	47.01
	Moutere	47.02
	Bryant	47.03
	Red Hills	47.04
NORTH WESTLAND	Ngakawau	48.01
	Foulwind	48.02
	Buller	48.03
	Reefton	48.04
	Punakaiki	48.05
	Maimai	48.06
	Totara Flat	48.07
	Blackball	48.08
	Hochstetter	48.09
	Greymouth	48.10
	Brunner	48.11
SPENSER	Rotoroa	49.01
	Travers	49.02
	Ella	49.03
	Lewis	49.04
	Hope	49.05
WHATAROA	Hokitika	50.01
	Whitcombe	50.02
	Harihari	50.03
	Wilberg	50.04
	Waiho	50.05
	Glaciers	50.06
	Karangarua	50.07
	Mahitahi	50.08
ASPIRING	Paringa	51.01
	Mataketake	51.02
	Landsborough	51.03
	Haast	51.04
	Okuru	51.05
	Arawata	51.06
	Dart	51.07
LOWRY	Hundalee	52.01
	Leslie	52.02
	Culverden	52.03
	Waiau	52.04
	Cheviot	52.05
	Motunau	52.06
	Waikari	52.07

HAWDON	Minchin	53.01
	Arthur's Pass	53.02
PUKETERAKI	Sumner	54.01
	Poulter	54.02
	Cass	54.03
	Torlesse	54.04
	Craigieburn	54.05
	Coleridge	54.06
CANTERBURY FOOTHILLS	Ashley	55.01
	Oxford	55.02
	Whitecliffs	55.03
CANTERBURY PLAINS	High Plains	56.01
	Low Plains	56.02
	Ellesmere	56.03
BANKS	Port Hills	57.01
	Herbert	57.02
	Akaroa	57.03
D'ARCHIAC	Browning	58.01
	Armoury	58.02
	Mt Cook	58.03
HERON	Mathias	59.01
	Mt Mutt	59.02
	Arrowsmith	59.03
	Hakatere	59.04
	Two Thumb	59.05
TASMAN	Godley	60.01
	Dobson	60.02
PAREORA	Orari	61.01
	Fairlie	61.02
	Geraldine	61.03
	Hunters	61.04
	Waimate	61.05
	Hakataramea	61.06
WAINONO	Makikihi	62.01
	Glenavy	62.02
	Oamaru	62.03
MACKENZIE	Tekapo	63.01
	Pukaki	63.02
	Ben Ohau	63.03
	Grampians	63.04
	Ahuriri	63.05
	Omarama	63.06
	Benmore	63.07
WAITAKI	Kirkliston	64.01
	St Mary	64.02
	Hawkdun	64.03
	St Bathans	64.04

KAKANUI	Duntroon	65.01
	Dansey	65.02
	Waianakarua	65.03
LAKES	Huxley	66.01
	Wanaka	66.02
	Richardson	66.03
	Shotover	66.04
	Remarkables	66.05
CENTRAL OTAGO	Lindis	67.01
	Pisa	67.02
	Dunstan	67.03
	Maniototo	67.04
	Old Man	67.05
	Manorburn	67.06
	Rock and Pillar	67.07
LAMMERLAW	Macraes	68.01
	Waipori	68.02
	Tapanui	68.03
	Lawrence	68.04
OTAGO COAST	Waikouaiti	69.01
	Dunedin	69.02
	Tokomairiro	69.03
	Balclutha	69.04
CATLINS	Waipahi	70.01
	Tahakopa	70.02
OLIVINE	Cascade	71.01
	Pyke	71.02
FIORD	Darran	72.01
	Doubtful	72.02
	Te Anau	72.03
	Preservation	72.04
MAVORA	Livingstone	73.01
	Eyre	73.02
	Upukerora	73.03
WAIKAIA	Nokomai	74.01
	Umbrella	74.02
GORE	Gore	75.01
SOUTHLAND HILLS	Takitimu	76.01
	Taringatura	76.02
	Hokonui	76.03
TE WAE WAE	Waitutu	77.01
	Tuatapere	77.02
	Longwood	77.03
MAKAREWA	Southland Plains	78.01
	Waituna	78.02

RAKIURA	Foveaux	79.01
	Anglem	79.02
	Freshwater	79.03
	Mt Allen	79.04
	Solanders	79.05
	Snares	79.06
CHATHAMS	Chathams	80.01
BOUNTY	Bounty	81.01
ANTIPODES	Antipodes	82.01
AUCKLAND ISLANDS	Auckland Islands	83.01
CAMPBELL	Campbell	84.01
MACQUARIE	Macquarie	85.01

INTRODUCTION

> "A sense of identity or place develops where an individual grows up within a particular province and learns to recognise its flora and fauna, to respond to its climatic regime, to become familiar with its limits. Many serious land use blunders could have been avoided if people had not tried to transplant land-use practices developed within one biotic province to the differing ecological conditions of another."
>
> Raymond Dasmann, 1976, Biogeographical Provinces, Understanding Whole Systems; the Co Evolution Quarterly.

Background

New Zealand's physical environment is extremely diverse and this diversity is reflected in the indigenous plant and animal communities (ecosystems). The concept of dividing New Zealand into a series of Ecological Regions and Districts evolved because of the need for the establishment of a representative system of reserves which would encompass this ecological diversity. One purpose of the Reserves Act 1977, is to ensure the

> "preservation of representative samples of all classes of natural ecosystems and landscapes which in the aggregate originally gave New Zealand its own recognisable character."
>
> (Section 3(1) (b))

Before this could be done a framework on which to define representativeness was necessary. In the late 1970s Mr John Nicholls, then forest ecologist with the New Zealand Forest Research Institute, Rotorua, pioneered the idea of ecological districts grouped within an ecological region. He proposed the division of a large area in North Westland (defined as the NORTH WESTLAND Ecological Region) into eleven smaller parts (Ecological Districts) as a framework for the selection of forest reserves (Ecological Areas) by the Scientific Co-ordinating Committee. Each ecological district is a unique unit with its own distinctive general pattern of ecosystems and special features. Together they form an ecological region with its own broad ecological character, differing in many ways from those of its neighbouring regions.

Definitions

Ecological District:

The definition of an ecological district depends on a thorough consideration of the topography, geology, climate, soils, vegetation and man-induced modifications of the area (Nicholls, 1979). Thus an ecological district is a local part of New Zealand where the topographical, geological, climatic, soil and biological features, including the broad cultural pattern, produce a characteristic landscape and range of biological communities (Park et al., 1983).

Ecological Region:

An aggregation of adjacent ecologicl districts with very closely related characteristics together form an ecological region. In some cases, a single very distinctive ecological district is given the status of ecological region to emphasise its uniqueness (Park et al., 1983).

The Biological Resources Centre and the Ecological Regions and Districts Project

The concept of ecological regions and districts was embraced by the New Zealand Biological Resources Centre which co-ordinated the mapping of the country into over 260 districts in 1982. Many different scientists were involved in this exercise, with DSIR Botany Division scientists, Dr Ian Atkinson and Dr Brian Molloy, overall convenors for the North and South Island respectively.

First edition maps of ecological regions and districts were produced and circulated widely, together with a publication describing the concept and calling for submissions (Simpson, 1982). Many of the suggested changes were incorporated into second edition maps which were produced as an overlay series (Biological Resources Centre, 1983). Since then further refinements have been made to the region and district boundaries, particularly as a result of surveys made under the Protected Natural Areas Programme, and these are shown in the present edition.

Other Uses of the Ecological Region and District Framework

Ecological regions and districts are refinements at a national scale of the concept of the "biogeographic province". This concept has been widely promoted by the International Union for the Conservation of Nature and Natural Resources (IUCN) as a valuble scientific tool for nature conservation planning.

The ecological regions and districts system is already in use, for example, in the Register of Protected Natural Areas (Department of Lands and Survey, 1984), and in the Protected Natural Areas Programme (under the auspices of the National Parks and Reserves Authority). However the ecological regions and districts framework has potential values which go well beyond its original purpose as a basis for designing a representative system of protected natural areas throughout New Zealand. For example the concept helps to make people aware of the natural areas that make their own district unique and can help to promote the feeling of local identity (a sense of place), the awareness of landscape and the stewardship of local and national heritage values. It can also be used in many practical ways to organise, record and retrieve biological and other resource information; to aid in land use planning; and as an educational tool.

THE MAPS

There are four maps at 1:500,000 scale. The ecological region and district boundaries have been printed on Department of Lands and Survey NZMS 242 topographic maps.

Sheet 1 — The northern North Island including ecological descriptions and prescriptions of 29 ecological districts: from Kermadec E.D. and Three Kings E.D. in the north (not shown on map) to Mayor E.D. in the south.

Sheet 2 — The central North Island including ecological descriptions and prescriptions of 55 ecological districts: from Meremere E.D. in the north to Eastern Hawkes Bay E.D. in the south.

Sheet 3 — Central New Zealand including ecological descriptions and prescriptions of 84 ecological districts: from Eastern Wairarapa E.D. in the north to Akaroa E.D. in the south; also includes Chathams E.D. (not shown on map).

Sheet 4 — The southern South Island including ecological descriptions and prescriptions of 100 ecological districts (plus parts of CANTERBURY Low Plains and High Plains): from Browning E.D. in the north to Snares E.D. in the south; also includes Bounty, Antipodes, Auckland Islands, Campbell and Macquarie E.D.'s (not shown on map).

Prescriptions

Brief prescriptions, summarising the ecological character of each of the ecological districts, are printed on the map surface of each map.

Descriptions

Ecological descriptions of each district on Sheet 1 are included in this booklet. They have been compiled giving a broad picture of the district in terms of topography, geology, climate, soils, vegetation and modifications; information about flora and fauna with special conservation or scientific value is included where this is known. Descriptions vary in length depending on the district's size and complexity and the amount of information which has been compiled. The descriptions are compiled under a series of headings as follows:

Criteria: a statement at the beginning of each description lists the criteria on which the district has been defined, in the order of importance where it is possible to determine this. Criteria consist of one or more of the features of the district which distinguish it from neighbouring districts.

GEOLOGY: the descriptions of geology were compiled using New Zealand Geological Survey (DSIR) geological maps (scale 1:250,000), and edited by regional geologists from the New Zealand Geological Survey.

CLIMATE: for most districts the climate description is based on the New Zealand Meteorological Service map "New Zealand Climate Regions (scale 1:2,000,000)"; temperatures (cool, warm etc.) generally refer to the lowlands in districts which include a wide altitudinal range. The rainfall ranges are from the New Zealand Meteorological Service "Mean Annual Rainfall (1941-70)" maps (scale 1:500,000). Other climate information was included when provided by ecologists with local knowledge.

SOILS: descriptions of soils for most districts (apart from some island districts), were written by Mr Des Cowie, formerly of the New Zealand Soil Bureau; they have been shortened for inclusion here. The descriptions deliberately avoid the use of descriptive soil names (e.g. yellow-brown earth) and instead attempt to describe the soils in ecological terms.

TOPOGRAPHY/VEGETATION: most of the information in these sections was provided by a large number of plant ecologists. In the north of the North Island the main contributors were Mr John Nicholls (formerly F.R.I., NZ Forest Service) and Dr Bruce Clarkson (DSIR Botany Division, (BD)). Dr Ian Atkinson (BD) was responsible for the south of the North Island as well as the outlying and offshore islands off the North Island. Dr Brian Molloy (BD) was responsible for the north of the South Island with other contributors including Dr Peter Williams (BD), Dr Philip Simpson (Commission for the Environment, now Department of Conservation), Dr Geoff Park (Biological Resources Centre, now DOC), and Dr Peter Wardle (BD). Dr Peter Johnson (BD) was responsible for the south of the South Island with other contributors including Dr Ralph Allen (BD), Dr Collin Meurk (BD), and Professor Alan Mark (Otago University). Other contributors include Mr Geoff Kelly (BD), Mr Hugh Wilson, Mr Chris Jenkins (NZ Forest Service), Mr Rowly Taylor (DSIR Ecology Division), Mr Henk Stengs (NZ Forest Service), Dr Colin Burrows (Canterbury University), Mr Colin Ogle (NZ Wildlife Service), Mr Willie Shaw (Forest Research Institute), Mr Mike Page (MOWD), Dr Niel Mitchell (Auckland University), Mr Geoff Rogers (Victoria University), Mr Ash Cunningham (NZ Forest Service), Mr Geoff Walls (BD), Mr Warren Burke, Dr John Wardle (FRI), Ms Cathy Brumley, Dr Kathy Dickenson, Ms Maggie Bayfield, Mrs Margaret Bulfin (BD) and Mr Pat Burstall (Wildlife Service).

MODIFICATIONS: include changes to indigenous ecosystems caused by farming, forestry, urban and other developments and by introduced plants and animals. Land uses were taken from "The New Zealand Atlas" (Government Printer, 1976) and checked by local ecologists. Introduced mammals such as rodents, rabbits, mustelids, possums, and deer are widespread and not always mentioned; their absence may be a more notable ecological feature than their presence. In some cases modifications are described together with the vegetation section.

FLORA: where contributors mentioned any special elements of the flora of a district these were included. In some cases flora is combined with the vegetation section.

FAUNA: most animal information is restricted to species considered to be important in terms of nature conservation. Information about indigenous animals has come from a wide variety of sources.

MAMMALS: only bats and marine mammals are included. The short-tailed bat belongs to an endemic family Mystacinidae, and is classified as vulnerable in "The Red Data Book of New Zealand" (Nature Conservation Council, 1981); It is mentioned where it has been positively identified in recent years. The long-tailed bat is an endemic species of a southern hemisphere family and is widespread in suitable habitats; it is only mentioned in districts where the population is isolated. Dr Mike Daniel (DSIR Ecologuy Division) provided bat information (Daniel, M.J. and Williams, G.R. 1984 "A Survey of the Distribution, Seasonal Activity and Roost Site of New Zealand Bats," New Zealand Journal of Ecology 7:9-25)
Marine mammals are mentioned if they breed in the district or are present in large numbers. Much of the information was provided by Mr Rowly Taylor (DSIR Ecology Division). Breeding localities of New Zealand fur seals were obtained from Crawley, M.C. and Wilson G.J., 1976 "The Natural History and Behaviour of the New Zealand Fur Seal (Arctocephalus forsteri)," Tuatara 22:1.29.

Introduced mammals are mentioned in the MODIFICATIONS section.

BIRDS: only certain groups of birds are mentioned, including kiwi, sea bird colonies, endemic ducks, falcon, crakes, large congregations of waders, kaka, parakeets, kea, Rock Wren, Yellowhead and Fernbird; other birds are mentioned where they occur close to the limits of their range, or show other peculiarities of distribution. Mr Sandy Bartle (National Museum) contributed much of the bird information, especially about the North Island and north of the South Island and Mr Tony Whitaker added bird information for the rest of the country. Bird distributions were obtained from the Ornithological Society of New Zealand's "Atlas of Bird Distributions in New Zealand", the "New Guide to the Birds of New Zealand" (Collins), the "Complete book of New Zealand Birds" (Readers Digest), Notornis, 1976-86 and a variety of papers and reports. Additional bird information was received from Mr Paul Sagar and Mr Wynston Cooper (both Ornithological Society of New Zealand) and Mr John Atkinson (Lands and Survey).

REPTILES AND FROGS: Mr Whitaker also provided information about indigenous reptiles and frogs. Reptiles considered to be widespread and common are only mentioned where they occur at the limits of their range, show other pecularities of distribution or are distinctive or peculiar in other ways. Information was obtained from the NZ Wildlife Service's amphibian and reptile distribution mapping scheme, a variety of papers (see Reptiles in Glossary) and some personal observations by Mr Whitaker. Dr Ben Bell (Victoria Univeristy) provided additional frog information.

FISH: information about fresh-water fish was obtained from Dr Bob McDowell (MAF, Fisheries Research Division). Only indigenous fish listed in "The Red Data Book of New Zealand" (Nature Conservation Council, 1981) are included.

INVERTEBRATES: information was compiled by Ms Jojette Drost (while employed by the National Museum) from a large number of sources; further information was added by Ms Cath Walker (NZ Wildlife Service), Mr Frank Climo (National Museum) and Mr Graeme Ramsay (DSIR Entomology Division).

Acknowledgements

The Biological Resources Centre acknowledges the help of all these contributors and also others whose names may have been omitted inadvertently. Without the assistance of so many experts the task of compiling the descriptions of the 268 Ecological Districts would have taken many years. Special thanks are due to Mrs Karen Lewis who typed most of the extensive manuscript and made the numerous corrections and alterations with unending patience.

Future Amendments

In such a large project there are certain to be errors both of omission and of fact or interpretation. If you know any corrections or additional information which could be used to improve this work, please forward them to the Biological Resources Centre for inclusion in future editions of this map series.

It is expected that further refinements to ecological region and district boundaries will be made in future, especially in the course of surveys made under the Protected Natural Areas Programme.

GLOSSARY AND EXPLANATION OF TERMS

General

Certain words have been used in the text to mean specific things:

"Original" refers to conditions prior to the arrival of Polynesian man in New Zealand; original conditions are only included when they are well known.

"Former" refers to conditions at the time of European settlement, about 1840.

"Treeline" refers to the "timberline" of other authors, indicating the upper altitudinal limit of tree growth.

"Remnant" refers to vegetation or animal populations which are diminished from their former size because of the influence of man.

"Scattered patches" refers to vegetation types which were once extensive but are now reduced to small areas because of natural change, e.g. climate change.

"Offshore islands" are within 50 km from the New Zealand mainland.

"Outlying islands" are further than 50 km from the New Zealand mainland.

"Pakihi" refers to dense low cover of sedges, umbrella fern, rushes and low growing shrubs and herbs on level water-logged country.

"Endemic" refers to plants and animals which are restricted to a certain area; in this case usually one or several Ecological Districts.

"Indigenous" means native.

"Exotic" means introduced, as opposed to indigenous, usually referring to pine plantations.

Abbreviations

a.s.l.	above sea level
E.A.	Ecological Area
E.D.	Ecological District
E.R.	Ecological Region
L.	Lake
N, S, E and W etc.	North, South, East and West etc.
p.a.	per annum
R.	River
S.F.	State Forest
Stm	Stream

Plant Names Used (in alphabetical order)

Maori or Common Name	Scientific Name
agropyron	Agropyron scabrum
akeake	Dodonea viscosa
akepiro	Olearia furfuracea
akiraho	Olearia paniculata
alpine fescue tussock	Festuca matthewsii
beech	Nothofagus spp.
black maire	Gymnelaea cunninghamii (Nestegis cunninghamii)
black beech	Northofagus solandri var. solandri
blue tussock	Poa colensoi
bog pine	Dacrydium bidwillii (Halocarpus bidwillii)
boxthorn	Lycium ferrocissimum
bracken	Pteridium esculentum
broadleaf	Griselinia littoralis
broom	Cytisus scoparius
browntop	Agrostis tenuis
bull kelp	Durvillaea antarctica
cabbage tree	Cordyline spp.
celmisias	Celmisia spp.
clover	Trifolium spp.
cocksfoot	Dactylis glomerata
composites	Family Compositae
coprosma	Coprosma spp.
corokia	Corokia spp.
crack willow	Salix fragilis
cyperus	Cyperus spp.
Douglas fir	Pseudotsuga menziesii
dracophyllum	Dracophyllum spp.
fescue tussock	Festuca novae-zelandiae
fivefinger	Pseudopanax arboreus
flax	Phormium spp.
fuchsia	Fuchsia excorticata
golden spaniard	Aciphylla aurea
gorse	Ulex europeus
Hall's totara	Podocarpus totara
hangehange	Geniostoma ligustrifolium
hard beech	Nothofagus truncata
hard tussock	Festuca novae zelandiae
hawkweed	Hieracium pilosella H.pracaltum, H.aurantiacum, H.lachenalii
hebes	Hebe spp.
heketara	Olearia rani
Himalayan honeysuckle	Leycesteria formosa
hinau	Elaeocarpus dentatus
hohere	Hoheria spp.
inaka	Dracophyllum longifolium
inanga	Dracophyllum longifolium

kahikatea	Podocarpus dacrydioides (Dacrycarpus dacrydioides)
kaikawaka	Libocedrus bidwillii
kaikomako	Pennantia corymbosa
kamahi	Weinmannia racemosa
kanuka	Leptospermum ericoides (Kunzea ericoides)
karaka	Corynocarpus laevigatus
karamu	Coprosma australis
karo	Pittosporum crassifolium
kauri	Agathis australis
karaka	Libocedrus plumosa
kawakawa	Macropiper exelsum
Kermandec pohutukawa	Metrosideros kermandecensis
kiekie	Freycinetia banksii
kohekohe	Dysoxylum spectabile
kohuhu	Pittosporum tenuifolium
koromiko	Hebe spp.
kowhai	Sophora spp.
lacebark	Hoheria populnea
lancewood	Pseudopanax crassifolius
larch	Larix decidua
leatherwood	Olearia spp.
lemonwood	Pittosporum eugenioides
mahoe	Melicytus ramiflorus
maire	Gymnelaea spp. (Nestegis spp.)
mamaku	Cyathea medullaris
mangeao	Litsea calicaris
mangroves	Avecinnia resinifera
manuka	Leptospermum scoparium
mapau	Myrsine australis
marbleleaf	Carpodetus serratus
marram	Ammophila arenaria
matagouri	Discaria toumatou
matai	Podocarpus spicatus
microlaena	Microlaena spp.
mingimingi	Coprosma propinqua
miro	Podocarpus ferrugineus
mistletoe	Family Loranthaceae
mountain beech	Nothofagus solandri var. solandri
mountain flax	Phormium cookianum
mountain lacebark	Hoheria glabrata
mountain toatoa	Phyllocladus alpinus
narrow-leaved lacebark	Hoheria angustifolia
narrow-leaved snow tussock	Chionochloa rigida
native broom	Carmichaelia spp.
ngaio	Myoporum laetum
nikau	Rhopalostylis sapida
niggerhead	Carex secta
northern rata	Metrosideros robusta
pate	Schefflera digitata
pampas grass	Cortaderia spp.
pine	Pinus spp.
pigeonwood	Hedycarya arborea
pigmy pine	Dacrydium laxifolium (Lepidothamnus laxifolius)
pingao	Desmoschoenus spiralis
pink pine	Dacrydium biforme

	(Halocarpus biformis)
praire grass	Bromus carthaticus
pohuehue	Meuhlenbeckia complexa
pohutukawa	Metrosideros excelsa
pokaka	Elaeocarpus hookerianus
ponga	Cyathea dealbata
Poor Knights ngaio	Myoporum laetum var. decumbens
pukatea	Laurelia novae-zelandiae
puriri	Vitex lucens
putaputaweta	Carpodetus serratus
quintinia	Quintinia spp.
rarekau	Coprosma australis
rata	Metrosideros spp.
raupo	Typha orientalis
red beech	Nothfagus fusca
red tussock	Chionochloa rubra
restiad	Family Restionaceae
rewarewa	Knightea excelsa
ribbonwood	Hoheria glabrata
	or Plagianthus betulinus
rimu	Dacrydium cupressinum
rush	Family Juncaceae
ryegrass	Lolium spp.
scabweed	Raoulia spp.
sedge	Family Cyperaceae
silver beech	Nothofagus menziesii
silver fern	Cyathea dealbata
silver pine	Dacrydium colensoi
	(Lagarostrobos colensoi)
silver tussock	Poa laevis
slim snow tussock	Chionochloa macra
sorrel	Rumex spp.
southern rata	Metrosideros umbrellata
snow totara	Podocarpus nivalis
snow tussock	Chionochloa spp.
spaniard	Aciphylla spp.
supplejack	Ripogonum scandens
swamp maire	Eugenia maire
	(Syzygium maire)
sweet brier	Rosa rubiginosa
sweet vernal	Anthoxanthum odoratum
tanekaha	Phyllocladus trichomanoides
taraire	Beilschmiedia tarairi
tarata	Pittosporum eugenioides
tawa	Beilschmiedia tawa
tawari	Ixerba brexioides
tauhinu	Cassinia leptophylla
taupata	Coprosma repens
tawapou	Planchonella novo-zelandica
tawaroa	Beilschmiedia tawaroa
	(ref. Wright 1984, NZ J.Bot.22(1))
thyme	Thymus spp.
titoki	Alectryon excelsus
toatoa	Phyllocladus glaucus
toetoe	Cortaderia spp.

toro	Myrsine salicina
totara	Podocarpus totara
towai	Weinmannia silvicola
tree lupin	Lupinus arboreus
tree mallow	Lavatera arboria
tutu	Coriaria spp.
umbrella fern	Gleichenia spp.
whau	Entelia arborescens
white maire	Gymnelaea lanceolata (Nestegis lanceolata)
wineberry	Aristotelia serrata
wire rush	Empodism minus
yellow silver pine	Dacrydium intermedium (Lepidothamnus intermedius)

Mammal Names Used (in alphabetical order)

Common Name	Scientific Name
bats	Chalinobus tuberculatus or Mystacina tuberculata
black rat	Rattus rattus
bush wallabies	Macropus rufogriseus
cattle	Bos taurus
cats	Felis catus
chamois	Rupicapra rupicapra
deer	Cervus spp. etc.
dolphins	Family Delphinidae
elephant seal	Mirounga leonina
fallow deer	Dama dama
ferret	Mustela putorius
fur seal	Arctocephalus forsteri
goats	Capra hircus
hares	Lepus europaeus
Hooker's sealion	Phocarctos hookeri
horses	Equus caballus
leopard seal	Hydrurga leptonyx
lesser short-tailed bat	Mystacina tuberulata tuberculata
long-tailed bat	Chalinobus tuberculatus
mice	Mus musculus
mustelids	Mustela spp.
New Zealand fur seal	Arctocephalus forsteri
Norway rat	Rattus norwegicus
pigs	Sus scrofa
Polynesian rat	Rattus exulans
possums	Trichosurus vulpecula
rabbits	Oryctolagus cuniculus
rats	Rattus spp.
red deer	Cervus elaphus
sea leopard	Hydrurga leptonyx
short-tailed bat	Mystacina tuberculata
stoats	Mustela ermina
tahr	Hemitragus jemlahicus
wallabies	Macrocopus spp.
wapiti	Cervus canadensis
whales	Cetaceans
whitetail deer	Odocoileus virginianus

Birds

Only common names have been used for birds. Scientific names can be found in the "Annotated Checklist of the Birds of New Zealand" by the Checklist Committee (F.C. Kinsky, Convenor), Ornithological Society of N Z Inc. A.H. and A.W. Reed, 1970. Capital letters are used for full common names, e.g. Red-crowned Parakeet; small letters are used for generalised common names, e.g. parakeets.
Some commonly used abbreviations are followed e.g. SIPO for South Island Pied Oystercatcher.

Reptiles

Both common and scientific names have been used in the text. Nomenclature follows several authorities:

Hardy, G.S. 1977: The New Zealand Scincidae (Reptilia:Lacertilia); a taxonomic and zoogeographic study. New Zealand Journal of Zoology 4:221-325

McCann, C. 1955: The lizards of New Zealand. Gekkonidae and Scincidae. Dominion Museum Bulletin No 17. 127p.

Robb, J. 1980: Three species of gekkonid lizards, genera Hoplodactylus Fitzinger and Heteropholis Fischer, from New Zealand. National Museum of New Zealand records 1:305-310

Robb, J.; Rowlands, R.P.V. 1977: Reinstatement of Hoplodactylus maculatus (Boulenger) with redescription of H. pacificus (Gray) (Reptilia:Squamata:Gekkonidae). Records of the Auckland Institute and Museum 14:133-142

Robb, J.; Hitchmough, R.A. 1980: Review of the genus Naultinus Gray (Reptilia:Gekkonidae). Records of the Auckland Institute and Museum 16:189-200

Thomas, B.W. 1981: Hoplodactylus rakiurae n.sp. (Reptilia:Gekkonidae) from Stewart Island, New Zealand, and comments on the taxonomic status of Heteropholis nebulosus McCann. New Zealand Journal of Zoology 8:33-47

Whitaker, A.H. 1984: Hoplodactylus kahutarae n.sp. (Reptilia:Gekkonidae) from the Seaward Kaikoura Range, Marlborough, New Zealand. New Zealand Journal of Zoology 11:259-270

Frogs

Both common and scientific names are given in the text.

Fish

Both common and scientific names are given in the text.

Invertebrates

Information about invertebrates is very varied. Mainly large conspicuous species are included; in particular large wetas, cicadas, beetles and land snails. Scientific names (where known) are given in the text.

N.B. Snails: refers to land snails only.

ECOLOGICAL DISTRICT DESCRIPTIONS

On the following pages are ecological descriptions of the 29 ecological districts from Kermadec (01.01) to Mayor (10.09)

KERMADEC ECOLOGICAL DISTRICT

Criteria: Isolation and plant endemism.

TOPOGRAPHY/GEOLOGY: young Holocene basaltic to dacitic volanic islands. Raoul Island (29^0 15' S), a steep volcanic dome with large caldera, and Curtis Islands (30^0 2' S) are active volcanoes; Macauley (30^0 14' S) is not active. The islands were never connected to mainland New Zealand.

CLIMATE: subtropical climate; rainfall approximately 1500mm p.a.

SOILS: mainly yellow-brown loams and recent soils from volcanic ash or alluvium.

VEGETATION: Kermadec pohutukawa forest on Raoul; microlaena grassland and cyperus sedgeland on Macaulay. Vegetation of both islands regenerating following goat removal.

FLORA: twenty-three taxa of endemic plants.

BIRDS: land bird fauna has lower degree of endemism than any other isolated island group in the SW Pacific - no endemic species. Sea birds: several species breed nowhere else in the N.Z. region; they occur here because of proximity to subtropical waters, e.g. Kermandec Petrel, White-naped Petrel, White-bellied Storm Petrel, White Tern, a noddy, Sooty Tern.

REPTILES: no terrestrial reptiles.

MODIFICATIONS: Raoul reached by Polynesians who did not persist. Goats formerly on Raoul and Macaulay only, now eradicated (from Macaulay in 1970). Other introduced mammals: cats (Raoul only); kiore (Raoul, Macaulay); Norway rats (Raoul only). Meteorological station and farm (c.lll ha) on Raoul. Parts of Raoul I. forests periodically modified or destroyed by volcanic eruptions.

THREE KINGS ECOLOGICAL DISTRICT 02.01

Criteria: isolation, endemism, absence of introduced mammals.

TOPOGRAPHY/GEOLOGY: steep islands of eroded basaltic and acidic volcanics and associated indurated sediments of marine origin, at 34^0 10' S, about 56km NW of Cape Reinga; not connected to New Zealand during the last glacial period.

CLIMATE: warm humid summers, mild winters; rainfall approximately 1000-1200 mm p.a.; probably drought prone; cold waters upwelling nearby.
SOILS: northern yellow-brown earths and related steepland soils.

VEGETATION: forest and scrub of kanuka, pohutukawa, Meryta sinclairii and mixed coastal hardwoods where less subject to disturbance.
FLORA: there are eleven species of endemic plants (e.g. Elingamita johnsonii).

BIRDS: fauna reflects modification. Land birds include an endemic subspecies of bellbird. Sea birds: probably the largest red-billed gull colonies in N.Z.; large gannet colonies; proximity to cold water to the W means that species not normally breeding at this latitude are common, e.g. Buller's Mollymawk; Fluttering Shearwater and Black-winged Petrel are the commonest sea birds.

REPTILES: high reptile diversity with 6 species of lizards. Endemic Three Kings skink (Leiolopisma fallai) is one of the largest N.Z. lizards. Pacific gecko (Hoplodactylus pacificus) are larger and more robust than from elsewhere in N.Z. and may be subspecifically distinct. Northern limit for Hoplodactylus pacificus, ornate skink (Cyclodina ornata), moko skink (Leiolopisma moco), N.Z. oviparous skink (L. suteri) and shore skink (L. smithi).

INSECTS: many endemic forms including five anthribid beetles: (ANTHRIBIDAE - Fauna of N.Z. No 3) all occuring from sea level to 100m: Cerius triregius on Great I.; Dsynocryptus balthasar, flightless, on leaf litter and moss on Great I.; D. gaspar, flightless, on shrubs and litter on Great I.; D. melchior n.sp., flightless, in leaf litter on Great I., and Sth West I.; Tribasileus noctivagus n.sp., flightless, on Great I. and Sth West I.

SNAILS: a high degree of endemism in the land snail fauna. Great King I. is the only habitat of Cytora hirsutissima Powell (protected under the W/L Act 1953); Placostylus hongii (also protected) occurs here (as well as coastal Northland).

MODIFICATIONS: heavily modified by Polynesian occupation in pre-European times. Goats caused extensive modification in early European time until eradicated in 1946. No introduced mammals.

TE PAKI ECOLOGICAL DISTRICT 03.01

Criteria: geology, soils, flora and fauna (endemism).

TOPOGRAPHY: isolated from mainland in past periods of higher sea level; low hilly district dissected from former peneplain, with remnant plateau surfaces; cliffed northern coastline; large estuary (Parengarenga Harbour); a number of peaty (oligotrophic to mesotrophic) swamps behind dunes and/or around upper reaches of tidal streams.

GEOLOGY: higher hill country Cretaceous basalts, flanked by Cretaceous, Oligocene and Miocene sediments; remnants of Pleistocene sands on some plateau surfaces, dune sands in the W; ultramafic, gabbroic and basaltic rocks in the NE at North Cape, with distinctive lateritic soils on them - the only laterised ultramafics in N.Z.

CLIMATE: very mild climate close to subtropical with laterisation continuing on North Cape plateau; moderate rainfall, 1500mm p.a.; seasonal droughts common.

SOILS: mainly acid and low fertility clay textured soils: on weathered greywacke strongly leached clay textured soils with impeded drainage, showing various degrees of podzolisation; on weathered andesite strongly leached brown granular clays with better drainage and compact and blocking to prismatic structured subsoils.

VEGETATION: originally extensively forested, with sub-fossil evidence of kauri in many places; today extensive scrub, regenerating forest, some forest remnants; raupo-Baumea spp. in swamps; 726 ha of mangroves in Parengarenga Harbour.

FLORA: good representation of northern N.Z. plant species, several species of subtropical affinities frequent (e.g. Cassytha, Todea barbara, Ipomoea cairica - not confined to this district); recently discovered Metrosideros bartlettii; some southern cold climate species in forest remnants (e.g. silver pine, Hall's totara, Neomyrtus pedunculata). About 12 endemic plants (mostly subspecies) associated with the ultramafics, suggesting that original vegetation of ultramafics included scrub and light forest, however degree of plant endemism markedly less than Three Kings.

BIRDS: large number of wading birds (10,000 plus), especially Arctic breeding migrants, congregate in Parengarenga Harbour immediately prior to departure for northern tundra; Golden Plover and Wrybill present; New Zealand Dotterel and Variable Oystercatchers breed on sandy coasts; Fernbirds abundant in manuka; coastal swamps support crakes and Banded Rail. District notable for absence of some fauna e.g. kokako, kiwi, kaka, native parakeets, tomtit, which all occur S of Aupouri district, i.e. endemic forest birds mostly extinct in district. Sub-fossil deposits of bird bones and land snails are thought to be very significant and require protection.

REPTILES: high reptile diversity with 9 species of lizards. Northern limit of goldstripe gecko (Hoplodactylus chrysosireticus) (on Taupiri Island), Duvaucel's gecko (H. duvauceli) (old museum specimen from Cape Maria van Dieman), common gecko (H. maculatus), Northland green gecko (Naultinus grayi) and copper skink (Cyclodina aenea).Populations of

Naultinus grayi in Spirits Bay can be separated from those further S by the colour of their mouths and may be subspecifically distinct. Mainland populations of N.Z. oviparous skink (Leiolopisma suteri) at Tapotupotu Bay and North Cape.

INSECTS: include endemic harvestman and stag beetle.

SNAILS: Parphyanta busbyi wattii Powell, found in forest remnants N of Ninety Mile Beach (protected under the W/L Act 1953); found at Pandora, Kahuronaki and Unuwhao (type locality); restricted to damper bush; not common. Several subspecies of the flax snail, Placostylus ambagiosus occur here. Liarea aupouria aupouria Powell, is found from Taputaputa across to Tom Bowling Bay and Whareau; type locality, Unuwhao; occurs on leaf litter in bush remnants; it is the largest species of its genus and is endemic to this region. Liarea aupouria tara Powell, is the small form of this snail genus, and evolved through isolation on North Cape Block; it is restricted to this area and abundant at Kerr Pt herbfield. Cytora ampla Powell, occurs from Taputaputa-Pandora-UnuwhaoHuka, in leaf litter in bush remnants; it is the largest species of the genus; more prevalent in higher, heavier bush. Cytora hispida Gardner, occurs at Taputaputa (type locality)-Pandora-Unuwhao in bush remnants and some smaller copses. Cytora tepakiensis Gardner, occurs at Taputaputa (type locality)-Pandora-Unuwhao in bush remnants and some smaller copses. Charapa (Egestula) charapiformis Gardner, occurs from Taputaputa type locality - and as above. Charapa (Egestula) pandora Gardner - as above. Flammulia tepakiensis Gardner - found on Pandora main ridge (type locality) in a small area of bush; not known from elsewhere. Allodiscus spiritus Powell - found from Taputaputa-Pandora-Unuwhao; type locality Kapu-Wairua; in bush remnants and some smaller copses. Phenacohelix thaloides (Suter), occurs from Taputaputa across to Huka; prevalent in bush and copses. Allodiscus basilirata Gardner, occurs in Taputaputa (type locality), Pandora Bush and some copses. Serpho matthewsi Suter, an arboreal snail, occurs from Taputaputa across to North Cape in bush and some copses; may occur also around Kaitaia; lives on broad-leaved trees and shrubs. Laomarex minuta Gardner, occurs from Taputaputa (type locality)-Pandora-Unuwhao in bush remnants and some copses; more prevalent in the W of the area. Rhytida duplicata Suter, occurs from Taputaputa to Whareana; relatively common in bush, copses and flax.

WORMS: include an endemic earthworm.

MODIFICATIONS: large areas modified for sheep and cattle farming and exotic forestry.

AUPOURI ECOLOGICAL DISTRICT 04.01

Criteria: geology, topography, climate.

TOPOGRAPHY/GEOLOGY: major tombolo-like isthmus (west coast characterised by longest unbroken sandy beach in New Zealand), connecting former Te Paki island and several smaller islands, e.g. Mt Camel, to the mainland; minor isthmus connecting Karikari Peninsula; latter a former small island of Cretaceous acidic and basic marine volcanics, sedimentary rocks and Miocene plutonic rocks; Aupouri isthmus mainly Holocene dune sands, shifting within historical times on the W, stable on the E, where prograded shoreline has wide sequence of parallel fore-dunes with extensive swampy depressions; minor belt of Pleistocene fixed dunes occurs in the NE; Karikari isthmus also Holocene dune sands; small areas of Cretaceous acidic and basic marine volcanics and sedimentary rocks occur at Puheke Beach, Blackney Pt, Mt Camel, Grenville Pt, along east coast S of Ngataki Stm and at Paxton Pt. Key features are dune lakes in the W and important estuaries including large area of mangroves.

CLIMATE: very mild, approaching sub-tropical; moderate rainfall, 1500mm p.a., seasonal droughts common; prevailing wind SW, occasional strong gales and heavy rains from E or NE.

SOILS: mainly from sand of varying ages ranging from unweathered unconsolidated sands bordering the west coast, with only a scattered plant cover to sand podzols with indurated iron, humus and silica pans along eastern coast; gleyed strongly leached sandy and peaty soils in depressions between dunes where water table high; poorly drained gleyed but fertile alluvial clay soils along river valleys.

VEGETATION/MODIFICATIONS: native dune vegetation is being widely replaced by pasture (for sheep and cattle grazing) on more stable areas and exotic forest (originally for sand stabilisation) on the W; rare relics of pohutukawa coastal forest remain; "sub-fossil" kauri common in large swamps, many of which have been drained for pastoral and horticultural development; second largest mangrove area in N.7,. occurs in Rangaunu Harbour (2415 ha), mangroves also in Houhora Harbour.

FLORA: rare plant species of oligotrophic to mesotrophic bogs: Lycopodium serpentinum, Utricularia delicatula, Thelypteris confluens, Cyclosorus interruptus, Cryptostylis subulatus (this species at Kaimaumau and Karikari Peninsula - the only sites in N.Z.).

BIRDS: major breeding areas for N.Z. Dotterel on coastal dunes; N.Z. Dabchick occur on dune lakes. Houhora Harbour is important for waders. Fernbird, Golden Plover, Brown Teal, Banded Rail and both crake species present. Motupia I. has breeding Black-winged Petrels. Tokerau Beach is a nationally important site for sub-fossil bird deposits.

REPTILES: robust skink (Cyclodina alani) on Motupia I. (northern limit), and on Moturoa I. off Cape Karikari (known elsewhere from only three islands to the E of the Coromandel Peninsula). N.Z. oviparous skink (Leiolopisma suteri) on Moturoa Islands. Scattered populations of Northland green gecko (Naultinus grayi) throughout.

FISH: black mudfish (Neochanna diversus) occurs at Kaimaumau, one of 2 major sites for this species in N.Z.

SNAILS: Rhytida forsythi Powell, a land snail, occurs in the Taipa estuary in this region (type locality) and also in western Northland region.

MAUNGATANIWHA ECOLOGICAL DISTRICT 05.01

Criteria: geology, topography, climate, vegetation (significant remnants of kauri forest).

TOPOGRAPHY/GEOLOGY: broken landscape dominated by Cretaceous-Eocene basic marine volcanic uplands, 500-700m a.s.l., intervening hill country up to c. 300m, of Cretaceous to Oligocene sedimentary rocks; the Puketi-Omahutu upland of Mesozoic greywacke and argillite; two long narrow harbours (Herekino and Whangape) provide limited tidal wetland habitat. Deeply weathered with narrow over-steepened valleys, often swampy valley floors; minor areas of Holocene coastal dune sands and early Pleistocene terraces along west coast.

CLIMATE: very mild, humid, with warm summers, mild winters, rainfall 15003000mm p.a.; occasional tropical storms from NE and N; also exposed to SW.

SOILS: complex pattern of soils related to parent material and vegetation: on consolidated sands podzols with iron humus and silica pans with low fertility gleyed sands, peaty soils in depressions; soils from andesitic rocks clayey textured, ranging from moderately leached where original vegetation was hardwood podocarp forest to very strongly leached soils where kauri was dominant; yellow-brown earths from sedimentary rocks show similar range and pattern, those developed under kauri show podzolisation and impeded drainage.

VEGETATION/FLORA: volcanic massifs and Puketi-Omahuta upland largely in species-rich podocarp-hardwood and kauri forests with Northland endemic plants; occasional occurrences of southern species, e.g. hard beech, silver pine; much upland kauri forest heavily logged; all virgin areas in reserves. Ahipara-Herekino sand country-gumland is important biological feature. Mnagroves occur at Whangape Harbour (303 ha) and Herekino Harbour (125 ha).

MAMMALS: only known mainland colony of the vulnerable lesser short-tailed bats occurs in Omahuta.

BIRDS: kokako occur in Puketi, Omahuta, Raetea State Forests; also present in district, parakeet, kaka, N.I. Brown Kiwi; wetlands support Banded Rail, Fernbird.

REPTILES: Northland green gecko (Naultinus grayi) in the N around Kaitaia. Northern limit of forest gecko (Hoplodactylus granulatus) in Warawara SF.

SNAILS: include kauri snail (Paryphanta busbyi busbyi); new genus of freshwater (hydrobiid) snail, Paxillostium; Cytora aranea Powell (also in Hokianga and Tutamoe Districts) in bush leaf litter; Laoma (Phrixgnathus) clathrata Gardner, in bush leaf litter; L. laierchei

Powell, Flammulia albozonata Gardner in bush leaf litter; Laoma ruporadiata Gardner in leaf litter; Rhytida forsythi Powell.

MODIFICATIONS: tertiary hill country now mosaic of farmland (sheep and cattle grazing and some dairying), forest remnants, regenerating scrub and exotic forest.

HOKIANGA ECOLOGICAL DISTRICT 05.02

Criterion: topography.

TOPOGRAPHY: a flat to rolling and locally hilly district, mostly below 300m a.s.l., between the generally higher Maungataniwha and Tutamoe districts; the harbour is a long drowned valley in contrast to the bays of EASTERN NORTHLAND); includes L. Omapere.

GEOLOGY: mostly mid to late Cretaceous concretionary micaceous sandstones and siliceous shales; small areas of Paleocene sandstone and shale, Miocene sandstone, Oligocene limestone and Pleistocene and Holocene basalts.

CLIMATE: very mild, humid, with warm summers, mild winters, rainfall about 1500mm p.a.; occasional tropical storms from NE and E, also exposed to cool winds and showers from SW.

SOILS: mainly clay-textured soils from sedimentary rocks, differences due to lithology of parent material and original vegetation: range from weakly leached and fertile soils with well structured subsoils where hardwood trees were dominant; most soils show iron, humus and silica pans where kauri was dominant, and impeded drainage; small areas of better drained weakly and moderately leached soils on weathered andesitic rocks.

VEGETATION: only small forest remnants; important species of inland forests include kahikatea, rimu, rewarewa, puriri, taraire, kohekohe and nikau and, near coast south of harbour entrance, pohutukawa, puriri, kohekohe and taraire; much secondary forest with good podocarp regeneration on low hilly country; mangroves line many harbour inlets (totalling 1899 ha).

BIRDS: harbour a major area for wetland birds, especially Banded Rail, Spotless Crake; also Marsh Crake, Fernbird, Brown Teal, bitterns in unusually high numbers for Northland; N.I. Brown Kiwi in forests.

REPTILES: the unique specimen of the skink (Leiolopisma gracilicorpus) was collected close to Hokianga.

INSECTS: weta Hemiandrus montrosus occurs near Okaihau.

SNAILS: include Cytora aranea in bush leaf litter; Laoma(Phrixgnathus) clathrata Gardner in bush leaf litter; L. laierchei Powell; Rhytida forsythi Powell.

MODIFICATIONS: much of district farmed with intensive dairying, some sheep and cattle grazing; exotic forests on sand country by harbour mouth.

TUTAMOE ECOLOGICAL DISTRICT 05.03

Criteria: topography, vegetation (largest remaining tracts of indigenous forest north of Auckland), climate, soils.

TOPOGRAPHY: highest ranges in Northland, maximum altitude Mt Misery, 776m a.s.l.; straight, relatively unbroken coastline with small sand dune complexes.

GEOLOGY: predominantly lower Miocene Waipoua basalts and sedimentary rocks in W, separated by areas of mid to late Cretaceous and lower Tertiary sedimentary rocks, from Cretaceous Tangihua basic marine volcanics in E.

CLIMATE: very mild, humid, with warm summers, mild winters, rainfall 15002400mm p.a.; occasional tropical storms from NE and E, also exposed to colder SW influence.

SOILS: mainly well structured and well drained clay soils from andesitic rocks ranging from weakly leached and fertile soils where original vegetation was hardwood forest to strongly leached and acid soils where kauri was dominant; in high rainfall areas in upland plateaux, drainage poor, soils waterlogged in winter; small areas of strongly acid, podzolised soils from sedimentary rocks occur along the W coast.

VEGETATION/FLORA: largely in indigenous forest in the W: species-rich podocarp-hardwood and kauri forest (including Waipoua forest sanctuary containing some of the largest kauri trees). Northern Northland species (e.g. Ackama); endemic species (e.g. Cotula rotundata, confined to Maunganui Bluff); rare Hebe speciosa also on Maunganui Bluff; occasional occurrences of southern species, e.g. southern rata; notable large remnants of virgin dense kauri and taraire-dominated forests; large remnants of unique high altitude rimu-towai-tawari-swamp maire-Ascarina forest on the crest of Tutamoe plateau.

BIRDS: kokako occur in Mataraua-Waipoua forests and in Tutamoe Range; also parakeet, kaka in forests; Fernbird, Banded Rail in wetlands; N.Z. Dabchick on dune lagoon. N.I. Brown Kiwi abundant in forests.

REPTILES: common green gecko (Naultinus e. elegans) present in southern part of district is near its northern limit.

FISH: include giant kokopu (Galaxias argenteus) and short jawed kokopu (G. postvectis).

SNAILS: include kauri snail, Paryphanta busbyi busbyi; Cytora aranea Powell in bush leaf litter; Laoma (Phrixgnathus) laierchei Powell; L. ruporadiata Gardner in leaf litter; L. waipoua Gardner (called 'Tane Mahuta') occurs in Waipoua Forest (type locality); Liarea turriculata Powell, also has its type locality in Waipoua Forest; Rhytida forsythi Powell.

MODIFICATIONS: established exotic forests along coast and large areas of current establishment along SE margin. Much farmland and scrub in the E.

TANGIHUA ECOLOGICAL DISTRICT 05.04

Criteria: topography, geology, land use.

TOPOGRAPHY/GEOLOGY: large, low-lying, landlocked district of complex geology: mainly patchily distributed late Cretaceous siliceous claystones, Eocene sandstones and coal measures and Oligocene crystalline limestones, surrounding small massifs of Cretaceous basic marine volcanics and intrusives (e.g. Tangihua Range to 627m a.s.l.); extensive alluvial flats with recent organic soils extend right up major rivers (e.g. Wairoa); small areas of Mesozoic Waipapa Group sandstone and argillite in fault bounded blocks in E.

CLIMATE: mild, humid, warm summers, mild winters; rainfall 1500mm p.a.; occasional tropical storms from NE to E.

SOILS: those from sedimentary rocks and andesite form complex pattern related to rock type and vegetation: moderately leached soils, formed under podocarp-hardwood forest have fair to good drainage and moderate fertility; strongly leached and podzolised soils and podzols, formed where kauri and other mor-forming trees were more dominant have poorer drainage and lower natural fertility; volcanic loam soils (red and brown) formed from basaltic scoria and ash under hardwood forest are fertile, friable and free draining; clay soils from andesite formed under podocarp-hardwood forest are slightly acid and moderately fertile.

VEGETATION/FLORA: forests extensively logged and modified, now mainly confined to certain rugged volcanic hills: species include towai, rata and rimu; former extensive lowland kahikatea forest widely cleared and swamplands drained but best remaining areas of fertile floodplain forest in North Island are along the Manganui R.-Okahu R.-Tauraroa R. area (kahikatea with matai-kowhai-ribbonwood-lacebark forests); includes northern limit of Hoheria angustifolia, outlying population, otherwise near Taihape and Wairoa; fairly frequent remnants of taraire-puriri forest and dense stands of young totara and kahikatea remain; also Leptospermum scrub.

BIRDS: include dense populations of N.I. Brown Kiwi in Leptospermum at Tangiteroria Kiwi Reserve and elsewhere; wetlands support Banded Rail; parakeet present in forests.

REPTILES: old museum specimen of Duvaucel's gecko (Hoplodactylus duvauceli) from near Maungatoroto.

FROGS: Hochstetter's frog (Leiopelma hochstetteri) present in forests.

SNAILS: include Paryphanta busbyi busbyi .

MODIFICATIONS: much of district farmed (semi-intensive sheep and cattle grazing; some intensive dairying near Hikurangi); extensive exotic forest development in W and N.

EASTERN NORTHLAND AND ISLANDS ECOLOGICAL DISTRICT 06.01

Criteria: topography (complex predominatly lowland landforms, indented coastline), geology, flora, climate. The district is floristically comparable to WESTERN NORTHLAND region but lacks the high country and associated high rainfall and upland forest types.

TOPOGRAPHY: deeply embayed coastline; numerous islands close to shore, varied landscape, mostly low hills, to 440m a.s.l., some distinctive landforms; large swamps (many drained).

GEOLOGY: finely dissected, faulted Permian-Jurassic greywacke and argillite blocks with Waipapa Group limestone in the E; upper Cretaceous to Oligocene sediments, including coal measures and crystalline limestones towards the W; acidic and basic Cretaceous volcanics with Tertiary intrusives form an upstanding block in the N at Doubtless Bay; extensive, ruggedly eroded andesites around Whangaroa and Whangarei Harbour; coastal and inland areas of lower Pleistocene Horeke basalts; upper Pleistocene to Holocene Takeke basalt sheets form low tablelands with scoria cones in Kerikeri hinterland; red weathering common.

CLIMATE: warm and humid, mild winters; rainfall 1500-2400mm p.a.; summer droughts occur; occasional tropical storms from NE and N.

SOILS: clayey textured soils from sedimentary rocks show complex pattern related to rock type and vegetation; mainly strongly leached and acid soils, developed under a mixed podocarp-hardwood forest with kauri, have impeded drainage; podzols with pale coloured subsurface horizon, iron-humus pans, and poor drainage common in central part. Moderate areas of volcanic loam soils from basalt, range from weakly leached, fertile soils from young scoria ash under hardwood forest, through moderately leached acid soils under mixed podocarp-hardwood or podocarp dominant forest to very strongly leached acid "ironstone" soils on older basalt flows under mixed kauripodocarp forest; these are friable soils but have low natural fertility, droughty in summer. Small areas of fertile but poorly drained gleyed clay soils from alluvium occur in valleys.

VEGETATION: originally mainly kauri-dominated, species-rich forest; much of it heavily exploited and burnt; large areas of towai shrubland and Leptospermum scrub; dense kauri and podocarp regeneration (totara-kahikatea-rimu) especially conspicuous between Whangarei and Bay of Islands; coastal forest remnants (puriri-pohutukawa dominant) relatively frequent; special vegetation on divergent landscape features, e.g. andesite volcanics of rugged Bream Head, Manaia, and upstanding limestone buttresses with caves beneath, e.g. Waiomio and Abbey caves. Mangroves line harbours and river estuaries (Mangonui Harbour, 158 ha; Whangaroa Harbour, 415 ha; Bay of Islands, 1050 ha; Whangaruru Harbour, 130 ha; Ngunguru Harbour, 175 ha; Horahora R., 53 ha; Pataua Estuary, 104 ha; Whangarei Harbour, 1193 ha).

FLORA: southern boundary approximates southern limit of Ackama rosaefolia and towai (in Northland); endemic Baumea complanata occurs only at Ngawha, formerly elsewhere in district e.g. Okaihau; Chionochloa bromoides on coasts; endemic Hebe.

BIRDS: not as important as western districts for estuarine birds but nevertheless extensive estuaries present at Mangonui and Whangarei Harbours (latter has between 4000 and 9000 waders); adjacent wetlands provide habitat for Fernbird and high numbers of Banded Rail; sandy beaches provide important breeding and feeding habitats for shore birds such as

N.Z. Dotterel. Relatively limited extent of remaining forest restricts some species but kaka and N.I. Brown Kiwi still present. Includes one of few remaining natural populations of Brown Teal in the Waipu R. and Helena Bay area. All islands modified, mostly burnt, most have rats, however Cavalli Islands, Stephenson I. and some islands in Bay of Islands are significant for seabirds.

REPTILES: high reptile diversity with 12 species of lizards. Duvaucel's gecko (Hoplodactylus duvauceli) present on Motukawanui and Mothuarakeke Islands in the Cavalli group, and on the Bream Islands. Southernmost record of Northland green gecko (Naultinus grayi) near Bay of Islands; northernmost record of common green gecko (N. e. elegans) just N of Whangarei. The skink Cyclodina macgregori on Motuharakeke I.in the Cavalli group (northern limit), known elsewhere only from Sail Rock (Taranga E.D.) and Mana I. (Cook Strait E.D.). Mainland populations of N.Z. oviparous skink (Leiolopisma suteri) in Taupo Bay and of moko skink (Leiolopisma moco) at Cape Brett; both L. suteri and L. moco occur on many of the islands along the E coast.

FROGS: northernmost populations of Hochstetter's frog (Leiopelma hochstetteri) occur in the ranges W of Waipu. Also known from the Brynderwyn Hills.

FISH: include black mudfish (Neochanna diversus) and short jawed kokopu (Galaxias postvectus) (near Whangarei).

INSECTS: include the weevil (a dead wood borer) Nothaldonus peacei (Brown), probably locally common in Whangarei area.

SNAILS: the flax snail, Placostylus hongii is endemic (at Bream Head, Whangaruru Head and near Russell) though also found on Poor Knights; kauri snail, Paryphanta busbyi busbyi present. Laoma (Phrixgnathus) ruporadiata Gardner occurs only in Kaeo (type locality) and some district in WESTERN NORTHLAND.

MODIFICATIONS: exotic forest area expanding; main areas of farming (dairying, sheep and cattle grazing), orchards and horticulture are the basalt terrain and fringe of Tertiary sedimentary hills in the W. Cavalli and Stephenson I. have kiore rats only (no Norway or ship rats).

TARANGA ECOLOGICAL DISTRICT 06.02

Criteria: isolation, coastal biota and communities, no introduced mammals except kiore.

TOPOGRAPHY/GEOLOGY: a group of offshore islands east of Northland. The largest, Hen Island (Taranga), is predominantly bouldery andesite conglomerate with thin lava flows. The Chickens (Marotere Is) are Mesozoic greywacke and argillite of Waipapa Group intruded by Miocene quartz diorite with sparse copper mineralisation. The group were almost certainly connected to the mainland during the last glacial period. Further east are the Mokohinau Is. which are mostly mid to late Tertiary dacite or rhyolite with a small plug of andesite on Burgess Is.

CLIMATE: oceanic climate, warm humid summers, mild winters; moderate annual rainfall (approximately 1400mm); periodic summer droughts are more acute on the Chickens Is. than on Hen I.; occasional tropical storms from the E or NE.

SOILS: from volcanic rocks are red and brown loams or brown granular clays, those from greywacke are northern yellow-brown earths.

VEGETATION/MODIFICATIONS: on Taranga and the Marotere Is. the vegetation is a varied coastal forest dominated by pohutukawa, kohekohe, karaka, taraire and tawa with areas of kanuka and rewarewa in more recently burnt areas; Meryta sinclairii present locally. Extensively modified by Maori occupation in pre-European times. There are no cats but kiore are present on all but the smallest islands.

BIRDS: the land bird fauna of Hen I. is similar to that of a large forest remnant in Northland with the exception of absence of kiwi and kokako and presence of large numbers of saddleback, bellbird and Red-crowned Parakeet (eliminated from mainland). The largest breeding population of Pycroft's Petrel is found on the Chickens Islands. Flesh-footed Shearwaters of the Chickens are believed to be the second most important population of the N.Z. subspecies.

REPTILES: high reptile diversity with the tuatara and 10 lizards. Tuataras (Sphenodon punctatus) are scarce on Hen I. but reasonably common on Marotiri, Whatupuke and Coppermine; not reported from the Mokohinau group for many years. Duvaucel's gecko (Hoplodactylus davauceli), moko skink (Leiolopisma moco) and N.Z. oviparous skink (L. suteri) present on most islands. Marbled skink (Cyclodina oliveri) on rat-free islands in the Chickens group and one islet in the Mokohinau group. The skink (Cyclodina macgregori) on Sail Rock (known elsewhere only from the Cavalli Islands Eastern Northland E.D.) and Mana I. (Cook Strait E.D.)).

INSECTS: include the stag beetle Dorcus ithaginis (Broun) known only from and probably endemic to Mokohinau Is.; possibly now extinct due to rat predation; protected by Wildlife Amendment Act, 1980.

SNAILS: an endemic punctid snail occurs on Burgess and Mokohinau Is.

POOR KNIGHTS ECOLOGICAL DISTRICT 07.01

Criteria: endemism, restricted land bird fauna, absence of introduced mammals.

TOPOGRAPHY/GEOLOGY: Eroded late Micoene rhyolitic to dacite volcanic islands off the east coast of Northland; apparently not connected to the mainland during the low sea-levels of the last Glacial.

CLIMATE: oceanic, with a much more marked subtropical influence than any other N.Z. islands except Kermandecs. Despite oceanic climate the low altitude results in irregular rainfall and periodic droughts.

SOILS: brown granular loams, often deep, unstructured and much affected in places by burrowing petrels and human cultivation.

VEGETATION: forest and scrub of kanuka, pohutukawa; Poor Knights ngaio prominent on seward slopes.

FLORA: there are several endemic or near endemic plants, e.g. Xeronema callistemon, Asplenium pauperequitum (a new fern species), Todea barbara, Hebe bollonsii, Kermadec cabbage tree, Carmichaelia williamsii. A number of plant taxa differ from mainland relatives but have yet to be described, e.g. Myrsine divaricata, Arthropodium cirrhatum.

BIRDS: very restricted land bird fauna. Only abundant land bird species are bellbird and Red-crowned Parakeet; Spotless Crake also present. Only other native passerine, the fantail (rare). Ten species of burrowing petrels breed in the group with Buller's Shearwater (only known breeding site) numerically dominant. Poor Knights are the northernmost breeding site for Fairy Prion. Gannet colonies occur on High Peak and Sugarloaf Rocks.

REPTILES: high reptile diversity with tuatara and 8 lizards. Tuatara (Sphenodon punctatus) abundant on both main islands and present on some of the smaller ones. These are the northernmost extant populations of tuataras although sub-fossil remains occur in the Far North. Northernmost populations of marbled skink (Cyclodina oliveri). Duvaucel's gecko (Hoplodactylus davauceli), moko skink (Leiolopisma moco) and N.Z. oviparous skink (L. suteri) present. Many of the lizard species show morphological differences from populations elsewhere, presumably a result of the long isolation of the Poor Knights Islands.

FISH: include short jawed kokopu (Galaxias postvectis).

INSECTS: many endemic, including Coleoptera: Coccinella leonina F. the orange spotted ladybird, not found on the mainland; a new species of giant weevil; the weevil Angotus sp., of which only one specimen has been found; Neuraphoconnus sp.nov.; the stag beetle Lissotes sp.nov.; metallic flower beetle, Dasytes sp.nov.; Holopsis sp.3; Holoparamecus sp.4, sp.8; Tarphiomimus sp.nov.; Mimopeus sp.nov., the false wireworm; Thelyphassa latiuscula; Gastrosarus sp.nov.; Tenebrosoma sp.nov.; Xylotoles laetus, the longhorn beetle; Eucolapsis sp.nov. Orthoptera: the large Poor Knights weta, Deinacrida fallai Salmon (not threatened) common but protected by the Wildlife Amendment Act, 1980; the ground wets, Hemiandrus sp.nov.aff. anomalus; the cave and rockfall dwelling weta, Gymnoplectron giganteum, the largest rhaphidophorid in N.Z.; the new species of weta, gen.aff. Talitropsis sp.nov.; another new species of weta. There are several new and undescribed species whose

distribution on the Poor Knights and in New Zealand could well be limited, e.g. Criseus sp. (Coleoptera) (several minor morphological differences can be seen on the same species on the mainland).

SNAILS: a degree of endemism in the land snail fauna; Paryphanta busbyi and Placostylus hongii present.

MODIFICATIONS: extensively modified by Maori occupation in pre-European times, particularly Aorangi. Pigs introduced to Aorangi last century, eradicated 1936 with subsequent recovery of forest and the numbers of several species of petrel. No introduced mammals.

KAIPARA ECOLOGICAL DISTRICT 08.01

Criteria: topography (harbour), geology, vegetation.

TOPOGRAPHY: encompasses Kaipara Harbour, the largest harbour in N.Z., 95,000 ha in area with 612km of shore length, and surrounding low-lying country: South and North Head consist of rolling hills to 150m a.s.l., with impounded lagoons and swampy depressions bordered on W by fixed sand dunes with coastal fringe of shifting dunes and long open sandy beaches.

GEOLOGY: includes Plio-Pleistocene dune formations and lignite beds of South and North Head; Cretaceous to Miocene sedimentaries and andesitic and basaltic volcanics of inner harbour headlands (e.g. Okahukura Peninsula), Holocene alluvial flats with recent organic soils bordering upper harbour.

CLIMATE: warm humid summers, mild winters; rainfall 1100-1500mm p.a.; occasional storms from E or NE; also exposed to SW.

SOILS: those on dunes show range of profile development with increasing age of sands and changes in vegetation from unweathered, largely bare sands with little horizon development to well developed podzols with indurated silica, humus and iron pans on oldest dunes formerly under kauri. Soils from sedimentary rocks form complex pattern related to vegetation ranging from moderately and strongly leached soils with fair to poor drainage to low fertility podzols with impeded drainage, rendzinas from lime-rich rocks; alluvial clay-textured gleyed soils in valleys, fertile but poorly drained.

VEGETATION: coastal vegetation heavily modified by Polynesian occupation; rare remnants of coastal forest and other indigenous vegetation, e.g. pockets of kahikatea swamp forest; extensive areas of mangrove swamps (5529ha; largest area of mangroves in N.Z.) and intertidal mudflats and sandflats on estuarine/harbour margins, 41,000 ha, but estuary locally modified by oyster farming; remnant kauri-podocarp-hardwood forests continue to mangroves in some places (Kaukapakapa).

BIRDS: important feeding and roosting areas for a maximum of 10,000 wading birds occur in Kaipara Harbour at Sand Island, Jordons Farm and Oyster Point. These include the 2nd or 3rd largest assemblage of Arctic breeding migrant waders (e.g. Godwits, Knots etc.) in the SW Pacific-East Australian area - the district's significance as a wintering ground for these birds goes far beyond N.Z.; the next most important group are internal migrants, e.g. SIPO, Wrybill, Pied Stilt etc.. Important breeding colonies of Caspian Terns at Muriwai Beach. Pouto Ponds and other dune lakes support scaup and major concentrations of N.Z. Dabchick; wetlands support Banded Rail, Spotless Crake, Fernbird, formerly Brown Teal. Grey-faced Petrels nest on North Kaipara Head.

REPTILES: southernmost west coast populations of shore skink (Leiolopisma smithi) at Muriwai.

FISH: include endemic Galaxias gracilis in lagoons on North Head, formerly also in L. Taharoa.

SNAILS: include kauri snail, Paryphanta busbyi busbyi.

MODIFICATIONS: extensive, expanding exotic forests in south, farming (semiintensive sheep and cattle grazing and intensive dairying on the Dargaville-Ruawai flats) and horticulture elsewhere.

RODNEY ECOLOGICAL DISTRICT 09.01

Criteria: topography (uniformity).

TOPOGRAPHY: low altitude, well dissected hill country from steep and broken to easy and rolling (maximum altitude Tamahunga, 439m a.s.l.); indented eastern coastline with sand dune strip in the NE.

GEOLOGY: lower Miocene sandstone and siltstone; Pleistocene and Holocene alluvium in valleys.

CLIMATE: warm humid summers, mild winters; high sunshine hours; rainfall 1200-1600mm p.a.; prevailing wind SW; also frequent, destructive winds from E and NE.

SOILS: those from sedimentary rocks form complex pattern related to rock type and vegetation: weakly leached, fertile soils with good drainage formed under hardwood forest; less fertile soils, strongly leached and podzolised with impeded drainage formed under podocarp-hardwood forest with kauri; friable, free-draining, fertile soils from sediments containing volcanic ash occur in the S. There are small areas of clay soils from andesite and limited areas of sandy soils and associated poorly drained peaty soils in coastal strip near Mangawhai.

VEGETATION: originally extensively forested: remnants include mixed podocarp-hardwood forest with tanekaha and localised kauri, often on ridges, largely exploited; many small areas of regenerating conifers (especially kauri, rimu, tanekaha, totara and kahikatea) amongst kanuka and manuka with tree ferns; taraire dominated remnants particularly on inland lowlands in combination with pohutukawa on the coasts, common associates include puriri, kohekohe and karaka; totara dominated remnants along rivers; kahikatea swamp forest at Omaha and kahikatea in small modified inland sites; other species include nikau, pigeon wood, kowhai, tawa, miro, northern rata, hohere, titoki, pukatea, hinau, kawakawa and hard beech; mangrove forests and saltmarsh sedgelands occur in Mahurangi Harbour and elsewhere (areas of mangroves: Mangawhai Harbour, 93 ha; Matakana R., 89 ha; Mahurangi Harbour, 444 ha; Waiwera/Puhoi Rivers, 50 ha; Weiti/Okura Rivers, 79 ha); freshwater wetlands, including dune lakes, formerly common; sand vegetation including Spinifex and pingao occur on Mangawhai Spit, Pakiri Beach and Tawharanui.

BIRDS: Mangawhai Spit important breeding area for White Fronted, Fairy and Caspian Terns, N.Z. Dotterel; Mangawhai Harbour important habitat for waders; former Fernbird swamps greatly reduced by land development; wetlands support Brown Teal, Banded Rail; parakeet and kaka occur in remnant forests though forest birds are low in numbers of species and individuals.

REPTILES: striped skink (Leiolopisma striatum) recorded near Kaipara Flats (northern limit).

FROGS: Hochstetter's frog (Leiopelma hochstetteri) occurs in the hills N and NW of Warkworth.

SNAILS: include kauri snail, Paryphanta busbyi busbyi.

MODIFICATIONS: district largely modified for farming (semi-intensive sheep and cattle grazing, intensive dairying in W and S); exotic forests on infertile broken hill country and sand dune strip. Some native frog localities e.g. near Warkworth threatened by afforestation.

WAITAKERE ECOLOGICAL DISTRICT 09.02

Criteria: topography, soils, vegetation (lacks stands of taraire, kohekohe and totara which are a feature of Rodney).

TOPOGRAPHY: distinctive upland district, mostly over 300m a.s.l.; maximum altitude 482m; western coastline straight and cliffed, three narrow bays on S coast, edging Manakau Harbour.

GEOLOGY: lower Miocene Manukau marine andesitic to basaltic breccia.

CLIMATE: warm humid summers, mild winters; rainfall 1400-2000mm p.a., somewhat wetter than rest of region, high humidity; prevailing wind SW, occasional strong gales from E and NE.

SOILS: predominently strongly leached, acid clay soils from weathered andesitic rocks; natural fertility low but good drainage and structure.

VEGETATION/FLORA: originally mostly kauri-podocarp-hardwood forest with rimu, northern rata, some totara, Hall's totara, miro, matai, tawa and, more locally, puriri and kahikatea; small stands of predominantly kauri forest survived sawmilling; now Leptospermum scrub with regenerating kauri and podocarps on burnt areas; much cutover vegetation dominated by secondary forest species. Endemic Hebe sp.

BIRDS: Tasman sea coast: important habitats for sea and shore birds, some breeding; gannets at Piha, Spotted Shags at Bethells Beach, Reef Herons etc. Whatipu sand dune and estuarine areas important for migrant and

REPTILES: there is an old museum specimen of striped skink (Leiolopisma striatum) from the Waitakere Range.

FROGS: Hochstetter's frog (Leiopelma hochstetteri) occurs in the Waitakere Range.

INSECTS: the Anthribid beetle Notochoragus fungicola (Broun) n.comb.is found only in Howick and the Waitakere Ranges from sea level to loom.

MODIFICATIONS: mixed farming, small holdings of intense orcharding and viticulture on fringes.

TAMAKI ECOLOGICAL DISTRICT 09.03

Criteria: topography, geology (volcanic terrain of late Quaternary age).

TOPOGRAPHY: comprises Takapuna, East Coast Bays, the Auckland Isthmus, and the drowned valley of Waitemata Harbour.

GEOLOGY: largely Miocene Waitemata group sandstone, siltstone and minor limestone with numerous late Quaternary basaltic scoria cones (e.g. Mt Eden, 196m a.s.l.), tuff rings and lava flows and some small areas of Pleistocene and Holocene alluvium.

CLIMATE: warm humid summers, mild winters; rainfall 1200-1400mm p.a. with winter maximum.

SOILS: mainly volcanic ash soils from sedimentary rocks containing volcanic ash (generally silty, friable, free-draining, some areas have slightly impeded drainage); also volcanic soils on basaltic volcanic cones and flows ranging from shallow and stony friable, free draining soils on recent volcanic cones to deeper and less friable soils on older flows, natural fertility high to medium; small areas of clay-textured soils from sedimentary rocks, some podzolised in the NE with compact, slow draining subsoils, low natural fertility.

VEGETATION/MODIFICATIONS: original forest the characteristic northern North Island lowland type with abundant taraire and puriri; much Polynesian clearance and landform modification; some kauri remnants (with hard beech) on North Shore. Mangroves line parts of Waitemata Harbour (951 ha) andTamaki R. (92 ha). Today the district is occupied by New Zealand's largest urban centre, Auckland city.

BIRDS: includes major wetland habitats at Tamaki Estuary and Waitemata Harbour; large areas of tidal flats, many mangroves but latter reduced from former extent.

REPTILES: mainland populations of moko skink (Leiolopisma moco) near Auckland city.

FISH: include giant kokopu (Galaxias argenteus).

RANGITOTO ECOLOGICAL DISTRICT 09.04

Criteria: geology (recent basaltic lava flow, associated cinder cone); incipient soil development, xeric edaphic conditions; vegetation (early stage of ecosystem development, many epiphytic plants grow on the ground).

TOPOGRAPHY: a gently sloping symmetrical volcanic island close to the entrance to Waitemata Harbour. 259m in altitude, it is the most recent of the group of basaltic volcanoes in the Auckland volcanic field. Believed to have begun erupting approximately 1200 AD and to have erupted spasmodically until about 200 years ago. No permanent water.

GEOLOGY: entirely basalt, comprising a wide lava apron around the remnants of its scoria cones.

CLIMATE: warm summers, mild winters; rainfall approximately 1200mm p.a.

SOILS: xeric conditions with incipient soil development on lava and young reddish-brown loams on scoria cone; some basaltic ash in crevices.

VEGETATION: ranges from lichens, mosses and liverworts to dense carpets of filmy ferns and kidney fern under well established patches of trees, usually centred on small pohutukawas. Other species within these patches include Griselinia lucida, northern rata, rewarewa, karo, mapou, hangehange, karamu and Astelia banksii. Manuka, akepiro and mapou dominate vegetation on the cone.

FLORA: pohutukawa x rata hybrids common; Psilotum nudum present.

BIRDS: numbers of species and individuals very restricted; large colony of black-backed gulls near shoreline.

REPTILES: N.Z. oviparous skink (Leiolopisma suteri) present.
MODIFICATIONS: wallabies, possums and fallow deer present; Pinus radiata has proven a problem weed. The island is managed to preserve its natural character by the Hauraki Gulf Maritime Park Board.

INNER GULF ISLANDS DISTRICT 09.05

Criteria: some large, mostly small islands; mild climate, probably warmer than mainland; many remnants of indigenous communities.

TOPOGRAPHY: a group of inshore islands in the Hauraki Gulf, sometimes steep but not elevated. The largest islands are Waiheke (9459 ha) and Ponui (1851 ha).

GEOLOGY: of several islands (e.g., Rakino, The Noises) is Jurassaic turbidite, finely bedded siltstone and sandstone, thick sandstone and indurated mudstone. Others (e.g., Waiheke, Motutapu, Motuihe, Tiritiri Matangi, Motuora, Motuketekete and Kawau) have this basement overlain by Miocene marine sedimentray rocks of the Waitemata Group. There are some Miocene andesitic volcanic rocks on Waiheke Island.

CLIMATE: warm, humid summers, mild winters, rainfall approximately 1200 mm pa with winter maximum.

SOILS: mostly northern yellow-brown earth; Motutapu has a 350mm mantle of Rangitoto sandy loam, derived from Rangitoto ash.

VEGETATION/MODIFICATIONS: originally most of the islands were clad in coastal forest, predominantly pohutukawa but with some kauri. On Waiheke hard beech, kauri, rimu, miro and tawa were common trees; on Kawau the forest was similar except that kauri and hard beech were rare and Cordyline pumilio was common. Pohutukawa occurs on most islands and on gentler slopes forms a forest with a sparse understory of Pittosporum crassifolium, Pseudopanax lessonii, Coprosma macrocarpa and Macropiper excelsum. Leptospermum forests on the larger islands probably resulted from Polynesian clearings; vegetation on most islands has been extensively modified, however mangroves occur in tidal inlets on Kawau (7 ha) and Waiheke (79 ha). Several islands are farmed; sheep and cattle grazing especially on Waiheke, Ponui, Kawau, Motuihe, Motukorea, Motutapu and Moturoa Islands; permanent and holiday settlements on Waiheke, Rakino and Kawau. Modifications include many introduced mammals on Kawau Island: eg several species of wallaby.

BIRDS etc: diverse group of islands greatly varying in importance for bird and invertebrate fauna depending on degree of modification. The most important islands for birds are The Noises, Tiritiri Matangi I., and Kawau I. The Noises are especially important for breeding sea birds (8 species) and are now rat free. The White-faced Storm Petrel population is probably the largest outside Bay of Plenty and Motunau I. Other breeding petrels include Diving and Grey-faced Petrels; altogether 52 bird species have been recorded on these small islands although many are not resident. Tiritiri is primarily important because of presence of bellbird, now eliminated from adjacent Northland mainland. Vegetation remnants now protected and recovering; only kiore present.
Kawau I. has a breeding population of kookaburra. Despite modification Pakatoa and Rotoroa Islands have significant populations of breeding sea birds. Horu Horu I. (off Waiheke I.) has a large and much studied gannet colony, as well as other sea birds. Ponui I. contains much regenerating forest including kauri with pigeon, tui, sometimes kaka, Spotless Crake and, on the coast, breeding White-fronted Tern, Caspian Tern and N.Z. Dotterel. Motuihe, Motutapu, Rakino, Motukorea Islands have little forest and are not of much importance for birds.

REPTILES: N.Z. oviparous skink (Lieolopisma suteri) present on Motutapu and Waibeke Islands. Forest gecko (Hoplodactylus granulatus) and common green gecko (Naultinus elegans) occur on Waiheke I.- one of the very few places they are known from islands. Moko skink (Leiolopisma moco) present on Saddle I. near Kawau I.

AWHITU ECOLOGICAL DISTRICT 09.06

Criteria: geology and topography (entirely lowland, coastal).

TOPOGRAPHY: low country, to 300m a.s.l., from Manukau Harbour South Head to mouth of Waikato River.

GEOLOGY: eastern interior consists of terraced Pliocene and Holocene fixed dune sand; near Waikato River Holocene fluviatile and estuarine deposits; with Holocene drifting dune sands at both N and S.

CLIMATE: warm humid summers, mild winters; rainfall approximately 1100mm p.a., maximum in winter; prevailing wind S;1.

SOILS: includes sandy soils on iron rich coastal sands; deep, friable and generally well drained volcanic ash soils on sediments containing ash on flattish terrace land; strongly leached, well structured clayey soils on hilly and rolling land from weathered andesitic and rhyolitic volcanic ash; poorly drained and gleyed loamy and sandy soils from alluvium with interlayered peat on river flats and between dunes.

VEGETATION: original forest probably mostly coastal podocarp/taraire-puriri-kohekohe with local kahikatea and totara; kauri was and is locally common; dune communities occur in the W.

BIRDS: Fernbirds and Banded Rails abundant.

SNAILS: extremely high diversity of small land snails in relict bush patches believed to represent overlap of species endemic to Northland and Waikato since Tamaki Isthmus bridged a Pliocene Strait: species reaching known southern limit here are Cytora pallida, 'Charopa' fuscosa, 'Phenacohelix' n.sp., Therasiella serrata, Laoma n.sp. aff. marine, Phrixgnathus glabriusculus, 'Phenalaoma' francesci and Egestula egesta; species reaching known northern limit here are 'Charopa' ochra, Allodiscus n. sp. aff. ranum, Geminoropa cookiana, Therasiella n.sp. aff. neozelanica, Phrixgnathus poecilosticta, P. levis, P. n. sp. 61; one species, Schizoglassa worthyae reaches its known western limit here.

MODIFICATIONS: much Polynesian clearance; most of district farmed (semiextensive sheep and cattle grazing), exotic forests in the S, steel mill at Glenbrook.

MANUKAU ECOLOGICAL DISTRICT 09.07

Criteria: geology, topography (lowland, flat to rolling).

TOPOGRAPHY: the Manukau Harbour and low altitude land running S to Waikato R.

GEOLOGY: Pliocene-Quaternary basalts in central region, fringed N and S by Pliocene to Holocene sediments; Pleistocene sediments form large area in the N, Holocene river deposits in the S.

CLIMATE: warm humid summers, mild winter;; rainfall approximately 11001300mm p.a.

SOILS: silty, generally well drained loam soils on rolling and hilly land from old, strongly weathered volcanic ashes; strongly leached and podzolised clayey soils from strongly weathered sedimentary rocks on hilly and steep slopes; poorly drained and gleyed alluvial soils and peats on river flats and swamps; small areas of volcanic loam soils from basaltic lava and scoria scattered through district.

VEGETATION/FLORA: original forest on volcanic soils was most southerly common occurrence of characteristic northern North Island lowland type with abundant taraire and puriri. Mangroves occur around Manukau Harbour (totalling 458 ha) and also in the Wairoa R. (127 ha).

BIRDS: Manukau Harbour together with Firth of Thames and Kaipara form the most important wintering grounds for wading birds in N.Z. and the SW Pacific. The number of waders in Manukau Habour both in summer and winter can reach 40,000 individuals (more than the entire number of waders that occur in the Australian states of Victoria, NSW and Queensland). The principal high tide roosts are Pollock Strip, Seagrove, Karaka shell banks, Wiroa I. (airport), Puketutu (Mangere) and Onehunga; 30 or more wetland species congregate at the Mangere Sewage Treatment Ponds. Species involved fall into several groups - migrant endemic waders, 5 species: S.I.P.O., Banded Dotterel, Wrybill, Pied Stilt, Black Stilt. Arctic breeding migrants: main species Golden Plover, curlew, Turnstone, knot, Red-necked Stint plus 24 other species. Non-migratory N.Z. waders: Variable Oystercatcher, N.Z. Dotterel, Black-fronted Dotterel.

INSECTS: the osariine beetle Paratrochus aculeatus n.sp. has been collected only from litter and humus from beneath taraire, hangehange, kohekohe and punga at Drury, Papakura, Opaheke and Ramarama (altitudinal range 20-274m).

MODIFICATIONS: district largely modified: much urban settlement (Manukau City), dairy farming, some with sheep and cattle for finishing, deer remnants of modified or regenerating forest (puriri, taraire, rimu, totara and kahikatea). The only significant area of natural landscape remaining is the Manukau Harbour itself.

HUNUA ECOLOGICAL DISTRICT 09.08

Criteria: topography, geology, soils and vegetation.

CLIMATE: warm humid summers, mild winters; rainfall 1400-2300mm p.a.

SOILS: mainly hill and steepland clayey soils with impeded drainage (some podzolised) from strongly weathered sedimentary rocks; small areas of clayey but friable, well drained loam soils on easier slopes from old, strongly weathered volcanic ash; loamy, poorly drained and gleyed alluvial soils in valleys; soils on hilly and steep slopes show complex pattern related to vegetation, podzolised soil where proportion of kauri in original forest was high.

VEGETATION: range largely covered by indigneous forest and fire induced Leptospermum and hardwood scrubland with occasionally abundant kauri and scattered podocarp regeneration; much kauri and kauri-hard beech forest on the peripheries, especially E and S, tawa-podocarp forest in centre and at higher altitudes; taraire, associated with puriri and rewarewa, common at lower altitudes in the N but becomes localised towards southern boundary; Weinmannia common in areas of kauri regeneration, rare elsewhere.

BIRDS: include a significant population of kokako; the only viable mainland bellbird population N of Lat. $55^{0}5$ other than in COROMANDEL; the only N.I. Brown Kiwi population S of Tangihua and N of Otanewainuku Districts, apart from in COROMANDEL; kaka present.

FROGS: Hochstetter's frog (Leiopelma hochstetteri) occurs in the Hunua Range.

MODIFICATIONS: Hunua forest severely damaged by goats and pigs; farms in foothills and around Cockle Bay, occasional dairying, cropping, horticulture; exotic forests in N.

LITTLE BARRIER ECOLOGICAL DISTRICT 10.01

Criteria: topography (dissected), geology (andesite volcano), vegetation (diverse), island free of introduced mammals except kiore, therefore important sanctuary for endangered birds.

TOPOGRAPHY/GEOLOGY: a very steep, deeply dissected Pleistocene andesite to dacite volcanic island, reaching 722m a.s.l.; connected to the mainland during the last glacial. The middle of the island and its eastern slopes are flows and dykes of fine grained grey hypersthene andesite while to the. north, east and west there are mainly breccias. The coastline is formed by an almost unbroken line of high cliffs, particularly along the northern and eastern coasts. A huge landslide has occurred at the north-eastern corner of the island. A boulder spit allows landings at the south-western corner.

CLIMATE: warm humid summers and mild winters; rainfall 1400mm p.a. with additional precipitation from cloud and fog-drip in the montane zone; no summer droughts.

SOILS: most widespread soils are steepland brown granular clays subject to infrequent but massive mass-movement during high intensity rainfalls. Older less fertile brown granular clays occur on the remnants of the ancient volcano surface.

VFGETATION: the vegetation forms a complete altitudinal sequence in which the major species are pohutukawa and kohekohe in the coastal zone, kauri, northern rata and tawa in the lowland zone, passing upwards into montane forest of towai, tawa, quintinia, tawari and southern rata and Dracophyllum pyramidale; black beech present.

MAMMALS: the vulnerable lesser short-tailed bat is present.
BIRDS: the land bird fauna of Little Barrier Island, unlike the reduced faunas of smaller islands such as the Poor Knights, appears to be more representative of the land bird faunas of northern N.7.. at the time of European colonisation; includes both Yellow- and Red-crowned Parakeets and abundant kaka. It contains the northernmost populations of Whitehead, Rifleman, robin and what at the present time is the only viable population
stitchbird. Saddleback have been introduced, following their disappearance from the island last century. N.T. Brown Kiwi, Kakapo and N.I. Kokako have all been introduced.
The most important sea bird populations present are Black Petrel and Cook's Petrel.

REPTILES: Tuatara (Spenodon puctatus) are very rare and perhaps extinct. One of only two sites where marbled skink (Cyclodina oliveri) occurs in presence of kiore (other is Great Barrier). Moko skink (Leiolopisma moco) present; Duvaucel's gecko (Hoplodactylus duvaciceli), forest gecko (H. granulatus) and common green gecko (Naultinus elegans) have been reported.

FISH: include the giant kokopu (Galaxias argenteus).

INSECTS: include the giant weta Deinacrida heteracantha White (population 3000); apparently extinct on the mainland.

OTHER INVERTEBRATES: endemic invertebrates include 2 species of earthworm Spenceriella gigantea and S. shakespeari as well as the harvestman Rakaia dorothea insula.

MODIFICATIONS: with the exception of Raoul I., Little Barrier supports the largest area of N.Z. forest free from browsing mammals. The lower third of the island was extensively modified during Polynesian occupation and subsequently by European fires. It is now covered by a variety of secondary forest communities in which kanuka and kauri are the most important species. Cats were eliminated in 1980. Kiore are present but neither ship nor Norway rats have established.

GREAT BARRIER ECOLOGICAL DISTRICT 10.02

Criteria: topography (large offshore island), geology (diverse rock types), vegetation (diverse), flora and fauna (endangered plants and animals), free of possums, mustelids and Norway rat.

TOPOGRAPHY/GEOLOGY: approximately 28,500 ha island of andesites, dacites and rhyolites with Jurassic greywacke and argillite in the N, intruded by an andesite dike swarm. Indented coastlines, long sandy beaches on the E, tidal mudflats (with mangroves) on the W and peaty swamps. Maximum altitude 621m a.s.l.

CLIMATE: warm humid summers, mild winters, rainfall 1600-2400mm p.a.

SOILS: mostly red and brown loams and brown granular clays; yellow-brown earths in the north.

VEGETATION/MODIFICATIONS: most of the vegetation modified by logging, sylvicultural management, fires, feral goats and pigs; excellent regeneration of kauri and other species in some areas. Over half the island is in Leptospermum and Kunzea ranging from low manuka to tall kanuka; some grassland; forests are mixed hardwood with relatively few podocarps. Kauri generally confined to regenerating stands in the central area, with isolated pockets in Northern Bush containing large kauri and associated species. Beech species absent (cf Little Barrier). There are no possums, mustelids or Norway rat on the island; only kiore, ship rat and mice.

FLORA: two endemic plant species are confined to low vegetated areas near the centre of the island: Olearia allomii and Leptospermum sinclairii. Several rare plant species including Fuchsia procumbens and Ophioglossum petiolatum.

BIRDS: depleted bird fauna resulting from many extinctions including Stitchbird, bellbird, robin, Whitehead, Pied Tit, Rifleman, N.I. Saddleback, N.7.. Quail and N.Z. Shore Plover; Kiwis absent; island supports world's largest population of Brown Teal, the only remaining substantial population; Fernbird and kaka common; Red-crowned Parakeet occur naturally; largest known population of Black Petrel; Cook's Petrel present.

REPTILES: high reptile diversity with 13 species of lizards. Endemic Great Barrier or chevron skink (Leiolopisma homalonotum) very rare, known from forest streams throughout the island. Only island population of striped skink (Leiolopisma striatum) (in forest at northern end) which is the northernmost record for this rare species. Uncommon species also present are Duvaucel's gecko (Hoplodactylus duvauceli), N.Z. oviparous skink (Leiolopisma suteri), moko skink (L. moco) and marbled skink (Cyclodina oliveri). Forest gecko (Hoplodactylus granulatus) and common green gecko (Naultinus elegans) occur here as one of the very few island populations of either species.

FISH: include the giant kokopu (Galaxias argenteus).

INVERTEBRATES: include the land snail Rhytida greenwoodi and the 'paua slug' Shizoglossa novae-zelandiae.

FROGS: good populations of Hochstetter's frog (Leiopelma hochstetteri) occur in most of the streams in the large area of forest N of Okiwi.

COLVILLE ECOLOGICAL DISTRICT 10.03

Criteria: partial isolation, topography, climate.

TOPOGRAPHY: mainly broken, steep fault block country with both cuspate and drowned deeply embayed coastlines; mostly less than 600m a.s.l.; maximum altitude Mt Moehau, 892m.

GEOLOGY: largely Miocene, andesitic to dacitic volcanic rocks of Coromandel Group, overlying Jurassic siltstone, sandstone and conglomerate; intruded by quartz diorite pluton on Moehau Range; also minor basalt and Oligocene and Miocene sediments.

CLIMATE: mild, moist oceanic; rainfall 1250-2500mm p.a.; summer droughts.

SOILS: includes large areas of steepland clayey soils from andesite and sandstone etc., with associated hill soils: steepland soils tend to be shallow to moderately deep over weathered rock, mostly in forest or scrub; soils on hill slopes are deeper but strongly leached and acid; small areas of imperfectly to poorly drained gleyed, but fertile alluvial soils in valleys.

VEGETATION/MODIFICATIONS: higher parts of district remain in indigenous forest: mostly association of kauri, podocarps and hardwoods, including towai; forest below 300m typical of northern North Island with taraire and puriri throughout; hard beech and kauri occur locally; modified but strongly regenerating coastal forest occurs on margins of some eastern bays with pohutukawa on the coast and spreading well inland; many forests greatly modified by kauri logging, burning and gold mining though largest remnants not greatly affected; the most exploited areas now extensive scrub, with regenerating forest species. Mangroves occur around Whangapoua Harbour (161 ha) and elsewhere. Much of lower altitude area farmed (semiextensive sheep and cattle), exotic forestry in the S and E.

FLORA: exposed summit of Moehau is northern limit of several southern species, e.g. Phyllocladus alpinus and kaikawaka.

BIRDS: most N.Z. forest birds present including kokako (status uncertain), kaka, N.I. Brown Kiwi; northernmost resident N.Z. Falcon and northern mainland limit of rifleman and bellbird (numbers of latter increasing in recent years); parakeets absent. Breeding shore birds (e.g. Whangaparoa Spit) include N.7_. Dotterel at Colville Harbour, Port Charles, Waikawau Bay, Kennedy's Bay, Whangapoua, and Mercury Bay; Banded Rail occur around most of the harbours; gannet and Grey-faced Petrel breed on islands off west coast.

REPTILES: mainland populations of N.Z. oviparous skink (Leiolopisma suteri) at Port Jackson and Cape Colville.

FROGS: Hochstetter's frog (Leiopelma hochstetteri) occurs throughout the district. Archey's frog (L. archeyi) is known from most of the higher ridges, especially the Moehau Range, and is found only here and in Thames and Waihi E.Ds.

FISH: include giant kokopu (Galaxias argenteus).

INSECTS: endemic stag beetle, Dorcus auriculatus; 2 species of cicada, Maoripsalta iolanthe and Kikihia laneorum have northernmost records here.

MERCURY ISLANDS ECOLOGICAL DISTRICT 10.04

Criteria: islands of variable size and degree of modification by fire and introduced mammals; several small islands free of all introduced mammals.

TOPOGRAPHY: three groups of small islands off the east coast of the Coromandel Peninsula; the largest, Great Mercury reaches nearly 300m a.s.l., (Mt Mohi).

GEOLOGY: except for Cuvier, most are eroded islands of late Miocene to Pliocene igneous rocks. Cuvier Island is Mesozoic sandstone/argillite intruded by lower Miocene diorite to grancdiorite plugs. Red Mercury and the other smaller islands are basaltic with minor pumice rocks. There is minor basalt on Great Mercury but mostly andesite in the north, pumiceous rocks in the centre and rhyolite in the south. Ohena, Little Ohena, Castle Rock and the Alderman islands are all rhyolite islands. All islands were probably connected to the mainland during the last Glacial.

CLIMATE: warm, humid summers, mild winters; rainfall approx. 1500mm p.a.

SOILS: strongly leached yellow-brown earths, brown granular clays, red and brown loams.

VEGETATION/MODIFICATIONS: all but the smallest were extensively modified in pre-European times by Polynesian occupation and subsequently by early European fires; vegetation is dominated by pohutukawa except on Great Mercury I. where there are large areas of pasture, manuka (gumland) scrub and much smaller areas of swamp, dune and lavafield communities. Most islands apart from the larger islands of the Alderman group have kiore; Great Mercury I. also has goats, sheep, cattle, cats and ship rats. Cuvier I. is the site of a major effort in biological restoration.

BIRDS: include many species of burrowing petrel including Pycroft's Petrel (vulnerable) which breeds on Red Mercury and Stanley Islands; saddleback introduced to Red Mercury in 1972, introduced and established on Cuvier I.; Red-crowned Parakeet abundant on forested islands, re-introduced to Cuvier I.

REPTILES: high reptile diversity with tuatara and 10 lizards. Tuatara (Sphenodon punctatus) are rare on Cuvier and Red Mercury Islands, but abundant on Middle and Green Islands in the Mercury group, and on all the Alderman Islands except Middle Chain. Robust skink (Cyclodina alani)on Middle and Green Islands in the Mercury group is known elsewhere only from Motupia I. and Moturoa I. (Aupouri E.D.) and Castle Rock (Tairua E.D.). The skink Cyclodina whitakeri on Middle I. is known elsewhere only from Castle Rock (Tairua E.D.) and Pukerua Bay (Cook Strait E.D.). Marbled skink (Cyclodina oliveri) present in the Mercury, Ohena and Alderman island groups, the Aldermans being the southern-most limit. Also present are Duvaucel's gecko (Hoplodactylus duvauceli), N.Z. oviparous skink (Leiolopisma suteri) and moko skink (L. moco). Southern-most limit for L. suteri is the Alderman Islands

INSECTS: a large unique "horned" weta (unnamed new genus) occurs only on rat free Middle Mercury I.; few tree wetas (Hemideina sp.) or ground wetas (Stenopelmatidae) elsewhere except on rat-free islands (e.g. Green I.); numerous cave wetas (Rhaphidophoridae).

THAMES ECOLOGICAL DISTRICT 10.05

Criteria: topography, geology.

TOPOGRAPHY: steep hill country, continuation of Coromandel Range; generally higher than Colville district but mostly below 800m a.s.l.; well defined major deep valleys, semi-plateau interfluves and a high mesa; steep coastline (line of major fault); drained mostly to W via Kauaeranga, Tapu and other rivers, also to NE via Waiwawa R.

GEOLOGY: consists of older and younger unconformably separate andesites and dacites, resting on Jurassic siltstone/argillite at Tararu and unconformably covered by pumiceous and rhyclitic rocks of Whitianga Group; these in turn overlain and intruded by andesites of Table Mt, Hihi and Kaitarakihi.

CLIMATE: warm humid summers, mild winters; rainfall 1250-2800mm p.a., fairly evenly spread but area prone to periods of torrential rain and flooding; frequent summer droughts.

SOILS: dominantly moderately and strongly leached clayey steepland soils from andesitic rocks, generally shallow with low natural fertility, largely in forest or scrub.

VEGETATION/MODIFICATION: much of district forested with kauri below 300m a.s.l., associated with podocarps and hardwoods (including towai); above 300m major non-kauri areas with kaikawaka on highest points. Kauri logged extensively until 1930s; only very minor virgin areas remain, but kauri regeneration common and locally abundant in fire induced secondary forest. Much forest destroyed by mining last century, especially north of Thames, resulting in large scrub areas on western steep country fringe.

BIRDS: kaka and kokako present, though rare; Whitehead on Kaitarakihi and probably N to Table Mt (northern limit on mainland); Rifleman, N.Z. Falcon present.

REPTILES: there is an old museum specimen of Duvaucel's gecko (Hoplodactylus duvauceli) from the Thames district.

FROGS: Hochstetter's frog (Leiopelma hochstetteri) occurs throughout the district. Archey's frog (L. archeyi) occurs on the top of the Coromandel Range near the Coroglen-Tapu saddle (L. archeyi is known only from here, Colville and Waihi E.Ds.)

TAIRUA ECOLOGICAL DISTRICT 10.06

Criteria: geology, topography, vegetation.

TOPOGRAPHY: relatively wide lower valleys, rolling to hilly land on E; very steep-sided but wide-topped interior ridges to about 850m a.s.l., some with outcropping dykes; several islands off the east coast.

GEOLOGY: mainly upper Miocene rhyolite domes and flows associated with extensive pumiceous ignimbrite flow sheets; andesites only prominent in NE and S; young andesite forms the Wharekawa Plateau; some ancient hot spring deposits of silica and clay.

CLIMATF: warm dry summers, autumn floods, mild winters; rainfall 15002800mm p.a.

SOILS: mainly strongly leached and podzolised clayey hill and steepland soils from deeply weathered rhyolite and andesite; more podzolised soils where kauri was extensive in original forest; on easier slopes volcanic ash loam and pumice soils from sandy brown ashes.

VEGETATION: indigenous forest only remains on western margin, notable for extensive sub-montane kauri forest from 600-800mm a.s.l. with abundant yellow-silver pine and southern rata, but no kaikawaka; taraire rare, confined to very low altitude remnants. Kauri logged extensively early this century and former near complete forest cover east of present tract destroyed by fire; kauri regeneration is occurring in Leptospermum scrub; Pomaderris rugosa common in scrub, including regeneration after pine forest clearing; hard beech formerly occurred, mostly below 600m. Mangroves occur around Whitianga Harbour (445 ha).

BIRDS: include kaka (rare), N.I. Brown Kiwi, bellbird; swamps mostly coastal, support healthy Fernbird populations, also Banded Rails; Variable Oystercatcher and N.Z. Dotterel nest on sandspits (declining with increase in beach subdivisions); Opouteri is a small sandy estuary valuable for waders.

REPTILES: tuatara (Sphenodon punctatus) were abundant on Whenuakura I. until 1984 when Norway rats colonised the island; they are now probably extinct. Robust skink (Cyclodina alani) (known elsewhere only from the Mercury group in Mercury Islands E.D., and Motupia I. and Moturoa I. in Aupouri F.D.) and the skink Cyclodina whitakeri (known elsewhere only from the Mercury group and Pukerua Bay in Cook Strait E.D.) are present on Castle Rock. Duvaucel's gecko (Hoplodactylus duvauceli) on Rabbit and Penguin Islands in the Slipper group.

FROGS: Hochstetter's frog (Leiopelma hochstetteri) occurs along the Coromandel Range.

FISH: include giant kokopu (Galaxias argenteus).

MODIFICATIONS: exotic forests widely established in E; lowland around Whitianga Harbour farmed (intensive dairying, some with cattle and sheep). Shoe, Slipper, Penguin, Rabbit and Watchman Islands are all modified and of limited wildlife value.

WAIHI ECOLOGICAL DISTRICT 10.07

Criteria: geology, topography, vegetation.

TOPOGRAPHY: mainly hilly to steep country of moderate altitude reaching approximately 750m a.s.l.; drained to the W via Ohinemuri-Waihou, and directly to the coast in E.

GEOLOGY: mainly Miocene and younger andesites in central area, surrounded by significant areas of upper Tertiary rhyolite and ignimbrite sheet remnants; some of the southern ignimbrites are dacite and intruded by large areas of Pliocene andesite forming the Waitawheta Plateau; late Tertiary and Quaternary ash deposits cover district, especially deep in the Waihi basin and plain; coastal sand terraces prominent S of Waihi beach.

CLIMATE: warm, moist summers, mild winters, rainfall 1400-2800mm p.a.

SOILS: in the W mainly steepland clayey soils from andesite, strongly leached and acid, moderately deep over weathered rock; in the E on terrace and rolling land volcanic ash loam soils dominate, moderately to strongly leached but deep, friable and well drained soils, moderately fertile.

VEGETATION/FLORA: much of hill country covered by indigenous podocarphardwood forest, with tawa and scrub: Leptospermum-rewarewa dominated scrub on eastern foothills; regenerating kauri and hard beech towards forest edge. Former kauri concentrations W of divide widely logged, but there are local remnants and areas of regeneration, mostly restricted to peripheral broken country below 300m a.s.l. Towai occurs, kamahi comes in towards the S.

BIRDS: include Blue Duck, kokako and N.Z. Falcon; N.Z. Dotterel (on coast).

FROGS: Hochstetter's frog (Leiopelma hochstetteri) occurs at the southern end of the Coromandel Range E of Paeroa. Recent discovery of Archey's frog (L. archeyi) in this district.

FISH: include giant kokopu (Galaxias argenteus), short jawed kokopu (G. postvectis), and black mudfish (Neochanna diversus).

MODIFICATIONS: much of Waihi basin farmed (mostly semi-extensive sheep and cattle, some intensive dairying); some exotic forests in the SE; gold mining occurs mainly round Waihi.

TE AROHA ECOLOGICAL DISTRICT 10.08

Criteria: topography and vegetation.

TOPOGRAPHY: southernmost sector of Coromandel Range; highest point Mount Te Aroha (952m a.s.l.); very varied terrain.

GEOLOGY: includes Mid Miocene and Pliocene andesite lavas, breccias, dacite lavas and ignimbrites and Pliocene rhyolite domes and flows; mantle of Quaternary rhyolitic and dacitic ash.

CLIMATE: warm humid summers, mild winters; rainfall 1600-2800mm p.a. with winter maximum; prevailing wind SW but occasional strong gales and heavy rains from E and NE; occasional winter snowfalls above 600m.

SOILS: steepland clayey soils from andesite along western border, strongly leached and acid, largely in forest; silty and sandy volcanic ash soils from weathered brown ashes occur on flat, rolling and hilly lands, deep, friable and well drained with moderate natural fertility.

VEGETATION/FLORA: intricate complex of podocarp-hardwood forest types plus the most southern extensive kauri stands (occurring up to 600m a.s.l.), red and silver beech forest (the most northern mainland occurrence of this type), Kaikawaka-Dacrydium forests on highest ridges; most extensive kauri-hard beech forest occurs in NE quarter; some with yellow-silver pine (a unique association); some kauri-silver beech forest; hard and silver beech forest with and without kauri at Ngatukituki forest sanctuary; rimurata/tawa forest at lower altitudes. Kamahi becomes predominant in place of towai; many other overlappings of northern and southern floristic elements occur; district marks beginning of gap across volcanic plateau in distribution of certain species, e.g. kaikawaka, yellow-silver pine.

BIRDS: include Blue Duck and kokako.

FROGS: Hochstetter's frog (Leiopelma hochstetteri) present.

MODIFICATIONS: includes some forest destruction.

MAYOR ECOLOGICAL DISTRICT 10.09

Criteria: isolation and unique geology.

TOPOGRAPHY/GEOLOGY: a Pleistocene composite rhyolitic volcanic island of unique sodium-rich composition with large caldera, tholoid lava flows and two crater lakes; fine obsidian; connected to the mainland during the last Glacial.

CLIMATE: oceanic climate; warm humid summers, mild winters.

SOILS: yellow-brown loams and brown granular loams.

VEGETATION/MODIFICATIONS: extensively modified by Polynesian occupation during pre-European times. Vegetation dominated largely by pohutukawa, kanuka and rewarewa. Freshwater lake communities of particular interest. Pigs, cats, kiore and Norway rats present.

FLORA: Hibiscus trinonum present.

BIRDS: include high populations of bellbirds; kaka present in good numbers; Australian Bittern and NZ Scaup present.

REPTILES: moko skink (Leiolopisma moco) present.

MAP APPENDIX

01 KERMADEC

01.01 Kermadec

Young basaltic and dacitic volcanic islands at approx. 30°S, two (Raoul and Curtis Islands) remain active; subtropical oceanic climate; yellow-brown loams and recent ash soils; Kermadec pohutukawa forest on Raoul, grassland and sedgeland on Macaulay; goats now eradicated, vegetation recovering, farm and met. station on Raoul I.

02 THREE KINGS

02.01 Three Kings

Steep islands of eroded basaltic and acidic volcanics and indurated sediments about 56km NW of Cape Reinga, not connected to mainland during last glaciation; warm summers, mild winters, yellow-brown earths and steepland soils; forest and scrub; endemic plants and invertebrates; modified by Polynesian occupation and later by goats, latter eradicated 1946; now no introduced mammals.

03 TE PAKI

03.01 Te Paki

Low hilly farmer island, remnant plateau surfaces; endemics; includes ultramafic, gabbroic and basaltic rocks in NE; mainly acid; low fertility, clay textured soils; near subtropical climate; formerly forested, extensive scrub, regenerating forest, some forest remnants; large areas farmed and in exotic forest.

04 AUPOURI

04.01 Aupouri

A major and a minor isthmus; mainly dune sands, stable on E: parallel dunes, swampy depressions; small areas marine volcanics and sedimentary rocks; in W longest sandy beach in NZ; soils mainly sandy showing increasing profile development with age of sands; near subtropical climate; exotic forest and pasture replacing dune vegetation; mangroves Rangaunu Harbour; floristically rich forest remnants and scrub at N end.

05 WESTERN NORTHLAND

05.01 Maungataniwha

Broken landscape: basic volcanic uplands (to 700m a.s.l.) dominate; sedimentary hill country (to 300m), greywacke Puketi-Omahuta upland in SE; mild with rainfall to 3000mm on highest ground; complex pattern of soils related to parent material and vegetation; widely logged forest on uplands; hill country mosaic of farms, forest remnants, regenerating scrub, exotic forests.

05.02 Hokianga

Flat to rolling, locally hilly district with long drowned valley harbour; mostly sedimentary rocks; very mild with about 1500 mm rainfall p.a.; soils mainly clay textured, from sedimentary rocks,

differences due to lithology and vegetation; largely farmed, exotic forests on sand at harbour mouth, small forest remnants and secondary forest inland; mangroves line harbour inlets.

05.03 Tutamoe

Highest ranges in Northland (max. 776m a.s.l. and Tutamoe plateau; basic volcanics, sedimentaries; wet, mild climate (1500-2430mm rainfall p.a.); soils mainly well structured, well drained clays; largest remaining tract of indigenous forest north of Auckland.

05.04 Tangihua

Large low-lying land-locked district of complex geology, mostly sedimentary rocks, marine volcanics; extensive alluvial flats; mild, humid; mainly moderately leached to podzolised clay textured soils, small areas of volcanic soils original forests largely cleared and swamplands drained for farms; exotic forests in W and N; fairly frequent forest remnants, patches of secondary forest.

06 EASTERN NORTHLAND

06.01 Eastern Northland and Islands

Large, complex district: predominantly hilly, low relief, deeply embayed coastline, numerous small islands; complex geology; mainly clay textured soils from sedimentary rocks, moderate areas of voIcanic soils, poorly drained alluvial soils in valleys; very warm, humid; much original kauri dominated forest logged, burnt; large as shrubland, scrub, kauri and podocarp regeneration; coastal forest remnants; exotic forests; farms, orchards, horticulture near Kerikeri and in W.

06.02 Taranga

Group of offshore islands probably connected to mainland during last glaciation; largest, Hen I., mainly andesite conglomerate and thin lava flows, the Chicken Islands mainly greywacke and argillite, Mokohinau Islands mainly dacite or rhyolite, some andesite, oceanic climate; loams, clays and yellow-brown earth soils; on larger islands varied coastal forest; much Polynesian modification; some endemic animals; important sea bird colonies.

07 POOR KNLGHTS

07.01 Poor Knights

Eroded rhyolitic to dacite volcanic islands apparently not connected to mainland during last glaciation; oceanic climate with marked subtropical influence; deep loam soils; rest and scrub mostly kanuka, pohutukawa; some endemic plants and animals; much Polynesian and early European modification, pigs formerly present; now no introduced mammal, forests and petrel populations recovering.

08 KAIPARA

08.01 Kaipara

Kaipara Harbour, surrounding lowland; sand dunes, at South and North Head; alluvial flats border upper harbour, separated by headlands of sedimentary and volcanic rocks; warm, humid; includes sandy soils on dunes, weakly leached to podzolised clay textured soils, rendzinas and alluvial soils in valleys; originally forested: Polynesian modification; forest remnants; mangroves in some tidal inlets; exotic forests, farms. Numerous wading birds.

09 AUCKLAND

09.01 Rodney

Low bill country mostly below 300m a.s.l., eastern coastline with dunes, peninsulas, headlands; sandstones, mudstones; warm, humid; dominantly clay textured soils from sedimentary rocks, small areas of volcanic ash soils; originally forested, now modified: farms, exotic forests; forest remnants, scrub, sandfield vegetation, mangroves, saltmarsh, freshwater wetlands.

09.02 Waitakere

Upland district reaching 482m a.s.l.; andesitic to basaltic breccia Waitakere Range; warm, wetter than lower districts; predominantly strongly leached, acid clay soils; original forest widely logged, marginal *Leptospermum* scrub with regenerating kauri and podocarps; farms, orchards and vineyards on fringes

09.03 Tamaki

Low hills, isthmus, harbours, Quaternary basaltic cones, lava flows, some sandstone; warm, humid; soils from sedimentary rocks containing volcanic ash, basic volcanic soils, small areas of clay textured soils in NE; originally forested; near total Polynesian clearance; mangroves; some kauri remnants on North Shore; Auckland and surrounding cities.

09.04 Rangitoto

Gently sloping, young symmetrical basalt volcanic island reaching 259m a.s.l., last erupted about 200 years ago; warm summers, mild winters; xeric substrate incipient and young soils, basaltic ash; early stage of ecosystem development, lichens, bryophytes, ferns, patches of trees, especially pohutukawa, manuka on cone.

09.05 Inner Gulf Islands

Group of onshore islands, some steep but not elevated, largest Waiheke (9459 ha); geology varied, mainly sedimentary; warm, humid; mainly clay textured soils, sandy loam on Motutapu; originally islands in coastal forest, Polynesian and subsequent modification, some forest mangroves; some islands farmed.

09.06 Awhitu

Low country from South Head Manukau Harbour to Waikato R. mouth, terraced fluviatile and coastal sediments, fixed dune sand on W; drifting dune sands N and S; warm, humid; sandy soils on coastal sands, basic volcanic ash soils, poorly drained loamy, sandy soils with peat; original coastal forest mostly cleared by Polynesians, dune vegetation on W; mostly farmed, exotic forest in S.

09.07 Manukau

Low country from Manukau Harbour to Waikato R.; central basalt fringed by sedimentary rocks N and S; warm, humid; wide range of soils; originally forested; largely cleared; urban settlement, farms, orchards, market gardens; remnants of modified or secondary forest; Manukau city.

09.08 Hunua

Hill country reaching 688m a.s.l.; sandstone and siltstone Hunua Range; warm, wetter than lower districts; mainly hill and steepland clayey soils with impeded drainage; largely forested, kauri and beech; *Leptospermum* and other scrub with abundant kauri and podocarp regeneration; farms in foothills, exotic forest in N.

10 COROMANDEL

10.01 Little Barrier

Very steep, dissected andesite to dacite volcanic offshore island reaching 722m a.s.l., connected to mainland during last glaciation; warm, humid summers, mild winters; mainly brown granular clay soils, subject to occasional mass movement; altitudinal sequence of forest types; lower third of island extensively modified by Polynesian occupation, European fires, now in secondary forest; important sanctuary for endangered birds as kiore only introduced mammal present; some endemic invertebrates.

10.02 Great Barrier

Large offshore island (c. 28,500 ha), reaching 621m a.s.l.; andersite, dacite and rhyolite, greywacke and argillite in the N; warm, humid summers, mild winters; mostly loams and brown granular clay soils; vegetation mostly modified, excellent kauri regeneration in some areas, much manuka and kanuka, some small pockets of original kauri forest; some endemic plants and animals.

10.03 Colville

Steep broken country, mostly below 600m a.s.l., deeply embayed coastline; andesitic to dacitic volcanics overlie siltstone, sandstone and conglomerate; mild moist climate; large areas of stony steepland soils, associated deeper, strongly leached hill soils, higher parts forested, local kauri; submontane forest on Mt Moehau; modified coastal forest, extensive scrub, lower parts farmed; exotic forests in S, mining.

10.04 Mercury Islands

Three groups of small islands, most of eroded igneous or volcanic rocks, Cuvier I. mostly sandstone/argillite with igneous intrusions; probably all were connected to mainland during last glaciation; warm, humid summers, mild winters; strongly leached brown granular clays, loams and yellow-brown earth soils; extensive burning of larger islands during Polynesian and early European period; vegetation on most islands dominated by pohutakawa, but pasture and manuka on Great Mercury I.

10.05 Thames

Steep hill country, mostly below 800m a.s.l.; andesites and dacites rest on siltstone/argillite, covered by rhyolitic rocks; warm, humid, dominantly, moderately and strongly leached steepland soils; mostly forested, widely logged, secondary kauri forest, large scrub areas; modifications include mining.

10.06 Tairua

Wide lower valleys, rolling to hilly on E; very steep-sided, wide-topped interior ridges to about 850m a.s.l.; mainIy rhyolite domes and flows; warm, humid; thick tephra deposits, complex pattern of steepland, podzolised clay and volcanic ash soils; extensive logged forest, local beech on high interior; former near complete forest cover in E destroyed by fire, replaced by exotic forest

10.07 Waihi

Hilly to steep country to about 750m a.s.l.; central andesites surrounded by ignimbrite sheet remnants; warm, humid; mainly steepland soils in W, volcanic ash soils on easier slopes; hill country mostly in forest and scrub; former Kauri W of divide widely logged; Waihi basin farmed, exotic forests in SE, mining near Waihi.

10.08 Te Aroha

Varied hilly to very steep terrain reaching about 900m a.s.l.; andesite lavas, breccias, dacite lavas, ignimbrites, rhyolite domes and flows; warm, humid; steepland soils along W, volcanic ash soils elsewhere; mainly forest: widely logged and regenerating, complex of forest types, southernmost extensive kauri stands (to 600m).

10.09 Mayor

Rhyolitic volcanic island, large caldera, lava flows, 2 crater lakes, fine obsidian; connected to mainland during last glacial oceanic climate; yellow-brown loams, brown granular loams; pohutukawa, kanuka, rewarewa forest, freshwater, lake communities; extensively modified by occupation.