

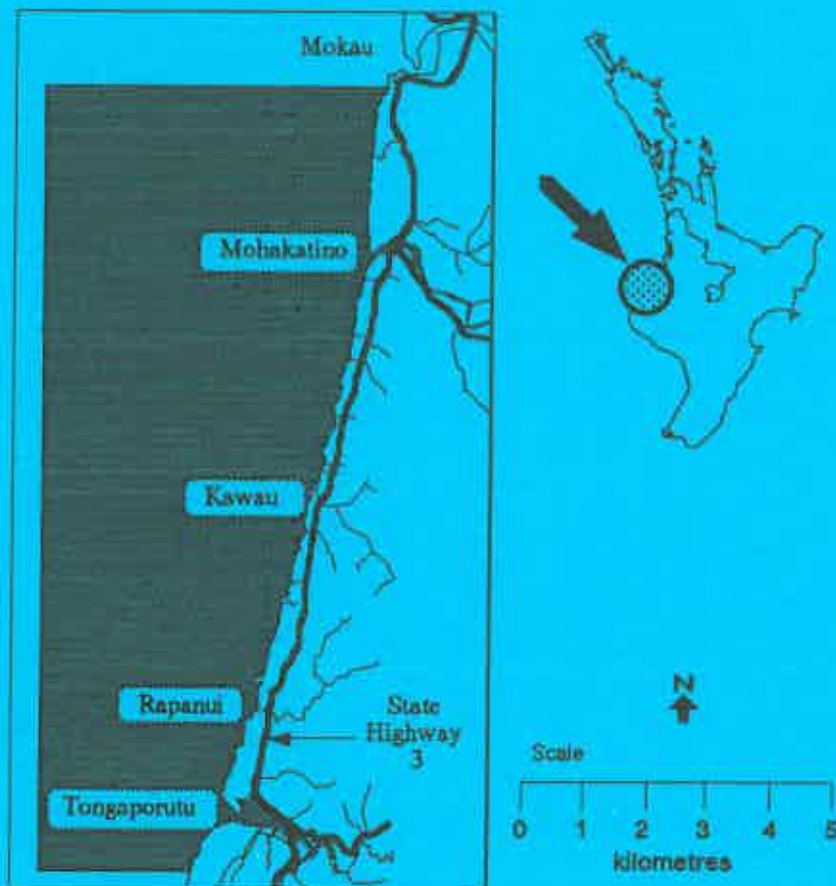
Dave Lano

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A Contribution to a Description of Biological Resources in Estuarine, Intertidal and shallow subtidal habitats: south of the Mokau River to Tongaporutu, February - March 1991



Prepared for:

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Brian Coffey and Bryan Williams

Summary

The Mohakatino Estuary has intrinsic historic, botanical and wildlife values (Department of Conservation, 1990).

It is also known to support a highly valued fishery (flounder and whitebait) and the endangered Hector's dolphin is resident in local coastal waters.

This report details a baseline biological survey of estuarine and coastal benthos in the area, relative to which the impact of proposed habitat protection or development can be monitored and described.

It is based on a late summer survey of twenty transects which have been established at estuarine, intertidal and subtidal sites. It does not describe seasonal change in community structure.

High suspended silt loads were a feature of both estuarine and coastal waters, and a lack of in-water visibility precluded an adequate description of off-shore subtidal sites during the survey period.

Estuaries

Estuaries were generally dominated by soft shore communities with a short upper beach of clean black sand, a wide and more or less flat middle beach of compacted clay and silt, and a lower part, sloping to the channel, of compacted clay and silt overlain with fine black sand and shell debris.

Ecologically constructive saltmarsh communities were a feature of both the upper and middle Mohakatino and Tongaporutu estuaries. Perched, marginal, wetlands also appear to be an integral part of the estuarine fisheries habitat (including the Rapanui river mouth).

Muddy, estuarine, intertidal sites were dominated by mud crabs (*Helice crassa*) and muddy subtidal sites were dominated by the isopod *Paracorophium excuvatum* and worms. Pipis (*Paphies australis*) were present at sandy, subtidal, middle estuarine sites. Seagrasses were not recorded as present.

Macroalgae (seaweeds) were not a feature of "hard" (mudstone / sandstone) shores in estuaries or at river mouths. Such sites in middle - lower estuaries and at river mouths were dominated by communities associated with pholad borings and / or the little black mussel *Xenostrobus pulex*.

Accumulated driftwood (with associated *Talorchestia spp.*) was a feature of the upper tidal zone at both lower estuarine sites and at river mouths.

Coastal Sites

Sand dune communities occur at the mouth of rivers in the study area, but generally the Mohakatino coastline comprises iron sand beaches below uplifted tertiary marine terraces which are developed for pastoral farming. The 20-30m high coastal cliffs between the beach and terrace are dominated by *Phormium - Machaerina sinclairii* communities with coastal-forest remnants in gullies and on headlands.

Notwithstanding an inshore reef between Mokau and Mohakatino, the mid - lower intertidal was dominated by biologically barren "soft" shore (sand) community profiles.

"Hard" inshore, subtidal, substrata were generally characterised as "slippery" mudstones which were subject to sand scour and periodic burial / re-exposure by long shore sand transport. Such sites were characteristically devoid of macroalgae and colonised by a diverse assemblage of opportunistic (small size class) encrusting organisms.

Biotic zoning on intertidal coastal cliffs is obscured by the complexity of microhabitats (caves, headlands and stacks) an erodible mudstone substrate and freshwater seepage. The visually dominant organisms are *Xenostrobus pulex*, the barnacles *Chamaesipho columna*, and *Elminius plicatus*, and the green alga *Enteromorpha sp.* Sand scouring may account for the lack of organisms on rock surfaces near the sand.

Acknowledgements

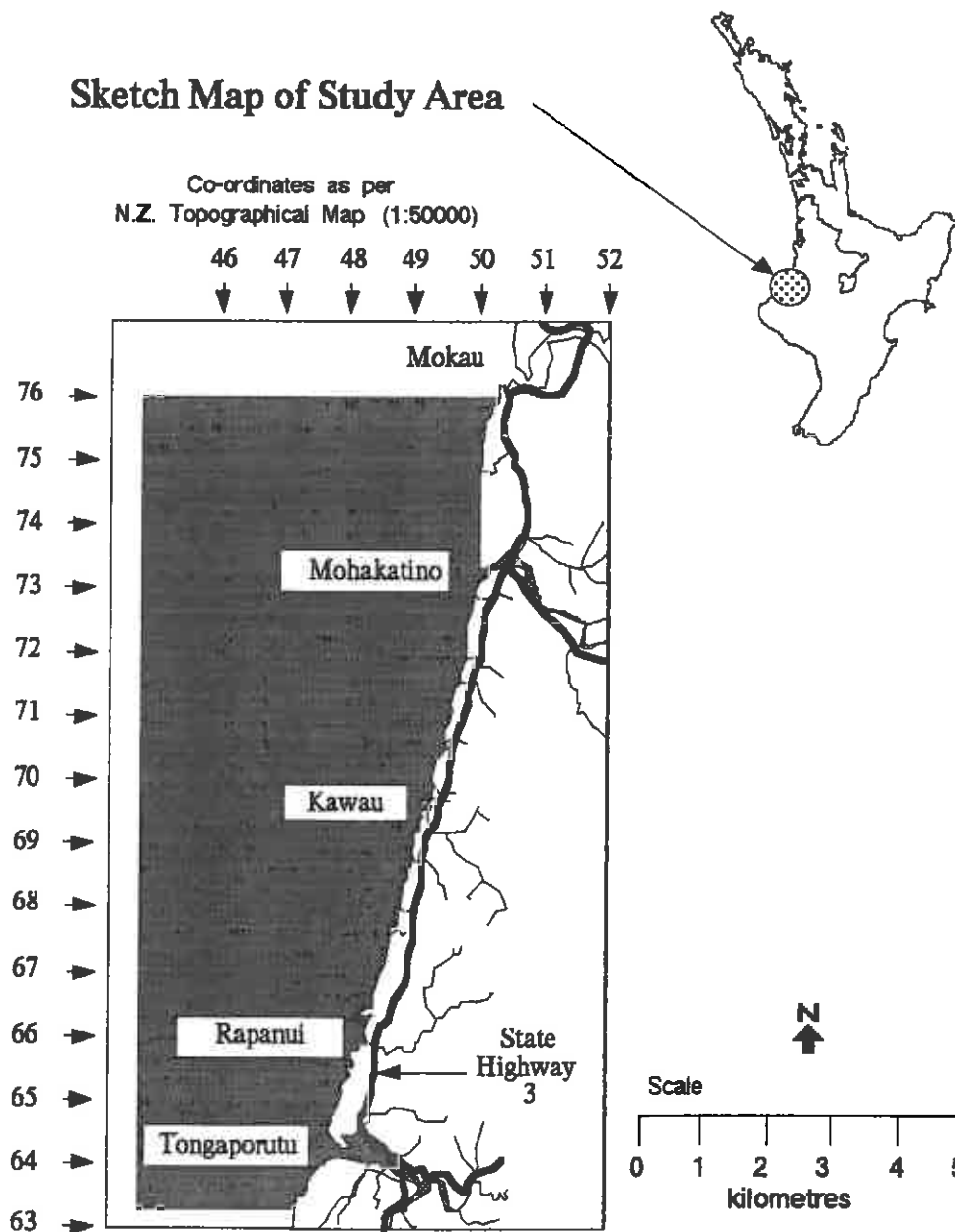
We are particularly grateful to Leonie Fechney, Senior Conservation Officer, Wanganui Conservancy for her constructive direction and logistical support during this project.

Norm Marsh and John Heaphy (Department of Conservation) also provided a significant contribution to field work.

Introduction

This report presents the results of three weeks field work on estuarine, intertidal and shallow subtidal habitats between the south head of the Mokau River mouth to the south head of the Tongarporutu River Mouth (see Figure 1).

Figure 1.



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Information on biological resources in the environs of Mohakatino has been collated in a First Order Coastal Resource Inventory prepared / collated by the Department of Conservation (Department of Conservation, 1990).

This inventory has documented the high historic, botanical and wildlife values of the Mohakatino estuary but also highlighted a baseline information shortfall on marine resources if the area is to be considered for non extraction protection under the Marine Protected Area programme.

This report was commissioned to provide a baseline biological survey of estuarine and coastal benthos in the area, relative to which the impact of proposed habitat protection can be monitored and described. It is based on a once-off late summer survey of twenty transects which have been established at estuarine, intertidal and subtidal sites.

Methods

Field work was conducted between 10 February and 04 March 1991. Offshore sites were sampled by spot diving.

Survey Protocols (after Department of Conservation, 1991)

Survey of Estuaries

- prepare sketch map from maps and aerial photographs
- mark position of replicate locations for upper, mid and lower estuary (plus impact areas)
- establish line transects from upper shore to mid channel at each of two random sites for each location (mark position of transects on sketch map)

A. Intertidal

Plot intertidal profile for each transect and divide into the following zones or habitats;

- * upper intertidal sedge / rush zone
- * mid intertidal mud/sediment flats on basis of substrate type or crab/gastropod species
- * lower intertidal mud/sediment flats on basis of substrate type or crab/gastropod species.

Subsample each zone using 5 randomly placed 1 m⁻² quadrats (score cover, dig up 25 cm x 25 cm sediment to 0.5 m depth and sieve [0.5mm mesh] for burrowing animals).

B. Subtidal

Plot intertidal profile for each transect and divide into appropriate zones or habitats.

Subsample each zone using 5 randomly placed 1 m⁻² quadrats (score cover, dig up 25 cm x 25 cm sediment to 0.5 m depth and sieve [0.5mm mesh] for burrowing animals).

C. Shellfish

Measure not less than 50 individuals from each zone or habitat at each location where commercial species are present.

Survey of Open Beaches

- Prepare sketch map from maps and aerial photographs,
- mark position of replicate locations for recognised beach types,
- line transects from upper shore (mean high water) until a constant habitat type is evident at each random site for each location (mark position of transects on sketch map).

A. Intertidal

Plot intertidal profile for each transect and divide into appropriate zones or habitats, e.g.

- * upper intertidal dunes boulders cliffs
- * upper tidal fine sand
- * mid tidal coarse sand/shell
- * rock outcrop zones.

Subsample each zone using 5 randomly placed 1 m⁻² quadrats (score cover, dig up 25 cm x 25 cm sediment to 0.5 m depth and sieve [0.5mm mesh] for burrowing animals).

B. Subtidal

Plot intertidal profile for each transect and divide into appropriate zones or habitats.

Subsample each zone using 5 randomly placed 1 m⁻² quadrats (score cover, dig up 25 cm x 25 cm sediment to 0.5 m depth and sieve [0.5mm mesh] for burrowing animals).

C. Shellfish

Measure not less than 50 individuals from each zone or habitat at each location where commercial species are present.

Survey of Rocky Shores

Care is required to select replicate locations and sites, e.g. points v. inlets v. embayments v. straight sections of coast v. slope variations.

- Prepare sketch map from maps and aerial photographs,
- mark position of replicate locations for each hard shore type recognised,
- line transects from upper shore to lower littoral at each random site for each location (mark position of transects on sketch map).

A. Intertidal

Plot intertidal profile for each transect and divide into appropriate zones or habitats.

Subsample each zone using 5 randomly placed 1 m⁻² quadrats noting rock type and slope.

B. Subtidal

Plot intertidal profile for each transect and divide into appropriate zones or habitats.

Subsample each zone using 5 randomly placed 1 m⁻² quadrats noting rock type and slope.

C. Shellfish

Measure not less than 50 individuals from each zone or habitat at each location where commercial species are present.

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Subsample each zone using 5 randomly placed 1 m⁻² quadrats noting rock type and slope.

C. Shellfish

Measure not less than 50 individuals from each zone or habitat at each location where commercial species are present.

Notes on Transect Analyses

Distance along transect line relates to distance over the ground.

Water depth was measured with a capillary depth gauge, height above water level was measured with a 3.0 m staff and a customised level.

Vegetation cover class, animal frequency / abundance, and substrate type was assessed subjectively (Dr. B.T. Coffey) per square metre.

Subtidal quadrats were scored / sampled using SCUBA.

Results

Results are arranged in six sub sections

- A) Mohakatino Estuary
- B) Rapanui River Mouth
- C) Tongaporutu Estuary
- D) Open Coast
- E) Off-shore sites
- F) Fisheries Data

A provisional list of species encountered on all transects and their surrounds is presented in Table 1. Scientific names are arranged in alphabetical order (together with their common names or the group to which they belong) to permit a ready reference to unfamiliar species recorded on transects.

Tide Height in relation to daylight saving time for the study period (10 February to 04 March 1991) is plotted in Figure 2.

Complementary resources for this report include:

- a colour positive still-photographic collection (120 and 35 mm) of selected sites and specimens,
- an edited video tape of selected sites and specimens (together with full shoreline coverage of the Mohakatino and Tobgporutu Estuaries),
- a pressed herbarium, and
- a collection of preserved wet specimens.

These have been deposited with the Regional Office of the Department of Conservation, Private Bag, Wanganui.

A) Mohakatino Estuary

A sketch map of the Mohakatino Estuary (compiled from aerial photographs) is given in Figure 3.

The Mohakatino River drains a catchment of indigenous forest but following rain events freshwater entering the estuary is highly discoloured with considerable silt loads.

The wetland (north of the bridge - see Figure 3) is one of the few unmodified reed swamps in Taranaki and supports the threatened Australasian bittern (Department of Conservation, 1990). It is also the only known location of the rush *Juncus caespiticus* in this ecological district.

The locality of sampling stations in the Mohakatino Estuary (together with the open coast sites MO1 and MO2 - see section D) are shown in Figure 4.

Table 1. Provisional Species List

(plants animals)

see also

- photographic collection
- pressed herbarium specimens [for larger plants] and
- preserved wet specimens [for smaller plants and animals]

which have been deposited with the Regional Office,
Department of Conservation,
Private Bag, Wanganui

Scientific Name	Common Name
<i>Acanthochiton zelandicus</i>	chiton
<i>Acanthoclinus fucus</i>	fish: rock
<i>Acheta commodus</i>	insect: cricket
<i>Acridotheres tristis</i>	bird: indian myna
<i>Adiantum cunninghamii</i> Hook.	fern: blue maidenhair
<i>Aeodes nitidissima</i> J. Agardh.	alga: red prostrate
<i>Aglaophanius macoura</i>	worm: bristle
<i>Agropyron repens</i> Beauv.	grass
<i>Alcithoe arabica</i>	shell: arabic volute
<i>Aldrichetta fosteri</i>	fish: yellow eyed mullet
<i>Alnus glutinosa</i> (L.) Gaertner	tree: alder
<i>Alocasia macrorrhiza</i> (L.) G. Don.	herb: elephant's ear
<i>Alope spinifrons</i>	shrimp
<i>Alpheus richardsoni</i>	shrimp: snapping
<i>Amalda australis</i>	snail: southern olive
<i>Amaurochiton glaucus</i>	chiton
<i>Ammophila arenaria</i> (L.) Link.	grass: marram
<i>Amphibola crenata</i>	shell: mud snail
<i>Amphiporus</i> sp.	worm: proboscis
<i>Anagallis arvensis</i> L.	herb
<i>Anas platyrhynchos</i>	bird: mallard duck
<i>Anas superciliosa</i>	bird: grey duck
<i>Anchomasa similis</i>	shell: rock borer
<i>Angelica pachycarpa</i> Lange	herb: angelica "aniseed"
<i>Anguilla australis</i>	fish: short finned eel
<i>Anguilus gaimardi</i>	shell: boring tellinid
<i>Anisolabis littorea</i>	insect: earwig
<i>Anthopleura aureoradiata</i>	anemone: small brown
<i>Apium prostratum</i> Vent	herb
<i>Aplodactylus arctidens</i>	fish: marblefish
<i>Arachnoides zelandiae</i>	echinoderm: sand dollar
<i>Ararenicola affinis</i>	worm: lug
<i>Ardea novaehollandiae</i>	bird: white faced heron
<i>Aristotelia serrata</i> (J.R. et G.Forst.) Oliver	bush: wineberry
<i>Arripis trutta</i>	fish: kahawai
<i>Asplenium flaccidum</i> Forst f.	fern: spleenwort
<i>Atalacmea fragilis</i>	limpet: fragile
<i>Atriplex prostrata</i> D.C.	herb
<i>Australomysis</i> sp.	amphipod: shrimp
<i>Austrosimulium</i> sp.	insect: sandfly
<i>Avicennia resinifera</i> Forster f.	bush: mangrove
<i>Balanoglossus australiensis</i>	worm: acorn
<i>Balanus decorus</i>	barnacle

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<i>Bassina yatei</i>	shell: bivalve
<i>Blechnum fluviatile</i> (R. Br.) Salom.	fern: kiwakiwa
<i>Blechnum minus</i> (R.Br.) Ettingsh	fern: lesser kiokio
<i>Blechnum penna-marina</i> (Poiret) Kuhn	fern: little hard
<i>Blechnum sp.</i>	fern
<i>Bolboschoenus caldwellii</i> (V.Cook) Sojak	sedge
<i>Bolboschoenus fluviatilis</i> (Torrey) Sojak	clubrush: marsh
<i>Brachyglottis repanda</i> J.R. et G. Forst.	bush/tree: rangiora
<i>Buccinulum sp.</i>	shell: lined whelks
<i>Bugula neritina</i>	polyzoan
<i>Calaglossa leuprieurii</i> (Montagne) J. Agardh.	alga: small red
<i>Callianassa filholi</i>	shrimp: ghost
<i>Callitriche stagnalis</i> Scop.	herb: starwort
<i>Calothrix sp.</i>	cyanophyte
<i>Calystegia sepium</i> (L) R.Br.	herb: pink bindweed
<i>Cantharidella tessellata</i>	shell: topshell
<i>Carcharhinus brachyurus</i>	shark: bronze whaler
<i>Carex litorosa</i> L Bailey	sedge
<i>Carex pumila</i> Thunb.	sedge
<i>Carex subdola</i> Boott	sedge
<i>Carex virgata</i> Boott	sedge
<i>Carpodetus serratus</i> J.R. et G. Forst	bush/tree: putaputaweta
<i>Carpophyllum maschalocarpum</i> (Turner) Grev.	seaweed: flapjack
<i>Cassinia leptophylla</i> A. Cunn.	shrub: tuahinu / cottonwood
<i>Catenella fusiformis</i> (J.Agardh) Skottsberg	alga: small red
<i>Catenella nipae</i> Zanardini	alga: small red
<i>Cavodiloma coracina</i>	shell: top shell
<i>Cellana ornata</i>	limpet
<i>Cellana radians</i>	limpet
<i>Ceramium sp.</i>	alga: small red
<i>Chaerodes trachyscelides</i>	beetle: black
<i>Chaetomorpha sp.</i>	alga: green filamentous
<i>Chamaesipho brunnea</i>	barnacle
<i>Chamaesipho columna</i>	barnacle: columnar
<i>Cheimarrichthys fosteri</i>	fish: torrent
<i>Chelidonichthys kumu</i>	fish: red gurnard
<i>Chione stutchburyi</i>	shellfish: cockle
<i>Chironemus marmoratus</i>	fish: hiwihivi kelpfish
<i>Chondria macrocarpa</i> Hook. f. et Harvey	alga: small; red
<i>Chrysanthemum leucanthemum</i> L	herb: oxeye daisy
<i>Chrysophrys auratus</i>	fish: snapper
<i>Cirsium vulgare</i>	herb: (Scotch thistle)
<i>Circus approximans gouldi</i>	bird: Australian harrier
<i>Cirolana sp.</i>	isopod: sea slater
<i>Cirsium vulgare</i> (Savi) Ten.	herb: scotch thistle
<i>Cladostephus verticillatus</i> (Lightfoot) C. Agardh	alga: small brown
<i>Cladyhymenia oblongifolia</i> Hooker fil. et Harvey	alga: red
<i>Codium fragile</i> (Sur.) Har. ssp. <i>novae zelandicum</i> Del.	alga: green
<i>Colpomenia sinuosa</i> (Roth.) Derb et. Sol. Silva	alga: brown
<i>Cominella glandiformis</i>	shell: beach whelk
<i>Conger sp.</i>	eel: conger
<i>Conyza bilbaona</i> E.J. Remy	herb
<i>Cookia sulcata</i>	shell: Cook's Turban
<i>Coprosma acerosa</i> A. Cunn.	shrub: sand dune Coprosma
<i>Coprosma australis</i> (A. Rich) Robinson	shrub: kanono
<i>Coprosma perpusilla</i> Colenso	herb: creeping
<i>Coprosma propinqua</i> A. Cunn.	scrub
<i>Coprosma repens</i> A. Rich.	shrub: taupata

<i>Coprosma rigida</i> Cheeseman	bush: wiry
<i>Coprosma robusta</i> Raoul	tree/bush karamu
<i>Coprosma rotundifolia</i> A. Cunn.	shrub
<i>Corallina hombronii</i> Montagne	alga: coralline
Coralline Paint	alga
Coralline turf	algae: coralline
<i>Cordyline australis</i> (Forst. f.) Endl.	tree: cabbage
<i>Corokia cotoneaster</i> Raoul.	bush: korokio
<i>Cortaderia seloana</i> (Schult.) Asch. & Graeb.	grass: pampus
<i>Cortaderia toetoe</i> Zotov	grass: toetoe
<i>Corynocarpus laevigatus</i> J.R. et G. Forst.	tree: karaka
<i>Coscinasterias calamaria</i>	starfish: 11-armed
<i>Cotula coronopifolia</i> L.	herb batchelor's button
<i>Crassostrea glomerata</i>	shell: rock oyster
<i>Cyathea colensoi</i> (Hook f.) Domin	fern: tree
<i>Cyathea dealbata</i> (Forst. f.) Swartz	fern: ponga
<i>Cyperus eragrostis</i> Lam.	sedge: umbrella
<i>Cyperus ustulatus</i> A.Rich.	sedge: giant umbrella
<i>Cystopteris fragilis</i> (L) Bernh.	fern: bladder
<i>Dacrycarpus dacrydioides</i> (A. Rich) Laubenfels	tree: Kahikatea
<i>Dianella nigra</i> Colenso	lily: inkberry
<i>Dilome subrostrata</i>	shell: mudflat top
<i>Diplocrepis puniceus</i>	fish: clingfish
<i>Disphyma australe</i> (W.T. Aiton) N.E. Br.	herb: maori ice plant
<i>Dosinia anus</i>	bivalve
<i>Dracophyllum</i> spp.	shrubs
<i>Drepanocladus aduncus</i> (Hedw.) Warnst	moss
<i>Ectocarpus</i> sp.	alga: filamentous brown
<i>Electra pilosa</i>	polyzoan
<i>Eleocharis acuta</i> R.Br.	sedge: sharp spike
<i>Elminius modestus</i>	barnacle
<i>Elminius plicatus</i>	barnacle
<i>Entelia arborescens</i> R.Br.	tree: whau cork tree
<i>Enteromorpha</i> sp.	alga: tubular green
<i>Epilobium chionanthum</i> Hausskn.	herb
<i>Epilobium pallidiflorum</i> Cunn.	herb: willow
<i>Eulalia microphylla</i>	worm
<i>Euphorbia glauca</i> Forst f.	herb: sea spurge
<i>Euphorbia heliosopia</i> L.	herb
<i>Evichinus chloroticus</i>	echinoderm: sea egg
<i>Festuca arundinacea</i> Schreb.	grass: tall fescue
<i>Ficus</i> sp.	scrub/tree: fig
<i>Filograna</i> sp.	worm: tube - polychaete
<i>Foeniculum vulgare</i> Miller	herb: fennel
<i>Fosterygion varium</i>	fish: variable triplefin
<i>Galaxias brevipennis</i>	fish: koaro
<i>Galaxius maculatus</i> Jenyns	fish: inanga
<i>Galium palustris</i> L.	herb: marsh bedstraw
<i>Gelidium caulacanthum</i> J.Ag.	alga: small red
<i>Geniostoma rupestre</i> A. Rich.	bush/tree: hangechange
<i>Gigartina alveata</i> (Turner) J. Agardh.	alga: small red
<i>Gigartina circumcincta</i> J. Ag. var. <i>apoda</i> (J. Ag.)	alga: large leafy red
<i>Gigartina decipiens</i> "complex"	algae: small red
<i>Gleichenia dicarpa</i> R.Br.	fern: tangle
<i>Glycera americana</i>	worm: 3bristle
<i>Gobiomorphus hubbsi</i>	fish: blue-gilled bully
<i>Gobiomorphus huttoni</i>	fish: red finned bully
<i>Gobiomorphus</i> sp.	fish

<i>Gracilaria secunda</i> Harvey f. <i>secunda</i>	alga: small red
<i>Gymnorhina</i> sp.	bird: magpie
<i>Haematopus ostralegus finschi</i>	bird: pied oyster catcher
<i>Halcyon sancta vagans</i>	bird: N.Z. Kingfisher
<i>Halicarcinus</i> sp.	crab
<i>Haustrum haustorium</i>	shell: dark rock
<i>Hebe stricta</i> (Benth) L.B.Moore	bush: koromiko
<i>Helice crassa</i>	crab: burrowing mud
<i>Hemigrapsus crenulatus</i>	crab: hairy handed
<i>Hieracium lepidulum</i> (Stenstroem) Omang	herb: tussock hawkweed
<i>Himantopus himantopus</i>	bird: pied stilt
<i>Holcus lanatus</i> L.	grass: yorkshire fog
<i>Hordeum marinum</i> L.	grass: salt barley
<i>Hormosira banksii</i> (Turner) Descaisne	algae: Venus' necklace
<i>Hydrocotyle novae-zealandiae</i> D.C.	herb
<i>Hydroprogne caspia</i>	bird: caspian tern
<i>Hymeniacidon perlevis</i>	sponge
<i>Hypochoeris glabra</i> L.	herb
<i>Hypochoeris radicata</i> L.	herb: dandelion
<i>Idyanthyrsus quadricornis</i>	tubeworm
<i>Isachne globosa</i> (Thumb.) Kuntz.	grass: swamp millet
<i>Isocardactis magna</i>	sea anenome
<i>Isolepis cernua</i> (M. Vahl.) Roemer et Schultes	clubrush: slender
<i>Isolepis nodosa</i>	rush
<i>Isolepis setacea</i> (L.) R.Br.	clubrush
<i>Jania micrarthrodia</i> Lamouroux	alga: coralline
<i>Juncus acuminatus</i> Michaux	rush: sharp fruited
<i>Juncus acutus</i> L.	rush
<i>Juncus bulbosus</i> L.	rush: bulbous
<i>Juncus effusus</i> L.	rush: soft
<i>Juncus gregiflorus</i> L.Johnson	rush
<i>Juncus maritimus</i> Lam. var. <i>australiensis</i> Buch.	rush: sea
<i>Juncus planifolius</i> R.Br.	rush
<i>Knightea excelsa</i> R.Br.	tree: rewarewa
<i>Kunzea ericoides</i> (A.Rich) J. Thompson	bush/tree: kanuka
<i>Lachnagrotis filiformis</i> (Forster f.) Trin.	grass
<i>Lagurus ovatus</i> L.	grass: hairstail
<i>Larus bulleri</i>	bird: black billed gull
<i>Larus novaehollandiae</i>	bird: red billed gull
<i>Lasteropsis glabella</i> (A. Cunn.) Tindale	fern: shield fern
<i>Latia neritoides</i> Gray	limpet: f.w.
<i>Leontodon taraxacoides</i> (Villers) Mérat	herb: hawkbit
<i>Lepas anatifera</i>	barnacle: goose
<i>Lepidium oleraceum</i> Sparrman	herb: Cook's scurvey grass
<i>Lepsiella scobina</i>	whelk
<i>Leptinella dioica</i> Hook f.	herb
<i>Leptinella dispersa</i> (D. Lloyd) L.Lloyd et. Webb	herb
<i>Leptinella pusilla</i> Hook f.	herb
<i>Leptinella squalida</i> Hook f.	herb
<i>Leptocarpus similis</i> Edgar	rush: jointed wire
<i>Leptograpsus variegatus</i>	crab
<i>Leptoplana</i> sp.	flatworm
<i>Leptoscopus macropygus</i>	fish: estuarine stargazer
<i>Leptospermum scoparium</i> Foster et Foster f.	manuka
<i>Leucopogon fasciculatus</i> A. Rich.	scrub: mingimingi
<i>Liagora harviana</i> Zeh.	small red alga
<i>Libertia ixiodes</i> (Forst f.) Sprengn.	lily
<i>Ligia novaezealandiae</i>	isopod: sea lice

<i>Lilaeopsis ruthiana</i> Affolter	herb
<i>Limosella lineata</i> Glück	herb: mudwort
<i>Linum monogynum</i> Forst. f.	herb
<i>Lithothamnion</i> sp.	alga: hard encrusting
<i>Littorina cincta</i>	shell: univalve
<i>Littorina unifasciata</i>	shell: small univalve
<i>Lobelia anceps</i> Linn. f.	herb
<i>Lolium perenne</i> L.	grass: perennial ryegrass
<i>Lomentaria caespitosa</i> (Harv.) comb nov. Chap.	alga: small red
<i>Lophortyx californica</i>	bird: californian quail
<i>Lotus corniculatus</i> L.	herb: "clover" birdsfoot trefoil
<i>Lotus pedunculatus</i> Cav.	herb: "clover" lotus
<i>Ludwigia palustris</i> (L.) Elliott	herb: water purslane
<i>Lunaria</i> sp.	liverwort
<i>Lupinus arboreus</i> Sims	bush: tree lupin
<i>Lycium ferocissimum</i> Miers	bush: boxthorn
<i>Lycopodium fastigiatum</i> R.Br.	lycopod
<i>Lycopus europeus</i> L.	herb
<i>Lygodium articulatum</i> A. Rich.	fern: mangemange
<i>Lysiosquilla spinosa</i>	shrimp: mantis
<i>Machaerina sinclarii</i> (Hook. f.) T. Koyama	sedge: tuhara
<i>Macra discors</i>	shell: large trough
<i>Macropiper excelsum</i> (Forst. f.) Miq.	bush/tree: kawakawa
<i>Maorichiton caelatus</i>	chiton
<i>Marphysa depressa</i>	worm: bristle
<i>Maurea tigris</i>	shell: tiger
<i>Mazus pumilio</i> R. Br.	herb
<i>Melagraphia aethiops</i>	shell: common spotted top
<i>Melanopsis trifasciata</i>	snail: freshwater
<i>Melicytis ramiflorus</i> J. R. et G.. Forst.	bush/tree: mahoe
<i>Mentha cunninghamii</i> Benth.	herb: hioi native mint
<i>Mentha pulegium</i> L.	herb: pennyroyal
<i>Mentha spicata</i> L.	herb: spearmint
<i>Mentha x piperita</i> L.	herb: peppermint
<i>Metrosideros carminea</i> W.R.B. Oliver	bush/tree: crimson rata
<i>Metrosideros excelsa</i> Sol. ex Gaertn.	bush/tree: pohutukawa
<i>Microcionia</i> sp.	sponge
<i>Microlenchus huttoni</i>	shell: topshell
<i>Microlenchus</i> sp.	shell: small oval top
<i>Mimulus repens</i> R. Br.	herb: moari musk
<i>Muehlenbeckia complexa</i> (A. Cunn.) Meissn.	bush
<i>Myadora striata</i>	barnacle: pink
<i>Myliobatus tenuicaudatus</i>	ray: eagle
<i>Myoporum laetum</i> Forst. f.	bush/tree: ngai
<i>Myosotis</i> sp.	herb: forget me not
<i>Nerita melanotragus</i>	shell: black nerita
<i>Nostoc</i> sp.	cyanophyte
<i>Notacmea parviconnidea</i>	limpet
<i>Notirus reflexus</i>	boring shell
<i>Notoacmea daedala</i>	limpet
<i>Notoacmea parviconoidea</i>	limpet
<i>Notoacmea pileopsis</i>	limpet
<i>Notoacmea scopulina</i>	limpet
<i>Notomithrax ursus</i>	crab: camouflage
<i>Nucula harvigiana</i>	shell: wedge
<i>Oedogonium</i> sp.	alga: green filamentous
<i>Olearia albida</i> Hook f.	tree
<i>Olearia solandri</i> Hook f.	scrub: tree daisy

<i>Olearia townsonii</i> Cheesem.	tree
<i>Olearia virgata</i> Hook. f.	tree
<i>Onchidella nigricans</i>	slug
<i>Ophicardelus costellaris</i>	shell
<i>Oreomyrrhis</i> sp.	herb: myrrh
<i>Oscillatoria</i> sp.	cyanophyte: filamentous
<i>Owenia fusiformis</i>	worm
<i>Pagurus novizealandiae</i>	crab: hermit
<i>Palaemon affinis</i>	shrimp
<i>Paphies australis</i>	shellfish: pipi
<i>Paracorophium excuvatum</i>	isopod: small burrower
<i>Paranephrops planifrons</i>	crayfish: f.w. koura
<i>Paraphies subtriangulatum</i>	shellfish: tuatua
<i>Paratya curvirostris</i>	shrimp: f.w.
<i>Paspalum dilatatum</i> Poir	grass
<i>Paspalum paspaloides</i> (Michx.) Scribn.	grass: mercer
<i>Paspalum vaginatum</i> Swartz	grass
<i>Passer domesticus</i>	bird: house sparrow
<i>Patelloidea corticata</i>	limpet
<i>Pecten novaezealandiae</i>	scallop
<i>Pectinaria australis</i>	worm: sandmason
<i>Pennisetum clandestinum</i> Hochst. ex. Chiov.	grass
<i>Peperomia urvilleana</i> A. Rich.	herb
<i>Pericoptus truncatus</i>	insect (larvae): sand scarab
<i>Perinereis americanus</i>	worm: ragworm
<i>Perinereis novaehollandiae</i>	worm: ragworm
<i>Perna canaliculus</i>	shell: green lipped mussel
<i>Petalonia fascia</i> (O. F. Muller) Kuntz.	alga: brown
<i>Petrolishes elongatus</i>	crab
<i>Phalacrocorax</i> sp.	bird: shag
<i>Phasianus colchicus</i>	bird: pheasant
<i>Pholadida spathulata</i>	shell: burrowing piddock
<i>Pholadidea tridens</i>	shell: boring pholad
<i>Phormium cookianum</i> Le Jolis	flax: montain
<i>Phormium tenax</i> Foster et Foster f.	flax: New Zealand
<i>Phycosecis limbata</i>	insect (larvae): beetle
<i>Physalia physalis</i>	jellyfish: Portuguese man o war
<i>Phytolacca octandra</i> L.	herb
<i>Picris echoides</i> L.	herb
<i>Pimelea arenaria</i> A. Cunn.	herb: sand daphne
<i>Pimelea urvilleana</i> A. Rich.	herb
<i>Pinus halepensis</i> Miller	bush/tree: pine
<i>Pinus radiata</i> D. Don	tree: radiata pine
<i>Pittosporum crassifolium</i> Banks et Sol. ex. Cunn.	shrub/tree
<i>Plagianthus divaricatus</i> J.R. et G. Forst.	bush: saltmarsh ribbonwood
<i>Plagusia chabrus</i>	crab
<i>Plantago major</i> L.	herb: plantain
<i>Polysiphonia</i> sp.	alga: small red
<i>Pomaderris kumeraho</i> A. Cunn.	tree gumdiggers soap
<i>Pomatoceros caeruleus</i>	worm: tube
<i>Porphyra columbina</i>	alga: red sheet
<i>Porphyrio melanotus</i>	bird: pukeko
<i>Porpita</i> sp.	jellyfish
<i>Potamopyrgus antipodarum</i>	snail
<i>Potamopyrgus estuarinus</i>	snail
<i>Potentilla anserinoides</i> Raoul.	herb: N.Z. silverweed
<i>Prothemadera novaeseelandiae</i>	bird: tui
<i>Protothaca crassicosta</i>	crab

<i>Pseudocaranx dentex</i>	fish: trevally
<i>Pseudopanax arboreum</i> (Murr.) Allan	scrub: five finger
<i>Pseudopanax crassifolium</i> (Sol. ex A.Cunn.) Koch	bush/tree: lancewood
<i>Pseudopanax discolor</i> (Kirk) Harms	shrub/tree
<i>Pteridium aquilinum</i> (L.) Kuhn	fern: bracken
<i>Pterocladia capillacea</i> (Gmel.) Born.et Thur.	alga: red
<i>Pterocladia lucida</i> (R. Brown) J. Agardh	alga: red
<i>Pterocladia pinnata</i> (Hudson) Papensuss.	alga: red
<i>Pterocladia</i> sp.	alga: red
<i>Pyrosia serpens</i> (Forst. f.) Ching	fern
<i>Racosperma longifolia</i> (Andrews) C. Martins	tree: Sydney golden wattle
<i>Ralfsia verrucosa</i> (Areschoug) J. Agardh	alga: encrusting
<i>Ranunculus amphitrichus</i> Colenso	herb: waoriki
<i>Ranunculus macropus</i> Hook f.	herb: swamp buttercup
<i>Ranunculus repens</i> L.	herb: creeping buttercup
<i>Ranunculus scleratus</i> L.	herb: celery buttercup
<i>Resania lanceolata</i>	shell
<i>Rhipidura fuliginosa</i>	bird: fantail
<i>Rhomboselea retiaria</i>	fish: flounder
<i>Rissellopsis varia</i>	snail: discoid
<i>Rivularia</i> sp.	cynaophyte
<i>Rorripa nasturtium aquaticum</i> (L.) Hayek	herb: watercress
<i>Rubus fruticosus</i> L.	bush: blackberry
<i>Sabellaria kaiparaensis</i>	worm: tube polychaete
<i>Salix fragilis</i> L.	tree: crack willow
<i>Samolus repens</i> (Forster et Forster f.) Pers.	herb: sea primrose.
<i>Sarcocornia quinquefolia</i> (Ung. Sternb.) Scott	herb: glasswort
<i>Schefflera digitata</i> J.R. et G. Forst	tree: pate
<i>Schoenoplectus pungens</i> (M. Vahl.) Palla	sedge: three square
<i>Schoenoplectus validus</i> (Vahl.) Love et love	clubrush: lake
<i>Schoenus carsei</i> Chesseman	sedge
<i>Schoenus tendo</i> (Hook f.) Hook f.	sedge
<i>Scyphax ornatus</i>	isopod: sea slater
<i>Scytosiphon lomentaria</i> (Lyngbye) J. Agardh	alga: small brown
<i>Scytothamnus australis</i> (J. Agardh) Hooker	alga
<i>Sebaea ovata</i> (Labill.) R.Br.	herb
<i>Selliera radicans</i> Cav.	herb: remuremu
<i>Senecia vulgaris</i> L.	herb
<i>Senecio jacobaea</i> L.	herb: ragwort
<i>Siphonaria zelandica</i>	shell: limpet-like pulmonate
<i>Sophora microphylla</i> Ait.	scrub/tree: kowhai
<i>Sphacelaria</i> sp.	alga
<i>Sphaeroma quoyanum</i>	isopod: pill bug
<i>Spinifex hirsutus</i>	grass: spinifex
<i>Spirula spirula</i>	worm: ram's horn shell
<i>Splachnidium rugosum</i> (L.) Greville	alga
<i>Stenotaphrum secundatum</i> (Walt.) Kuntze.	grass: buffalo
<i>Stichaster australis</i>	starfish
<i>Stipa stipoides</i> (Hook. f.) Veldk.	grass: needlegrass
<i>Struthiolaria papulosa</i>	shell: Ostrich foot
<i>Stylarioides parmatus</i>	worm: tube
<i>Suberites</i> sp.	sponge
<i>Sypharochiton pelliserpentis</i>	chiton
<i>Tadorna variegata</i>	bird: paradise shelduck
<i>Talorchestia quoyana</i>	amphipod: sand hopper
<i>Talorchestia tumida</i>	amphipod: sand hopper
<i>Taxodium officinale</i> Weber	herb: dandelion
<i>Tellinia liliana</i>	shell: large wedge

<i>Tetraclita purpurascens</i>	shell: flat wafer-like bivalve
<i>Tetragonia trigyna</i> Banks & Sol. ex Hook f.	herb
<i>Thais orbita</i>	snail
<i>Tinocladia novae-zelandiae</i> Kylin	small brown alga
<i>Toronia toru</i> (Cunn.) L Johnson et Briggs	scrub/tree: toru
<i>Torpedo fairchildi</i>	ray: electric
<i>Trachelochismus pinnulatus</i>	fish: lumpfish
<i>Trachurus novaezelandiae</i>	fish: jack mackerel
<i>Trapaeolum majus</i> L	herb
<i>Trichomanes</i> sp.	fern: filmy
<i>Trifolium incarnatum</i> L.	clover: purple
<i>Trifolium repens</i> L	clover: white
<i>Triglochin striata</i> (Ruiz) Lopez et Pavon	herb
<i>Triplectides obsoleta</i>	insect (larvae): caddisfly
<i>Tripterygion nigripenne</i>	fish: cockabully
<i>Turbo smaragdus</i>	snail catseye
<i>Turdus merula</i>	bird: blackbird
<i>Turdus philomelos</i>	bird: song thrush
<i>Tylotis proliferus</i>	alga
<i>Typha orientalis</i> C.B. Presl.	raupo
<i>Ulex europeus</i> L	bush: gorse
<i>Ulva lactuca</i>	alga: sea lettuce
<i>Ulva</i> sp.	alga: sea lettuce
<i>Uncinia uncinata</i> Boott	sedge: hook
<i>Vanellus miles novae-hollandiae</i>	bird: spur winged Plover
<i>Vaucheria</i> sp.	alga: filamentous green
<i>Verbena litoralis</i> Kunth	herb: blue vervain
<i>Xenostrobus pulex</i>	shell: little black mussel
<i>Xymene corticata</i>	shell
<i>Zediloma arida</i>	shell: top shell
<i>Zenatia acinaces</i>	shell: scitimar
<i>Zoysia minima</i>	grass

Figure 2.

Tidal Height: Mohakatino Coast, 10 February to 04 March, 1991

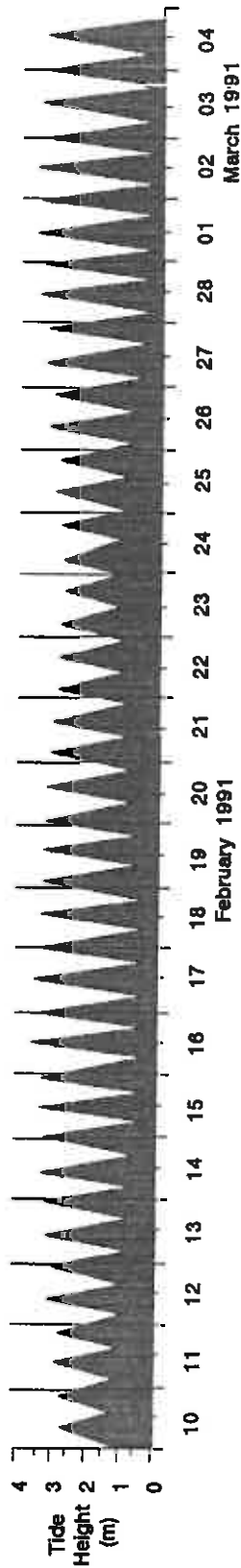
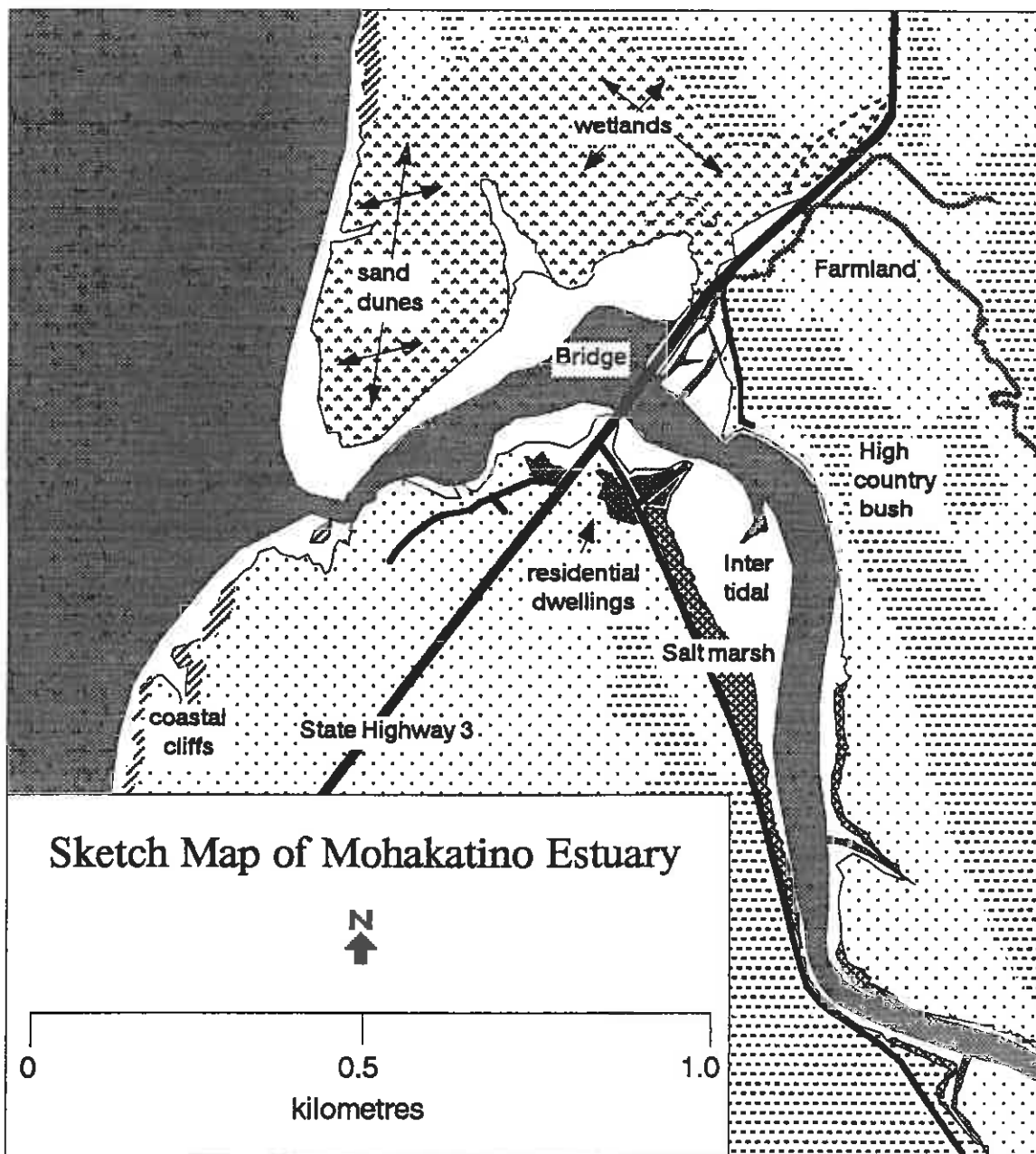


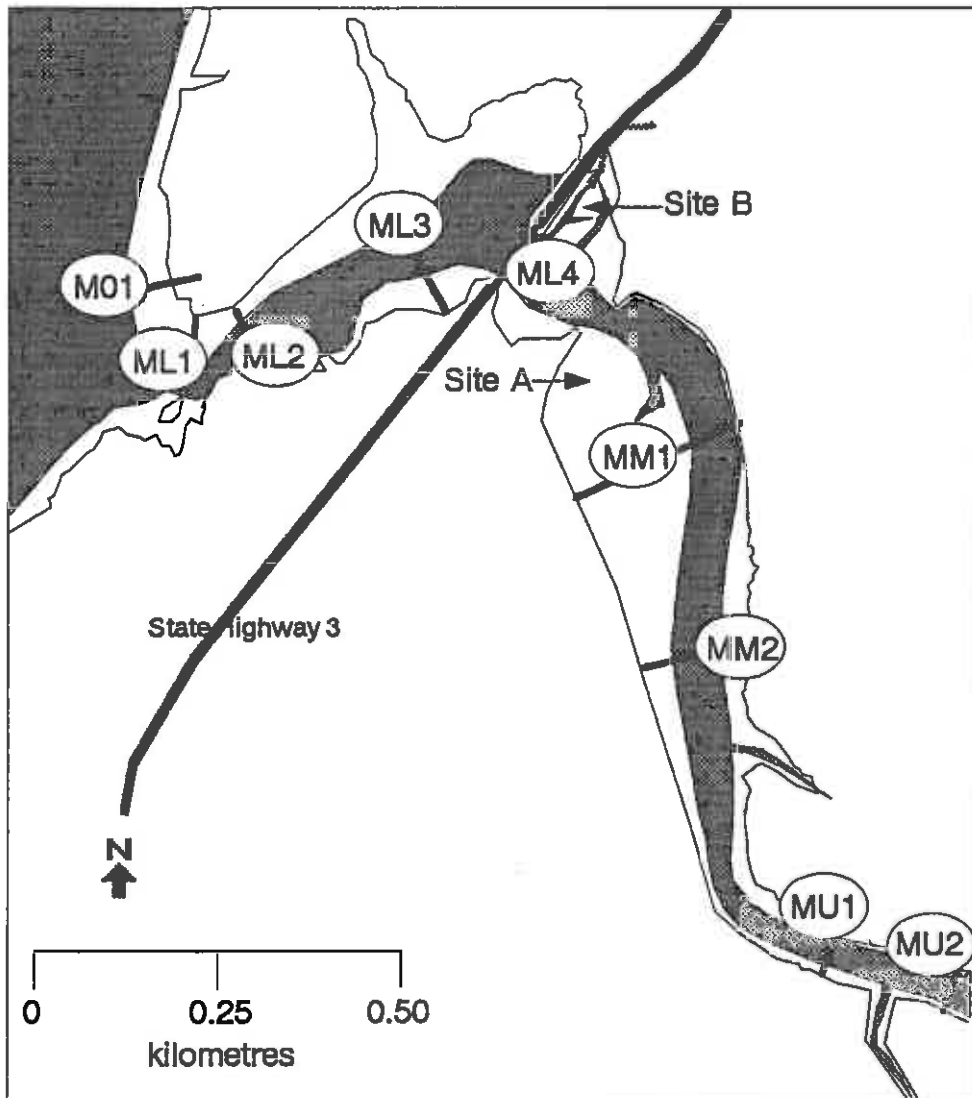
Figure 3.



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Figure 4.

Locality of Sampling Stations: Mohakatino Estuary

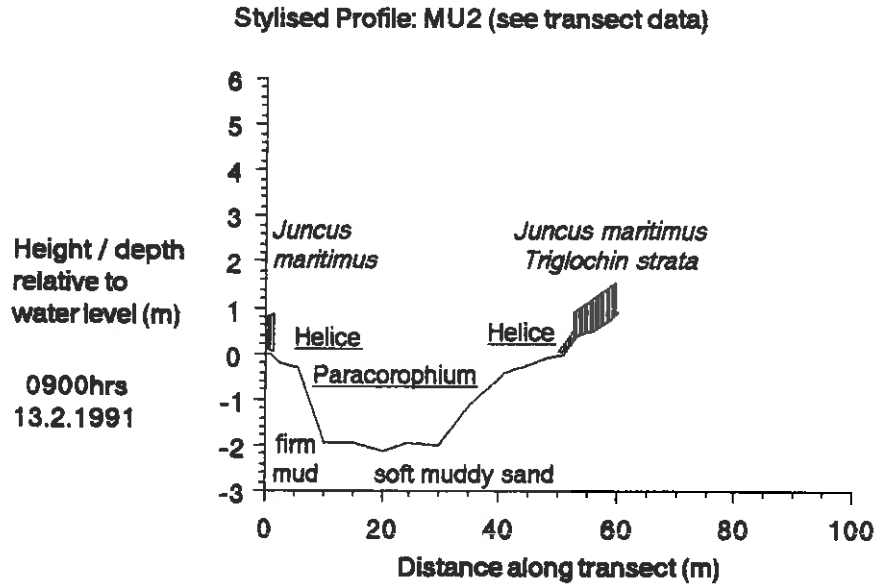


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The Mohakatino data base follows.

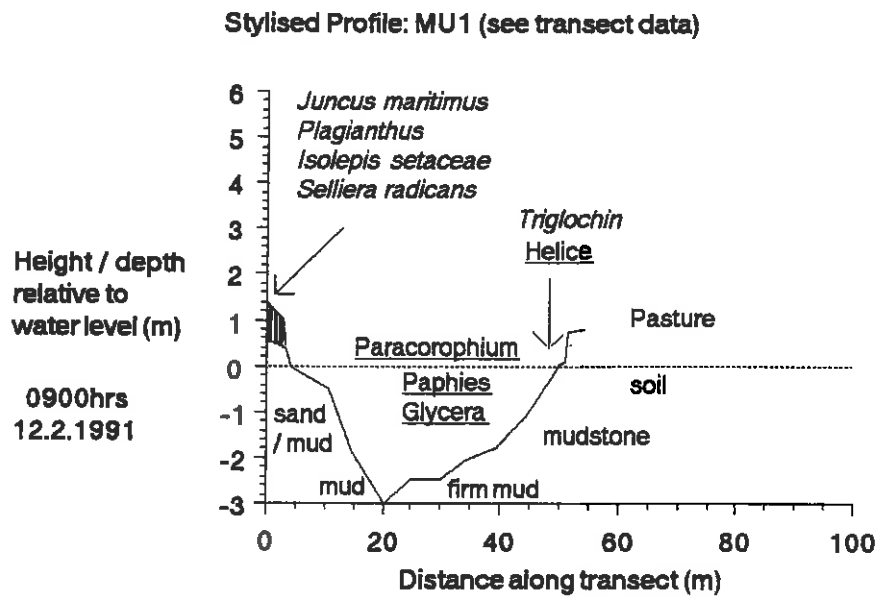
Transect U2 (see Table 2. and Figures 4 & 5)

Figure 5.



Transect U1 (see Table 3. and Figures 4 & 6)

Figure 6.



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Table 2. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: MU2 Date: 13 FEB 1991 Time: 0900 (transect score) hrs.

Site Description: Upper estuarine site (tidal / brackish) in contained river section. Conservation planting on right bank (*Phormium tenax* etc.). Stock access to water level on left bank. Right bank steep; left bank gently sloping. See sketch map.

Notes: time consuming to slurry and sieve consolidated mud without damaging animals. Small schooling fish with white spot on caudal peduncle not caught or identified.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r = rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	MU201	0m	m/ mudst log	4	<i>Juncus maritimus</i> <i>Catenella nipae</i> <i>Helice crassa</i> burrows	0.8 <0.01	3 2 c	00-05
005	MU202	0.3	m firm		<i>Helice crassa</i> burrows <i>Paracorophium exc.</i> burrows		a o	05-10 as per quadrat
010	MU203	2.0	m firm		<i>Helice crassa</i> burrows <i>Paracorophium exc.</i> burrows		a o	10-15 as per quadrat
015	MU204	2.0	m/ mudst.		<i>Helice crassa</i> burrows <i>Paracorophium exc.</i> burrows		a o	15-20 as per quadrat
020	MU205	2.2	s/m 8cm waves		<i>Paracorophium exc.</i> burrows		a	20-25 as per quadrat
025	MU206	2.0	s/m 8cm waves		<i>Paracorophium exc.</i> burrows		a	25-30 as per quadrat
030	MU207	2.0	s/m 8cm waves		<i>Paracorophium exc.</i> burrows		a	30-35 as per quadrat
035	MU208	1.1	s/m		<i>Paracorophium exc.</i> burrows		a	35-40 start of <i>Helice</i> burrows at 36m
040	MU209	0.5	s/m		<i>Helice crassa</i> burrows <i>Paracorophium exc.</i> burrows		a a	40-45 as per quadrat
045	MU210	0.2	m		<i>Helice crassa</i> burrows <i>Paracorophium exc.</i> burrows		a a	45-50 as per quadrat
050	MU211	0.0	m/s/ log	1	<i>Juncus maritimus</i> <i>Enteromorpha sp.</i> (on log) <i>Crassostrea glom.</i> (on log)	0.7 0.01	1 1 c	50-55 51 - 55 - 0.7m tall <i>Juncus maritimus</i> cover 5 50 <i>Helice crassa</i> burrows.m ²
055	MU212	+0.3	m/s/ wood	1	<i>Triglochin striata</i>	0.06	1	55-60 stick & wood jumble on muddy sand
060	MU213	+1.0		3	<i>Juncus maritimus</i>	0.8	3	60-65 Poor quality pasture <i>Paspalum pasp.</i> <i>Lotus ped.</i> <i>Cyperus ust.</i> <i>Rubus fruticosus</i>

MU2: Habitat / Zones recognised

MU2: soft subtidal muddy sand

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Paphies australis</i> 00-05mm 45 06-10mm 5 11-15mm 1 <i>Pectinaria australis</i> 17 <i>Paracorophium ex</i> 80 <i>Chione st.</i> 00-05mm 3	
b	-			-		<i>Paphies australis</i> 00-05mm 12 06-10mm 5 <i>Pectinaria australis</i> 14 <i>Paracorophium ex</i> 60 <i>Chione st.</i> 00-05mm 3 <i>Squilla armata</i> 1 <i>Australomysis sp.</i> 3 <i>Ararenicola affinis</i> 1	
c	-			-		<i>Paphies australis</i> 00-05mm 6 06-10mm 5 <i>Pectinaria australis</i> 15 <i>Paracorophium ex</i> 80 <i>Perinereis amer.</i> 1 <i>Squilla armata</i> 2	
d	-			-		<i>Paphies australis</i> 00-05mm 15 06-10mm 2 <i>Pectinaria australis</i> 20 <i>Paracorophium ex</i> 30 <i>Perinereis amer.</i> 1	
e	-			-		<i>Paphies australis</i> 00-05mm 3 <i>Pectinaria australis</i> 6 <i>Paracorophium ex</i> 60	

MU2: firm mud / mudstone: Right Bank

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Helice crassa</i> 7 <i>Sphaeroma quoy.</i> 13 <i>Paracorophium ex</i> 3 <i>Amphibola cren.</i> 2 <i>Glycera americana</i> 1 <i>Potamopyrgus est.</i> 1	

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b	-			-		<i>Helice crassa</i>	14
c	-			-		<i>Helice crassa</i>	6
						<i>Sphaeroma quoy.</i>	11
						<i>Paracorophium ex</i>	14
						<i>Potamopyrgus est.</i>	15
d	-			-		<i>Helice crassa</i>	3
						<i>Paracorophium ex</i>	32
						<i>Glycera americana</i>	3
e	-			-		<i>Helice crassa</i>	6
						<i>Sphaeroma quoy.</i>	6
						<i>Potamopyrgus est.</i>	14

Table 3. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: MU1 Date: 12 FEB 1991 Time: 0900 -1200 hrs.

Site Description: Contained (tidal) river channel in upper estuary. Improved pasture on both north and south banks. Sward of *Triglochin striata* south bank, narrow salt marsh community on right bankNotes: 0m (start of transect) on right bank. In water visibility very poor (<0.10m). Heavy surf running outside and periodic surges up channel. Stock access to stream bank. *Austrosimulium* sp. abundant. Considerable quantities of flotsam surging with tide.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/ Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	MU101	+0.5	s/m	4	<i>Juncus maritimus</i> <i>Plagianthus divaricatus</i> <i>Isolepis setacea</i> <i>Selliera radicans</i> <i>Helice crassa</i>	0.80 1.00 0.10 0.01	4 3 1 1 25 .m ⁻²	00-05
005	MU102	0.1	m/s	0	no visual / touch records of species present (see quadrat data)			05-10 as per quadrat
010	MU103	0.5	m / litter floc.	0	no visual / touch records of species present (see quadrat data)			10-15 as per quadrat
015	MU104	2.0	m / litter floc.	0	no visual / touch records of species present (see quadrat data)			15-20 as per quadrat
020	MU105	3.0	m / litter floc.	0	no visual / touch records of species present (see quadrat data)			20-25 as per quadrat
025	MU106	2.5	m / litter floc.	0	no visual / touch records of species present (see quadrat data)			25-30 as per quadrat
030	MU107	2.5	m / litter floc.	0	no visual / touch records of species present (see quadrat data)			30-35 as per quadrat
035	MU108	2.0	m firm	0	no visual / touch records of species present (see quadrat data)			35-40 as per quadrat
040	MU109	1.8	m firm	0	no visual / touch records of species present (see quadrat data)			40-45 as per quadrat
045	MU110	1.0	m firm	0	no visual / touch records of species present (see quadrat data)			45-50 as per quadrat
050	MU111	0.0	m (soft mudst.)	4	<i>Triglochin striata</i> <i>Helice crassa</i>	0.04	4 50.m ⁻²	50-55 up 1m vertical bank riddled with crab burrows (50.m ⁻²) to flat improved pasture

MU1: Habitat / Zones recognised

MU1: Upper tidal *Triglochin / Helice* zone (described by line transect)

MU1: Relatively consolidated subtidal mud habitat

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Paracorophium ex</i> <i>Helice crassa</i> <i>Paphies australis</i> <i>Glycera americana</i>	70 1 4 2
b	-			-		<i>Paracorophium ex</i> <i>Paphies australis</i>	90 3
c	-			-		<i>Paracorophium ex</i> <i>Marphysa dep.</i> <i>Potamopyrgus ant</i> <i>Helice crassa</i>	30 1 1 1
d	-			-		<i>Paracorophium ex</i> <i>Paphies australis</i> <i>Pectinaria australis</i>	60 5 2
e	-			-		<i>Paracorophium ex</i> <i>Glycera americana</i> nematode	50 1 2

MU1: Soft, flocculent, subtidal mud habitat

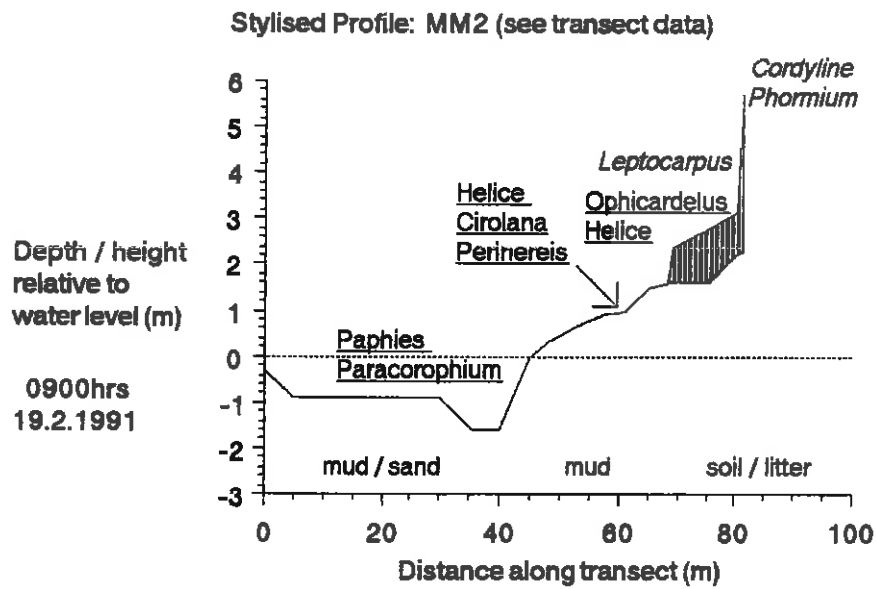
Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a						<i>Paphies australis</i> <i>Paracorophium ex</i> <i>Glycera americana</i>	5 3 2
b						<i>Glycera americana</i> <i>Paphies australis</i>	4 36
c						<i>Paracorophium ex</i> <i>Paphies australis</i>	10 47
d						<i>Paphies australis</i> <i>Paracorophium ex</i> <i>Glycera americana</i>	7 4 2
e						<i>Paphies australis</i> <i>Marphysa dep.</i>	69 1

MU1: Narrow saltmarsh community (described by line transect)

Transect MM2 (see Table 4 and Figures 4 & 7)

Figure 7.



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Table 4. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: MM2 Date: 19 FEB 1991 Time: 0900 hrs.

Site Description: At end of vehicular access lane in middle estuary. Om in channel (see sketch map).

Notes: *Ardea novaehollandiae* in vicinity of transect

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	MM201	-0.3	m	0	-			00-05 as per quadrat
005	MM202	-0.9	m/s	0	<i>Paphies australis</i> (see quadrat data)	-	c	05-10 as per quadrat
010	MM203	-0.9	m/s	0	<i>Paphies australis</i> (see quadrat data)	-	c	10-15 as per quadrat
015	MM204	-0.9	m/s	0	<i>Paphies australis</i> (see quadrat data)	-	c	15-20 as per quadrat
020	MM205	-0.9	m/s	0	<i>Paphies australis</i> (see quadrat data)	-	c	20-25 as per quadrat
025	MM206	-0.9	m/s	0	<i>Paphies australis</i> (see quadrat data)	-	c	25-30 as per quadrat
030	MM207	-0.9	m/s	0	<i>Paphies australis</i> (see quadrat data)	-	c	30-35 as per quadrat
035	MM208	-1.8	m/s	0	<i>Paphies australis</i> (see quadrat data)	-	c	35-40 as per quadrat
040	MM209	-1.8	m/s/ wood	0	<i>Paphies australis</i> (see quadrat data)	-	c	40-45 as per quadrat
045	MM210	0.0	m	6	epipellic algae* <i>Helice crassa</i> (see quadrat data)	- -	6 c	45-50 as per quadrat
050	MM211	+0.5	m soft	4	epipellic algae <i>Helice crassa</i>	- -	4 c	50-55 as per quadrat
055	MM212	+0.8	m soft	1	epipellic algae <i>Helice crassa</i> (see quadrat data)	- -	1 c	55-60 as per quadrat
060	MM213	+1.0	m soft	1	epipellic algae <i>Helice crassa</i> (see quadrat data)	- -	1 c	60-65 62 m start of mudstone platform with Fe markings
065	MM214	+1.5	m firm	0	<i>Helice crassa</i> (see quadrat data)	-	c	65-70 67 m start of (6) <i>Leptocarpus sim.</i>
070	MM215	+1.8	m/firm	3	<i>Leptocarpus similis</i> <i>Helice crassa</i> <i>Ophicardelus costellaris</i>	0.8 - -	3 o c	70-75 71 - 72 m log pile <i>Juncus maritimus</i> <i>Olearia solandri</i>
075	MM216	+1.6	m firm moist	6	<i>Leptocarpus similis</i> <i>Ophicardelus costellaris</i>	1.3 -	6 a	75-80 76 m, 1m tall <i>Plagianthus div.</i> <i>Leptocarpus sim.</i> 78 m end of <i>Leptocarpus sim.</i>
080	MM217	+2.2	litter s / soil	4/6	<i>Phormium tenax</i> <i>Cordyline australis</i> <i>Calystegia sepium</i> <i>Olearia solandri</i> <i>Carex virgata</i>	2.0 3.5 1.8 1.8 1.1	5 4 1 1 1	80 m+ <i>Cyperus ustulatus</i> <i>Coprosma repens</i> <i>Dicksonia squar.</i> <i>Bolboschoenus fl.</i> <i>Dacrycarpus dac.</i> <i>Isolepis nodosa</i>

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MM2: Habitat/Zones recognised

MM2: saltmarsh community

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Leptocarpus sim.</i> <i>Gelidium caul.</i>	0.8 0.01	1 1	see sieving data		<i>Helice crassa</i> <i>Potamopyrgus est.</i> <i>Littorina uni</i> <i>Ophicardelus cos.</i>	4 43 17 3
b	<i>Leptocarpus sim.</i>	0.8	3	see sieving data		<i>Helice crassa</i> <i>Potamopyrgus est.</i> <i>Ophicardelus cost.</i>	6 3 5
c	<i>Leptocarpus sim.</i> <i>Gelidium caul.</i>	0.8 0.01	4 1	see sieving data		<i>Helice crassa</i> <i>Potamopyrgus est.</i> <i>Littorina uni</i> <i>Ophicardelus cos.</i>	3 22 10 9
d	<i>Samolus repens</i>	0.05	1	see sieving data		<i>Helice crassa</i>	11
e	<i>Leptocarpus sim.</i> <i>Gelidium caul.</i>	0.8 0.01	2 1	see sieving data		<i>Helice crassa</i> <i>Potamopyrgus est.</i> <i>Littorina uni</i> <i>Ophicardelus cos.</i>	4 12 9 4

MM2: Muddy Upper shore

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-					<i>Helice crassa</i> <i>Cirolana sp.</i>	1 4
b	-					<i>Cirolana sp.</i>	48
c	-					<i>Cirolana sp.</i> <i>Perinereis am.</i>	10 13
d	-					<i>Helice crassa</i> <i>Perinereis am.</i>	3 3
e	-					<i>Paphies australis</i> (0-5mm) <i>Helice crassa</i> <i>Perinereis ame.</i>	1 3 4

MM2: Sub tidal Pipi Zone

Random 1 m² Quadrats

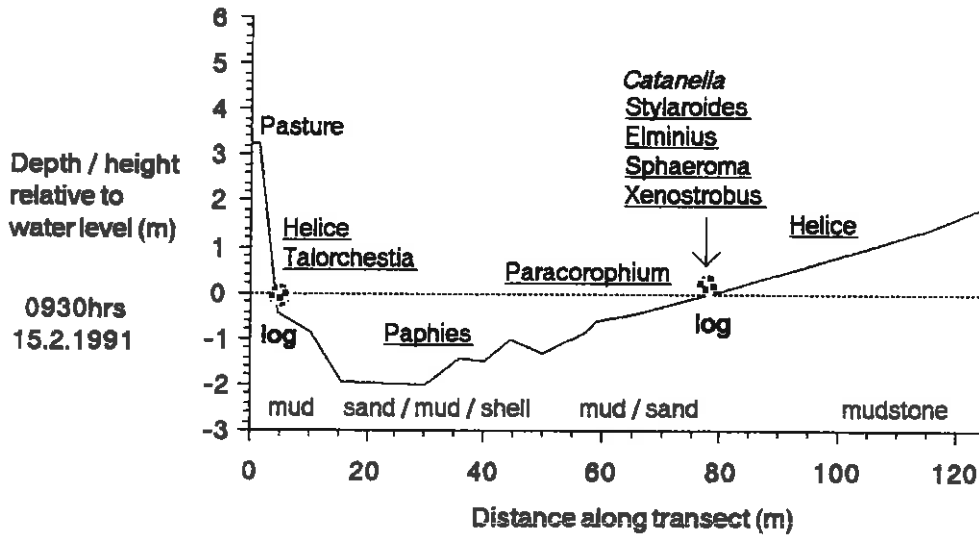
vegetation				surface animals		animals collected by sieving	
reps.	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			<i>Paphies australis</i>	c	<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm 45-50mm <i>Pectinaria australis</i> (cases) <i>Paracorophium ex</i>	47 30 8 0 0 0 0 3 2 1 30 150
b	-			<i>Paphies australis</i>	c	<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm 45-50mm <i>Pectinaria australis</i> (cases) <i>Paracorophium ex</i>	43 15 0 0 0 0 1 0 0 0 3 250
c	-			<i>Paphies australis</i>	c	<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm 45-50mm <i>Paracorophium ex</i>	22 4 0 0 0 0 0 0 0 0 40
d	-			<i>Paphies australis</i>	c	<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm 45-50mm <i>Pectinaria australis</i> (cases) <i>Paracorophium ex</i>	39 7 1 0 0 0 1 8 2 1 3 40

e	-		<i>Paphies australis</i>	c	<table border="0"> <tr> <td colspan="2"><i>Paphies australis</i></td> </tr> <tr> <td>00-05mm</td> <td>30</td> </tr> <tr> <td>06-10mm</td> <td>14</td> </tr> <tr> <td>11-15mm</td> <td>4</td> </tr> <tr> <td>16-20mm</td> <td>3</td> </tr> <tr> <td>21-25mm</td> <td>0</td> </tr> <tr> <td>26-30mm</td> <td>6</td> </tr> <tr> <td>31-35mm</td> <td>21</td> </tr> <tr> <td>36-40mm</td> <td>21</td> </tr> <tr> <td>41-45mm</td> <td>0</td> </tr> <tr> <td>45-50mm</td> <td>0</td> </tr> <tr> <td colspan="2"><i>Paracorophium ex</i></td> </tr> <tr> <td></td> <td>30</td> </tr> </table>	<i>Paphies australis</i>		00-05mm	30	06-10mm	14	11-15mm	4	16-20mm	3	21-25mm	0	26-30mm	6	31-35mm	21	36-40mm	21	41-45mm	0	45-50mm	0	<i>Paracorophium ex</i>			30
<i>Paphies australis</i>																															
00-05mm	30																														
06-10mm	14																														
11-15mm	4																														
16-20mm	3																														
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31-35mm	21																														
36-40mm	21																														
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<i>Paracorophium ex</i>																															
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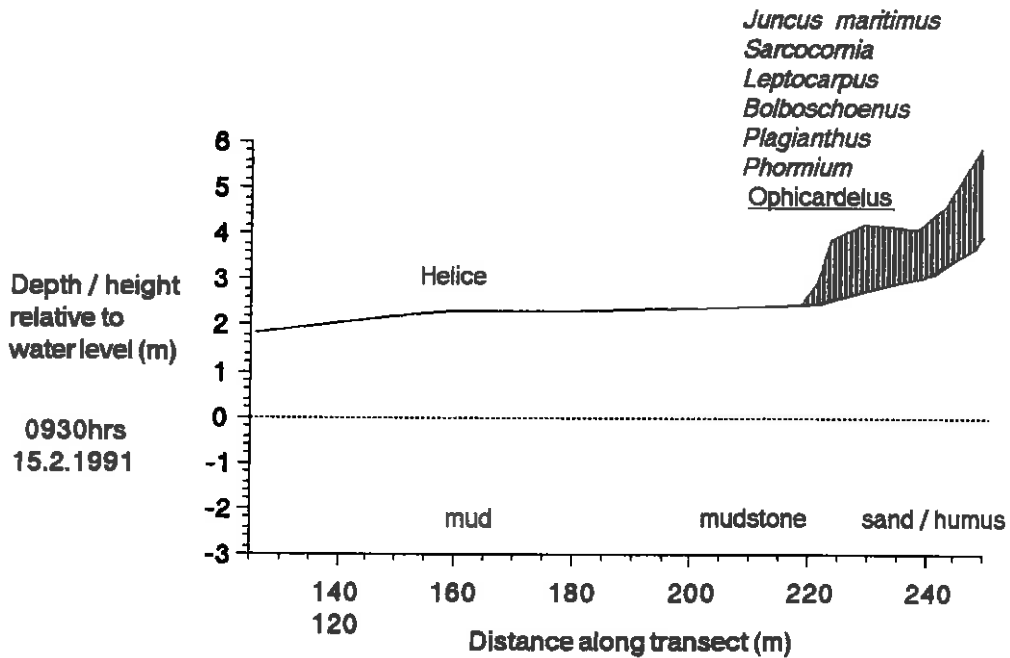
Transect MM1 (see Table 5. and Figures 4 & 8)

Figure 8.

Stylised Profile: MM1 Part A (Right Bank- see transect data)



Stylised Profile: MM1 Part B (Left Bank- see transect data)



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Table 5. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: MM1 Date: 15 FEB 1991 Time: 0900-0930 hrs. for 0 - 80m score
1445 - 1500 hrs. for 80 - 250m score

Site Description: 0m on right bank (see sketch map)

Notes: Flock of 18 *Tadorna variegata* in vicinity of transect. Mudcrab burrows on left bank to a depth in excess of 1.5m at all intertidal sites. Depth profile corrected for 0930 hrs.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	MM201	+3.5	m/s/humus	6	Retired pasture inside fence	0.3	sum 6	00-05 0-2 m vertical bank 4-5 m mud/clay platform littered with crab burrows <i>Talorchestia</i> abundant on mud platform
005	MM202	-0.5	m old tree	1	<i>Enteromorpha</i> sp. on wood <i>Carpophyllum masc.</i> (drift) <i>Elminius modestus</i> (on log) crab burrows	<0.01	1 - c a	05-10 as per quadrat
010	MM203	-0.9	m/s	0	mud crab burrows	-	c	10-15 as per quadrat
015	MM204	-2.0	m/sh	0	-	-	-	15-20 as per quadrat
020	MM205	-2.0	s/m/sh	0	<i>Paphies australis</i> (see quadrat data)	-	c	20-25 as per quadrat
025	MM206	-2.0	s/m/sh	0	<i>Paphies australis</i> <i>Rhomboselea retiaria</i> (see quadrat data)	-	c o	25-30 as per quadrat
030	MM207	-2.0	s/m/sh	0	<i>Paphies australis</i> <i>Chione stutchburyi</i> (see quadrat data)	-	c c	30-35 as per quadrat
035	MM208	-1.5	s/m/sh	0	<i>Paphies australis</i> <i>Elminius modestus</i> (see quadrat data)	-	c c	35-40 as per quadrat
040	MM209	-1.5	s/m/sh	0	<i>Paphies australis</i> (see quadrat data)	-	c	40-45 as per quadrat
045	MM210	-1.0	s/m/sh	0	<i>Paphies australis</i> (see quadrat data)	-	c	45-50 as per quadrat
050	MM211	-1.3	m/s	0	<i>Paracorophium excuvatum</i>		a	50-55 as per quadrat
055	MM212	-1.0	m/s	0	<i>Paracorophium excuvatum</i>		a	55-60 as per quadrat
060	MM213	-0.5	m/s	0	<i>Paracorophium excuvatum</i>		a	60-65 as per quadrat
065	MM214	-0.5	m/s	0	<i>Paracorophium excuvatum</i>		a	65-70 as per quadrat
070	MM215	-0.3	m/s	0	<i>Paracorophium excuvatum</i>		a	70-75 as per quadrat
075	MM216	-0.1	m/s	0	<i>Paracorophium excuvatum</i>		a	75-80 as per quadrat

080	MM217	0.0	s/m wood	1	<i>Catenella nipae</i> <i>Stylarioides parmatius</i> <i>Elminius modestus</i> <i>Sphaeroma quoyanum</i> <i>Helice crassa</i> <i>Xenostrobus pulex</i>	0.01	- c c c o o	80 - 85 82 - 85 m as per quadrat MM218
085	MM218	+0.2	s/m/sh firm	0	<i>Helice crassa</i> (see quadrat data)	-	o	85 - 90 dead <i>Paphies</i> and <i>Chione</i> in situ
090	MM219	+0.4	s/m/sh firm	0	<i>Helice crassa</i> (see quadrat data)	-	o	90 - 95 dead <i>Paphies</i> and <i>Chione</i> in situ
095	MM220	+0.6	s/m/sh firm	0	<i>Helice crassa</i> (see quadrat data)	-	o	95 - 100 dead <i>Chione</i> in situ
100	MM221	+0.8	s/ mudst.	0	<i>Helice crassa</i> (see quadrat data)	-	o	100 - 105 dead <i>Chione</i> in situ
105	MM222	+1.0	s/ mudst.	0	<i>Helice crassa</i> (see quadrat data)	-	o	105 - 110 as per quadrat
110	MM223	+1.2	s/ mudst.	0	<i>Helice crassa</i> (see quadrat data)	-	o	110 - 115 as per quadrat
115	MM224	+1.4	mudst.	0	<i>Helice crassa</i> (see quadrat data)	-	c	115 - 120 as per quadrat
120	MM225	+1.8	mudst.	0	<i>Helice crassa</i> (see quadrat data)	-	c	120 - 125 as per quadrat
125	MM226	+1.8	mudst.	0	<i>Helice crassa</i> (see quadrat data)	-	a	125 - 130 as per quadrat
130	MM227	+2.0	m firm	0	<i>Helice crassa</i> (see quadrat data)	-	a	130 - 135 as per quadrat
135	MM228	+2.1	m firm	0	<i>Helice crassa</i> (see quadrat data)	-	a	135 - 140 as per quadrat
140	MM229	+2.1	m firm	0	<i>Helice crassa</i> (see quadrat data)	-	a	140 - 145 as per quadrat
145	MM230	+2.2	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	145 - 150 as per quadrat
150	MM231	+2.2	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	150 - 155 as per quadrat
155	MM232	+2.2	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	155 - 160 as per quadrat
160	MM233	+2.3	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	160 - 165 as per quadrat
165	MM234	+2.3	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	165 - 170 as per quadrat
170	MM235	+2.3	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	170 - 175 as per quadrat
175	MM236	+2.3	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	175 - 180 as per quadrat
180	MM237	+2.3	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	180 - 185 as per quadrat
185	MM238	+2.3	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	185 - 190 as per quadrat
190	MM239	+2.3	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	190 - 195 as per quadrat
195	MM240	+2.4	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a 100	195 - 200 as per quadrat
200	MM241	+2.4	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	200 - 205 as per quadrat
205	MM242	+2.4	m slushy	0	<i>Helice crassa</i> (see quadrat data)	-	a	205 - 210 as per quadrat
210	MM243	+2.4	s / red clay/ mudst.	0	<i>Helice crassa</i> <i>Amphibola crenata</i> (see quadrat data)	-	o	210 - 215 as per quadrat
215	MM244	+2.4	s / red clay/ mudst.	0	<i>Helice crassa</i> (see quadrat data)	-	o	215 - 220 as per quadrat

220	MM245	+2.5	s / red clay/ mudst.	4	<i>Stipa stipoides</i> <i>Juncus maritimus</i> <i>Sarcocornia quinquefolia</i> <i>Helice crassa</i> <i>Ophicardelus costellaris</i>	0.2 0.8 0.03 - -	1 2 2 0 0	220 - 225 start of salt marsh <i>Isolepis setacea</i> <i>Selliera radicans</i>
225	MM246	+2.5	s / wood	3	<i>Agropyron repens</i> <i>Phormium tenax</i> <i>Isolepis nodosa</i> <i>Leptocarpus similis</i> <i>Helice crassa</i>	1.4 1.0 1.0 0.8 -	2 1 1 1 0	225 - 230 <i>Plagianthus div.</i> <i>Juncus effusus</i> <i>Ophicardelus co.</i>
230	MM247	+2.7	s / humus	5	<i>Phormium tenax</i> <i>Calystegia sepium</i> <i>Circium vulgare</i> <i>Juncus maritimus</i> <i>Leptocarpus similis</i> <i>Isolepis nodosa</i>	1.5 0.8 0.8 0.8 0.8 1.0	1 1 2 2 1 1	230 - 235 <i>Helice crassa</i> <i>Ophicardelus co.</i> <i>Isachne globosa</i>
235	MM248	+3.0	s / humus	5	<i>Phormium tenax</i> <i>Calystegia sepium</i> <i>Juncus maritimus</i> <i>Leptocarpus similis</i> <i>Isolepis nodosa</i> <i>Agropyron repens</i>	1.5 1.5 0.8 0.8 0.8 1.0	2 1 1 2 2 1	235 - 240 <i>Circium vulgare</i> <i>Anagallis arv.</i> <i>Atriplex prostrata</i> <i>Catenella nipae</i>
240	MM249	+3.0	s / humus	3	<i>Plagianthus divaricatus</i> (dead) <i>Phormium tenax</i>	1.0 1.5	3 2	240 - 245 <i>Euphorbia hel.</i>
245	MM250	+3.5	s / humus	6	<i>Bolboschoenus fluviatilis</i>	1.5	6	245 - 250 as per quadrat
250	MM251	+4.0	s / humus	6	<i>Phormium tenax</i> <i>Calystegia sepium</i> <i>Pennisetum clandestinum</i> <i>Stenotaphrum secundatum</i> <i>Lotus pedunculatus</i>	2.0 0.8 0.3 0.8 0.5	5 1 1 1 1	250+ road

MM1: Habitat / Zones recognised

MM1: soft mud right bank (05 - 15 m)

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-					<i>Paphies australis</i> 00-05mm	7
						<i>Paracorophium ex.</i>	12
						<i>Chione st.</i>	2
						<i>Pectinaria australis</i>	1
						* <i>Palaemon affinis</i>	2
b						<i>Paphies australis</i> 0-5mm	20
						<i>Paracorophium ex.</i>	30
						<i>Chione st.</i>	1
						<i>Pectinaria australis</i>	1
c	-					<i>Paphies australis</i> 00-05mm	10
						06-10mm	2
						11-15mm	1
						<i>Paracorophium ex.</i>	6
						<i>Chione st.</i>	1
						<i>Pectinaria australis</i>	21
						* <i>Palaemon affinis</i>	5
d	-					<i>Paracorophium ex.</i>	7
						<i>Pectinaria australis</i>	5
						<i>Helicecrassa</i>	2
e	-					<i>Paphies australis</i> 00-05mm	3
						<i>Paracorophium ex.</i>	17
						<i>Pectinaria australis</i>	12
						* <i>Palaemon affinis</i>	3
						<i>Helicecrassa</i>	1

* probably introduced with wash water

MM1: subtidal sand pipi zone (15 - 45 m)

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-					<i>Paphies australis</i> 00-05mm 19 06-10mm 32 11-15mm 4 16-20mm 5 21-25mm 0 26-30mm 1 31-35mm 6 36-40mm 13 41-45mm 1 45-50mm 0	
b	-					<i>Paphies australis</i> 00-05mm 12 06-10mm 15 11-15mm 6 16-20mm 1 21-25mm 0 26-30mm 0 31-35mm 19 36-40mm 19 41-45mm 4 45-50mm 0 <i>*Palaemon affinis</i> 3 <i>Chione st.</i> 1 <i>Ararenicola affinis</i> 1	
c	-					<i>Paphies australis</i> 00-05mm 6 06-10mm 28 11-15mm 8 16-20mm 2 21-25mm 1 26-30mm 0 31-35mm 13 36-40mm 14 41-45mm 5 45-50mm 2 <i>Paracorophium ex.</i> 40 <i>*Palaemon affinis</i> 3	
d	-					<i>Paphies australis</i> 00-05mm 0 06-10mm 19 11-15mm 8 16-20mm 0 21-25mm 1 26-30mm 2 31-35mm 23 36-40mm 22 41-45mm 9 45-50mm 0 <i>Chione st.</i> 1	

e	-					<i>Paphies australis</i>	
						00-05mm	5
						06-10mm	1
						11-15mm	11
						16-20mm	1
						21-25mm	0
						26-30mm	20
						31-35mm	1
						36-40mm	1
						41-45mm	0
						45-50mm	0
						<i>Paracorophium ex.</i>	20

* probably introduced into sample with wash water

MM1: upper intertidal flats, left bank

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-					<i>Helice crassa</i> <i>Cirolana sp.</i> <i>Marphysa dep.</i>	3 2 1
b	-					<i>Paphies australis</i> (0-5mm) <i>Cirolana sp.</i>	2 7
c	-					<i>Cirolana sp.</i> <i>Helice crassa</i>	10 2
d	-					<i>Helice crassa</i> <i>Scyphax o matus</i>	8 1
e	-					<i>Helice crassa</i> <i>Perinereis amer.</i>	4 2

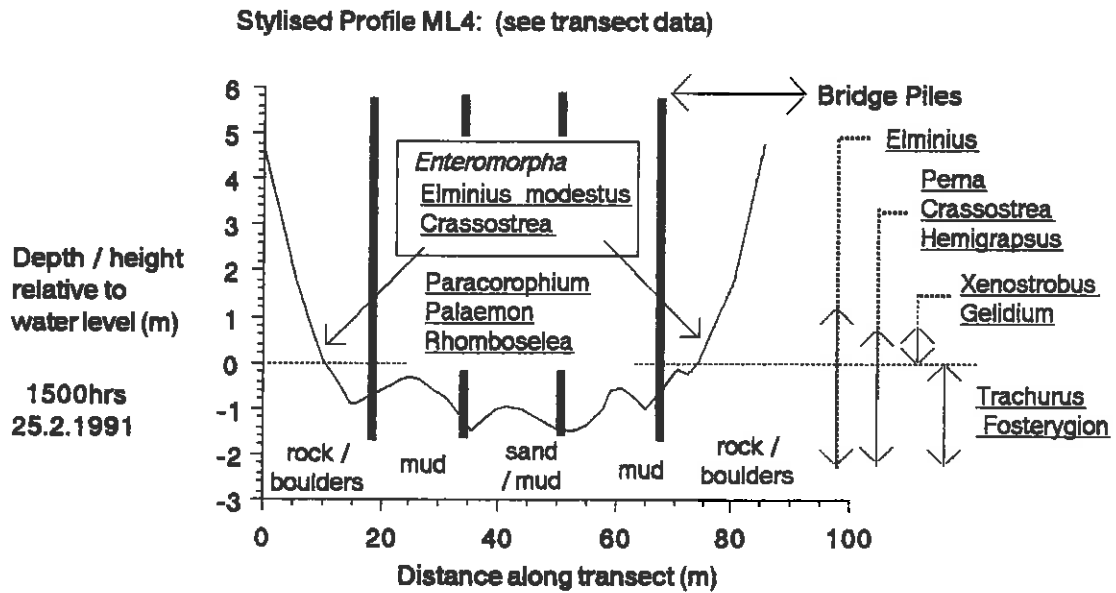
MM1: salt marsh, left bank

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Juncus maritimus</i>	0.8	4	<i>Potamopyrgus est.</i> <i>Opihcardelus cos.</i>	4 1	<i>Helice crassa</i>	3
b	<i>Isolepis nodosa</i>	0.7	2	<i>Potamopyrgus est.</i> <i>Amphibola crenata</i>	3 2	<i>Helice crassa</i> <i>Perinereis nov.</i>	2 1
c	<i>Sarcocornia quin.</i>	0.08	4	<i>Potamopyrgus est.</i> <i>Opihcardelus cos.</i>	22 9	<i>Helice crassa</i> <i>Marphysa dep.</i>	8 1
d	<i>Juncus maritimus</i>	0.8	1			<i>Helice crassa</i>	8
e	<i>Juncus maritimus</i>	0.8	2	<i>Potamopyrgus est.</i> <i>Amphibola crenata</i>	12 4	<i>Helice crassa</i> <i>Perinereis nov.</i>	7 3

Transect ML4 (see Table 6. and Figures 4 & 9)

Figure 9.



Transect ML3 (see Table 7. and Figures 4 & 10)

Figure 10.

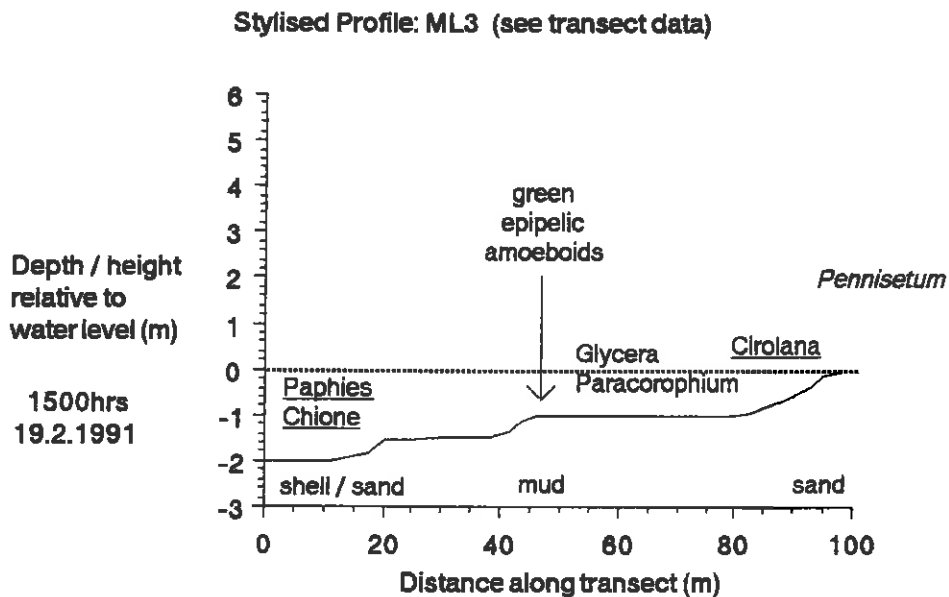


Table 6. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: ML4 Date: 25 FEB 1991 Time: 1500 hrs.

Site Description: under road bridge (between piles of road bridge: best hard shore available) see sketch map.

Notes: schools of *Trachurus novaezelandiae* and occasional *Rhomboselea retiaris* between bridge piles

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	ML401	+4.7	r/b/m	0	-			00-05 boulder rip rap
005	ML402	+2.0	r/b/m	1	<i>Enteromorpha sp.</i> <i>Elminius modestus</i>	<0.01	1 o	05-10 as per quadrat
010	ML403	0.0	r/b/m	0	<i>Elminius modestus</i> <i>Crassostrea glomerata</i>	-	o o	10-15 as per quadrat
015	ML404	0.9	m	0	<i>Palaemon affinis</i>	-	a	15-20 s/m wharf pile at 18m 0.7 - 1.2 a.w.l. <i>Elminius mod.</i> 0.0 - 0.7 m a.w.l. <i>Xenostrobus</i> (a) <i>Perna</i> (a) (see quadrat data) <i>Elminius mod.</i> (a) <i>Gelidium</i> (3) <i>Crassostrea</i> (o) <i>Hemigrapsus cr.</i> (c) 0.0 - 0.9 b.w.l. <i>Crassostrea</i> (a) <i>Perna</i> (a) <i>Elminius mod.</i> (a) <i>Fosterygion var</i> (c) <i>Trachurus n.z.</i> (c)
020	ML405	0.6	logs/r/m	0	-			20-25 as per quadrat
025	ML406	0.3	m	0	<i>Paracorophium excuvatum</i>	-	a	25-30 as per quadrat
030	ML407	0.6	m	0	<i>Paracorophium excuvatum</i>	-	a	30-35 s/m wharf pile at 34 0.7 - 1.2 a.w.l. <i>Elminius mod.</i> 0.0 - 0.7 m a.w.l. <i>Xenostrobus</i> (a) <i>Perna</i> (a) (see quadrat data) <i>Elminius mod.</i> (a) <i>Gelidium</i> (3) <i>Crassostrea</i> (o) <i>Hemigrapsus cr.</i> (c) 0.0 - 0.6 m.b.w.l. <i>Crassostrea</i> (a) <i>Perna</i> (a) <i>Elminius mod.</i> (a) <i>Fosterygion var</i> (c) <i>Trachurus n.z.</i> (a)
035	ML408	1.5	m	0	<i>Paracorophium excuvatum</i>		a	35-40 as per quadrat
040	ML409	1.0	s/m	0	<i>Paphies australis</i> <i>Paracorophium excuvatum</i>		o c	40-45 as per quadrat

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045	ML410	1.0	s/m	0	<i>Paracorophium excuvatum</i>		a	45-50 as per quadrat
050	ML411	1.5	m	0	<i>Paracorophium excuvatum</i> <i>Rhomboselea retiaria</i>		a c	50-55 s/m wharf pile at 51 0.7 - 1.2 a.w.l. <i>Elminius mod.</i> 0.0 - 0.7 m a.w.l. <i>Xenostrobus</i> (a) <i>Perna</i> (a) (see quadrat data) <i>Elminius mod.</i> (a) <i>Gelidium</i> (3) <i>Crassostrea</i> (o) <i>Hemigrapsus cr.</i> (c) 0.0 - 1.5 m.b.w.l. <i>Crassostrea</i> (a) <i>Perna</i> (a) <i>Elminius mod.</i> (a) <i>Fosterygion var</i> (c) <i>Trachurus n.z.</i> (c)
055	ML412	1.5	m	0	<i>Paracorophium excuvatum</i> <i>Rhomboselea retiaria</i>		a c	55-60 as per quadrat
060	ML413	0.6	m	0	<i>Paracorophium excuvatum</i>		a	60-65 as per quadrat
065	ML414	1.0	m	0	<i>Paracorophium excuvatum</i> <i>Rhomboselea retiaria</i>		a c	65-70 s/m wharf pile at 67 0.7 - 1.2m. a.w.l. <i>Elminius mod.</i> (a) 0.0 - 0.7 m a.w.l. <i>Xenostrobus</i> (a) <i>Perna</i> (a) (see quadrat data) <i>Elminius mod.</i> (a) <i>Gelidium</i> (3) <i>Crassostrea</i> (o) <i>Hemigrapsus cr.</i> (c) 0.0 - 1.0 m.b.w.l. <i>Crassostrea</i> (a) <i>Perna</i> (a) <i>Elminius mod.</i> (a) <i>Fosterygion var</i> (c) <i>Trachurus n.z.</i> (c)
070	ML415	0.3	m/logs	0	<i>Paracorophium excuvatum</i> <i>Palaeomon affinis</i>		a a	70-75 0.1m deep at 73 0.8m deep at 74
075	ML416	w.l.	m	0	<i>Helice crassa</i> <i>Crassostrea glomerata</i> <i>Elminius modestus</i> (see quadrat data)		c o o	75-80 as per quadrat
080	ML417	+1.7	r/b/m/ logs	1	<i>Enteromorpha sp.</i> <i>Helice crassa</i> <i>Elminius modestus</i> (see quadrat data)		1 c o	80-85 boulder rip rap
085	ML418	+4.7	r/b/m	0	-			85-90 bridge foundations

ML4: Habitat/Zones recognised

ML4: Intertidal rubble zone
Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			<i>Helice crassa</i>	32 .m ⁻² in mud		
b	-			<i>Helice crassa</i>	4 .m ⁻² in mud		
c	-			<i>Helice crassa</i>	4 .m ⁻² in mud		
d	-			-			
e	-			<i>Helice crassa</i>	2 .m ⁻² in mud, 12 . m ⁻² in wood		

ML4: *Perna canaliculus* zone on wharf piles

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			<i>Perna canaliculus</i> 0-5mm 8-10mm 11-20mm <i>Crassostrea glomerata</i> <i>Hemigrapsus crenulatus</i>	80 143 345 1 7		
b	-			<i>Perna canaliculus</i> 0-5mm 6-10mm 11-20mm <i>Crassostrea glomerata</i> <i>Hemigrapsus crenulatus</i>	82 80 327 1 14		
c	-			<i>Perna canaliculus</i> 0-5mm 6-10mm 11-20mm <i>Hemigrapsus crenulatus</i> <i>Marphysa depressa</i> <i>Cantharidella tessellata</i>	50 35 414 14 1 1		

d	-			<i>Perna canaliculus</i>			
				0-5mm	17		
				6-10mm	26		
				11-20mm	394		
				<i>Crassostrea</i>			
				<i>glomerata</i>	1		
				<i>Hemigrapsus</i>			
				<i>crenulatus</i>	13		
				<i>Marphysa</i>			
				<i>depressa</i>	1		
e	-			<i>Perna canaliculus</i>			
				0-5mm	10		
				6-10mm	9		
				11-20mm	484		
				<i>Crassostrea</i>			
				<i>glomerata</i>	17		
				<i>Hemigrapsus</i>			
				<i>crenulatus</i>	1		
				<i>Paphies australis</i>	1		

Table 7. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: ML3 Date: 19 FEB 1991 Time: 1500 hrs.

Site Description: 100 m downstream of bridge, left bank. Transect from centre of channel to left bank (see sketch map).

Notes: Sandy beach on left bank in front of cottage & temporary sea wall. Very turbid water with in water visibility c. 0.1 metre. *Ardea novaehollandiae* feeding in area. *Leptoscopus macropygus* and *Rhomboselea retiaris* in shallows. Quadrats sampled a.m. 20.02.1991.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	ML301	2.0	s / sh fine black curent riffles	0	Paphies australis (shell) (see quadrat data)		c	00-05 as per quadrat
005	ML302	2.0	s / sh fine black curent riffles	0	Paphies australis (shell) (see quadrat data)		c	05-10 as per quadrat
010	ML303	2.0	s / sh fine curent riffles black	0	(see quadrat data)			10-15 as per quadrat
015	ML304	1.9	s / sh fine black curent riffles	0	(see quadrat data)			15-20 as per quadrat
020	ML305	1.8	s fine black curent riffles	0	(see quadrat data)			20-25 as per quadrat
025	ML306	1.5	s fine black curent riffles	0	(see quadrat data)			25-30 as per quadrat
030	ML307	1.5	s fine black curent riffles	0	(see quadrat data)			30-35 as per quadrat
035	ML308	1.5	s fine black curent riffles	0	(see quadrat data)			35-40 as per quadrat
040	ML309	1.4	m	3	epipellic algae* see quadrat data	-	3	40-45 as per quadrat
045	ML310	1.0	m	4	epipellic algae* see quadrat data	-	4	45-50 as per quadrat
050	ML311	1.0	m	6	epipellic algae* see quadrat data	-	6	50-55 as per quadrat
055	ML312	1.0	m	3	epipellic algae* see quadrat data	-	3	55-60 as per quadrat

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060	ML313	1.0	m	0	- see quadrat data			80-85 as per quadrat
065	ML314	1.0	m	0	- see quadrat data			85-90 as per quadrat
070	ML315	1.0	m	0	- see quadrat data			70-75 as per quadrat
075	ML316	1.0	m/s	0	- see quadrat data			75-80 as per quadrat
080	ML317	1.0	m/s	0	- see quadrat data			80-85 as per quadrat
085	ML318	0.9	s fine black	0	- see quadrat data			85-90 s.st. reef outcrop 0.10 m high at 86 m (Pholad borings)
090	ML319	0.6	s fine black	0	- see quadrat data			90-95 log riddled with borings at 94 m
095	ML320	0.2	s fine black	0	- see quadrat data			95-100 as per quadrat
100	ML321	0.0	s fine black	0	- see quadrat data			100+ sea wall to lawn of <i>Pennisetum clandestinum</i>

* amoeboids full of *Chlorella sp.*

ML3: Habitat / Zones recognised

ML3: upper sandy beach 85 - 100 m

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Cirolana sp.</i>	23
b	-			-		<i>Cirolana sp.</i> <i>Paphies australis</i> 0-5mm <i>Marphysa depr.</i>	4 18 3
c	-			-		<i>Cirolana sp.</i> <i>Paphies australis</i> 0-5mm	15 30
d	-			-		<i>Cirolana sp.</i>	13
e	-			-		<i>Cirolana sp.</i> <i>Paphies australis</i> 0-5mm	53 25

ML3: mud flats 40 - 75

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a				<i>Amphibola crenata</i>	o	<i>Glycera americana</i> <i>Potamopyrgus ant</i> <i>Amphibola cren.</i> <i>Paphies australis</i> (<i><5mm</i>)	4 2 1 4
b				-		<i>Paracorophium ex.</i> <i>Paphies australis</i> (<i><5mm</i>)	5 10
c				-		<i>Glycera americana</i> <i>Marphysa depr.</i> <i>Paphies australis</i> (<i><5mm</i>) bur. anenome	3 1 5 1
d				<i>Potamopyrgus antipodarum</i>	o	<i>Paracorophium ex.</i> <i>Potamopyrgus ant</i> <i>Helice crassa</i> <i>Paphies australis</i> (<i><5mm</i>)	5 1 1 7
e				-	o	<i>Paphies australis</i> (<i><5mm</i>)	12

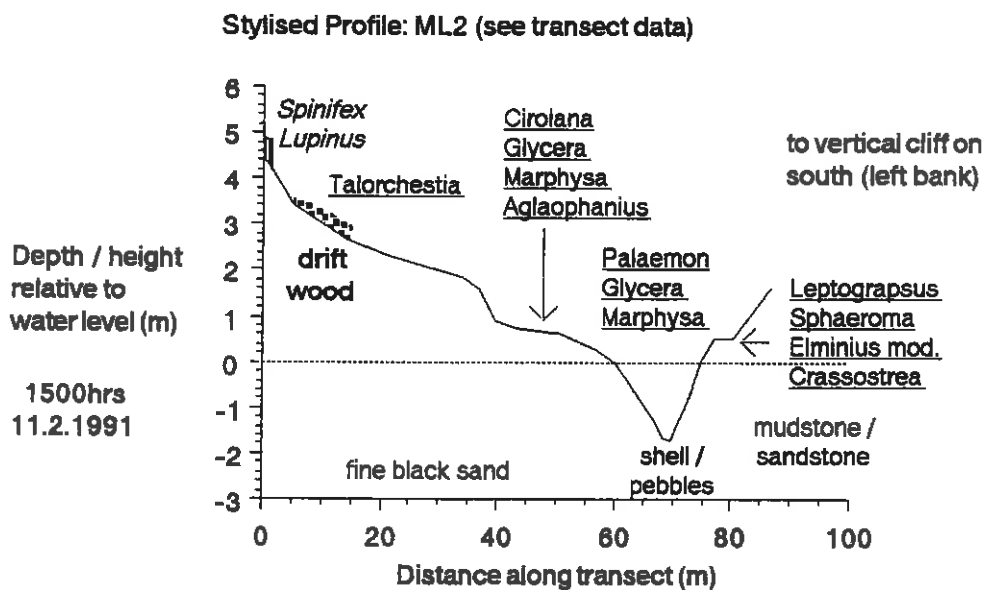
ML3: Subtidal Pipi Zone

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			dead shell		<i>Paphies australis</i> (<i><5mm</i>)	8
b	-			dead shell		<i>Paphies australis</i> (<i><5mm</i>) <i>Pectinaria australis</i> (cases) <i>Chione stutchb.</i> (<i><5mm</i>)	12 3 2
c	-			dead shell		<i>Paphies australis</i> (<i><5mm</i>) <i>Pectinaria australis</i> (cases)	7 1
d	-			dead shell		<i>Paphies australis</i> (<i><5mm</i>) <i>Chione stutchb.</i> (<i><5mm</i>)	8 3
e	-			dead shell		<i>Paphies australis</i> (<i><5mm</i>)	7

Transect ML2 (see Table 8. and Figures 4 & 11)

Figure 11.



Transect ML1 (see Table 9. and Figures 4 & 12)

Figure 12.

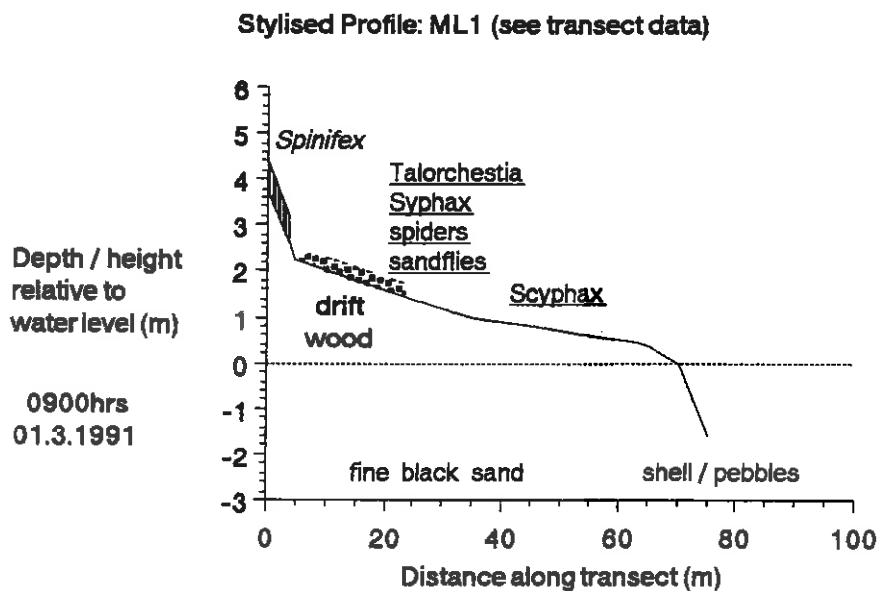


Table 8. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: ML2

Date: 11 FEB 1991

Time: 1430 - 1600 hrs.

Site Description: Lower Mohakatino Estuary. Vertical cliff face (horizontal strata) with canopy cover of *Machaerina sinclairii* and *Phormium tenax* with occasional *Blechnum sp.* and *Cortaderia toe toe* on southern end of transect (*Nostoc sp.* and *Enteromorpha sp.* on high tide level seepage areas); sand dunes with mixed vegetation including *Plagianthus divaricus*, *Lupinus arboreus*, *Coprosma repens*, *Spinifex hirsutus*, and *Mazus pumilio* on northern side (see sketch map).

Notes:

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r = rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	ML201	+4.5	humus layer / s	5	<i>Spinifex hirsutus</i> <i>Lupinus arboreus</i> <i>Calystegia sepium</i>	0.10 0.40 0.30	3 2 1	0 - 5 bare sand and drift wood with <i>Talorchestia</i> burrows
05	ML202	+3.4	s; fine black wood	0	burrows (see quadrat data)		30.m ²	5 - 10 as per quadrat
10	ML203	+3.0	s; fine black wood	0	burrows (see quadrat data)		18.m ²	10 - 15 as per quadrat
15	ML204	+2.6	s; fine black wood	0	burrows (see quadrat data)		30.m ²	15 - 20 as per quadrat
20	ML205	+2.4	s; fine black	0	burrows (see quadrat data)		10.m ²	20 - 25 as per quadrat
25	ML206	+2.2	s; fine black	0	burrows (see quadrat data)		6.m ²	25 - 30
30	ML207	+2.1	s; fine black	0	burrows (see quadrat data)		8.m ²	30 - 35 as per quadrat
35	ML208	+1.9	s; fine black	0	burrows (see quadrat data)		4.m ²	35 - 40 steep bank at 36 - 37m
40	ML209	+0.8	s; fine black rippled	0	- (see quadrat data)			40 - 45 as per quadrat
45	ML210	+0.7	s; fine black rippled	0	- (see quadrat data)			45 - 50 as per quadrat
50	ML211	+0.6	s; fine black rippled	0	- (see quadrat data)			50 - 55 as per quadrat
55	ML212	+0.4	s; fine black rippled	0	- (see quadrat data)			55 - 60 as per quadrat
60	ML213	0.00	s; fine black rippled	0	- (see quadrat data)			60 - 65 as per quadrat
65	ML214	-1.00	p/sh/s	0	- not quantitatively sampled			65 - 70 schools of <i>Trachurus n.z.</i>
70	ML215	-1.80	p/sh/s	0	- not quantitatively sampled			70 - 75 mid channel
75	ML216	0.00	r; mudst.	0	<i>Leptograpsus variegatus</i> <i>Sphaeroma quoyanum</i> <i>Elminius modestus</i> <i>Crassostrea glomerata</i>		c a a c	75 - 80 vertical cliff face

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ML2: Habitat / Zones recognised

ML2: 00 - 15 m upper intertidal flotsam (driftwood) zone

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	driftwood		4	-		<i>Talorchestia tum.</i> 30 burrows .m ²	4
b	-			(<i>Spirula spirula</i>) dead	1	<i>Talorchestia tum.</i> 30 burrows .m ²	1
c	driftwood Kowhai seeds		3	-deadwasp	1	<i>Talorchestia tum.</i> 17 burrows .m ²	3
d	driftwood		4	-smallspider (sample lost)	1	<i>Talorchestia tum.</i> 14 burrows .m ²	3
e	driftwood		4	-		<i>Talorchestia tum.</i> 30 burrows .m ²	1

ML2: 15 - 35 m upper intertidal sand terrace

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Talorchestia tum.</i> 13 burrows .m ²	1
b	-			-		<i>Talorchestia tum.</i> 8 burrows .m ²	-
c	-			-		<i>Talorchestia tum.</i> 6 burrows .m ²	1
d	-			-		<i>Talorchestia tum.</i> 4 burrows .m ²	-
e	-			-		<i>Talorchestia tum.</i> 4 burrows .m ²	-

ML2: 35 - 60 m lower intertidal sand ripple terrace

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Glycera americana</i>	1
b	-			-		<i>Glycera americana</i> <i>Cirolana sp.</i>	1 3
c	-			-		<i>Marphysa depr.</i> <i>Cirolana sp.</i>	2 4
d	-			-		<i>Glycera americana</i>	1
e	-			-		<i>Aglaophanius mac</i>	2

ML2: 60 - 70 m subtidal shell and pebble channel

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		* <i>Palaemon affinis</i> <i>Glycera americana</i> <i>Marphysa depr.</i>	1 2 1
b	-			-		* <i>Palaemon affinis</i>	2
c	-			-		<i>Glycera americana</i>	1
d	-			-		* <i>Palaemon affinis</i>	3
e	-			-		-	

* probably introduced with wash water

Table 9. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: ML1 Date: 01 March 1991 Time: 0900 hrs.

Site Description: lower estuary: right bank to channel (see sketch map)

Notes: fast tidal flow: drift dive back to bridge

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r = rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	ML101	+3.7	s (fine black)	5	<i>Spinifex hirsutus</i>	0.5	5	00-05 00-04: bank <i>Spinifex</i> ends at 4m
005	ML102	+2.1	s (fine black) drift log / wood	-	(see quadrat data)			05-10 as per quadrat
010	ML103	+1.9	s (fine black) drift log / wood	-	(see quadrat data)			10-15 as per quadrat
015	ML104	+1.7	s (fine black) drift log / wood	-	(see quadrat data)			15-20 as per quadrat
020	ML105	+1.5	s (fine black) drift log / wood	-	(see quadrat data)			20-25 as per quadrat
025	ML106	+1.4	s (fine black) drift log / wood	-	(see quadrat data)			25-30 as per quadrat
030	ML107	+1.2	s (fine black) drift log / wood	-	(see quadrat data)			30-35 as per quadrat
035	ML108	+1.0	s (fine black)	-	(see quadrat data)			35-40 as per quadrat
040	ML109	+0.9	s (fine black)	-	(see quadrat data)			40-45 as per quadrat
045	ML110	+0.8	s (fine black)	-	(see quadrat data)			45-50 as per quadrat
050	ML111	+0.7	s (fine black)	-	(see quadrat data)			50-55 as per quadrat
055	ML112	+0.6	s (fine black)	-	(see quadrat data)			55-60 as per quadrat
060	ML113	+0.5	s (fine black)	-	(see quadrat data)			60-65 as per quadrat
065	ML114	+0.4	s (fine black) sh / p	-	(see quadrat data)			65-70 as per quadrat
070	ML115	0.0	s (fine black) sh / p	-	(see quadrat data)			70-75 as per quadrat
075	ML116	-1.6	s / g	-	not quantitatively sampled			75-80

ML1: Habitat/Zones recognised

ML1: Log-Drift Zone

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			see sieve data		2% log cover burrows <i>Scyphax ornatus</i> <i>Talorchestia tum.</i> spider B sandflies	10 11 p p
b	-			see sieve data		100% log cover burrows <i>Talorchestia tumi.</i> spider C sandflies	45 15 1 p
c	-			see sieve data		75% log cover burrows <i>Talorchestia</i> sandflies	30 10 p
d	-			see sieve data		50% log cover burrows <i>Scyphax ornatus</i> <i>Talorchestia tumi.</i> sandflies	18 2 10 p
e	-			see sieve data		75% log cover burrows <i>Scyphax ornatus</i> <i>Talorchestia tumi.</i> spiders sandflies	10 6 p p

Mid-tide sand flats

Random 1 m² Quadrats

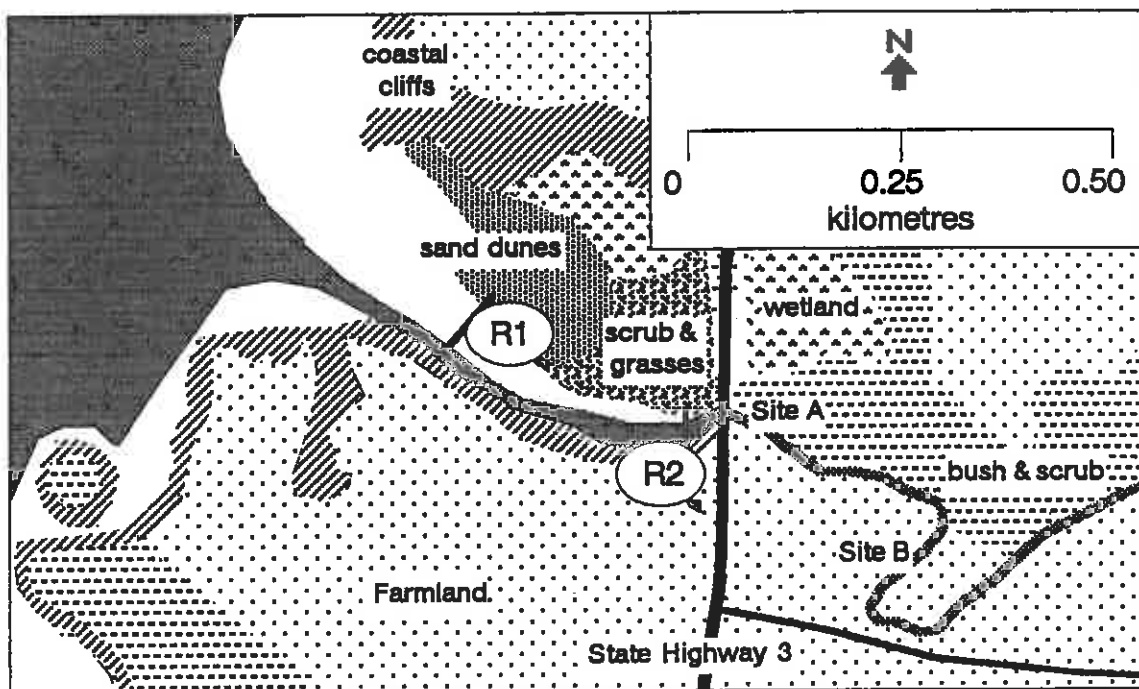
reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		-	
b	-			-		-	
c	-			-		<i>Scyphax ornatus</i>	2
d	-			-		<i>Scyphax ornatus</i>	1
e	-			-		-	

B) Rapanui River Mouth

A sketch map of the Rapanui River Mouth (compiled from aerial photographs) and the locality of sampling stations is given in Figure 13.

Figure 13.

Sketch Map of Rapanui River Mouth showing position of Sampling Stations



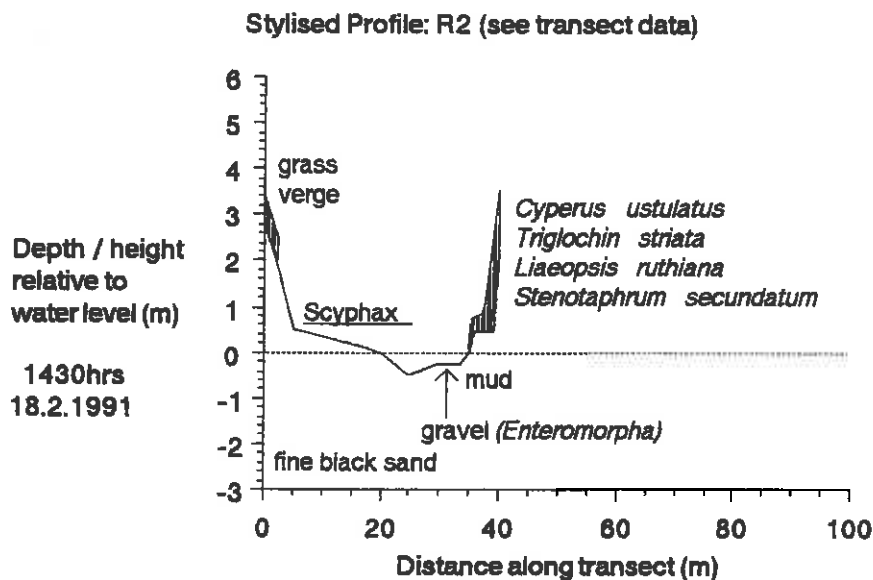
On the basis that there were no significant area of sediment deposition in this area, Rapanui was considered to be river mouth rather than an estuary (see discussion).

Freshwater influences dominated upstream of Site A (see Figure 13). Ecologically valuable wetlands occurred either side of the road north of the bridge. Sand dunes were a feature of the northern heads of this river mouth.

The Rapanui data base follows.

Transect R2 (see Table 10. and Figures 13 & 14)

Figure 14.



Transect R1 (see Table 11. and Figures 13 & 15)

Figure 15.

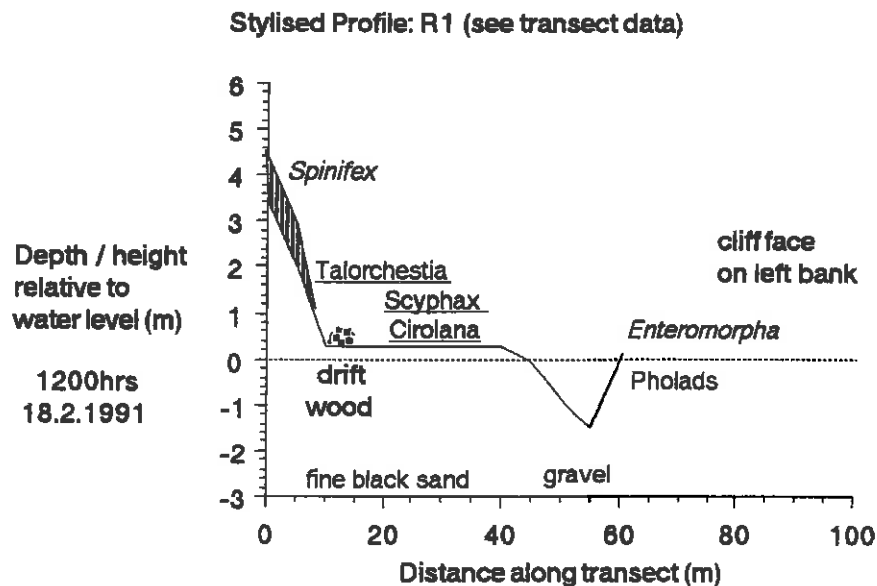


Table 10. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: R2. Date: 18 FEB 1991 Time: 1430 hrs.

Site Description: downstream of bridge at road entry point (see sketch map)

Notes: 0m right bank

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occassional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/ Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	R2.01	+2.9	s /fine black	6	<i>Stenotaphrum secundatum</i> <i>Libertia ixiodes</i> <i>Lotus pedunculatus</i> <i>Ranunculus macropus</i>	0.4 0.7 0.2 0.2	5 1 1 1	00-05 2m end of vegetation
005	R2.02	+0.55	s /fine black wood	0	- (see quadrat data)			05-10 as for quadrat
010	R2.03	+0.35	m/s	0	<i>Ligia novaezelandiae</i>	-	o	10-15 as for quadrat
015	R2.04	+0.2	s fine black	0	- (see quadrat data)			15-20 as for quadrat
020	R2.05	0.0	s fine black	0	- (see quadrat data)			20-25 as for quadrat
025	R2.06	0.5	s fine black	0	- (see quadrat data)			25-30 as for quadrat
030	R2.07	0.2	s fine black	0	- (see quadrat data)			30-35 33 start of boulder gravel channel some <i>Enteromorpha</i> on upper surfaces at 0.3m depth
035	R2.08	0.0	m	5	<i>Cyperus ustulatus</i> <i>Triglochin striata</i> <i>Lilaeopsis ruthiana</i>	0.8 0.08 0.08	3 2 1	35-40 36-37m (0.6m a.w.l.) zone of <i>Cyperus ust.</i>
040	R2.09	+2.0	m/b/ logs	3	<i>Stenotaphrum secundatum</i> <i>Mazus pumilio</i> <i>Rubus fruticosus</i>	0.2 0.9 1.0	3 1 1	40-45 <i>Coprosma repens</i> <i>Calystegia sep.</i> <i>Aristolelia serrata</i>

R2 Habitat/Zones recognised

R2: marginal high tide grasses

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Stenotaphrum secundatum</i> <i>Festuca arundinacea</i>	0.4 1.2	5 1	-			
b	<i>Stenotaphrum secundatum</i> <i>Hieracium lepidulum</i>	0.4 0.4	5 1	-			
c	<i>Stenotaphrum secundatum</i> <i>Holcus lanatus</i>	0.4 0.5	4 1	-			
d	<i>Stenotaphrum secundatum</i> <i>Lotus corniculatus</i> <i>Myosotis sp.</i>	0.4 0.2 0.5	4 1 1	-			
e	<i>Stenotaphrum secundatum</i>	0.4	6	-			

R2: inter tidal sand flats

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Scyphax ornatus</i>	4
b	-			<i>Ligia n.z.</i>	3	<i>Scyphax ornatus</i> <i>Ligia n.z.</i>	1 1
c	-			-		<i>Scyphax ornatus</i> <i>Squilla armata</i>	3 1
d	-			-		<i>Scyphax ornatus</i>	3
e	-			-		<i>Squilla armata</i>	1

R2: subtidal gravel/sand

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Enteromorpha sp.</i>	-	1	-		-	
b	-			-		-	
c	<i>Enteromorpha sp.</i>	-	1	-		-	
d	-			-		-	
e	-			-		-	

Table 11. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: R1 Date: 18 FEB 1991 Time: 1200 hrs.

Site Description: (see sketch map). Rapanui Estuary from sand dunes to channel (100m upstream of southern point)

Notes: channel 1.5m deep with gravel / pebble channel in sand. Sixty metres to left bank cliff with Phoad borings and *Enteromorpha*. Inshore sand dune vegetation included *Phormium tenax*, *Rubus fruticosus*, *Coprosma repens*, *Lupinus arboreus*, *Taxodium officinale*, *Macropiper excelsum*, *Pinus halepensis*, *Muehlenbeckia complexa*

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	R1.01	+3.4	s fine black	6	<i>Spinifex hirsutus</i> <i>Coprosma repens</i>	1.0 0.9	5 2	00-05 down slope with <i>Spinifex</i>
005	R1.02	+2.0	s fine black	4	<i>Spinifex hirsutus</i>	1.0	4	05-10 as per quadrat
010	R1.03	+0.3	s fine black wood	0	<i>Phycosecis limbata</i> (larvae) Dipteran larvae <i>Talorchestia tumida</i> millipede (see quadrat data)		o a c o	10-15 as per quadrat
015	R1.04	+0.3	s fine black	0	burrows (see quadrat data)			15-20 as per quadrat
020	R1.05	+0.3	s fine black wood	0	burrows (see quadrat data)			20-25 as per quadrat
025	R1.06	+0.3	s fine black wood	0	burrows (see quadrat data)			25-30 as per quadrat
030	R1.07	+0.3	s fine black wood & debris	0	- (see quadrat data)			30-35 as per quadrat
035	R1.08	+0.3	s fine black	0	- (see quadrat data)			35-40 as per quadrat
040	R1.09	+0.25	s fine black	0	- (see quadrat data)			40-45 as per quadrat
045	R1.10	0.0	s fine black	0	- (see quadrat data)			45-50 as per quadrat
050	R1.11	1.0	s/g/p	0	-			50-55 as per quadrat
055	R1.12	1.5	s/g/p	0	-			55-60 as per quadrat
060	R1.13	0.0	r (sst. / mst)	3	<i>Enteromorpha</i> sp. <i>Anchomasa similis</i>	-	3 c	60-65 up cliff face with <i>Machaerina</i> sin. <i>Cortaderia toetoe</i> <i>Blechnum</i> sp.

R1: Habitat/Zones recognised

R1: sand dunes

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Spinifex hirsutus</i>	0.8	4	spider D*	1		
b	<i>Spinifex hirsutus</i>	1.0	5	-			
c	<i>Spinifex hirsutus</i>	0.9	4	<i>Talorchestia tum.</i>	3		
d	<i>Spinifex hirsutus</i>	0.9	5	-			
e	<i>Spinifex hirsutus</i>	0.8	3	<i>Talorchestia tum.</i>	5		

* see sample collection

R1: log littler zone, upper beach (10 - 15 m)

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	logs		4	see sieving data	60	<i>Talorchestia tum.</i> cranny larvae spider C* <i>Anisolabis littorea</i>	12 30 2 1
b	logs		4	see sieving data		<i>Talorchestia tum.</i> cranny larvae	3 12
c	logs		1	see sieving data		<i>Talorchestia tum.</i>	7
d	logs		4	see sieving data		<i>Talorchestia tum.</i> cranny larvae spider C* <i>Anisolabis littorea</i>	14 23 1 2
e	logs		3	see sieving data		<i>Talorchestia tum.</i> cranny larvae	7 3

*see sample collection

R1: middle (intertidal) beach (15 - 40 m)

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-					<i>Scyphax ornatus</i>	1
b	-					<i>Pericoptus trun.</i> <i>Talorchestia tum.</i>	2 4
c	-					<i>Cirolana sp.</i>	2
d	-					-	
e	-					<i>Cirolana sp.</i> <i>Talorchestia tum.</i>	2 1

R1: subtidal sand (40 - 55 m)

Random 1 m² Quadrats

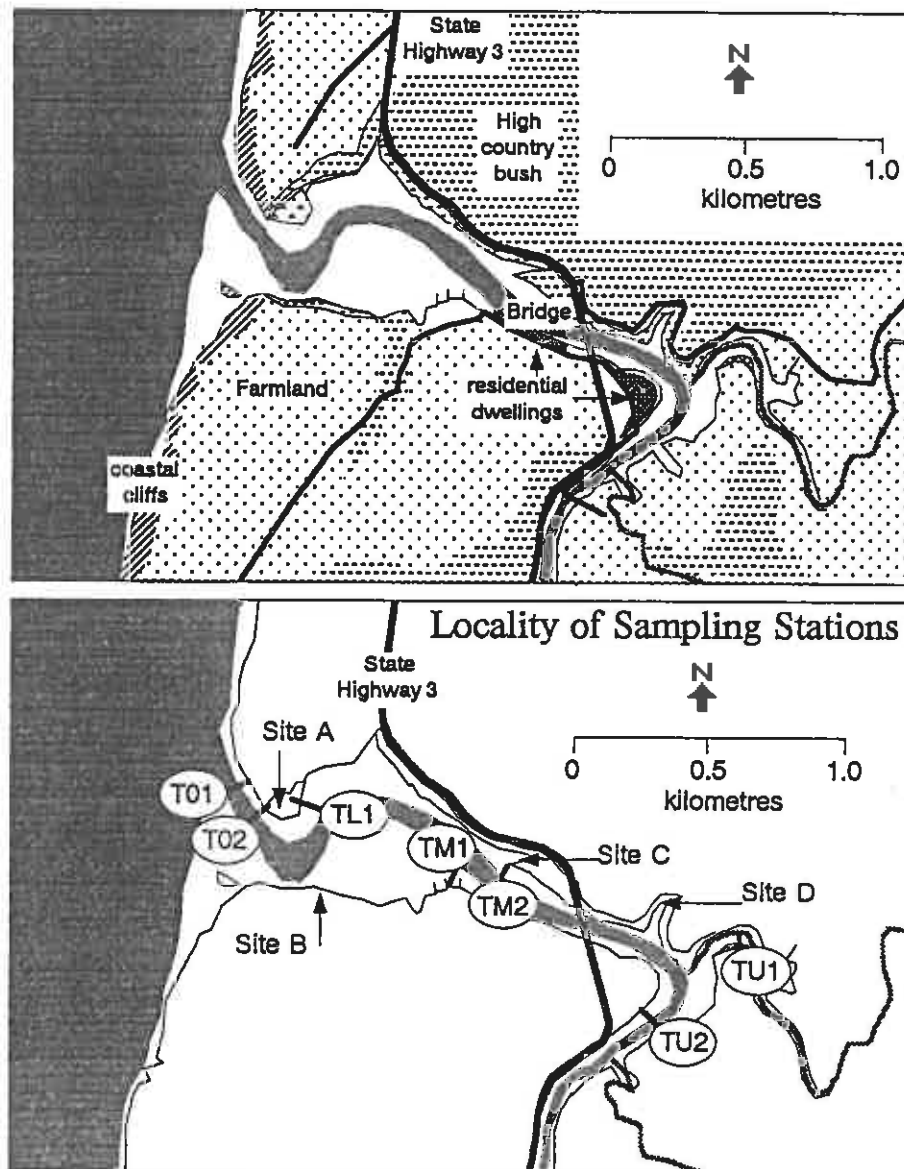
reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		-	
b	-			-		-	
c	-			-		-	
d	-			-		-	
e	-			-		-	

C) Tongaporutu Estuary

A sketch map of the Tongaporutu Estuary (compiled from aerial photographs) and the locality of sampling stations (together with the open coast sites T01 and T02 - see Section D) is given in Figure 16.

Figure 16.

Sketch Map of Tongaporutu Estuary

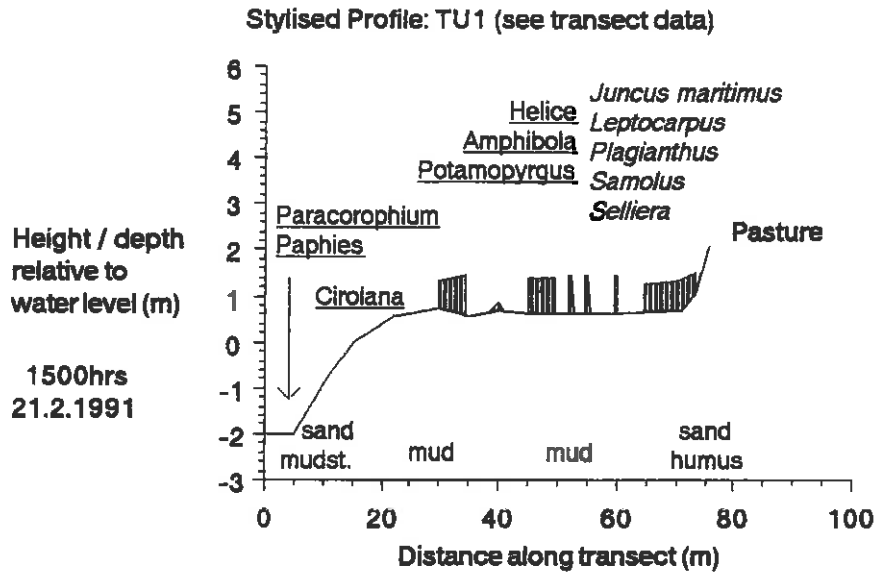


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The Tongaporutu data base follows.

Transect TU1 (see Table 12. and Figures 16 & 17)

Figure 17.



Transect TU2 (see Table 13. and Figures 16 & 18)

Figure 18.

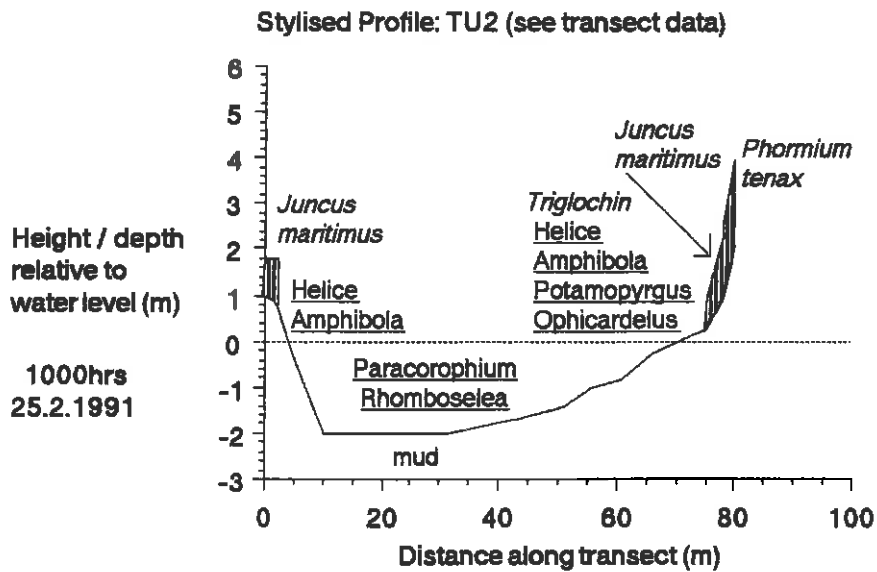


Table 12. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: TU1 Date: 21 FEB 1991 Time: 1500 hrs.

Site Description: Opposite rubbish dump on right bank Hutuiwai Stream. Pasture on left bank (with *Juncus gregiflorus*). See sketch map.Notes: *Vanellus miles novaehollandiae* in pasture. Saltmarsh plants on raised "islands" 0.5 m above w.l. at time of survey.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	TU110 1	2.0	s/m mudst.*	0	- (see quadrat data)	-	-	00-05 as per quadrat
005	TU102	2.0	m/s	0	- (see quadrat data)			05-10 as per quadrat
010	TU103	0.9	mud firm	0	- (see quadrat data)			10-15 as per quadrat
015	TU104	0.0	m./s. firm	0	- (see quadrat data)			15-20 as per quadrat
020	TU105	+0.3	m./s. firm	0	- (see quadrat data)			20-25 as per quadrat
025	TU106	+0.6	m./s. firm	0	- (see quadrat data)			25-30 as per quadrat
030	TU107	+0.7**	m/firm	6	<i>Plagianthus divaricatus</i> <i>Samolus repens</i> <i>Selliera radicans</i> <i>Leptocarpus similis</i> <i>Juncus maritimus</i> <i>Helice crassa</i>	0.8 0.10 <0.01 0.4 1.0 -	1 3 2 1 3 c	30-35 slightly higher ground 0.7m a.w.l.
035	TU108	+0.6**	m/firm	3/5	<i>Juncus maritimus</i> <i>Samolus repens</i> <i>Helice crassa</i>	0.8 0.10	3 5	35-40 bare mud / mud crabs
040	TU109	+0.6**	m/firm	5	<i>Samolus repens</i> <i>Helice crassa</i> <i>Amphibola crennata</i>	0.03 - -	6 c c	40-45 riverlet with <i>Potamopyrgus est</i>
045	TU110	+0.6**	m/firm	3	<i>Juncus maritimus</i> <i>Helice crassa</i> <i>Potamopyrgus estuarinus</i>	0.8 - -	3 c a	45-50 <i>Juncus maritimus</i> 0.8 (3)
050	TU111	+0.6**	m/firm	3	<i>Samolus repens</i> <i>Juncus maritimus</i> <i>Helice crassa</i>	0.03 0.8 -	2 2 c	50-55 clumps <i>Juncus</i> <i>maritimus</i> . 0.8 (3)
055	TU112	+0.6**	m/firm	5/3	<i>Samolus repens</i> <i>Juncus maritimus</i> <i>Helice crassa</i>	0.03 0.8 -	3 5 c	55-60 bare dry mud <i>Helice crassa</i>
060	TU113	+0.6**	m/firm	3	<i>Juncus maritimus</i> (isolated plant)	0.6	3	60-65 60-64 bare mud / <i>Helice crassa</i>
065	TU114	+0.6**	m/firm	5	<i>Juncus maritimus</i>	0.8	5	65-70 <i>Juncus mar.</i> 0.8(5)
070	TU115	+0.6	s fine black humus	6	<i>Samolus repens</i> <i>Selliera radicans</i> <i>Leptocarpus similis</i> <i>Juncus maritimus</i> <i>Triglochin striata</i> <i>Isolepis setacea</i> <i>Ophicardelus costellaris</i>	0.01 0.03 0.6 0.8 0.10 0.10 -	1 3 3 2 1 1 c	75-80 <i>Juncus mar.</i> 0.8(5) <i>Lobelia anceps</i>
075	TU116	+2.0	humus soil	6	pasturesward <i>Juncus gregiflorus</i>	0.05 0.6	5 1	80+ improved pasture

*with semi fossilised crabs and shellfish

** erosion of rootzone has left macrophytes perched on "island" of root material

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TU1: Habitat/ Zones recognised

TU1: saltmarsh

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Juncus maritimus</i>		3	<i>Helice crassa</i> <i>Ophicardelus cost</i>	7 9		
b	<i>Juncus maritimus</i> <i>Samolus repens</i> <i>Sarcocornia qu.</i>	0.7 0.05 0.10	4 1 1	<i>Helice crassa</i> <i>Ophicardelus cost</i>	8 43		
c	<i>Leptocarpus sim.</i> <i>Selliera radicans</i> <i>Zoysia minima</i>	0.8 0.10 0.5	1 4 1	<i>Helice crassa</i>			
d	-			<i>Helice crassa</i> cowpat shear water prints	2		
e	<i>Juncus maritimus</i> <i>Samolus repens</i>	0.7 0.05	3 1	<i>Helice crassa</i>	4		

TU1: mud flats

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Cirolana sp.</i>	2
b	-			-		<i>Cirolana sp.</i>	1
c	-			-		-	
d	-			-		-	
e	-			-		<i>Helice crassa</i>	2

TU1: subtidal channel

Random 1 m² Quadrats (compositsamplejar)

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-					<i>Paphies australis</i> 00-05 12 06-10 2 <i>Chione st.</i> 00-05 2 <i>Paracorophium ex</i> <i>Marphysa dep.</i> 60 4	
b	-					<i>Paphies australis</i> 00-05 10 06-10 1 11-15 1 <i>Paracorophium ex</i> <i>Cirolana sp.</i> 18 1	
c	-					<i>Paphies australis</i> 00-05 50 06-10 29 11-15 5 21-25 1 41-45 3 <i>Chione st.</i> 00-05 3 06-10 1 11-15 3 <i>Paracorophium ex</i> 133 <i>Sabellaria kai.</i> 1 <i>Marphysa dep.</i> 1 <i>Glycera americana</i> 1	
d	-					<i>Paphies australis</i> 00-05 6 06-10 6 <i>Chione st.</i> 00-05 2 <i>Helice crassa</i> 1 <i>Paracorophium ex</i> 4 <i>Pectinaria australis</i> 1 <i>Marphysa dep.</i> 1 <i>Glycera americana</i> 2	
e	-					<i>Cirolana sp.</i> 2	

Table 13. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: TU2 Date: 25 FEB 1991 Time: 1000 hrs.

Site Description: Upper estuary, left bank fork. See sketch map.

Notes: Right bank (0m) to left bank (west). One metre drop from pasture and *Circium arvense* to sloping mud bank on right bank. Mud flats in front of cottages with sea wall of old tyres on left bank..

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	TU201	+1.0	m	3	<i>Juncus maritimus</i> <i>Amphibola crenata</i>	0.8	3	00-05 3m: w.l./ <i>Amphibola cren.</i> and <i>Helice crassa</i>
005	TU202	0.3	m	0	<i>Paracorophium ex. burrows</i>	-	a	05-10 as per quadrat
010	TU203	2.0	m	0	<i>Paracorophium ex. burrows</i>	-	a	10-15 as per quadrat
015	TU204	2.0	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data) <i>Rhomboselea retiaris</i>	-	a o	15-20 as per quadrat
020	TU205	2.0	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data) <i>Rhomboselea retiaris</i>	-	a o	20-25 as per quadrat
025	TU206	2.0	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data) <i>Rhomboselea retiaris</i>	-	a o	25-30 as per quadrat
030	TU207	2.0	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data) <i>Rhomboselea retiaris</i>	-	a o	30-35 as per quadrat
035	TU208	1.9	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data)	-	a	35-40 as per quadrat
040	TU209	1.8	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data) <i>Rhomboselea retiaris</i>	-	a o	35-40 as per quadrat
045	TU210	1.6	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data)	-	a	35-40 as per quadrat
0050	TU211	1.4	m	0	<i>Paracorophium ex. burrows</i> (see quadrat data)	-	a o	35-40 as per quadrat
055	TU212	1.0	m	0	<i>Helice crassa</i> <i>Gobiomorphus sp.</i>	- -	c o	35-40 as per quadrat
060	TU213	0.9	m	0	<i>Amphibola crenata</i> <i>Helice crassa</i> (see quadrat data)	- -	o c	35-40 as per quadrat
065	TU214	0.3	m	0	<i>Amphibola crenata</i> <i>Helice crassa</i> (see quadrat data)	- -	o c	35-40 as per quadrat
070	TU215	0.0	m/sh	0	<i>Amphibola crenata</i> <i>Helice crassa</i> (see quadrat data)	- -	o c	70-75
075	TU216	+0.3	m	3	<i>Triglochin striata</i> <i>Helice crassa</i>	0.03 -	3 c	75-80 77 m 1.4 m tall (6) <i>Juncus maritimus</i>
080	TU217	+2.0	m	2/3	<i>Phormium tenax</i> <i>Juncus maritimus</i> <i>Gelidium caulacanthum</i> <i>Littorina unifasciata</i> <i>Ophicardelus costellaris</i> <i>Amphibola crenata</i> (see quadrat data)	2.0 1.4 <0.01 - - -	2 3 1 a c o	80m+ 2.0 m up wall of old tyres to lawn and garden

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TU2: Habitat / Zones recognised

TU2: Saltmarsh community

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Juncus maritimus</i> <i>Gelidium caul.</i>	0.8 -	5 1	<i>Potamopyrgus est.</i> <i>Opihcardelus cos</i> <i>Helice crassa</i> <i>Amphibola cren.</i>	700 20 4 1	-	
b	<i>Juncus maritimus</i> <i>Gelidium caul.</i> <i>Triglochin striata</i>	0.8 - 0.02	3 1 1	<i>Potamopyrgus est.</i> <i>Opihcardelus cos</i> <i>Helice crassa</i> <i>Amphibola cren.</i>	1,000 25 3 2	-	
c	<i>Juncus maritimus</i> <i>Gelidium caul.</i>	0.8 -	5 1	<i>Potamopyrgus est.</i> <i>Opihcardelus cos</i> <i>Helice crassa</i>	500 30 7	-	
d	<i>Juncus maritimus</i> <i>Gelidium caul.</i> <i>Triglochin striata</i>	0.9 - 0.03	1 1 3	<i>Potamopyrgus est.</i> <i>Opihcardelus cos</i> <i>Helice crassa</i> <i>Amphibola cren.</i>	1500 18 5 3	-	
e	<i>Triglochin striata</i> <i>Catenella fus.</i>	0.04 -	3 1	<i>Potamopyrgus est.</i> <i>Opihcardelus cos</i> <i>Helice crassa</i> <i>Amphibola cren.</i>	2,000 1 7 1	-	

TU2: Mudcrab / Amphibola Zone

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			<i>Amphibola cren.</i> <i>Potamopyrgus est.</i>	10 30	<i>Helice crassa</i> <i>Glycera americana</i> shrimp(washwater)	3 2 15
b	-			<i>Amphibola cren.</i> <i>Potamopyrgus est.</i>	3 21	<i>Helice crassa</i> <i>Glycera americana</i> platyhelminth	10 4 1
c	-			<i>Amphibola cren.</i> <i>Potamopyrgus est.</i>	3 4	<i>Helice crassa</i> <i>Glycera americana</i>	4 4
d	-			<i>Amphibola cren.</i> <i>Potamopyrgus est.</i>	5 20	<i>Helice crassa</i> <i>Glycera americana</i>	5 3
e	-			broken shell <i>Amphibola cren.</i> <i>Potamopyrgus est.</i>	 8 3	<i>Helice crassa</i> <i>Glycera americana</i> <i>Balanoglossus au.</i> <i>Marphysa dep.</i>	 3 4 1 3

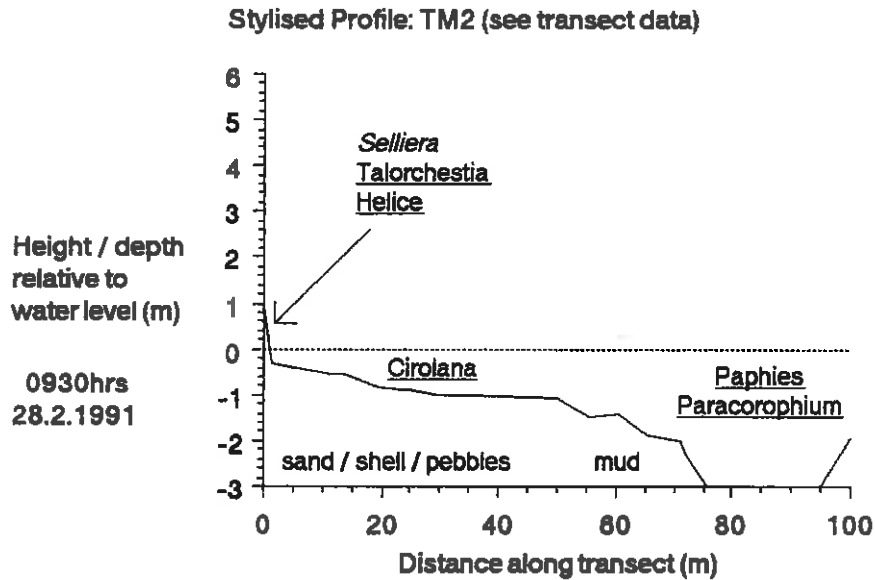
TU2: subtidal mud

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-					<i>Paphies australis</i> 06-10	-4
						<i>Paracorophium ex</i>	94
						<i>Perinereis ameri.</i>	1
						<i>Marphysa dep.</i>	2
b	-			-		<i>Paphies australis</i> 06-10	7
						<i>Paracorophium ex</i>	228
						<i>Perinereis ameri.</i>	1
c	-			-		<i>Paphies australis</i> 06-10	2
						<i>Paracorophium ex</i>	119
						<i>Perinereis ameri.</i>	2
d	-			-		<i>Paphies australis</i> 00-05	5
						06-10	1
						<i>Paracorophium ex</i>	75
						<i>Aglaophanius mac</i>	2
e	-			-		<i>Paracorophium ex</i>	43
						<i>Amphiporus sp.</i>	1

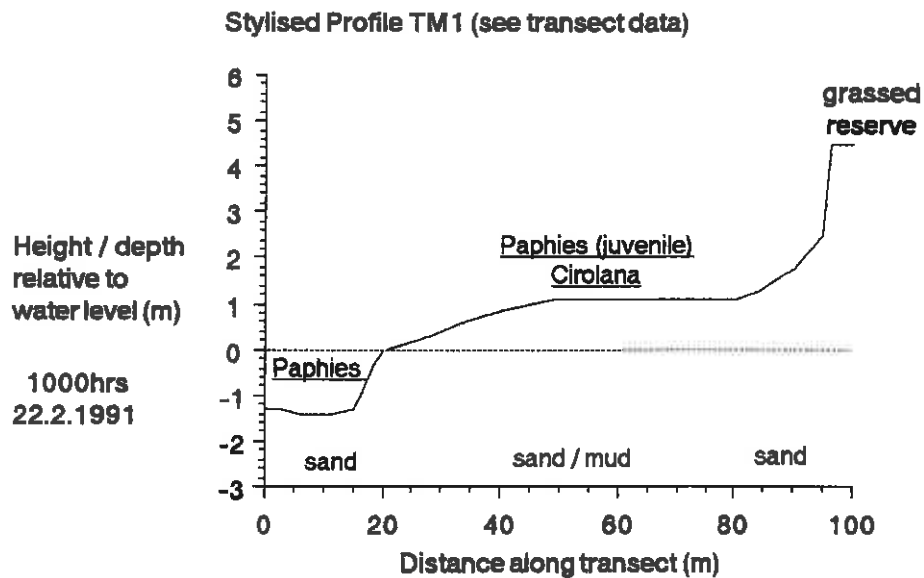
Transect TM2 (see Table 14. and Figures 16 & 19)

Figure 19.



Transect TM1 (see Table 15. and Figures 16 & 20)

Figure 20.



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Table 14. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: TM2 Date: 28 FEB 1991 Time: 0930 hrs.

Site Description: From eastern point of river mouth on right bank to mid channel on north - south line with bach 12 (grey). See sketch map.

Notes: bluff of north side with complete vegetation cover including *Knightea excelsa*, *Hebe stricta*, *Libertia ixiodes*, and *Ulex europaeus*.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r = rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	TM221	+1.0	s/st. cliff	1	<i>Selliera radicans</i> * <i>Talorchestia quoyana</i> * <i>Helice crassa</i> * in old pholad borings	0.01	1 o o	00-05 vertical cliff to sand flats at 02m.
005	TM202	0.4	s (fine black) / sh / p	-	- (see quadrat data)			05-10 as per quadrat
010	TM203	0.5	s / sh / p	-	- (see quadrat data)			10-15 as per quadrat
015	TM204	0.6	s / sh / p	-	- (see quadrat data)			15-20 as per quadrat
020	TM205	0.9	s / sh / p	-	- (see quadrat data)			20-25 as per quadrat
025	TM206	0.9	s / sh / p	-	- (see quadrat data)			25-30 as per quadrat
030	TM207	1.0	s / sh / p	-	- (see quadrat data)			30-35 as per quadrat
035	TM208	1.1	s / sh / p	-	- (see quadrat data)			35-40 as per quadrat
040	TM209	1.1	s / sh / p	-	- (see quadrat data)			40-45 as per quadrat
045	TM210	1.1	s / m / p	-	- (see quadrat data)			45-50 as per quadrat
050	TM211	1.1	s / sh	-	- (see quadrat data)			50-55 as per quadrat
055	TM212	1.5	m (firm) / s	-	- (see quadrat data)	-	c a	55-60 as per quadrat
060	TM213	1.5	m (firm) / s	-	- (see quadrat data)	-	c a	60-65 as per quadrat
065	TM214	1.9	m (firm)	-	- (see quadrat data)	-	c a	65-70 as per quadrat
070	TM215	2.0	m	-	- (see quadrat data)	-	a	70-75 as per quadrat
075	TM216	3.0	m/s/sh	-	<i>Paphies australis</i> (see quadrat data)	-	c	75-80 as per quadrat
080	TM217	3.0	m/s/sh	-	<i>Paphies australis</i> (see quadrat data)	-	c	80-85 as per quadrat
085	TM218	3.0	m/s/sh	-	<i>Paphies australis</i> (see quadrat data)	-	c	85-90 as per quadrat
090	TM219	3.0	m/s/sh	-	<i>Paphies australis</i> (see quadrat data)	-	c	90-95 as per quadrat
095	TM220	3.0	m/s/sh	-	- (see quadrat data)	-	c	95-100 as per quadrat
100	TM221	2.0	m	-	- (see quadrat data)	-	a	100+

d	-					<i>Paphies australis</i>	
						00-05mm	26
						06-10mm	1
						11-15mm	2
						16-20mm	
						21-25mm	3
						26-30mm	2
						31-35mm	9
						36-40mm	16
						41-45mm	8
							<i>Paracorophium ex</i>
e	-					<i>Paphies australis</i>	
						00-05mm	72
						06-10mm	9
						11-15mm	9
						16-20mm	11
						21-25mm	7
						26-30mm	4
						31-35mm	15
						36-40mm	9
						41-45mm	
							<i>Paracorophium ex</i>

Table 15. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: TM1 Date: 22 FEB 1991 Time: 1000 hrs.

Site Description: 100 m west of last house (southern shore) between groynes 2 - 3. See sketch map.

Notes: Start of transect (0m) in middle of channel.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r = rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	TM101	1.3	s (fine black) /sh	0	<i>Paphies australis</i> <i>Elminius modestus</i> (see quadrat data)	- -	a o	00-05 as per quadrat
005	TM102	1.4	s (fine black) /sh	0	<i>Paphies australis</i> <i>Elminius modestus</i> (see quadrat data)	- -	a o	05-10 as per quadrat
010	TM103	1.5	s / fine black	0	- (see quadrat data)			10-15 as per quadrat
015	TM104	1.3	s / fine black	0	- (see quadrat data)			15-20 as per quadrat
020	TM105	0.0	s / fine black	0	- (see quadrat data)			20-25 as per quadrat
025	TM106	+0.2	s/m rippled	0	- (see quadrat data)			25-30 as per quadrat
030	TM107	+0.4	s/m rippled	0	- (see quadrat data)			30-35 as per quadrat
035	TM108	+0.6	s/m rippled	0	- (see quadrat data)			35-40 as per quadrat
040	TM109	+0.8	s/m rippled	0	- (see quadrat data)			40-45 as per quadrat
045	TM110	+1.0	s/m rippled	0	- (see quadrat data)			45-50 as per quadrat
050	TM111	+1.1	s/m rippled	0	- (see quadrat data)			50-55 as per quadrat
055	TM112	+1.1	s/m rippled	0	- (see quadrat data)			55-60 as per quadrat
060	TM113	+1.1	s/m rippled	0	- (see quadrat data)			60-65 as per quadrat
065	TM114	+1.1	s/m rippled	0	- (see quadrat data)			65-70 as per quadrat
070	TM115	+1.1	s/m rippled	0	- (see quadrat data)			70-75 as per quadrat
075	TM116	+1.1	s/m rippled	0	- (see quadrat data)			75-80 as per quadrat
080	TM117	+1.1	s fine black	0	- (see quadrat data)			80-85 as per quadrat
085	TM118	+1.3	s fine black	0	- (see quadrat data)			85-90 as per quadrat
090	TM118	+1.8	s fine black	0	- (see quadrat data)			90-95 as per quadrat
095	TM113	+2.4	s fine black	0	- (see quadrat data)			95-100 95 - 97: log drift <i>Talorchestia tum</i> 97m+ grass verge
100	TM113	+4.4	s / litter	6	<i>Stenotaphrum secundatum</i> <i>Lotus pedunculatus</i> <i>Agropyron repens</i>	0.6 0.5 1.3	5 2 1	100+ grassed reserve <i>Libertia ixiodes</i> <i>Ranunculus sp.</i> <i>Paspalum pasp.</i>

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TM1: Habitat/ Zones recognised

TM1: Upper Beach

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		nil	
b	-			-		nil	
c	-			-		nil	
d	-			-		nil	
e	-			-		nil	

TM1: Middle Beach

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Paphies australis</i> 00-5mm 6-10mm	2 4
b	-			-		<i>Paphies australis</i> 00-5mm 6-10mm	3 5
c	-			-		<i>Cirolana sp.</i> <i>Paphies australis</i> 00-5mm	1 3
d	-			-		<i>Paphies australis</i> 00-5mm	1
e	-			-		<i>Paphies australis</i> 0-5mm 11-15mm	2 2

TM1: Lower Beach

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			dead <i>Paphies</i> & <i>Chione</i> shells occ stones & gravel		<i>Paphies australis</i> 00-05mm 06-10mm <i>Chione stutchb.</i> 06-10mm <i>Paracorophium ex</i>	124 65 - 2 21
b	-			dead <i>Paphies Chione</i> <i>Amphibola</i> shells		<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm <i>Chione stutchb.</i> 6-10mm <i>Ararenicola affinis</i>	146 64 2 2 14 1
c	-			broken shell only		<i>Paphies australis</i> 00-05mm 06-10mm <i>Paracorophium ex</i> <i>Palaemon affinis</i> <i>Aglaophanius mac</i> <i>Perinereis ameri.</i> nematode	125 68 -9 2 1 2 1
d	-			broken shell only		<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 21-25mm 26-30mm <i>Chione stutchb.</i> 06-10mm <i>Palaemon affinis</i> <i>Aglaophanius mac</i>	80 77 1 1 1 1 2 2
e	-			broken shell / wood		<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 26-30mm <i>Palaemon affinis</i> <i>Perinereis amer.</i>	61 84 3 1 3 1

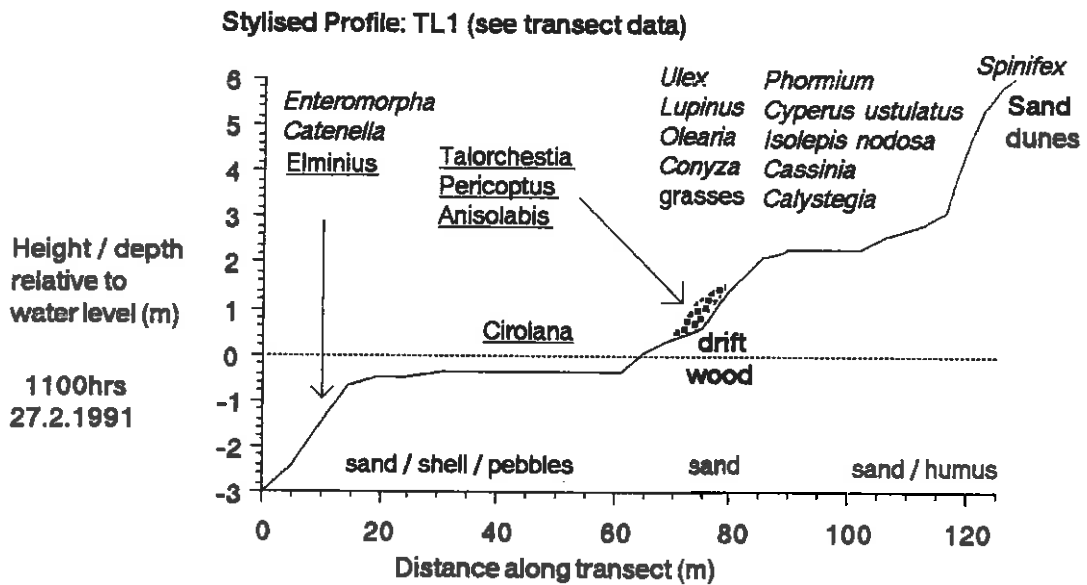
TM1: Subtidal

Random 1 m² Quadrats (*Paphies australis* counts only)

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			<i>Paphies australis</i> <i>Elminius modestus</i>	a c	<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm	58 61 12 4 3 2 87 20 11
b	-			<i>Elminius modestus</i> on emergent sections of <i>Paphies australis</i> shells		<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm	15 21 9 3 - 1 5 16 11
c	-			<i>Elminius modestus</i> on emergent sections of <i>Paphies australis</i> shells		<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm	5 7 2 1 1 - 3 - 4
d	-			<i>Elminius modestus</i> on emergent sections of <i>Paphies australis</i> shells		<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm	4 13 5 10 - - 3 20 10
e	-			<i>Elminius modestus</i> on emergent sections of <i>Paphies australis</i> shells		<i>Paphies australis</i> 00-05mm 06-10mm 11-15mm 16-20mm 21-25mm 26-30mm 31-35mm 36-40mm 41-45mm	5 3 2 - - 3 2 10 1

Transect TL1 (see Table 16 and Figures 16 & 21)

Figure 21.



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Table 16. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: TL1 Date: 27 FEB 1991 Time: 1000 - 1200 hrs.

Site Description: South-east spit from northern head of estuary. Western side of spit sand dunes with *Spinifex hirsutus* and Grass A (see herbarium); eastern side of spit with coastal scrub including *Alocasia macrorrhiza*, *Aristolelia serrata*, *Calystegia sepium*, *Carpodetus serratus*, *Cassinia leptophylla*, *Coprosma acerosa*, *Coprosma perpusilla*, *Coprosma propinqua*, *Coprosma robusta*, *Coprosma australis*, *Cordyline australis*, *Corokia cotoneaster*, *Hebe stricta*, *Kunzea ericoides*, *Leptospermum scoparium*, *Macropiper excelsum*, *Melicytis ramiflorus*, *Metrosideros carminea*, *Muehlenbeckia complexa*, *Myoporum laetum*, *Olearia solandri*, *Olearia townsonii*, *Olearia virgata*, *Pittosporum crassifolium*, *Pomaderris kumeraho*, *Pseudopanax arboreum*, *Pseudopanax discolor*, *Pseudopanax crassifolium*, *Racosperma longifolia*, *Salix fragilis*, *Schefflera digitata*, *Sophora microphylla*. See sketch map.

Notes: 1m through water visibility in channel at time of survey.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (freq) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	TL101	3.0	sh/s/p	0	dead <i>Chione</i> and <i>Paphies</i> shell	-		00-05 4m start of rise to lower beach
005	TL102	2.5	s/ fine black sh/p	1	<i>Catenella nipae</i> <i>Elminius modestus</i> (on exposed pebbles)	<0.01 -	1 o	05-10 as per quadrat
010	TL103	1.5	s/ fine black sh/p	1	<i>Enteromorpha</i> sp. <i>Elminius modestus</i> (on exposed pebbles)	<0.01 -	1 o	10-15 as per quadrat
015	TL104	0.7	s/ sh/p*	0	-			15-20 as per quadrat
020	TL105	0.6	s/ sh/p*	0	<i>Elminius modestus</i> (on exposed pebbles)	-	o	20-25 as per quadrat
025	TL106	0.6	s/ sh/p*	0	- (see quadrat data)			25-30 as per quadrat
030	TL107	0.5	s/ sh/p*	0	- (see quadrat data)			30-35 as per quadrat
035	TL108	0.5	s/ sh/p*	0	- (see quadrat data)			35-40 as per quadrat
040	TL109	0.5	s/ sh/p*	0	- (see quadrat data)			40-45 as per quadrat
045	TL110	0.5	s/ sh/p*	0	- (see quadrat data)			45-50 as per quadrat
050	TL111	0.5	s/ sh/p*	0	- (see quadrat data)			50-55 as per quadrat
055	TL112	0.5	s/ sh/p*	0	- (see quadrat data)			55-60 as per quadrat
060	TL113	0.5	s/ sh/p*	0	- (see quadrat data)			60-65 as per quadrat
065	TL114	0.0	s/ sh/p*	0	- (see quadrat data)			65-70
070	TL115	+0.3	s wood	0	- (see quadrat data)			70-75 as per quadrat
075	TL116	+0.5	s wood	0	- (see quadrat data)			75-80 as per quadrat
080	TL117	+1.4	s fine black / shallow humus wood	4	Grass A (see herbarium) <i>Agropyron repens</i> <i>Coryza bilbaona</i> <i>Lupinus arboreus</i> <i>Cyperus eragrostis</i> <i>Lycium ferocissimum</i>	1.5 1.0 0.8 0.7 1.0 0.7	2 1 1 1 2 2	80-85 <i>Hordeum marinum</i> <i>Hypochoeris glab.</i> <i>Leptinella dioica</i> <i>Ammophila aren.</i>

085	TL118	+2.0	s / humus	4/3	<i>Phormium tenax</i> <i>Ulex europaeus</i> <i>Lupinus arboreus</i> <i>Conyza bilbaona</i>	1.5 0.9 0.6 0.7	4 2 1 1	85-90 <i>Lotus ped.</i> <i>Angelica pachy.</i> <i>Lolium perenne</i>
090	TL119	+2.2	s / humus	6	<i>Ulex europaeus</i> <i>Calystegia sepium</i>	1.0 1.0	5 1	90-95 <i>Bolboschoenus fl</i> <i>Chrysanthemum le</i>
095	TL120	+2.2	s / humus	6	Grass A (see herbarium) <i>Calystegia sepium</i> <i>Cassinia leptophylla</i> <i>Conyza bilbaona</i>	1.5 1.5 0.5 1.0	5 1 1 1	95-100 <i>Euphorbia glauca</i>
100	TL121	+2.2	s / humus	6	Grass A (see herbarium) <i>Calystegia sepium</i> <i>Cassinia leptophylla</i> <i>Conyza bilbaona</i>	1.5 1.5 0.5 1.0	5 1 1 1	100-105 <i>Pimelea arenaria</i>
105	TL122	+2.5	s / humus	5	<i>Isolepis nodosa</i> <i>Cyperus ustulatus</i> <i>Calystegia sepium</i> Grass A (see herbarium) <i>Conyza bilbaona</i> <i>Foeniculum vulgare</i>	0.8 1.0 1.0 1.4 0.9 1.5	2 4 1 1 1 1	105-110 as per quadrat
110	TL123	+2.7	humus 0.01m / s (fine black)	5/5	<i>Phormium tenax</i> <i>Lupinus arboreus</i> Grass A (see herbarium)	2.0 1.0 1.3	5 3 2	110-115 <i>Macropiper ex.</i> <i>Phormium tenax</i> <i>Cyperus ust.</i> <i>Phytolacca oct.</i> <i>Agropyron repens</i>
115	TL124	+3.0	humus 0.01m / s (fine black)	3	<i>Spinifex hirsutus</i> <i>Phytolacca octandra</i> <i>Isolepis nodosa</i> <i>Conyza bilbaona</i> Grass A (see herbarium) <i>Olearia solandri</i>	0.5 1.0 0.6 1.0 1.5 0.6	1 1 1 1 1 1	115-120 as per quadrat
120	TL125	+4.9	humus 0.01m / s (fine black)	3	<i>Spinifex hirsutus</i> <i>Phytolacca octandra</i> <i>Isolepis nodosa</i> <i>Conyza bilbaona</i> Grass A (see herbarium) <i>Olearia solandri</i> <i>Cassinia leptophylla</i>	0.6 0.9 1 1	2 1 1 1 1 1 1	120-125 as per quadrat
125	TL126	+5.8	s / fine black	5	<i>Spinifex hirsutus</i>	0.8	5	125 + sand dunes

+ air entrapped in sediments

TL1: Habitat / Zones recognised

TL1: wet sand upper beach

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		<i>Helice crassa</i> <i>Cirolana sp.</i>	1 21
b	-			-		<i>Cirolana sp.</i>	17
c	-			-		<i>Helice crassa</i> <i>Cirolana sp.</i>	1 9
d	-			-		<i>Cirolana sp.</i>	23
e	-			-		<i>Cirolana sp.</i>	19

TL1: drift line (log) zone

Random 1 m² Quadrats

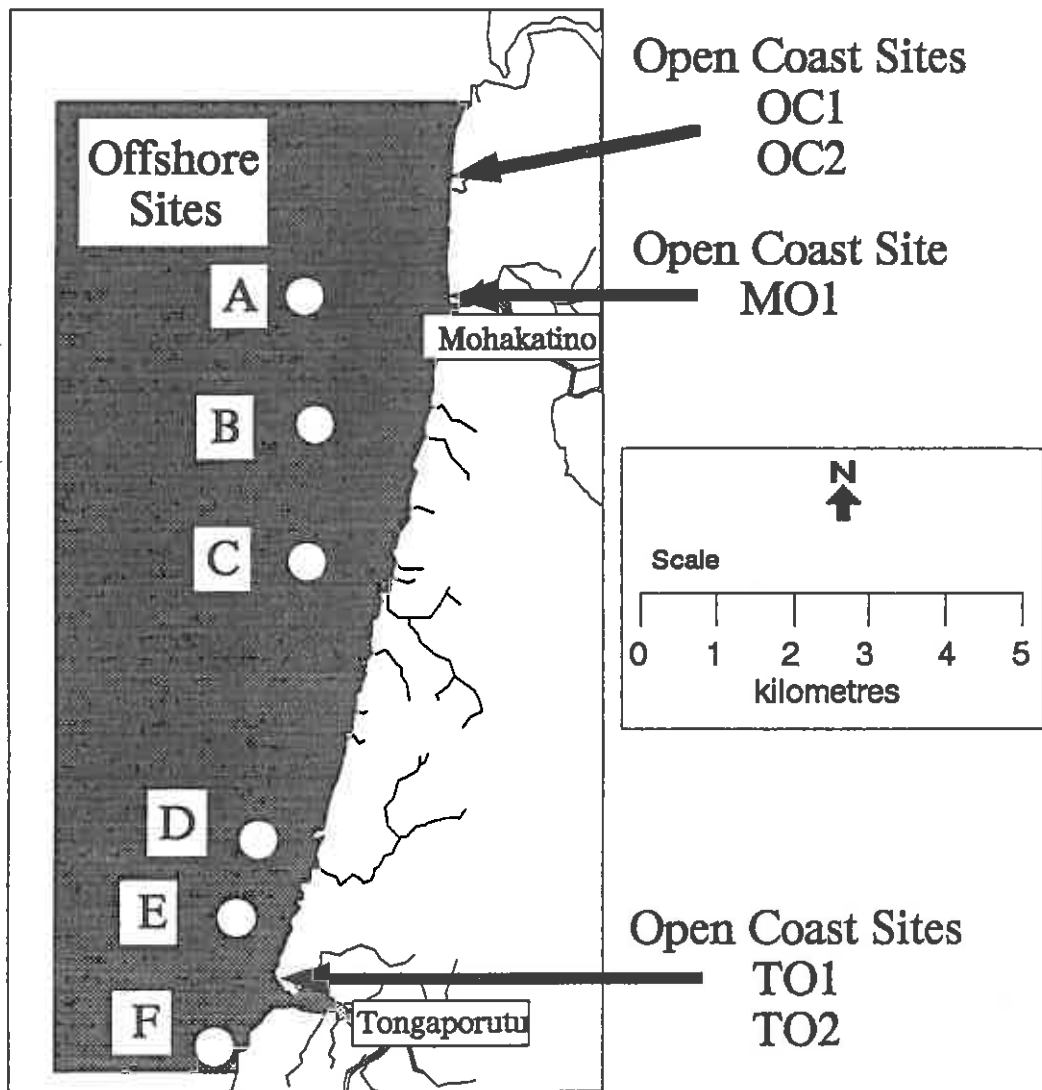
reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Hypochoeris radicata</i> logs & wood	0.4	1 2	<i>Talorchestia quoyana</i>	1		
b	- logs & wood		2	<i>Pericoptus truncatus</i>	2		
c	<i>Ammophila arenaria</i> logs & wood	0.8	2 5	<i>Anisolabis littorea</i> <i>Pericoptus truncatus</i> <i>Talorchestia quoyana</i>	3 4 150		
d	<i>Spinifex hirsutus</i> logs & wood	0.8	2 5	<i>Talorchestia quoyana</i> "ants" <i>Pericoptus truncatus</i>	10 20 1		
e	Grass A (see herbarium) logs & wood	0.8	3 1	<i>Cirolana sp.</i> <i>Talorchestia quoyana</i>	1 20		

D) Open Coast Environs

A sketch map of the study area coastline (compiled from aerial photographs) and the locality of open coast (and offshore, see Section E) sampling stations is given in Figure 22.

Figure 22.

Sketch Map of Mohakatino Coastline: locality of Offshore and Open Coast sampling stations

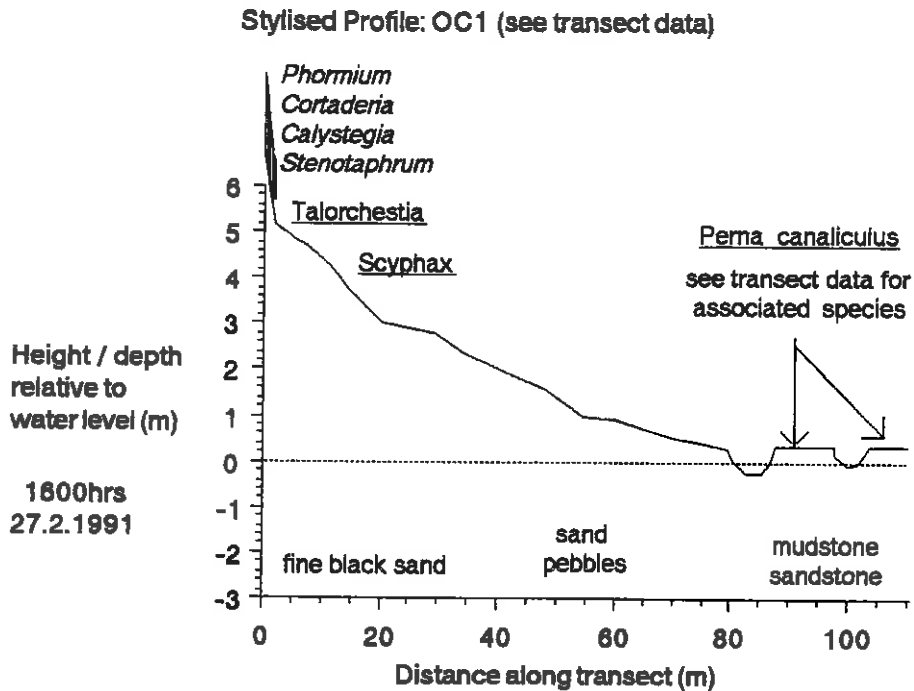


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The Open Coast data base follows.

Transect OC1 (see Table 17. and Figures 22 & 23)

Figure 23.



Transect OC2 (see Table 18. and Figures 22 & 24)

Figure 24.

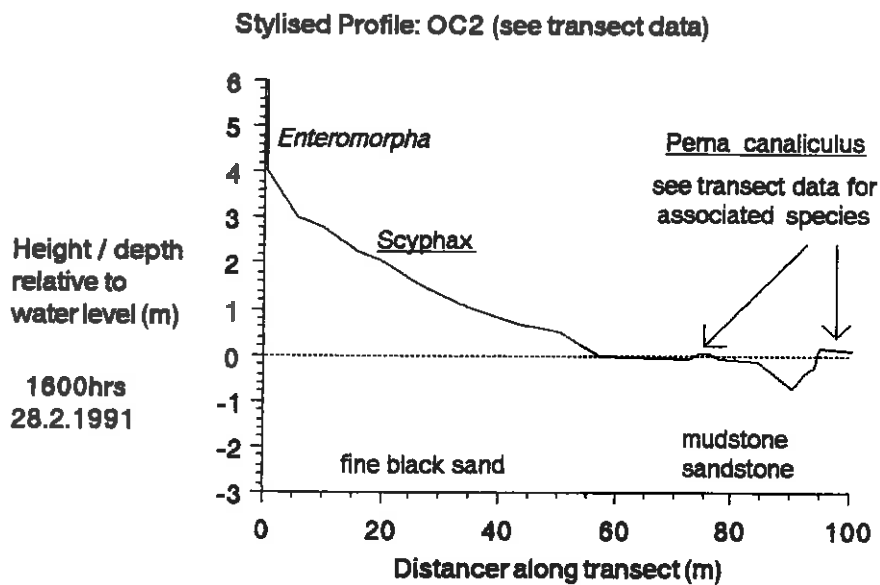


Table 17. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: OC1 Date: 12 & 27 FEB 1991 Time: 1430 - 1630 & 1500 - 1700hrs.

Site Description: Below steep mudstone cliffs with some scree but good vegetation cover (see photographic collection). See sketch map.

Notes: *Haematopus ostralegus finschi* and *Larus bulleri* feeding on mussels in shallow reef area. Levels as per 0.4 m low tide on 27.02.91.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	OC101	+6.7	s / fine black humus	4/5	<i>Phormium tenax</i> <i>Cortaderia toetoe</i> <i>Carex litorosa</i> <i>Coprosma repens</i> <i>Calystegia sepium</i> <i>Stenotaphrum secundatum</i> <i>Talorchestia quoyana</i> <i>Scyphax ornatus</i>	2.50 2.50 1.00 1.50 1.50 0.20	4 1 1 1 2 4 c o	00-05
005	OC102	+4.9	s / fine black (0.3 m cover / mudst.)	0	(see quadrat data)			05-10 as per quadrat
010	OC103	+4.4	s / fine black	0	(see quadrat data)			10-15 as per quadrat
015	OC104	+3.6	s / fine black	0	(see quadrat data)			15-20 as per quadrat
020	OC105	+3.0	s / fine black	0	(see quadrat data)			20-25 as per quadrat
025	OC106	+2.9	s / fine black	0	(see quadrat data)			25-30 as per quadrat
030	OC107	+2.7	s / fine black (0.27 m cover / mudst.)	0	(see quadrat data)			30-35 as per quadrat
035	OC108	+2.3	s / cs black	0	(see quadrat data)			35-40 as per quadrat
040	OC109	+2.0	s / cs black	0	(see quadrat data)			40-45 as per quadrat
045	OC110	+1.7	cs	0	(see quadrat data)			45-50 as per quadrat
050	OC111	+1.4	cs / p	0	(see quadrat data)			50-55 as per quadrat
055	OC112	+1.0	cs / p	0	(see quadrat data)			55-60 as per quadrat
060	OC113	+0.9	cs / p (0.1m cover / mudst.)	0	(see quadrat data)			60-65 as per quadrat
065	OC114	+0.7	r (mudst.)	0	(see quadrat data)			65-70 as per quadrat
070	OC115	+0.5	r (mudst.)	0	(see quadrat data)			70-75 as per quadrat
075	OC116	+0.4	r (mudst.)	0	(see quadrat data)			75-80 as per quadrat
080	OC117	+0.2	r (mudst.)	3	<i>Tylotus proliferus</i> <i>Polysiphonia sp.</i>	0.01 0.01	1 1	80-85 <i>Corallina homb.</i> <i>Ralfsia verrucosa</i>

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085	OC118	0.3	r/s (s.st.)	1	<i>Corallina hombronii</i> <i>Jania micrarthrodia</i> <i>Tylotis proliferus</i> <i>Polysiphonia</i> sp. <i>Cavodiloma coracina</i> <i>Cellana ornata</i> <i>Cantharidella tessellata</i> <i>Chamaesipho columna</i>	0.01 0.01 0.01 0.01 - - - -	1 1 1 1 c o o o	85-90 <i>Ralfsia verrucosa</i> <i>Cellana radians</i> <i>Chamaesipho col.</i> <i>Xenostrobus pul.</i> <i>Acanthoclinus fu.</i> <i>Aeodes nitid.</i> <i>Isocardactis mag.</i>
090	OC119	+0.4	r (s.st.)	2	<i>Perna canaliculus</i> (see quadrat data) <i>Gigartina circumcincta</i> <i>Gigartina alveata</i> <i>Corallina hombronii</i> <i>Jania micrarthrodia</i> <i>Codium fragile</i> <i>Polysiphonia</i> sp. <i>Elminius modestus</i> <i>Acanthochiton zelandicus</i> <i>Amaurochiton glaucus</i> <i>Patelloidea corticata</i> <i>Cantharidella tessellata</i> <i>Zediloma arida</i> <i>Maurea tigris</i> <i>Xenostrobus pulex</i> <i>Halicarcinus</i> sp. <i>Amphibestia bispinosa</i> <i>Glycera americana</i>	- 0.50 0.10 0.10 0.01 0.25 0.01 - - - - - - - - - -	a 1 1 1 1 1 0 c o oo o o o o c o	90-95 Fissures in rocks <i>Stichaster au.</i> <i>Scytothamnus au.</i> <i>Pholadida spath.</i> <i>Petrolishes elong.</i> <i>Patelloidea corti.</i> <i>Sypharochiton pe</i> <i>Notacmea par.</i> <i>Plagusia chabrus</i> <i>Suberites</i> sp. <i>Amalda australis</i> <i>Anthopleura aureoradiata</i> <i>Buccinulum</i> sp. <i>Haustrum haust.</i>
095	OC120	+0.4	r (s.st.)	2	<i>Perna canaliculus</i> (see quadrat data) <i>Corallina hombronii</i> <i>Jania micrarthrodia</i> <i>Polysiphonia</i> sp. <i>Colpomenia sinuosa</i> <i>Lomentaria caespitosa</i> <i>Liagora harviana</i> <i>Petalonia fascia</i> <i>Elminius modestus</i> <i>Maorichiton caelatus</i> <i>Sypharochiton pelliserpentis</i> <i>Cantharidella tessellata</i> <i>Xenostrobus pulex</i> <i>Halicarcinus</i> sp. <i>Amphibestia bispinosa</i>	- 0.10 0.10 0.10 0.01 0.01 0.01 0.20 - - - - - - -	a 1 1 1 1 1 1 1 c c o o o o c	95-100 95-99m above water reef dominated by Coralline algae
100	OC121	0.0	r (s.st.)	3/4	<i>Gigartina circumcincta</i> <i>Gigartina alveata</i> <i>Corallina hombronii</i> <i>Tylotis proliferus</i> Coralline Paint <i>Sypharochiton pelliserpentis</i> <i>Cantharidella tessellata</i> <i>Bulalia microphylla</i>	0.6 0.10 0.01 0.01 - - - -	3 1 4 1 1 c o o	100-105 <i>Notomithrax urs.</i>
105	OC122	+0.3	r/s (s.st.)	3/2	<i>Perna canaliculus</i> <i>Gigartina circumcincta</i> <i>Corallina hombronii</i> <i>Jania micrarthrodia</i> <i>Gigartina alveata</i> <i>Cladyhymenia oblongifolia</i> Coralline Paint <i>Pholadidea tridens</i>	- 0.4 0.01 0.01 0.10 0.08 - -	c 3 1 1 1 1 2 c	105-110 lower cover than 110 <i>Microciona</i> sp.
110	OC123	+0.3	r (s.st.)	3/2	<i>Perna canaliculus</i> <i>Gigartina circumcincta</i> <i>Corallina hombronii</i> <i>Jania micrarthrodia</i> <i>Gigartina alveata</i> <i>Cladyhymenia oblongifolia</i> Coralline Paint <i>Pholadidea tridens</i>	- 0.4 0.01 0.01 0.10 0.08 - -	c 3 1 1 1 1 2 c	110-115 on to sequence of above water reefs under surge attack to c. 170m

OC1: Habitat / Zones recognised

OC1: grassy verge immediately above high water mark

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	<i>Stenotaphrum secundatum</i>	0.4	4	spider A	1	-	
b	<i>Stenotaphrum secundatum</i>	0.4	3	"ants"	1	-	
c	<i>Stenotaphrum secundatum</i>	0.4	4	<i>Talorchestia q.</i> <i>Acheta commodus</i>	4 1	-	
d	<i>Stenotaphrum secundatum</i>	0.4	4	-		-	
e	<i>Stenotaphrum secundatum</i>	0.4	3	spider A "ants"	1 2	-	

OC1: fine sand (<1.0mm) upper -mid intertidal slope

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-			
b	-			-		<i>Scyphax ornatus</i>	3
c	-			-			
d	-			-			
e	-			-			

OC1: Lower intertidal coarse sand pebble slope

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-			
b	-			-			
c	-			-		<i>Aglaophanius mac</i>	1
d	-			-			
e	-			-		<i>Aglaophanius mac</i> nematode	2 1

OC1: *Perna canaliculus* community (mussel counts only)Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a		0.10	2	<i>Perna canaliculus</i> 10-20mm 20-30mm 30-40mm 40-50mm 50-70mm 70-90mm	40 400 600 500 250 76		
b				<i>Perna canaliculus</i> 10-20mm 20-30mm 30-40mm 40-50mm 50-70mm 70-90mm	40 300 450 300 95 30		
c				<i>Perna canaliculus</i> 10-20mm 20-30mm 30-40mm 40-50mm 50-70mm 70-90mm	130 50 300 200 20 3		
d				<i>Perna canaliculus</i> 10-20mm 20-30mm 30-40mm 40-50mm 50-70mm 70-90mm	150 250 200 400 500 60		
e				<i>Perna canaliculus</i> 10-20mm 20-30mm 30-40mm 40-50mm 50-70mm 70-90mm	30 20 30 30 100 20		

Table 18. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: OC2

Date: 28 FEB 1991 Time: 15-1700 hrs.

Site Description: Rocky Point 500m downstream of (OC1, see photographic collection). See sketch map.

Notes: cliff butts directly into upper sandy beach. Vegetation (*Phormium tenax*, *Coprosma repens*, *Ranunculus sp.*, *Isolepis setacea*, *Samolus repens*, *Selliera radicans*, *Drepanocladus aduncus*, *Lunaria sp.*, *Lilaeopsis ruthiana*, and *Sarcocornia quinquefolia*) starts 3m up cliff face.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/ Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	OC201	+4.15	s.st. / m.st.	4	<i>Enteromorpha sp.</i>	<0.01	4	00-05 02-05 s (fine black)
005	OC202	+3.0	s (fine black)	-	- (see quadrat data)	-		05-10 as per quadrat
010	OC203	+2.7	s (fine black)	-	- (see quadrat data)	-		10-15 as per quadrat
015	OC204	+2.3	s (fine black)	-	- (see quadrat data)	-		15-20 as per quadrat
020	OC205	+2.1	s (fine black)	-	- (see quadrat data)	-		20-25 as per quadrat
025	OC206	+1.7	s (fine black)	-	- (see quadrat data)	-		25-30 as per quadrat
030	OC207	+1.3	s (fine black)	-	- (see quadrat data)	-		30-35 as per quadrat
035	OC208	+1.0	s (fine black)	-	- (see quadrat data))	-		35-40 as per quadrat
040	OC209	+0.8	s (fine black)	-	- (see quadrat data)	-		40-45 as per quadrat
045	OC210	+0.6	s (fine black)	-	- (see quadrat data)	-		45-50 as per quadrat
050	OC211	+0.5	s (fine black)	-	- (see quadrat data)	-		50-55 as per quadrat
055	OC212	+0.1	s (fine black)	-	- (see quadrat data)	-		55-60 as per quadrat
060	OC213	0.1	s (fine black) / sh	-	- (see quadrat data)	-		60-65 as per quadrat
065	OC214	0.1	s (fine black) / sh	-	- (see quadrat data)	-		65-70 <i>Polysiphonia sp.</i>
070	OC215	0.1	s (fine black) m / sh / p	5	<i>Jania micrarthrodia</i> <i>Corallina hombronii</i> <i>Polysiphonia sp.</i> <i>Gigartina alveata</i> <i>Petalonia fascia</i> <i>Gigartina circumcincta</i> <i>Perna canaliculus</i> <i>Amphibestia bispinosa</i> <i>Cellana ornata</i>	0.01 0.01 0.01 0.08 0.06 0.20 - - -	3 2 1 1 1 1 0 0 0	70-75 <i>Xenostrobus pulex</i> <i>Cookia sulcata</i> <i>Hymeniacion per Splachnidium rug.</i>
075	OC216	0.0	m st.	3	<i>Ralfsia verrucosa</i> <i>Ulva lactuca</i> <i>Xenostrobus pulex</i> <i>Perna canaliculus</i>	<0.01 0.02 - -	3 1 0 0	75-80 s / r corallines <i>Ectocarpus sp.</i>
080	OC217	0.1	s / r (s.st.)	1	<i>Corallina hombronii</i> <i>Jania sp.</i> <i>Ceramium sp.</i>	0.01 0.01 <0.01	1 1 1	80-85 s / r corallines

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085	OC218	0.1	r (s.st.)	1	<i>Gigartina circumcincta</i> <i>Gigartina alveata</i> <i>Corallina hombronii</i> <i>Ulva lactuca</i> <i>Perna canaliculus</i> <i>Xenostrobos pulex</i>	0.10 0.03 0.01 0.01 - -	1 1 1 1 a c	85-90 <i>Polysiphonia sp.</i> <i>Petalonia fascia</i> <i>Cladostephus ver</i> <i>Sabellaria kai.</i>
090	OC219	0.7	s/sh/r (s.st.)	4	<i>Ceramium sp.</i>	<0.01	4	90-95 overhang with <i>Amaurochiton gl.</i> <i>Maorichiton cael.</i> <i>Sypharochiton pel</i> <i>Notomithrax urs</i> <i>Anchomasa simi.</i> <i>Isocardactis mag.</i> <i>Cantharidella tes.</i> <i>Stichaster aust.</i>
095	OC220	0.8	s/r (s.st.)	4	<i>Corallina hombronii</i> <i>Jania micrarthrodia</i> <i>Gigartina alveata</i> <i>Elminius modestus</i> <i>Perna canaliculus</i>	0.01 0.10 - -	2 1 c c	95-100 <i>Xenostrobos pul.</i> <i>Perna canaliculus</i> <i>Sypharochiton pel</i> <i>Tellinia liliiana</i>
100	OC221	+0.1	r (s.st.)		<i>Perna canaliculus</i> <i>Xenostrobos pulex</i>	- -	c a	100+ broken reef for 50m

OC2: Habitat/Zones recognised

OC2: intertidal sand community

Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a	-			-		-	
b	-			-		<i>Scyphax ornatus</i>	1
c	-			-		-	
d	-			-		<i>Scyphax ornatus</i>	2
e	-			-		-	

OC2: *Perna canaliculus* community (mussel counts only)Random 1 m² Quadrats

reps.	vegetation			surface animals		animals collected by sieving	
	species	height (m)	cover class	species	abd. (m ²)	species	abd. 0.016m ³
a				<i>Perna canaliculus</i>			
				00-10mm	2		
				11-20mm	10		
				21-30mm	18		
				31-40mm	102		
				41-50mm	143		
				51-70mm	144		
				71-90mm	155		
b				<i>Perna canaliculus</i>			
				00-10mm	7		
				11-20mm	14		
				21-30mm	14		
				31-40mm	77		
				41-50mm	186		
				51-70mm	89		
				71-90mm	86		
c				<i>Perna canaliculus</i>			
				00-10mm	12		
				11-20mm	6		
				21-30mm	25		
				31-40mm	184		
				41-50mm	156		
				51-70mm	104		
				71-90mm	58		
d				<i>Perna canaliculus</i>	11		
				00-10mm	7		
				11-20mm	16		
				21-30mm	155		
				31-40mm	160		
				41-50mm	145		
				51-70mm	101		
				71-90mm	130		
e				<i>Perna canaliculus</i>	5		
				00-10mm	4		
				11-20mm	20		
				21-30mm	90		
				31-40mm	138		
				41-50mm	174		
				51-70mm	130		
				71-90mm	98		

Transect MO1 (see Table 19, and Figures 22 & 5)

Figure 24.

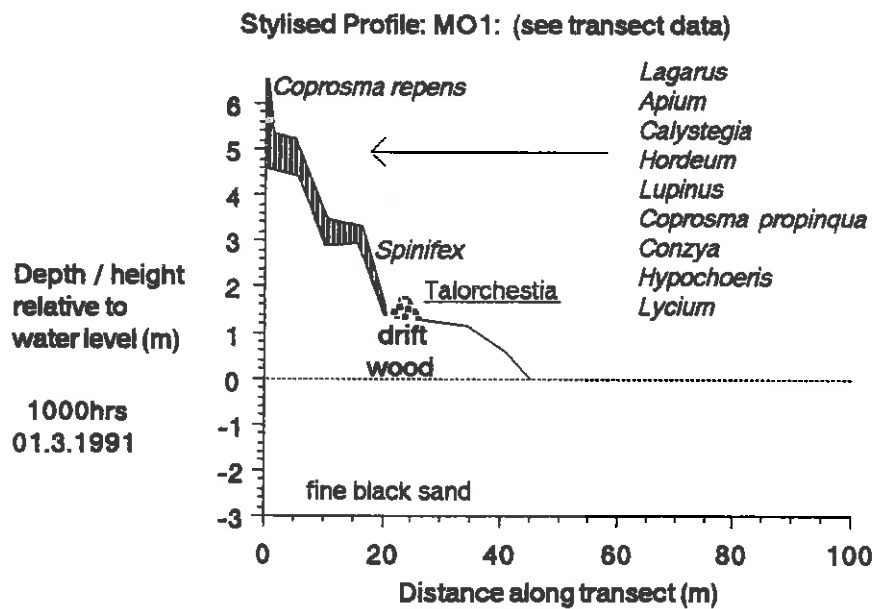


Table 19. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: MO1 Date: 1 March 1991 Time: 1000 hrs.

Site Description: 250 m north of North Head, Mohakatino Estuary

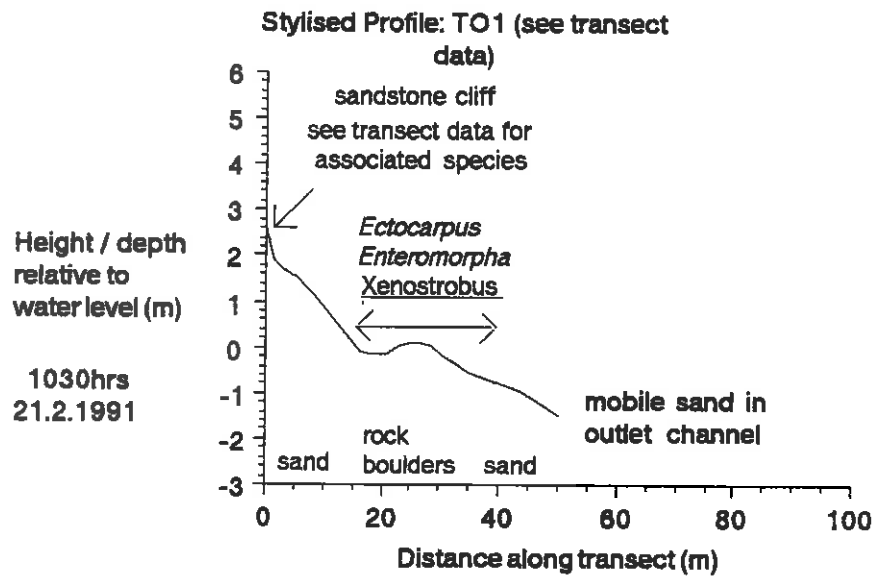
Notes: Rabbits common in sand dunes. Goats and sheep also present.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/ Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	MO101	+4.7	thin humus / s (fine black)	6	<i>Coprosma repens</i>	2.0	6	00-05 <i>Lagarus ovatus</i> <i>Apium prostratum</i> <i>Calystegia sepium</i>
005	MO102	+4.5	thin humus / s (fine black)	5	<i>Spinifex hirsutus</i> <i>Lupinus arboreus</i>	0.8 0.6	5 1	05-10 as per quadrat
010	MO103	+2.9	s (fine black)	5	<i>Spinifex hirsutus</i> <i>Lycium ferocissimum</i> <i>Coprosma propinqua</i> <i>Conyza bilbaona</i> <i>Hypochoeris glabra</i>	0.6 1.0 0.4 0.8 0.6	4 2 2 1 1	10-15 <i>Hordeum marinum</i>
015	MO104	+3.0	s (fine black)	5	<i>Spinifex hirsutus</i> <i>Isolepis nodosa</i> <i>Hypochoeris glabra</i> <i>Coprosma perpusilla</i>	0.6 0.8 0.8 0.6	4 1 1 1	15-20 as per quadrat
020	MO105	+1.4	s (fine black)	3	<i>Spinifex hirsutus</i>	0.4	3	20-25 <i>Spinifex hirsutus</i> to eroding edge at 24m
025	MO106	+1.3	s (fine black) log and flotsam drift	-	log and dead animal (sheep) drift <i>Talorchestia tumida</i>	-	a	25-30 25 - 28: drift line
030	MO107	+1.2	s (fine black)	-	no visuals			30-35 as per quadrat
035	MO108	+1.1	s (fine black)	-	no visuals			35-40 as per quadrat
040	MO109	+0.6	s (fine black)	-	no visuals			40-45 as per quadrat
045	MO110	0.0	s (fine black) / p	-	no visuals			45-50 surf zone

Transect TO1 (see Table 20. and Figures 22 & 26)

Figure 24.



Transect TO2 (see Table 21. and Figures 22 & 27)

Figure 24.

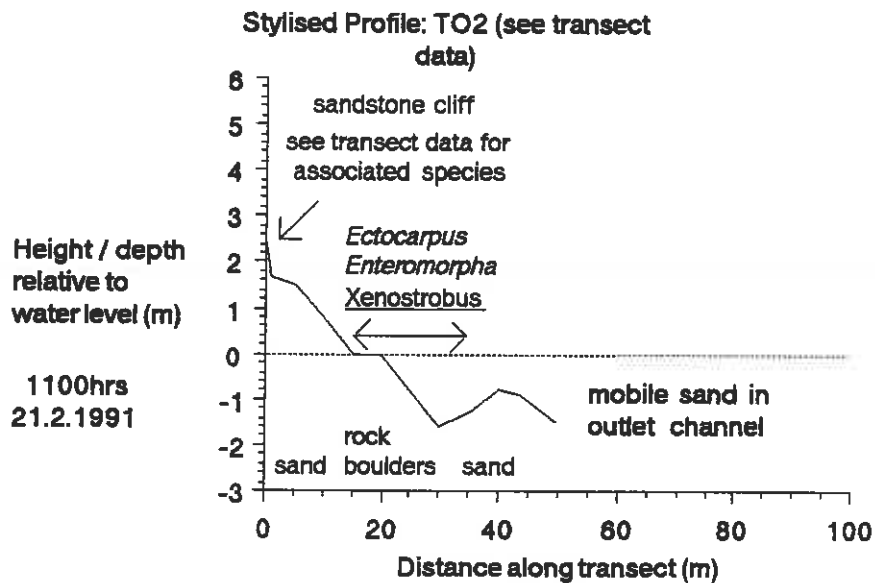


Table 20. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: TO1 Date: 21 FEB 1991 Time: 1030 hrs.

Site Description: Point on North head of Tongapurutu toward Mt. Taranaki (210° magnetic). Cliff with number of sea caves and vertical face to sand. See sketch map.

Notes: Transect start (0m) 1m up vertical cliff; ends in centre of outlet channel. Sand bar between open channel and open water. *Littorina cincta* 2 - 8 m up cliff in splash zone. No clear zonation of resident organisms on cliff face.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (frequ) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/ Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	TO101	+2.5	s.st.	2	collection from fissure in cliff <i>Enteromorpha</i> sp. <i>Ralfsia verrucosa</i> <i>Ectocarpus</i> sp. <i>Lomentaria caespitosa</i> <i>Polysiphonia</i> sp. <i>Xenostrobilus pulex</i> <i>Elminius plicatus</i> <i>Chamaesiphonia columna</i> <i>Maorichiton caelatus</i> <i>Acanthochiton zelandicus</i> <i>Notoacmea daedala</i> <i>Perna canaliculus</i> <i>Notacmea parvicornideans</i> <i>Cellana radians</i> <i>Littorina cincta</i> <i>Leptograpus variegatus</i>	<0.01 <0.01 0.02 0.02 0.01 - - - - - - - - - -	2 1 1 1 c o c o o c o o c c o	00-05 1 - 5m: fine black sand
005	TO102	+1.5	s/ fine black	0	-			05-10 as per quadrat
010	TO103	c.+0.8	s/ fine black	0	-			10-15 as per quadrat
015	TO104	0.0	s (5) r/b (1)	2	<i>Ectocarpus</i> sp. <i>Enteromorpha</i> sp. <i>Xenostrobilus pulex</i>	0.01 <0.01 -	1 1 o	15-20 as per quadrat
020	TO105	0.10	r/b (5) s (1)	4	<i>Ectocarpus</i> sp. <i>Enteromorpha</i> sp. <i>Xenostrobilus pulex</i>	0.01 <0.01 -	4 1 o	20-25 as per quadrat
025	TO106	+0.1	r/b (3) s veneer s (3)	3	<i>Ectocarpus</i> sp. <i>Enteromorpha</i> sp. <i>Xenostrobilus pulex</i>	0.01 <0.01 -	1 2 o	25-30 as per quadrat
030	TO107	0.0	r/b smooth flat with s veneer	1	<i>Ectocarpus</i> sp. <i>Enteromorpha</i> sp. <i>Xenostrobilus pulex</i> <i>Crassostrea glomerata</i>	0.01 <0.01 - -	1 1 c o	30-35 as per quadrat
035	TO108	0.5	r/b smooth flat	3	<i>Ectocarpus</i> sp. <i>Enteromorpha</i> sp. <i>Xenostrobilus pulex</i>	0.01 <0.01 -	1 2 c	35-40 as per quadrat
040	TO109	0.8	r/b smooth flat	3	<i>Ectocarpus</i> sp. <i>Enteromorpha</i> sp. <i>Xenostrobilus pulex</i>	0.01 <0.01 -	1 2 c	40-45 fine black sand
045	TO110	1.0	s/ fine black mobile	0	-			45-50 as per quadrat
050	TO111	1.5	s/ fine black mobile	0	-			50-55 as per quadrat

Table 21. Permanent Transect Records: Mohakatino M.P.A. Survey.

Transect Number: TO2 Date: 21 FEB 1991 Time: 1100 hrs.

Site Description: Point on North head of Tongapurutu toward Mt. Taranaki (210° magnetic). Cliff with number of sea caves and vertical face to sand. See sketch map.

Notes: 100 m south of TO1. Transect start (0m) 1m up vertical cliff: ends in centre of outlet channel. Transect start (0m) 1m up vertical cliff out to centre of channel. Sand bar between open channel and open water. *Littorina cincta* 2 - 8 m up cliff in splash zone. No obvious zonation on cliff face. Rocks at water level and below riddled with Pholad borings.

Vegetation cover classes: 1 = 1-5%, 2 = 6-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-95%, 6 = 96-100%
 Animal frequency (freq) estimates: o = occasional, c = common, a = abundant
 Substrate codes: r=rock, b = boulders, p = pebbles, cs = coarse sand, s = sand, sh = shell, m = mud.

Distance along transect (m)	Quadrat Number	Water Depth/ Height (m)	Substrate code	Total Vegetation cover class	Species present	Average height (m)	Individual cover class / frequency	Notes for transect Interval (m)
000	TO201	+2.5	s.st.	3	<i>Enteromorpha sp.</i> <i>Ralfsia verrucosa</i> <i>Ectocarpus sp.</i> <i>Lomentaria caespitosa</i> <i>Polysiphonia sp.</i> <i>Xenostrobos pulex</i> <i>Elminius plicatus</i> <i>Chamaesipho columna</i> <i>Maorichiton caelatus</i> <i>Littorina cincta</i>	<0.01 <0.01 0.02 0.01 - - - -	2 1 1 1 c o o o c	00-05 1 - 5m: fine black sand
005	TO202	+1.5	s/ fine black	0	-			05-10 as per quadrat
010	TO203	+0.8	s/ fine black	0	-			10-15 as per quadrat
015	TO204	0.0	s (5) fine black r/b (1) smooth flat	2	<i>Ectocarpus sp.</i> <i>Enteromorpha sp.</i> <i>Xenostrobos pulex</i>	0.01 <0.01 -	1 1 o	15-20 as per quadrat
020	TO205	0.10	r/b (5) smooth flat s (1) fine black	4	<i>Ectocarpus sp.</i> <i>Xenostrobos pulex</i>	<0.01	4 o	20-25 as per quadrat
025	TO206	0.80	r/b (3) smooth flat vener of s/ fine black s (3) fine black	3	<i>Ectocarpus sp.</i> <i>Xenostrobos pulex</i>	<0.01	3 o	25-30 as per quadrat
030	TO207	1.6	r/b smooth flat with vener of s/ fine black	4	<i>Ectocarpus sp.</i> <i>Enteromorpha sp.</i> <i>Xenostrobos pulex</i> <i>Crassostrea glomerata</i>	0.01 0.02 - -	4 1 c o	30-35 as per quadrat
035	TO208	1.3	s/ fine black	0	-			35-40 as per quadrat
040	TO209	0.8	s/ fine black	0	-			40-45 as per quadrat
045	TO210	1.0	s/ fine black mobile	0	-			45-50 as per quadrat
050	TO211	1.5	s/ fine black mobile	0	-			50-55 as per quadrat

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E) Offshore Environs

The locality of offshore sites sampled by SCUBA diving on 26 February 1991 are shown in Figure 22. Results are summarised in the following table.

Table 22: Dive notes for offshore dives 26.02.91 (see Figure 22)

Site	Through-water Visibility	Water depth	Substrate type	animals collected by hand	notes
A	0.5 m at surface 0.0 m on bottom	17 m	very soft mud pockets in sand	nil	Distance travelled along seabed = 5 m Recorder received electric shock: dive aborted <i>Torpedo fairchildi?</i>
B	1.0 m at surface 0.0 m on bottom	14 m	Rippled bed of fine, black, sand	<i>Pagurus novizealandiae</i> (common) "tube worm cast" <i>Arachnoides zelandiae</i> (1 per 2m ⁻²) <i>Dosinia anus</i> (occasional)	Distance travelled along seabed = 20 m.
C	0.8 m at surface 0.0 m on bottom	12 m	Rippled bed of fine, black, sand	<i>Arachnoides zelandiae</i> (1 per 2m ⁻²) <i>Bassina yatei</i> (occasional) <i>Pagurus novizealandiae</i> (common) <i>Amalda australis</i> (occasional)	Distance travelled along seabed = 20 m.
D	1.0 m at surface 0.0 m on bottom	11 m	Rippled bed of fine, black, sand	<i>Arachnoides zelandiae</i> (1 per 2m ⁻²) <i>Bassina yatei</i> (occasional) <i>Pagurus novizealandiae</i> (common) <i>Amalda australis</i> (occasional)	Distance travelled along seabed = 20 m.
E	1.5 m at surface 0.0 m on bottom	10 m	Rippled bed of fine, black, sand	<i>Arachnoides zelandiae</i> (1 per 2m ⁻²) <i>Pagurus novizealandiae</i> (common)	Distance travelled along seabed = 20 m. <i>Carcharhinus brachyurus</i> recorded at 3m depth.
F	0.5 m at surface 0.1 m on bottom	5 m	smooth boulders and sand	coralline paint	Distance travelled along seabed = 20 m. <i>Petalonia fascia</i> <i>Lepas anatifera</i> <i>Enteromorpha sp.</i> on stranded radio beacon

F) Fisheries Data

Fish caught by electric fishing in streams and marginal wetlands associated with estuaries and river mouths in the study area (21 February 1991) are listed in Table 23.

Table 23: Electric Fishing Records*, 21 February, 1991.
(data courtesy of John Heaphy and Norm Marsh, D.O.C)

Locality N.Z.M.S. 262	fish caught	relative abundance	notes
651 273	<i>Anguilla australis</i> <i>Galaxias brevipennis</i> <i>Gobiomorphus hubbsi</i> <i>Paranephrops planifrons</i> <i>Paratya curvirostris</i>	abundant rare abundant rare abundant	stream discharging at Site B Mohakatino Estuary (see Figure 4)
655 270	<i>Anguilla australis</i> <i>Galaxias brevipennis</i> <i>Gobiomorphus hubbsi</i> <i>Paratya curvirostris</i>	common abundant rare abundant	Upper Mohakatino tributary
649 269	<i>Anguilla australis</i> <i>Galaxias brevipennis</i> <i>Cheimarrichthys fosteri</i> <i>Gobiomorphus huttoni</i>	abundant occasional occasional abundant	Kawau Pa stream (below main bridge)
648 266	<i>Anguilla australis</i> <i>Gobiomorphus hubbsi</i> <i>Paratya curvirostris</i>	common common common	Rapanui mainstream below bridge
648264	<i>Anguilla australis</i> <i>Galaxias brevipennis</i> <i>Gobiomorphus hubbsi</i>	common common common	Tongaporutu Site C seepage area (see Figure 16)

* *Melanopsis trifasciata* and *Potamopyrgus antipodarum* also common in samples.

Aldrichetta fosteri were frequently seen moving in and out of the Mohakatino and Tongaporutu estuaries, and *Pseudocaranx dentex*, *Arripis trutta* and *Rhomboselea retiaria* were commonly caught in gill nets set in the Mohakatino estuary during the study period.

Records of fish caught in the offshore study area during the New Zealand Angling and Casting Association's national championships (February, 1991) included spotted smooth dogfish, eagle rays, kahawai, trevally, snapper, marblefish, kelpfish, red gurnard and conger eels.

Discussion

This report details a baseline biological survey of estuarine and coastal benthos in the Mohakatino area, relative to which the impact of proposed habitat protection or development can be monitored and described.

It is based on a late summer survey of twenty transects which have been established at estuarine, intertidal and subtidal sites. It does not describe seasonal change in community structure.

High suspended silt loads were a feature of both estuarine and coastal waters, and a lack of in-water visibility precluded an adequate description of off-shore subtidal sites during the survey period.

Estuaries

Estuaries were generally dominated by soft shore communities with a short upper beach of clean black sand, a wide and more or less flat middle beach of compacted clay and silt, and a lower part, sloping to the channel, of compacted clay and silt overlain with fine black sand and shell debris.

Ecologically constructive saltmarsh communities were a feature of both the upper and middle Mohakatino and Tongaporutu estuaries. Perched, marginal, wetlands are associated with these estuaries (including the Rapanui river mouth).

Muddy, estuarine, intertidal sites were dominated by mud crabs (*Helice crassa*) and muddy subtidal sites were dominated by the isopod *Paracorophium excuvatum* and worms. Pipis (*Paphies australis*) were present at sandy, subtidal, middle estuarine sites. Seagrasses were not recorded as present.

Macroalgae (seaweeds) were not a feature of "hard" (mudstone / sandstone) shores in estuaries or at river mouths. Such sites in middle - lower estuaries and at river mouths were dominated by communities associated with pholad borings and / or the little black mussel *Xenostrobus pulex*.

Accumulated driftwood (with associated *Talorchestia spp.*) was a feature of the upper tidal zone at both lower estuarine sites and at river mouths.

These estuaries are also known to support a highly valued flounder and whitebait fishery (Department of Conservation, 1990).

Coastal Sites

Sand dune communities occur at the mouth of rivers in the study area, but generally the Mohakatino coastline comprises iron sand beaches below uplifted tertiary marine terraces which are developed for pastoral farming. The 20-30 m high coastal cliffs between the beach and terrace are dominated by *Phormium - Machaerina sinclarii* communities with coastal-forest remnants in gullies and on headlands.

Notwithstanding an inshore reef between Mokau and Mohakatino, the mid - lower intertidal was dominated by biologically barren "soft" shore (sand) community profiles.

"Hard" inshore, subtidal, substrata were generally characterised as "slippery" mudstones which were subject to sand scour and periodic burial / re-exposure by long shore sand transport. Such sites were characteristically devoid of macroalgae and colonised by a diverse assemblage of opportunistic (small size class) encrusting organisms.

Biotic zoning on intertidal coastal cliffs is obscured by the complexity of microhabitats (caves, headlands and stacks) an erodible mudstone substrate and freshwater seepage. The visually dominant organisms are *Xenostrobus pulex*, the barnacles *Chamaesipho columna*, and *Elminius plicatus*, and the green alga *Enteromorpha sp.* Sand scouring may account for the lack of organisms on rock surfaces near the sand.

From the limited data available it appears that offshore sand flats are dominated by *Arachnoides zelandiae* and *Pagurus novizealandiae* with *Amalda australis*, *Dosinia anus*, *Bassina yatei* and tube worms as associated species

The endangered Hector's dolphin is resident in local coastal waters.

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