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MOLLUSCS, CRUSTACEA AND ECHINODERMS FROM KAWHIA, WEST COAST, NORTH ISLAND

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SUMMARY

One hundred and ninety-two Mollusca (10 chitons, 120 gastropods, 59 bivalves, 1 scaphopod, 2 cephalopods), seventy-two Crustacea (29 amphipods, 6 barnacles, 1 cumacean, 26 decapods, 9 isopods and 1 ostracod) and nine Echinodermata (3 echinoids, 3 asteroids, 2 ophiuroids, 1 holothurian) are recorded from Kawhia Harbour and adjacent areas on the west coast of the North Island of New Zealand. These Kawhia records provide geographic range extensions for 18 species of mollusc.

Keywords: Kawhia Harbour; Aotea Harbour; Mollusca; Crustacea; Echinodermata; ecology; biogeography.

INTRODUCTION

The biogeographic distribution of many groups of marine invertebrates is poorly documented for the west coast of the North Island of New Zealand. This shortage of information has been partly addressed for Northland's west coast with species lists of molluscs and echinoderms prepared for Kawerua (Hayward *et al.* 1995, Hayward 1975, 1990) and small ecologic distribution studies undertaken in Waimamaku Estuary and Whangape Harbour (Hayward & Hollis 1993, Hayward *et al.* 1994). Several studies have been undertaken documenting the ecological distribution patterns of marine invertebrates in various parts of the Manukau Harbour, on the west coast of Auckland (Powell 1937, Grange 1979, 1982, Henriques 1980), although no full species list of any group has been compiled. This present study provides useful biogeographic information on molluscs, crustacea and echinoderms from a harbour setting, 100km south of Manukau Harbour.

Kawhia Harbour (latitude 38°10'S, longitude 174°45'E) lies 50km south west of Hamilton on the west coast of New Zealand's North Island (Fig. 1). It is the southernmost of a group of three west coast harbours (including Raglan and Aotea) created by the partial blocking by sand barriers of drowned ice age river

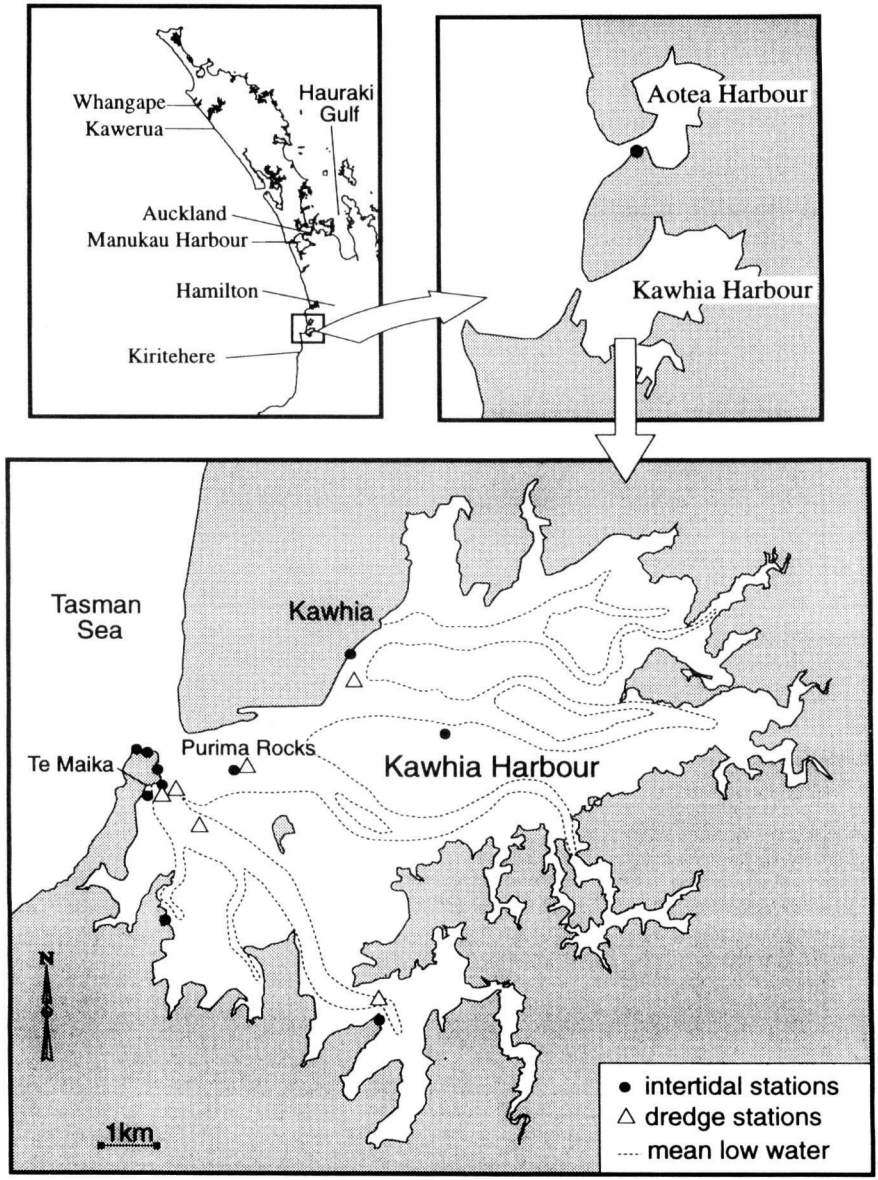

Fig. 1. Study areas in the Kawhia and Aotea Harbours on the west coast of the North Island, New Zealand.

valleys. Kawhia is the largest of the three harbours stretching 9km east-west and 8km north-south. It has three main channels and arms that join together near the relatively narrow harbour mouth. They are separated by extensive areas of tidal sand, shell and mud flats. Near the mouth the seafloor and tidal flat substrate is sandy but becomes progressively more muddy towards the headwaters.

Five kilometres up the coast from Kawhia is the mouth of smaller Aotea Harbour, which is 4km east-west and 5.5km north-south. It is essentially a single drowned valley (one arm) blocked by a large sand dune barrier on the northern side of the narrow entrance channel.

Both Kawhia and Aotea harbours receive freshwater into their headwaters from streams draining catchments that are a mixture of grazed pasture and regenerating native forest. Human population around each harbour is low and any associated anthropogenic pollution is minimal, although runoff from the topdressed pasturelands will undoubtedly have raised the nutrient levels in the harbours, especially Kawhia, over the last century.

This paper records all marine molluscan, crustacean and echinoderm taxa that were found in the Kawhia Harbour area during a three day Auckland Museum field trip by the authors during a period of spring low tides (0.1-0.2m low tides) in October 1995. Field work included extensive intertidal searching of the range of habitats present in the harbour, beach combing around the southern shore of the harbour mouth and on the adjacent ocean beach. Six dredge hauls of sediment were taken from the bed of the subtidal harbour channels from the harbour entrance up to its headwaters (Fig. 1).

In an effort to increase our records of exposed shore species, an hour was spent beach combing along the sandy southern side of the entrance to Aotea Harbour at high tide. These shell records have also been included within our species list as have recent mollusc washup records (Hendy & Eagle 1995) from the Kiritehere Coast, 25km south of Kawhia.

All records, except those from Kiritehere, are supported by voucher specimens in the collections of the Auckland Museum (AK).

SPECIES LIST

Habitat where found (Fig. 1):

wc = on exposed west coast rocks or beach, just outside Kawhia Harbour entrance

en = on or around intertidal rocks just inside the Kawhia Harbour entrance on the south shore at Te Maika and on Purima Rocks

sw = on seaweed just inside Kawhia Harbour entrance on the south shore

fl = in or on sandy or muddy intertidal flats inside Kawhia Harbour

ch = in subtidal harbour channels

Ao = washed up on sandy beach inside Aotea Harbour entrance
K = Kiritehere coastline
d = only seen dead
l = seen alive
Double letter = common

= recorded from Kawerua coastline, west coast of Northland (Hayward *et al.* 1995)
* = apparent extensions of recorded geographic range

Molluscan nomenclature follows Spencer & Willan (1995).

		wc	en	sw	fl	ch	Ao	K
	MOLLUSCA							
	POLYPLACOPHORA							
	Chiton (Amaurochiton) glaucus Gray, 1828		ll					l
	Cryptoconchus porosus (Burrow, 1815)		l					
	Eudoxochiton nobilis (Gray, 1843)	l	l					
	Ischnochiton maorianus Iredale, 1914				l			
	Leptochiton inquinatus (Reeve, 1847)		ll			l		
#	*Pseudotonicia cuneata* (Suter, 1908)		l			l		
	Plaxiphora caelata (Reeve, 1847)		ll					
#	*Plaxiphora obtecta* (Carpenter, 1893)		l					
#	*Rhyssoplax stangeri* (Reeve, 1847)					l		
	Sypharochiton pelliserpentis (Quoy & Gaimard, 1835)		ll					l
	GASTROPODS							
	Alcithoe arabica (Gmelin, 1791)				d			d
	Alloiodoris lanuginata (Abraham, 1877)		l					
	Amalda (Baryspira) australis (Sowerby, 1830)		l		ll	d		
#	*Amalda (Baryspira) mucronata* (Sowerby, 1830)	d						
	Amalda (Gracilispira) novaezelandiae (Sowerby, 1859)							d
	Amphibola crenata (Gmelin, 1791)				ll		d	
	Anabathron (Scrobs) sp.						d	
#	*Archidoris wellingtonensis* (Abraham, 1877)		l					
	Austrofusus glans (Roding, 1798)	d					d	d
	Austromitra rubiginosa (Hutton, 1873)		l			l		
	Buccinulum linea linea (Martyn, 1784)		l					d
	Buccinulum vittatum vittatum (Quoy & Gaimard, 1833)		l					
#	*Cabestana spengleri* (Perry, 1811)		l					d
	Caecum digitulum Hedley, 1904				d		d	
	Calliostoma (Maurea) punctulata (Martyn, 1784)		ll					d
	Calliostoma (Maurea) tigris (Gmelin, 1791)		l					
	Cantharidella tesselata (A. Adams, 1853)		ll					d
#	*Cantharidus opalus opalus* (Martyn, 1784)		l					
	Cellana denticulata (Martyn, 1784)							d
	Cellana ornata (Dillwyn, 1817)		l					
	Cellana radians (Gmelin, 1791)	ll	ll					
	Cellana stellifera (Gmelin, 1791)							d
	Charonia lampas rubicunda (Perry, 1811)							d

		wc	en	sw	fl	ch	Ao	K
#	*Chemnitzia* spp.		ll		dd	d		
*#	*Cirsotrema zelebori* (Dunker, 1866)					d		
	Cominella adspersa (Bruguiere, 1789)		l		ll			d
	Cominella (Josepha) glandiformis (Reeve, 1847)	l	l		ll			
	Cominella maculosa (Martyn, 1784)		l					d
#	*Cominella (Josepha) quoyana* A. Adams, 1854				d			
	Cookia sulcata (Gmelin, 1791)		l		d			d
	Crepidula monoxyla (Lesson, 1831)		l		l			
#	*Cymatium (Monoplex) parthenopeum* (Salis, 1793)		d					
#	*Dendrodoris citrina* (Cheeseman, 1881)		l					
	Dicathais orbita (Gmelin, 1791)	ll	ll					l
	Diloma (Fractarmilla) bicanaliculata (Dunker, 1844)		d					
	Diloma nigerrima (Gmelin, 1791)							d
	Diloma (Cavodiloma) coracina (Philippi, 1851)	l						
	Diloma subrostrata subrostrata (Gray, 1835)				ll		d	
	Diloma (Fractarmilla) zelandica (Quoy & Gaimard, 1834)		l					
*#	*Doriopsis flabellifera* (Cheeseman, 1881)		l					
	Eatoniella albocolumella Ponder, 1965				ll	ll		
#	*Eatoniella limbata* (Hutton, 1883)					d		
#	*Eatoniella* sp.						d	
#	*Eatonina atomaria* (Powell, 1933)				d	ll		
	Emarginula striatula Quoy & Gaimard, 1834							d
*#	*Epitonium (Acutiscala) minora* (Iredale, 1936)					d		
*#	*Epitonium (Papyriscala) tenellum* (Hutton, 1885)				d			
*#	*Eulimella levilirata* Murdoch & Suter, 1906				d			
	Gadinia conica Angas, 1867						d	
	Haliotis (Sulculus) australis Gmelin, 1791							d
	Haliotis (Paua) iris Gmelin, 1791							d
	Haminoea zelandiae (Gray, 1843)				l	d	d	
	Haustrum haustorium (Gmelin, 1791)		d					d
#	*Janthino exigua* Lamarck, 1822						d	
	Lepsiella albomarginata (Deshayes, 1839)	ll	ll			d		l
	Leuconopsis obsoleta (Hutton, 1878)		d					
*#	*Linopyrga rugata rugata* (Hutton, 1886)				d	d	d	
#	*Maoricolpus roseus manukauensis* Powell, 1931		ll			l	d	d
	Marinula filholi Hutton, 1878				l			
	Melagraphia aethiops (Gmelin, 1791)		ll				d	d
#	*Melanochlamys cylindrica* Cheeseman, 1881				l			
	Micrelenchus dilatatus (Sowerby, 1870)							d
	Micrelenchus sanguineus sanguineus (Gray, 1843)		l					
#	*Micrelenchus tenebrosus* (A. Adams, 1853)				l		d	
*	*Mitra carbonaria* Swainson, 1822							d
#	*Neoguraleus interruptus* Powell, 1942					d		
#	*Neoguraleus murdochi* (Finlay, 1924)				d	d		
	Nerita atramentosa Reeve, 1855	l						l
	Nodilittorina antipodum (Philippi, 1847)	ll	ll				l	l
	Nodilittorina cincta (Quoy & Gaimard, 1833)	l	l					l
	Notoacmea elongata (Quoy & Gaimard, 1834)		l			d		d
#	*Notoacmea helmsi* (E.A. Smith, 1894)		d		l	d		
	Notoacmea pileopsis pileopsis (Quoy & Gaimard, 1834)		l					d
*#	*Notoacmea subtilis* (Suter, 1907)					d		
*#	*Nozeba emarginata* (Hutton, 1885)					d		
*	*Odostomia incidata* Suter, 1908					dd		

		wc	en	sw	fl	ch	Ao	K
	Onchidella nigricans (Quoy & Gaimard, 1832)		ll					
	Paratrophon cheesemani cheesemani (Hutton, 1882)		d					
	Patelloida corticata (Hutton, 1880)	l						
	Penion sulcatus (Lamarck, 1816)					d		
	Pervicacia tristis (Deshayes, 1859)		d		d	d		
	Phenatoma rosea (Quoy & Gaimard, 1833)		d					
	Phenatoma zealandica (E.A. Smith, 1877)		d			d		
#	*Philine* sp.				l			
#	*Pisinna zosterophila* (Webster, 1905)				dd	d		
	Pleurobranchaea maculata (Quoy & Gaimard, 1832)		l					
#	*Potamopyrgus estuarinus* Winterbourn, 1971				ll		l	
#	*Potamopyrgus pupoides* Hutton, 1882					d		
*	*Pusillina (Haurakia) infecta* (Suter, 1908)						d	
	Radiacmea inconspicua (Gray, 1843)		l					
	Ranella australasia australasia (Perry, 1811)		d					
#	*Retusa oruaensis* (Webster, 1908)				dd	d		
	Risellopsis varia (Hutton, 1873)		dd					
	Rissoina chathamensis (Hutton, 1873)				d			
#	*Rostanga muscula* (Abraham, 1877)	l						
	Scutus antipodes Montfort, 1810		l		l			
	Semicassis pyrum (Lamarck, 1822)	d	d					d
	Sigapatella novaezelandiae (Lesson, 1831)		l			l		d
	Siphonaria australis Quoy & Gaimard, 1833							d
	Siphonaria propria Jenkins, 1983		l					
	Struthiolaria (Pelicaria) vermis (Martyn, 1784)							d
	Struthiolaria papulosa (Martyn, 1784)	d	d				d	d
	Tanea zelandica (Quoy & Gaimard, 1832)							d
*	*Taron dubius* (Hutton, 1878)				l			
#	*Trochus (Coelotrochus) tiaratus* Quoy & Gaimard, 1834		l		d	l	d	
#	*Tubbreva exigua* (Ponder, 1965)					d		
*	*Tugali elegans* Gray, 1843							d
	Turbo smaragdus Gmelin, 1791	l	l		l	d		d
	Xymene ambiguus (Philippi, 1844)							d
*#	*Xymene pusillus* (Suter, 1907)		l					
	Xymene plebeius (Hutton, 1873)		l		l	l		
	Xymene traversi (Hutton, 1873)		l					
#	*Zaclys sarissa* (Murdoch, 1905)					d		
	Zeacumantus lutulentus (Kiener, 1841)				ll		d	
	Zeacumantus subcarinatus (Sowerby, 1855)				ll			
#	*Zegalerus tenuis* (Gray, 1867)				ll	d		d
	Zemitrella choava (Reeve, 1859)				d	d		
*#	*Zemitrella pseudomarginata* (Suter, 1908)				d	d		
*#	*Zeradina ovata* (Odhner, 1924)					d		
	Zethalia zelandica (Hombron & Jacquinot, 1855)					d		
	BIVALVES							
#	*Anomia trigonopsis* Hutton, 1877		d					
#	*Arthritica bifurca* (Webster, 1908)					d		
#	*Atrina pectinata zelandica* (Gray, 1835)				l			
	Austrovenus stutchburyi (Gray in Wood, 1828)				ll	d	d	d
	Barbatia novaezelandiae (E.A. Smith, 1915)		d					d
#	*Barnea (Anchomasa) similis* (Gray, 1835)		l				d	
	Bassina (Callanaitis) yatei (Gray, 1835)	d				d		
	Borniola reniformis (Suter, 1908)		l			d		

		wc	en	sw	fl	ch	Ao	K
	Chlamys zelandiae (Gray, 1843)		l			d		d
#	*Cleidothaerus albidus* (Lamarck, 1819)		l					d
	Corbula (Caryocorbula) zelandica Quoy & Gaimard, 1835			l		d		
	Crassostrea gigas (Thunberg, 1793)		ll		ll		d	d
#	*Cyclomactra ovata* (Gray, 1843)				d			
	Diplodonta (Zemysina) striatula (Finlay, 1926)		l			d		
	Divaricella (Divalucina) huttoniana (Vanatta, 1901)				l			
	Dosinia (Austrodosinia) anus (Philippi, 1848)	d						d
	Dosinia (Phacosoma) subrosea (Gray, 1835)				ll	l		
#	*Dosinia (Asa) lambata* (Gould, 1850)				d			
#	*Dosina zelandica* Gray, 1835				d	d		d
	Felaniella (Zemysia) zelandica (Gray, 1835)				d	d		
#	*Gari (Gobraeus) stangeri* (Gray, 1843)				d	l		
#	*Glycymeris (Glycymerula) modestus* (Angas, 1879)					d		
	Hiatella arctica (Linne, 1767)		d					d
*#	*Irus (Notopaphia) elegans* (Deshayes, 1854)		d					
	Irus (Notirus) reflexus (Gray, 1843)		l		d		d	
#	*Kellia cycladiformis* (Deshayes, 1834)		l					
	Leptomya retiaria retiaria (Hutton, 1885)				d	d		
	Macomona liliana (Iredale, 1915)				ll		d	
#	*Mactra discors* Gray, 1837	d					d	d
#	*Maorimactra ordinaria* (E.A. Smith, 1898)				d	d		
	Modiolarca impacta (Hermann, 1782)						d	
#	*Myadora boltoni* E.A. Smith, 1880				d	l		
	Myadora striata (Quoy & Gaimard, 1835)					l		d
	Myllitella vivens vivens Finlay, 1926					d		
	Nucula hartvigiana Pffeiffer, 1864				ll	l	d	
	Nucula nitidula A.Adams, 1856				l			
	Paphies australis (Gmelin, 1791)				ll	d	d	d
	Paphies (Mesodesma) subtriangulata (Gray, 1828)	ll					d	d
#	*Parilimya neozelanica* (Suter, 1914)					d		
#	*Pecten novaezelandiae* Reeve, 1853				l	d		
#	*Periploma (Offadesma) angasi* Crosse & Fischer, 1864					d		
	Perna canaliculus (Gmelin, 1791)	ll	ll			d	d	ll
#	*Peronaea gaimardi* (Iredale, 1915)				d			
#	*Pholadidea suteri* Lamy, 1926		ll					
#	*Pododesmus zelandicus* (Gray, 1843)		d					d
	Protothaca crassicosta (Deshayes, 1835)							d
	Pseudoarcopagia disculus (Deshayes, 1855)		d					
#	*Ruditapes largillierti* (Philippi, 1849)				d	l		d
	Spisula (Crassula) aequilatera (Deshayes, 1854)	dd				d		d
#	*Tawera spissa* (Deshayes, 1835)					l		
#	*Tellinota edgari* (Iredale, 1915)		l		d	d		
*	*Theora (Endopleura) lubrica* Gould, 1861				l			
	Tiostrea chilensis lutaria (Hutton, 1873)		l		ll	d	d	
	Xenostrobus pulex (Lamarck, 1819)	ll	ll				d	l
#	*Zelithophaga truncata* (Gray, 1843)		l					
	Zenatia acinaces (Quoy & Gaimard, 1835)							d
	SCAPHOPODA							
#	*Antalis nana* (Hutton, 1873)				d			
	CEPHALOPODA							
#	*Octopus* sp. indet		l					
	Spirula spirula (Linne, 1758)	dd					d	d

	wc	en	sw	fl	ch	Ao	K
ECHINODERMATA							
ECHINOIDEA							
Echinocardium cordatum (Pennant, 1777)				II			
Evechinus chloroticus (Valenciennes, 1846)		I					
Fellaster zelandiae (Gray, 1855)						d	
ASTEROIDEA							
Coscinasterias calamaria Verrill, 1864		II					
Patiriella regularis (Verrill, 1867)	II	II		I			
Stichaster australis (Verrill, 1867)	II	I					
OPHIUROIDEA							
Ophionereis fasciata Lutken, 1859		I					
Ophiopteris antipodum Smith, 1877		I					
HOLOTHUROIDEA							
Stichopus mollis (Hutton, 1872)		II					
CRUSTACEA							
AMPHIPODA							
Allorchestes novizealandiae Dana, 1852		I					
Ampithoe sp.					I		
Ampithoe aorangi Barnard 1972			II				
Aora maculata (Thomson, 1879)		I					
Bircenna fulva Chilton, 1884			I				
Caprella sp.			I				
Cephalophoxus regium Barnard, 1930					I		
Gammaropsis sp.		I					
Gammaropsis typica (Chilton, 1884)			I				
Gondogeneia rotorua Barnard, 1972			II				
Gondogeneia sp.		I					
Haplocheira lendenfeldi Chilton, 1884		II	I				
Haustoria sp.				I			
Hyale sp.	II						
Hyale grenfelli Chilton, 1916			II				
Hyale rubra (Thomson, 1879)		I					
Ischyrocerus longimanus (Haswell, 1880)			II				
Liljeborgia hansoni Hurley, 1954	I						
Melita awa Barnard, 1972					II		
Melita inaequistylis (Dana, 1852)					II		
Orchestia sp.	I	I				II	
Paracentromedon manae (Lowry & Stoddard, 1983)					I		
Paradexamine pacifica (Thomson, 1879)		I			I		
Paraperioculodes sp.					I		
Parawaldeckia sp.					I		
Podocerus wanganui Barnard, 1972			II				
Protophoxus australis (Barnard, 1930)					II		
Stenothoe moe Barnard, 1972			II				
Tetradeion crassum (Chilton, 1883)		II			I		
CARIDEA							
Alpheus richardsoni Yaldwyn, 1971				II			
Alpheus socialis Heller, 1865		I					
Pontophilus australis (Thomson, 1879)		I		II			
CUMACEA							
Cyclaspis thomsoni Calman, 1907					I		

	wc	en	sw	fl	ch	Ao	K
ISOPODA							
Amphoroidea media Hurley & Jansen, 1974			II				
Batedotea elongata Miers, 1876			II				
Deto sp.					I		
Dynamenella huttoni (Thomson, 1879)		II	I				
Eurylana cookii (Filhol, 1885)				II			
Isocladus armatus (Milne Edwards, 1840)		I		II		II	
Natatolana sp.				I	I		
Paranthura flagellata (Chilton, 1882)					II		
Scutuloidea maculata Chilton, 1883			II				
OSTRACODA							
Scleroconcha sculpta (Brady, 1898)					II		
REPTANTIA							
Callianassa sp.				II			
Callianassa filholi Milne Edwards, 1878		I		I			
Cancer novaezelandiae (Jaquinot, 1853)				II			
Cyclograpsus lavauxi Milne Edwards, 1853				II			
Halicarcinus cookii (Filhol, 1885)		II	I		I		
Halicarcinus innominatus Richardson, 1949				II			
Halicarcinus varius (Dana, 1851)		I			II	I	
Halicarcinus whitei (Miers, 1876)				I		I	
Hemigrapsus edwardsi (Hilgendorf, 1882)		I					
Liocarcinus corrugatus (Pennant, 1777)				I			
Macrophthalmus hirtipes (Heller, 1862)				II			
Notomithrax minor (Filhol, 1885)			I				
Notomithrax ursus (Herbst., 1788)		I		I			
Ovalipes catharus (White, 1843)				II			
Ozius truncatus Milne Edwards, 1834		I					
Paguristes pilosus (Milne Edwards, 1836)					II		
Pagurus sp.		II					
Pagurus novizelandiae (Dana, 1852)		II		II			
Palaemon affinis Milne Edwards, 1837		I					
Petrolisthes elongatus (Milne Edwards, 1837)		II					
Petrolisthes novaezelandiae Filhol, 1885					I		
Pilumnus novaezelandiae Filhol, 1886		II					
Plagusia chabrus (Linnaeus, 1764)		II					
THORACICA							
Balanus decorus Darwin, 1854	I						
Chamaesipho columna (Spengler, 1790)	II	I					
Chamaesipho brunnea Moore, 1944	II	I					
Conchoderma virgatum (Spengler, 1790)	d						
Elminius modestus Darwin, 1854		II					
Epopella plicata (Gray, 1843)	I						
Lepas anatifera Linnaeus, 1758	d						

FAUNA

Mollusca

One hundred and ninety-two Mollusca (10 chitons, 120 gastropods, 59 bivalves, 1 scaphopod and 2 cephalopods) are recorded here from Kawhia

Harbour and around its entrance, the entrance to Aotea Harbour and the exposed Kiritehere coast. Eighteen are extensions to the previously recorded geographic ranges of taxa (see later).

Echinodermata

Nine Echinodermata (3 echinoids, 3 asteroids, 2 ophiuroids and 1 holothurian) are recorded here from the Kawhia Harbour area. There are no surprises in the fauna. All are relatively common low tidal and shallow subtidal species around northern New Zealand. More extensive dredging has the potential to extend slightly the number of recorded ophiuroids and asteroids.

Crustacea

Seventy-two Crustacea (29 amphipods, 6 barnacles, 1 cumacean, 26 decapods, 9 isopods and 1 ostracod) are recorded here from the Kawhia Harbour area. Marine crustacea have not received much attention in New Zealand ecological studies, partly because of their mobility (escapement) and avoiding detection (camouflage and behaviour), and partly through taxonomic difficulties in their identification. In this context, the list of crustacea from Kawhia Harbour is comparatively lengthy, but is the result of somewhat more comprehensive work to include amphipod, isopod, caridea, thoracica and reptant faunas. The species are those frequently associated with shallow, sheltered, harbour situations and there are no surprises by way of habitat or distributional anomalies.

ECOLOGICAL NOTES (Figs. 2-3)

Exposed West Coast beaches and rocks

Zones of dense mussels (*Perna canaliculus, Xenostrobus pulex*) and barnacles (*Chamaesipho* spp., *Epopella plicata)* cover the exposed intertidal rocks on the west coast outside Kawhia Harbour entrance. Several tall specimens (up to 8cm high) of the barnacle *Balanus decorus* live in rock crevices at spring low tide level. Clinging tightly to the rocks are numbers of the common limpets *Cellana radians* and *Patelloida corticata,* fewer large exposed shore chitons *Eudoxochiton nobilis* and the small scarlet nudibranch *Rostanga muscula,* feeding on low tidal red sponges. Carnivorous gastropods are dominated by the muricids *Lepsiella albomarginata* and *Dicathais orbita.* At higher levels on the intertidal rocky shore are numerous periwinkles, *Nodilittorina antipodum* and fewer specimens of *N. cincta, Nerita atramentosa, Diloma coracina, Turbo smaragdus* and the carnivore *Cominella glandiformis*. Numerous large orange starfish *Stichaster australis* feed on the mussels and cling tightly to the rocks with their tube feet. The smaller cushion star *Patiriella regularis* occurs in fewer numbers in rocky pools higher

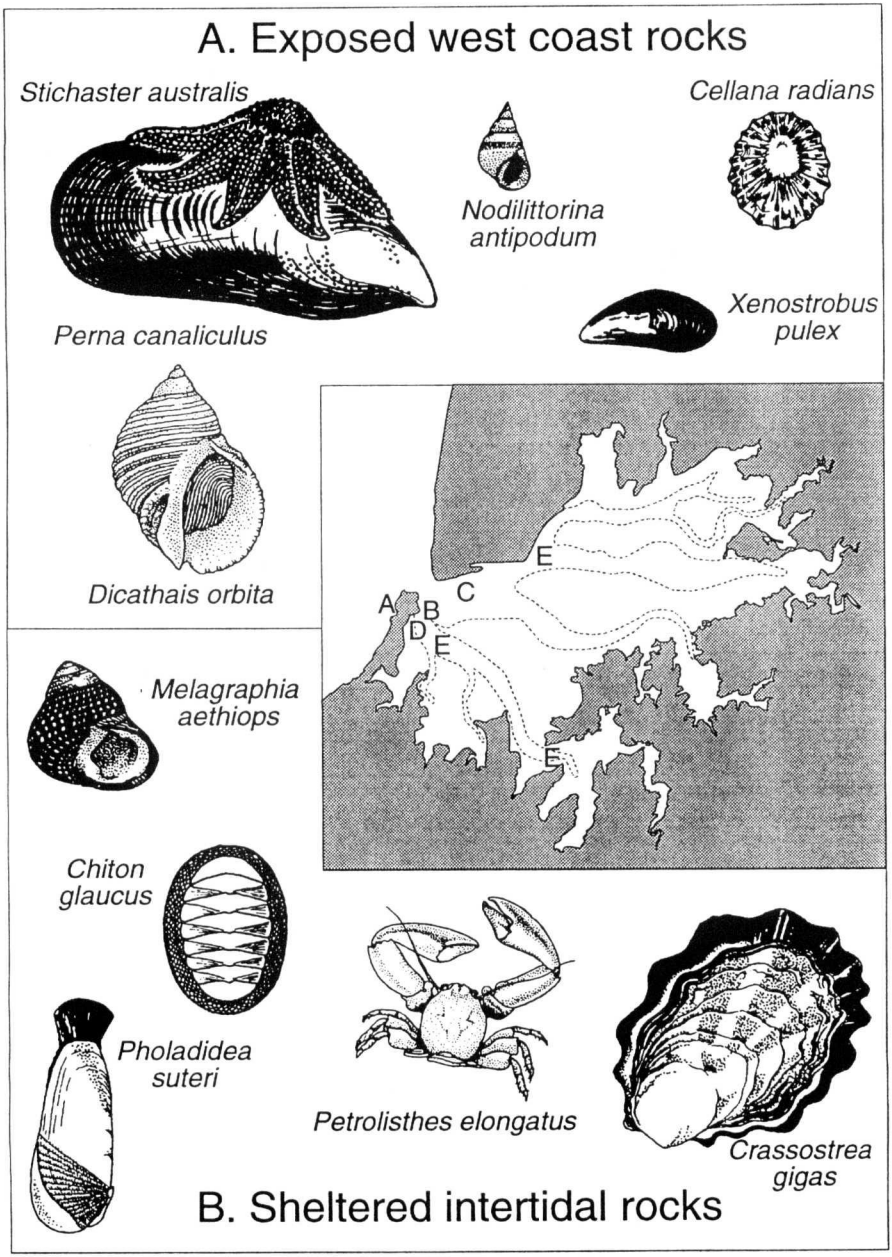

Fig. 2. Schematic diagram showing some of the more common or characteristic members of the faunas of intertidal rocks at Kawhia. Some drawings used are from Powell (1947).

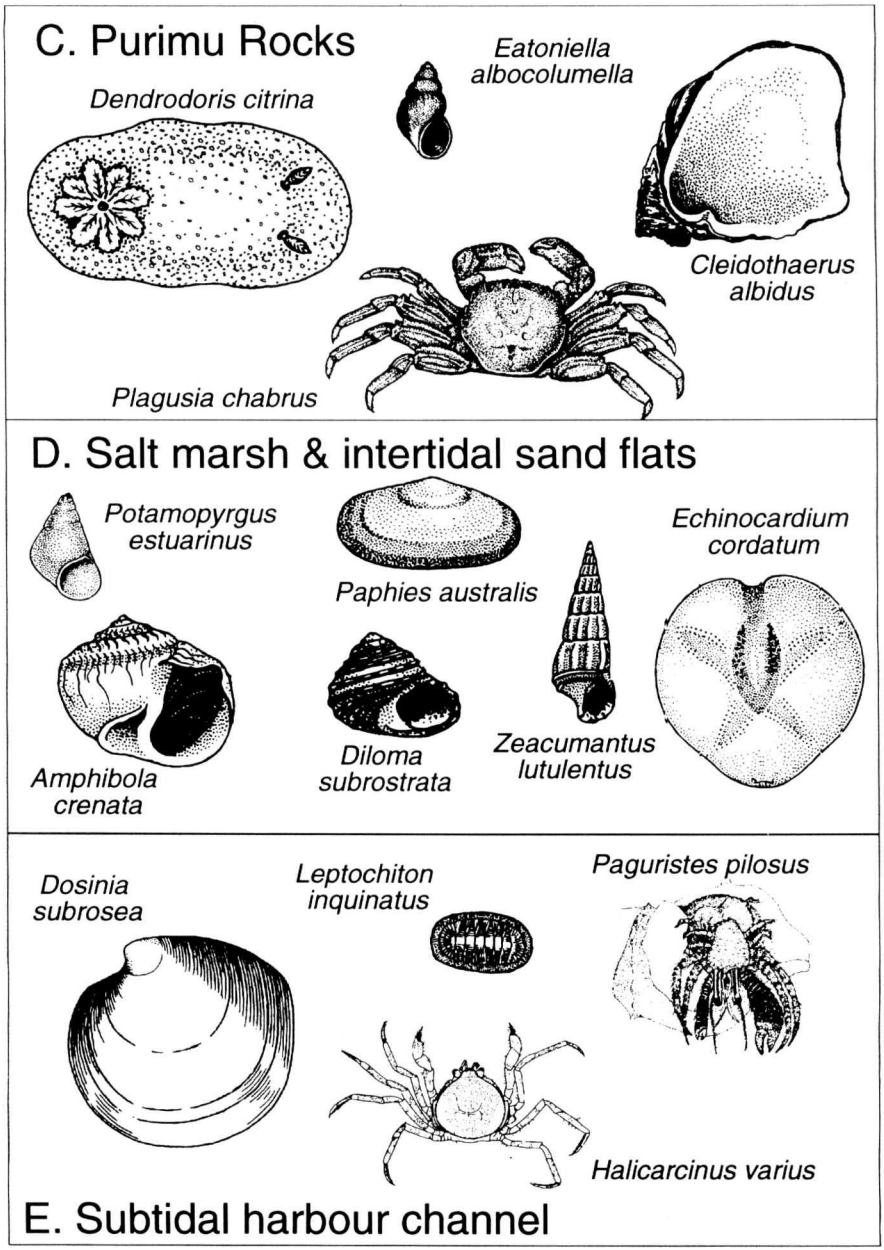

Fig. 3. Schematic diagram showing some of the more common or characteristic members of the faunas of different habitats in Kawhia Harbour. Some drawings used are from Powell (1947).

up the shore.

A number of exposed coast, sand-inhabiting molluscs wash up on the west coast beaches outside Kawhia Harbour entrance and provide some idea of the fauna living in the wave zone at and below low tide mark. These include the surf clams *Dosinia anus, Spisula aequilatera, Mactra discors* and *Bassina yatei,* and gastropods *Amalda mucronata, Austrofusus glans* and *Semicassis pyrum.* The only mollusc living in the intertidal sands in this harsh environment are numerous tuatua, *Paphies subtriangulata.* The goose barnacle *Conchoderma virgata* was collected from a green turtle that was washed up on the beach at the entrance to Kawhia Harbour in 1980 and occasional specimens of another goose barnacle *Lepas anatifera* wash ashore attached to floating logs.

Sheltered intertidal rocky area at harbour entrance

The greatest diversity of molluscs and echinoderms were encountered on and around intertidal rocks just inside the harbour entrance on its southern shore (Fig. 4). The live fauna is composed of 38 species of gastropod, 18 bivalves, 10 crabs, 9 chitons, 9 amphipods, 4 shrimps, 3 barnacles, 3 starfish, 2 brittle stars, 2 isopods, 1 cephalopod and 1 sea egg.

Only the small, herbivorous periwinkle *Nodilittorina antipodum* is common on rocks around high tide level. At mid tide levels the rock-dwelling fauna is dominated by the introduced oyster *Crassostrea gigas,* the barnacles *Chamaesipho columna, C. brunnea* and in greater shelter *Elminius modestus,* limpet *Cellana radians,* topshell *Melagraphia aethiops* and oyster borer *Lepsiella albomarginata.*

At mid to low tide level, the rock-dwelling fauna is dominated by the mussels *Perna canaliculus* and *Xenostrobus pulex,* the chiton *Chiton pelliserpentis,* the trochid *Calliostoma punctulatum* and carnivorous, white rock shell *Dicathais orbita.* The amphipods *Gammaropsis* sp., *Haplocheira lendenfeldi, Hyale rubra* and *Tetradeion crassum* and isopod *Dynamenella huttoni* are known seaweed-dwellers but are recorded here from their occurrence on holdfasts attached to rock.

Numerous chitons, mostly *Chiton glaucus, Leptochiton inquinatus* and *Plaxiphora caelata,* cling to the underside of loose rocks or in crevices. Also living beneath the shelter of these rocks are common halfcrabs *Petrolisthes elongatus* and the pillbox crab *Halicarcinus cookii.*

On the coarse shelly sand and gravel around the rocks at low tide are common turret shell *Maoricolpus roseus manukauensis,* minute gastropods of the genus *Chemnitzia,* starfish *Coscinasterias calamaria* and *Patiriella regularis,* hermit crabs *Pagurus* sp. and *Pagurus novizelandiae* and the large holothurian *Stichopus mollis* (Fig. 5). Also present under occasional rocks are the brittle stars *Ophionereis fasciata* and *Ophiopteris antipodum.*

Fig. 4. View north over Te Maika, just inside the entrance on the south shore of Kawhia Harbour. Intertidal *Zostera* flats fill much of the bay and a rich fauna inhabits the hard greywacke rock shoreline around the grass-covered Te Maika Point.

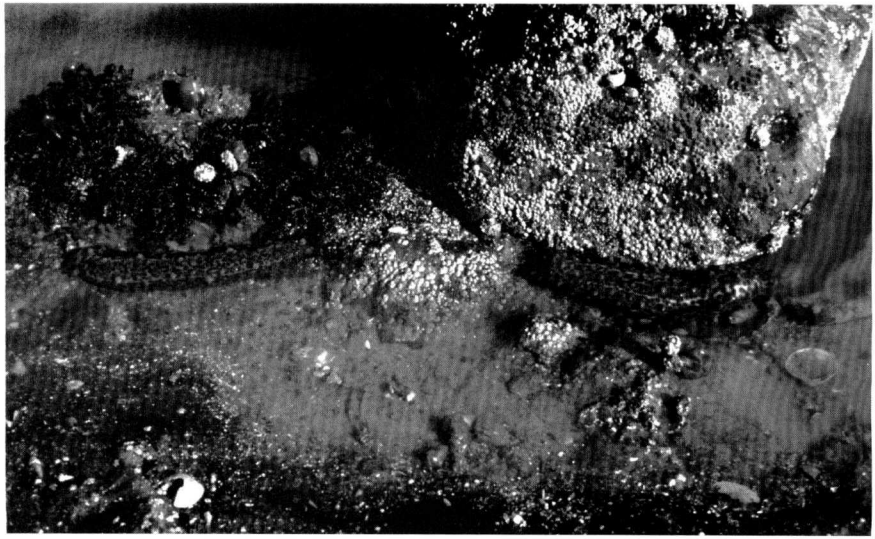

Fig. 5. Two elongate specimens of the sea cucumber (*Stichopus mollis*) in a low tide pool at Te Maika. Specimens approx. 15cm long.

Softer, more weathered low tide rock is sometimes riddled with the rock-boring bivalves *Pholadidea suteri* and less common *Barnea similis* and the date mussel *Zelithophaga truncata*.

Purimu Rocks

At low spring tide we were able to land on the Purimu Rocks, near the middle of the exposed outer Kawhia Harbour channel. The top of this isolated rock is subject to a greater degree of wave and current exposure than other parts of the harbour and is barely uncovered at spring low water. It supports a rich mosaic of encrusting and spherical, orange, yellow and red sponges. Only here did we find the exposure tolerant crabs *Plagusia chabrus*, *Pilumnus novaezelandiae* and the subtidal halfcrab *Petrolisthes novaezelandiae*. Also crawling and feeding on the sponges were the brightly coloured nudibranchs *Archidoris wellingtonensis, Dendrodoris citrina* and *Doriopsis flabellifera*. Many specimens of the heavy bivalve *Cleidothaerus albidus* were cemented onto the upper surface of the rocks and the micromollusc *Eatoniella albocolumella* was common on seaweed.

Seaweed

The mobile epifaunas of subtidal seaweeds are of particular interest as there is emerging information linking epifaunas with particular seaweeds or seaweed habitats (Taylor & Cole, 1994; Stephenson & Riley, 1995). Our list comes from a small sample (*c.* 3kg wet weight) of a common brown seaweed *Carpophyllum* sp. collected (exclusive of holdfasts) from rocks at low-tide inside the Kawhia Harbour entrance. Simultaneously, a brief examination of another seaweed *Sargassum sinclairii* from the same location failed to yield any significant crustacean fauna and it was not investigated in detail.

Though we are presenting the results of much smaller collecting effort, the range of taxa is not greatly different from that given in Taylor & Cole (1994), particularly in relation to their analysis of *Carpophyllum* species. Significantly, as Taylor & Cole (1994) have found, the amphipod *Ischyrocerus longimanus* (Ischyroceridae) was numerically dominant in a community that is largely comprised of gammarid amphipods and isopods. In this instance species such as *Ampithoe aorangi*, *Gondogenia rotorua*, *Hyale grenfelli*, *Podocerus wanganui*, *Stenothoe moe* (Amphipoda) along with *Amphoroidea media*, *Batedotea elongata* and *Scutuloidea maculata* (Isopoda) are other common components occuring in this epifauna.

Notwithstanding possible exceptions at the species level, only *Gondogenia rotorua* has not been widely found previously in seaweed communities. While Barnard (1972) suggests that it is a species of southern shores around coastal Kaikoura and Dunedin, specific work on seaweed epifaunas (which is still in its

infancy) is likely to assist in a better understanding of its distribution and habitat requirements.

Among the isopods from *Carpophyllum* species it has been suggested previously (Stephenson & Riley, 1995) that *Amphoroidea media* seems to be confined to sheltered habitats, or prefers *C. maschalocarpum* which grows in these conditions. That it occurs in our Kawhia sample is consistent, at least, with its preference for a sheltered habitat.

Sheltered intertidal harbour sand flats

A live fauna of 21 gastropods, 13 bivalves, 9 crabs, 3 isopods, 2 echinoderms, 2 shrimps, 2 carids, 1 chiton and 1 amphipod was recorded from the intertidal fine sand and muddy fine sand flats in the outer parts of Kawhia Harbour, particularly at Te Maika (Fig. 4). The fauna above mid tide level is of relatively low diversity and is dominated by the herbivores and deposit-feeding gastropods *Potamopyrgus estuarinus* (in salt marsh areas), *Amphibola crenata, Diloma subrostrata* and *Zeacumantus lutulentus* and the crabs *Cyclograpsus lavauxi* and *Hemigrapsus crenulatus*. Patches of bivalve pipi *Paphies australis* are present in some places.

Around mid tide level at Te Maika, the sea grass *Zostera* forms extensive cover. Here the fauna is dominated by the cockle *Austrovenus stutchburyi,* wedge shell *Macomona liliana,* whelks *Cominella adspersa* and *C. glandiformis,* crabs *Macrophthalmus hirtipes, Halicarcinus* spp. and *Pagurus novizelandiae,* and shrimps *Alpheus richardsoni* and *Pontophilus australis*. On several of the extensive mid tide sand banks between the various channels in the harbour are areas with abundant mud oysters *Tiostrea chilensis lutaria* (Fig. 6). Their live and dead shells provide a sheltered home for *Ischnochiton maorianus* and *Zegalerus tenuis* and a hard substrate for attachment by the Pacific oyster *Crassostrea gigas*.

The fine sometimes muddy fine sand around low and spring low tide levels at Te Maika is inhabited by common sediment burrowers such as the heart urchin *Echinocardium cordatum,* bivalves *Dosinia subrosea* and *Nucula hartvigiana,* olive shell *Amalda australis* and shrimp *Callianassa filholi*.

The crabs *Macrophthalmus hirtipes, Cyclograpsus lavauxi, Hemigrapsus crenulatus, Halicarcinus innominatus* and *H. whitei*, together with the hermit crab *Pagurus novizelandiae* and the mud shrimp *Pontophilus australis*, occur in reasonably high numbers throughout Kawhia Harbour. They are the typical crustacean components of a muddy and fine sandy intertidal community that occurs in similar situations throughout New Zealand (Dell 1963, McLay 1988). Somewhat more discretely placed are a cluster of other species having particular sediment or habitat preferences; *Ovalipes catharus* (sand) *Cancer novaezelandiae*,

Fig. 6. The edge of an intertidal sand bank in the middle of Kawhia Harbour slopes rapidly down into a subtidal channel. The sand flat is covered in extensive sea grass (*Zostera*) with the low tide slope covered in a bed of live and dead oysters (*Tiostrea chilensis lutaria*).

Callianassa filholi (muddy sand), and *Alpheus richardsoni*, *Callianassa filholi*, *Pontophilus australis*, *Notomithrax ursus* (*Zostera* beds).

Many crustacea of the harbour flats reside in or have temporary shelters associated with burrows and *Zostera* beds; others may bury themselves in surface sediments when the tide is out. The reasons for the sporadic and irregular occurrence of deeper burrowing species are not understood. The burrowing shrimp *Callianassa filholi* was frequently located in Kawhia Harbour at various sites along the low-tide boundary, but contrary to expectation no stomatopod fauna was found. By comparison, Harris (1993) refers to the mantid shrimp *Lysiosquilla spinosa* (= *Heterosquilla tricarinata*) as one of the common macro-invertebrates in tideways of the east coast Hauraki Gulf, but *Callianassa* is not mentioned. Personal collecting experiences in the Waitemata Harbour have indicated that both *Callianassa* and *Heterosquilla* are common genera and can be living in close proximity or even in overlapping situations. The premise that *Heterosquilla* should occur in Kawhia Harbour still remains.

Subtidal harbour channels

To gain some idea of the fauna living in the subtidal (3-12m depth) channels of Kawhia Harbour, we took six dredge samples (each with a volume of 10 litres

and penetration depth of *c.* 10cm) in several channels, mostly in the outer parts of the harbour, but also well up the southern arm (Fig. 1). The substrate was mostly fine sand in the outer harbour with shell and pebble gravel in the inner harbour.

The live fauna consisted of 10 species of amphipod, 7 gastropods, 7 bivalves, 4 crabs, 3 chitons, 3 isopods and 1 cumacean. Obviously some of the larger, rarer and deeper-burrowing channel inhabitants are not included in this list. The most common organisms present are the small gastropods *Eatoniella albocolumella* and *Eatonina atomaria* on seaweed, small pillbox crab *Halicarcinus varius,* hermit crab *Paguristes pilosus* and amphipods *Meita awa, M. inaequistylis* and *Protophoxus australis* and isopod *Paranthura flagellata.*

A wide variety of dead shells is recorded from the dredge hauls. Many are of molluscs that live in intertidal rocky and soft shore environments and their shells have been transported into the channels. Some of the shells, however, are of species that live in subtidal channels elsewhere (e.g. Hayward *et al.* in press) and these are presumably part of the live fauna at Kawhia Harbour but they were not found living in any of our dredge hauls. These include the gastropods *Odostomia incidata, Penion sulcatus* and *Zethalia zelandica,* and the bivalves *Dosina zelandica, Felaniella zelandica, Glycymeris modestus, Leptomya retiaria* and *Myllitella vivens.*

The resident crustacea of Kawhia channel sediments are mainly amphipods. Within the Amphipoda are three characteristically different groups; fossorial burrowers *Cephalophoxus regium, Protophoxus australis* (Phoxocephalidae), interstitialdwellers *Paracentromedon manae*, *Paraperioculodes* sp., *Parawaldekia* sp., and the itinerants *Ampithoe* sp., and *Melita* spp. which Barnard (1972) records in washings from rock, gravel and seaweed. The infaunal amphipods from Kawhia sediments are low in diversity when compared with other surveys we have undertaken in the Bay of Islands and Parengarenga and Waitemata harbours, and there are fewer species than those reported by Cooper (1968) for Wellington Harbour. Nevertheless, these amphipods along with other channel crustacea, particularly the crabs *Halicarcinus varius* and *Paguristes pilosus*, and the burrowing isopods *Natatolana* sp. and *Paranthura flagellata* are recurring inhabitants of the channels in other northern harbours.

Aotea Harbour

Our brief visit to the harbour shore coincided with high tide and the faunal list is little more than cursory. The molluscan wash-up comprised 19 gastropod species, 15 bivalves and 1 cephalopod. Five gastropods (*Eatoniella* sp., *Gadinia conica, Janthina exigua, Pusillina infecta*, *Anabathron (Scrobs)* sp.) and a bivalve (*Modiolarca impacta*) are additional to our recorded Kawhia Harbour faunal list.

The only live molluscs recorded at high tide level were *Potamopyrgus estuarinus* and *Nodilittorina antipodum*.

The only washed up echinoderm was the sand dollar (*Fellaster zelandiae*). Live crustacea recorded include the sandhopper *Orchestia* sp. (damp sand burrows), free swimming and interstitial isopods *Eurylana cookii* and *Natatolana* sp., and the crab *Halicarcinus whitei* (sandy pools), all of which are common and widely distributed coastal species.

MOLLUSCAN BIOGEOGRAPHIC NOTES

The records of eighteen mollusc species from Kawhia, listed below, extend their recorded geographic ranges. Powell's (1979) published ranges have been used when commenting on extension of range, because Spencer & Willan (1995) give zoogeographic provinces only. These provinces (Powell 1955) are used to summarise the known range of each species (A = Aupourian, C = Cookian, F = Forsterian, M = Moriorian, An = Antipodean). Additional records from the collections of Auckland Museum (AK), Margaret Morley (MM), Mike Eagle (ME), Don Watson (DW) and Nancy Smith (NS) are cited where they extend the published range.

* *Cirsotrema zelebori* - previously recorded from North Island; west coast Muriwai, down the east coast to the Bay of Plenty (Powell 1979). This species is also found in southern Florida, United States of America, under the name *Cirsotrema blainei* Clench & Turner, 1953 (pers. comm. Norman Paschal). The range in New Zealand is now extended by the following records: off the Three Kings Islands; Ahipara, Ninety Mile Beach; Manukau Harbour (all AK); Kariotahi west coast (MM); Foveaux Strait (NS); off Otago Heads; Paterson Inlet, Stewart Island (AK) and Kawhia (AK100159).

The range of *Cirsostrema zelebori* is now A, C and F provinces.

* *Doriopsis flabellifera* - previously recorded from North Island (Powell 1979) but only Aupourian Province (Spencer & Willan 1995). There are additional records from Petre Bay, Chatham Island (Joan Willan); Otago Harbour, and Fiordland (R.C. Willan pers.comm.); as well as this specimen from Kawhia (AK100210).

This is the first west coast record. The range of *Doriopsis flabellifera* is now updated to A, C, F and M provinces.

* *Epitonium minora* - previously recorded only from the east coast of Northland (Aupourian Province). It also occurs in New South Wales, Australia and

Tasmania (Powell 1979). The Kawhia specimen (AK100218) extends its range in New Zealand south and is the first west coast record. We have additional records from between Spirits Bay and the Three Kings Islands in 95m; Ahipara, Ninety Mile Beach; Mount Maunganui; Lyall Bay, Wellington; and Akaroa, Canterbury (all AK). This species lives in shallow water on fine sand in open coast situations (Powell 1979). Specimens have been found at Kaiarara, Great Barrier Island in depths of 1-3m in close association with the orange and white striped anemone *Actinothoe albocincta* (pers. obs. MM).

Epitonium minora is now known from A and C provinces.

* *Epitonium tenellum* (AK 131076) - previously recorded from the east coast of Northland to the Bay of Plenty (Aupourian Province) in sheltered shallow waters. It is also found in Australia from Queensland to Victoria (Powell 1979). It feeds on the mudflat anemone *Anthopleura aureoradiata*. We have additional records of *E. tenellum* from Kawerua, west coast Northland; Manukau Harbour; Cook Strait (AK) and Kawhia (AK131076).

Epitonium tenellum is now known from A and C provinces.

* *Eulimella levilirata* - previously recorded from the east coast of Northland and Great Barrier Island to Otago Heads. We have additional records from the Manukau Harbour; Cuvier Island (AK); Stewart Island (MM); and Kawhia (AK100153).

This species is known from A, C and F provinces. This is the first record from the west coast of the North Island.

* *Linopyrga rugata rugata* - previously recorded from the east coast from Northland to Stewart Island; Snares, Bounty and Auckland Islands. This Kawhia record (AK100143) is the first from the west coast. We know of additional specimens from Manukau Harbour and Waitangi, Chatham Island (MM). The Waitangi specimen was found living in algae on the back of a large specimen of *Cookia sulcata*.

Linopyrga rugata rugata is now known from A, C, F, M and An provinces.

* *Mitra carbonaria* (ME) - previously recorded from the Kermadec Islands and the east coast of northern New Zealand south to Tauranga. It is also found in Australia. The Kawhia coast specimen was found in good condition washed up on a boulder beach at Kiritehere (Hendy & Eagle 1995). We have additional records from Hawera, Mount Egmont; in 23m off Bare Island, Hawkes Bay (AK); Town Point, Maketu and most rocky shores east to Lottin Point, East Cape (NS); near Te Araroa (MM); and Kapiti Island (DW SCUBA).

Mitra carbonaria is known from A and C provinces, this now includes the west coast.

* *Notoacmaea subtilis* - previously known from east coast of the Northland Peninsula; North Cape to outer Hauraki Gulf; off Mayor Island; and between Little Barrier and Tiritiri Matangi Islands in 36m. The Kawhia specimen (AK131155) was dredged in 5m. It is larger (length 7.5mm), and thicker, with wider radiating brown lines, than specimens dredged from Northland. However it appears to fit the description of *N. subtilis*.

The range is further extended by specimens from Mount Maunganui to Mayor Island (fish gut); Waihau Bay, East Cape; Timaru; Taieri Beach, Dunedin (AK); Oneroa, Waiheke Island; Moeraki Beach, Otago; and Chalky Inlet, Fiordland (MM). All the South Island specimens are over 7mm in length and are heavier than those from Northland.

Thus the range for *Notoacmea subtilis* is now A, C and F provinces.

* *Nozeba emarginata* - previously recorded from Ahipara, Northland; Great Barrier Island; Hauraki Gulf; Waitemata Harbour; Manukau Harbour; Nelson; Wellington and off Otago Heads. This Kawhia record (AK100132) is the first from the west coast south of the Manukau Harbour. We also know of specimens found at Waharau, Firth of Thames (MM) and Cuvier Island (AK).

The range for *Nozeba emarginata* is A, C and F provinces, including the west coast of the North Island.

* *Odostomia incidata* - previously only recorded from south of Cuvier Island in 70m and dredged off Otago Heads. This Kawhia record (AK100138) is the first from the west coast. Additional specimens are known from Whangaroa, Northland (MM); Ahipara, Ninety Mile Beach; off Pakiri Beach; Great Barrier Island; Waitemata Harbour; Manukau Harbour; Bay of Plenty (AK); Chalky Inlet, Fiordland; and Stewart Island (MM).

The range for *Odostomia incidata* is now A, C, and F provinces.

* *Pusillina (Haurakia) infecta* - previously recorded only from Tom Bowling Bay; Lyall Bay, Wellington; Stewart Island; and Waitangi, Chatham Island. This uncommon species has also been found at Great Barrier Island (MM), as well as this Kawhia specimen (AK100222), which is the first for the west coast.

The range is already recorded from A, C, F and M provinces (Spencer & Willan 1995).

* *Taron dubius* - previously recorded as restricted to Northland east coast to East

Cape (Powell 1979); Manukau and Nelson Harbours; and Kawerua, Northland (Hayward *et al.* 1995). The range is now further extended by this Kawhia record (AK131013); a specimen found alive in Herekino Harbour, west coast Northland (MM) and specimens from Nelson Harbour (AK).

The range for this species is now A and C provinces.

* *Tugali elegans* - previously recorded from the northern part of the North Island (Powell 1979) but extended to A, C and M provinces (Spencer & Willan 1995). This is the first west coast record. We also have specimens from Dunedin, Otago (AK).

The range for *Tugali elegans* is A, C and F provinces.

* *Xymene pusillus* - previously recorded from "North Island and down the east coast of the North and South Islands to Stewart Island" (Powell 1979). We know of specimens from Ahipara, Northland and Raglan Harbour (AK, MM); and these records from Kawhia (AK100162, AK100158).

The range for *Xymene pusillus* is A, C and F including the west coast.

* *Zemitrella pseudomarginata* - previously recorded only from Bay of Islands; Great Barrier Island in 10m; and Hauraki Gulf in 45m. This Kawhia record (AK100155) is the first from the west coast. We know of specimens from Islington Bay, Rangitoto (MM); Waitemata Harbour; Whangaroa, Northland; and Mount Maunganui (AK).

The range for *Zemitrella pseudomarginata* is now A and C provinces.

* *Zeradina ovata* - previously known only from Mangonui, Northland 11-18m; Hen and Chickens Islands 47-55m; and Hauraki Gulf 64m. This Kawhia record (AK100160) is the first from the west coast. Additional unpublished records come from the Poor Knights Islands; off Cuvier Island; Cheltenham Beach, Auckland; and Mount Maunganui (fish gut) (all AK).

The range for *Zeradina ovata* is now A and C provinces.

* *Irus elegans* - previously known from the northern part of the North Island. This species burrows in soft mudstone or sandstone in the lower tidal zone. We have located unpublished records from Whiritoa, Coromandel; Mill Bay, Manukau Harbour; East Cape; Raglan Harbour, Waikato; Pukerua Bay, Wellington; Cape Campbell, Marlborough (AK); Marfells Beach, South Island (MM); Moeraki Beach and Kartigi, Otago (AK), as well as Kawhia (AK131166).

These records provide a large extension of range, which is now A, C and F provinces.

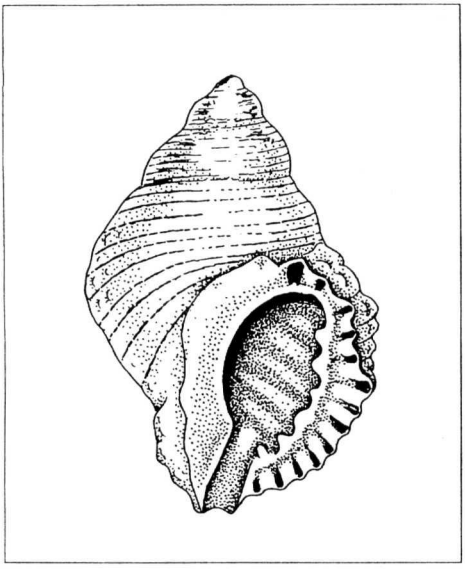

Fig. 7. ***Lepsiella albomarginata*** **(Deshayes, 1839), showing the dentate outer lip of the aperture. Specimen from Te Maika intertidal rocks, Kawhia Harbour. Length 20mm, width 12.5mm.**

* *Theora lubrica* - This introduced Asian species was first collected in New Zealand in the Bay of Islands in 1971 and has subsequently been recorded from Tutukaka, Whangaroa, Marlborough Sounds, Firth of Thames, Great Barrier Island and the Waitemata Harbour. It was found for the first time on the west coast at Herekino Harbour, Northland (Morley 1995). Three specimens were found alive by sieving in low tidal mud at Te Maika, Kawhia (AK100228).

The New Zealand range for *Theora lubrica* is now A and C provinces.

* *Lepsiella albomarginata* (Fig. 7) - Powell (1979) stated that *Lepsiella* has a thin edged outer lip, weakly crenulated, but not lirate or dentate within. Two of the Kawhia specimens (AK 131006) are strongly dentate within the outer lip. We have specimens of *Lepsiella scobina* with similiar dentate lips from the following localities, Parengarenga Harbour; Spirits Bay; Wainui near Takaka, Nelson (MM) Urquharts Bay and Taurikura, Whangarei; Leigh; Orua Bay, Manukau Harbour and Auckland Harbour (AK), a total of 31 specimens.

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REFERENCES

Barnard, L.J. 1972: The marine fauna of New Zealand: Algal-living littoral Gammaridea (Crustacea: Amphipoda). *New Zealand Oceanographic Institute Memoir 62.* 216pp.

Cooper, R.D. 1968: The systematics and ecology of the sub-order Gammaridea (Amphipoda). Families Lysianassidae, Phoxocephalidae and Haustoridae obtained from Wellington Harbour. Unpublished MSc thesis, Victoria University of Wellington. 164pp.

Dell, R.K. 1963: "Native crabs of New Zealand". Reed, Wellington. 64pp.

Grange, K.R. 1979: Soft-bottom macrobenthic communities of Manukau Harbour, New Zealand. *New Zealand Journal of Marine and Freshwater Research 13:* 315-329.

Grange, K.R. 1982: Macrobenthic communities at possible combined-cycle power station sites in Manukau and Waitemata Harbours, Auckland. *New Zealand Oceanographic Institute, Oceanographic Summary 19.* 20pp.

Harris, T.F.W. 1993: Hauraki Gulf tideways: elements of their natural sciences. *Leigh Laboratory Bulletin 29.* 111pp.

Hayward, B.W. 1975: Kawerua echinoderms. *Tane 21:* 59-60.

Hayward, B.W. 1990: Kawerua molluscs. *Tane 32:* 1-9.

Hayward, B.W., Blom, W., Morley, M., Stephenson, A.B. & Hollis, C.J 1994: Benthic ecology of Whangape Harbour, Northland. *Records of Auckland Institute and Museum 31:* 219-230.

Hayward, B.W. & Hollis, C.J. 1993: Ecology of Waimamaku River estuary, north of Kawerua, North Auckland. *Tane 34:* 69-78.

Hayward, B.W., Morley, M., Riley, J., Smith, N. & Stace, G. 1995: Additions to the mollusca from Kawerua, North Auckland. *Tane 35:* 183-193.

Hendy, A.J.W. & Eagle, M.K. 1995: A checklist of the molluscs of the Kiritehere coastline. *Poirieria 17(4):* 28-32.

Henriques, P.R. 1980: Faunal community structure of eight soft-shore, intertidal habitats in the Manukau Harbour. *New Zealand Journal of Ecology 3:* 97-103.

McLay, C.L. 1988: Brachyura and crab-like Anomura of New Zealand. *Leigh Laboratory Bulletin 22.* 463pp.

Morley, M. S. 1995: Extension of range in New Zealand for *Theora (Endopleura) lubrica* Gould, 1861: Selemidae. *Poirieria 17(4):* 21.

Powell, A.W.B. 1937: Animal communities of the sea-bottom in Auckland and Manukau Harbours. *Transactions of the Royal Society of New Zealand 66:* 354-401.

Powell, A.W.B. 1955: New Zealand biotic provinces. *Auckland Museum Conchology Section Bulletin 11:* 10-14.

Powell, A.W.B. 1947: "Native animals of New Zealand". 3rd ed., Auckland Institute & Museum. 88pp.

Powell, A.W.B. 1979: "New Zealand Mollusca." Collins. 500pp.

Powell, A.W.B. 1979: New Zealand molluscan systematics with description of new species, Part 8, *Records of the Auckland Institute and Museum 11:* 197-207.

Stephenson, A.B. & Riley, J. 1995: Isopods of four seaweeds in the Bay of Islands, New Zealand. *Records of the Auckland Institute and Museum 32:* 91-99.

Spencer, H.G. & Willan, R.C. 1995: The marine fauna of New Zealand: Index to the fauna 3. Mollusca. *New Zealand Oceanographic Institute Memoir 105.* 125pp.

Taylor, R.B. & Cole, R.G. 1994: Mobile epifauna on subtidal brown seaweeds in northeastern New Zealand. *Marine Ecology Progress Series 115:* 271-282.