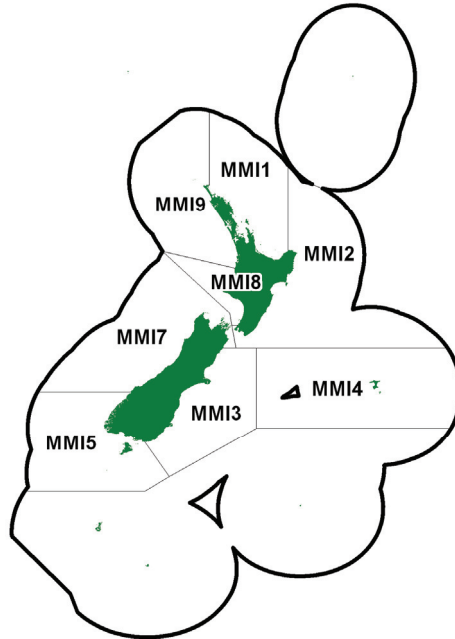


LARGE TROUGH SHELL (MMI)

(Maetra murchisoni)

1. FISHERY SUMMARY

1.1 Commercial fisheries

Large trough shells (*Maetra murchisoni*) were introduced into Quota Management System on 1 April 2004 with a combined TAC and TACC of 162 t. No allowances were made for customary, recreational or other sources of mortality. The fishing year is from 1 April to 31 March and commercial catches are measured in greenweight. All reported landings have been from MMI 3 and MMI 7. Between the 1991–92 and 1995–96 fishing years landings were small, apart from the 1993–94 and 1994–95 fishing years when about 8 and 10 t respectively were reported as landed. No further landings were reported until 2002–03, since then the reported catch has ranged between about 2.6 t to 60 t (Table 1). Figure 1 shows the historical landings and TACC for the two main MMI stocks. Notably, new survey information for QMA 2 and 3 have resulted in increases to a number of surf clam TACC from 1 April 2010, including MMI 3¹.

Table 1: TACCs and reported landings (t) of Trough Shell by Fishstock from 1990–91 to 2008–09 from CELR and CLR data. QMA where no catch has been reported are not tabulated. MMI, 2, 4, 5, 8 and 9 have TACC of 2, 3, 1, 1, 25 and 25 t, respectively.

Fishstock	MMI 3		MMI7		Total	
	Landings	TACC	Landings	TACC	Landings	TACC
1991–92	0	0	0.349	–	0.349	–
1992–93	0	0	1.541	–	1.541	–
1993–94	0	0	8.327	–	8.327	–
1994–95	0	0	10.432	–	10.432	–
1995–96	0	0	0.142	–	0.142	–
1996–97	0	0	0	–	0	–
1997–98	0	0	0	–	0	–
1998–99	0	0	0	–	0	–
1999–00	0	0	0	–	0	–
2000–01	0	0	0	–	0	–
2001–02	0	0	0	–	0	–
2002–03	0	0	22.623	–	22.623	–
2003–04	0	44	29.681	61	29.681	162
2004–05*	0	44	60.023	61	60.023	162
2005–06*	0	44	53.961	61	53.961	162
2006–07	7.476	44	54.091	61	61.567	162
2007–08	36.901	44	15.036	61	51.937	162
2008–09	32.149	44	6.657	61	38.806	162

*In 2004–05 and 2005–06 0.84 and 3.9554 t respectively were reportedly landed, but the QMA is not recorded. These amounts are included in the total landings for these years.

¹ From April 2010 TACC for MMI 3 is 62t.

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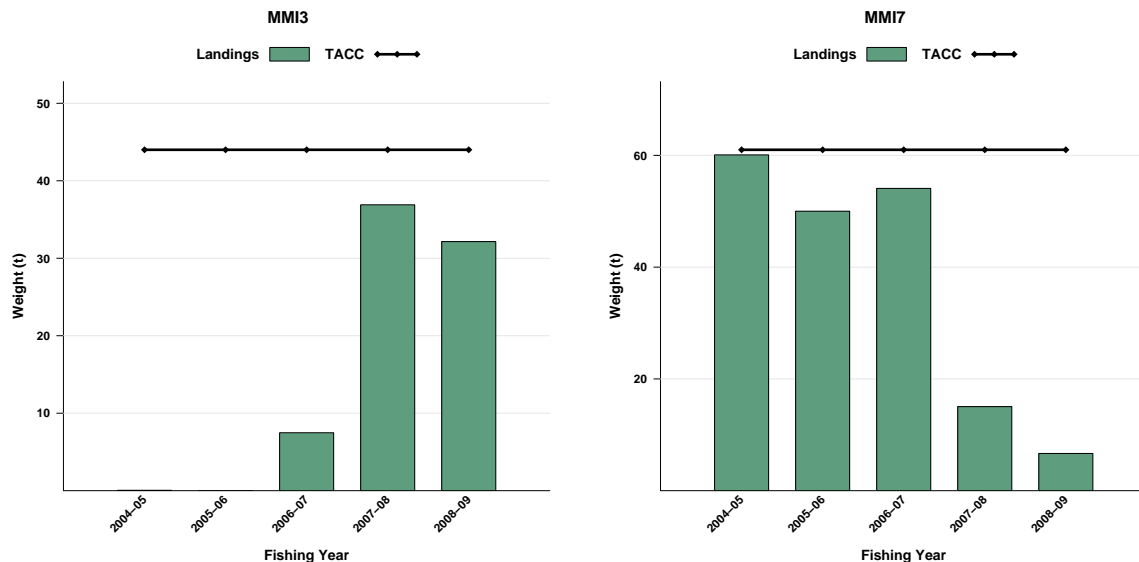


Figure 1: Right to left: Historical landings and TACC for MMI3 (South East Coast), and MMI7 (Challenger). Note that these figures do not show data prior to entry into the QMS.

1.2 Recreational fisheries

Offshore clams such as *M. murchisoni* are likely to have been harvested for recreational use only when washed ashore after storms. There are no estimates of recreational take for this surf clam.

1.3 Customary non-commercial fisheries

Offshore clams such as *M. murchisoni* are likely to have been harvested for customary use only when washed ashore after storms. Shells of this clam have been found irregularly, and in small numbers in a few middens. There are no estimates of current customary non-commercial catch of this clam.

1.4 Illegal catch

There is no known illegal catch of this clam.

1.5 Other sources of mortality

There is no quantitative information on other sources of mortality, although this clam is subject to localised catastrophic mortality from erosion during storms, high temperatures and low oxygen levels during calm summer periods, blooms of toxic algae and excessive freshwater outflow (Cranfield & Michael 2001).

2. BIOLOGY

M. murchisoni is most abundant in the South Island, but also occurs around the North Island and Stewart Island. It is found most commonly between about 4 m. and 8 m. Maximum length is variable between areas, ranging from 63 to 102 mm (Cranfield *et al.* 1993) The sexes are separate, they are broadcast spawners, and the larvae are thought to be planktonic for between 20 and 30 days (Cranfield & Michael 2001). Recruitment of spat is to the same depth zone that adults occur in, although recruitment between years is highly variable.

3. STOCKS AND AREAS

For management purposes stock boundaries are based on QMAs, however, the boundaries of stocks of surf clams are likely to be the continuous lengths of exposed sandy beaches between geographical features (rivers, headlands etc). The circulation patterns that maintain the separation of the surf zone habitat to form a self contained ecosystem also retain planktonic larvae of surf clams, probably isolating surf clams genetically as well as ecologically.

4. ENVIRONMENTAL EFFECTS OF FISHING

4.1 Sea-bed disturbance

The immediate impact of hydraulic dredging is not discernable a few hours after dredging. The surf zone is a high-energy environment subjected to frequent natural disturbance and high sand mobility. This environment tends to recover faster from disturbance than those in deeper water. Widespread and intensive hydraulic dredging, however, has the potential to adversely modify the environment.

4.2 Incidental catch (fish and invertebrates)

The only significant bycatch associated with surf clams dredging is the echinoid *Fellaster zealandiae* (sand dollar or sea biscuit).

4.3 Incidental Catch (seabirds and mammals)

Not relevant to surf clam fisheries.

4.4 Community and trophic structure

The effects dredging for *M. murchisoni* on the community and trophic structure are unknown.

4.5 Spawning disruption

The effects of hydraulic dredging on spawning are unknown.

4.6 Habitats of special significance

Habitats of special significance have not been defined for this fishery.

4.7 Biodiversity

The effect of fishing for this surf clam on the maintenance and healthy functioning of the natural marine habitat and ecosystems is unknown.

4.8 Aquaculture and enhancement

Not relevant to surf clam fisheries.

5. STOCK ASSESSMENT

5.1 Estimates of fishery parameters and abundance

Von Bertalanffy growth parameters for *M. murchisoni* are available from the Kapiti coast. These were estimated with GROTAG using data from mark-recapture experiments (Cranfield & Michael 2001). The estimates and annual mean growth estimates at lengths α and β are shown in Table 2.

Table 2: Mean annual growth estimates (mm/year) at lengths α and β (95% confidence intervals in parentheses), and von Bertalanffy growth parameters from Cloudy Bay and the Kapiti coast. – not estimated.

Site	Mean growth (g_{30})	Mean growth (g_{40})	Mean growth (g_{70})	L_{∞}	K
Cloudy Bay	–	17.83 (17.4–18.2)	4.65 (4.3–4.9)	80.6 mm	0.57
Kapiti coast	35.70 (33.2–38.0)	–	2.03 (1.2–2.6)	72.4 mm	1.84

Growth estimates for this species have also been estimated from sequential length frequency distributions using MULTIFAN. Estimates from Cloudy Bay and the Kapiti coast are shown in Table 3.

Table 3: Von Bertalanffy growth parameter estimates from Cloudy Bay and the Kapiti coast estimated using MULTIFAN. (SE in parentheses)

Site	L_{∞} (mm)	K
Cloudy Bay	88.00 (0.44)	0.57 (0.01)
Kapiti coast	72.3 (0.41)	0.60 (0.02)

Estimates of natural mortality (M) ranged from 0.40–0.46 at both Cloudy Bay and the Kapiti coast (Cranfield *et al.* 1993).

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The maximum age for this species was estimated from the number of age classes indicated in MULTIFAN analyses, and from shell sections. Estimated maximum ages from these methods were respectively 8 and 11 years, at both Cloudy Bay and the Kapiti Coast.

5.2 Biomass estimates

Biomass has been estimated at Cloudy Bay with a stratified random survey using a hydraulic dredge (Table 4).

Table 4: A summary of biomass estimates in tonnes green weight with standard deviation in parentheses from exploratory surveys of Cloudy Bay, Marlborough (Cranfield *et al.*, 1994b), and Clifford Bay, Marlborough (Michael *et al.* 1994), and Foxton beach, Manawatu coast (Haddon *et al.*, 1996). (– = not estimated).

Area	Cloudy Bay	Clifford Bay	Foxton Beach
Length of beach (km)	11	21	27.5
Biomass (t)	248 (96)	192 (79)	145 (–)

5.3 Estimation of Maximum Constant Yield (MCY)

Growth and mortality data from Cloudy Bay, Marlborough and Kapiti Coast, Manawatu have been used in a yield per recruit model to estimate the reference fishing mortality $F_{0.1}$ (Cranfield *et al.* 1994b). Estimates of MCY are available from 13 locations (Figure 1), and were calculated using Method 1 for a virgin fishery (Annala *et al.* 2001) with an estimate of virgin biomass B_0 , where

$$MCY = 0.25 * F_{0.1} B_0$$

These are shown in Table 5.

Table 5: MCY estimates (t) for *M. murchisoni* from virgin biomass in 450 m transects at locations sampled around New Zealand (data from Cranfield *et al.*, 1994b).

Location	$F_{0.1}$	MCY
Matakana	0.70	0.03
Ohope	0.70	0.989
Nuhaka	0.70	0.327
Waitarere	0.70	1.046
Otaki	0.70	1.098
Peka Peka	0.70	0.714
Fence	0.43	0.096
Wairau	0.43	2.231
Leithfield	0.43	1.340
Waikuku	0.43	0.219
Kainga	0.43	1.059
Te Waewae	0.43	0.108
Oreti	0.43	0.116

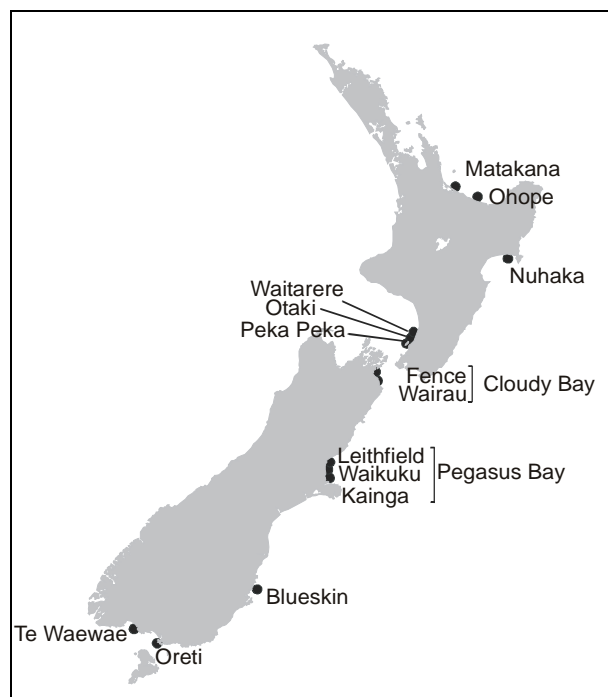


Figure 1: Location of sites surveyed.

5.4 Estimation of Current Annual Yield (CAY)

CAY has not been estimated for *M. murchisoni*.

6. STATUS OF THE STOCKS

Because of the relatively low levels of exploitation of *M. murchisoni*, it is likely that all stocks are still effectively in a virgin state. Because recruitment is variable and natural mortality caused by storm events may be high, biomass is likely to be highly variable.

7. FOR FURTHER INFORMATION

- Annala JH., Sullivan KJ., O'Brien CJ., Smith NWM. (comps.) 2001. Report from the fishery assessment plenary, May 2001: stock assessments and yield estimates. 515 p. (Unpublished report held in NIWA library, Wellington.)
- Beentjes MP., Baird SJ. 2004 Review of dredge fishing technologies and practice for application in New Zealand. New Zealand Fisheries Assessment Report 2004/37. 40p.
- Brierley P. (Convenor) 1990. Management and development of the New Zealand sub-tidal clam fishery. Report of the surf clam working group, MAF Fisheries (unpublished report held in NIWA library, Wellington). 57p.
- Cranfield HJ., Michael KP. 2001. The surf clam fishery in New Zealand: description of the fishery, its management, and the biology of surf clams. New Zealand Fisheries Assessment Report 2001/62. 24 p.
- Cranfield HJ., Michael KP., Stotter DR. 1993. Estimates of growth, mortality, and yield per recruit for New Zealand surf clams. New Zealand Fisheries Research Assessment Document 1993/20. 26p.
- Cranfield HJ., Michael KP., Stotter DR., Doonan IJ. 1994a. Distribution, biomass and yield estimates of surf clams off New Zealand beaches. New Zealand Fisheries Research Assessment Document 1994/1. 17p.
- Cranfield HJ., Doonan IJ., Michael KP. 1994b. Dredge survey of surf clams in Cloudy Bay, Marlborough. New Zealand Fisheries Technical Report 39: 18p.
- Haddon, M., Willis, T.J., Wear, R.G., Anderlini, V.C. (1996). Biomass and distribution of five species of surf clam off an exposed west coast North Island beach, New Zealand. *Journal of Shellfish Research* 15: 331–339.