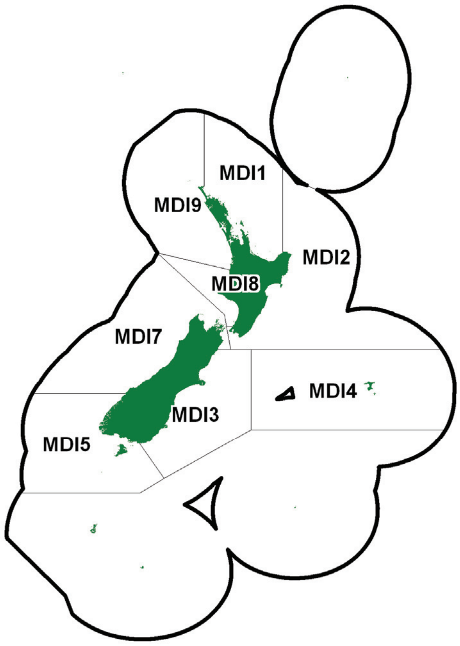
TROUGH SHELL (MDI)

(*Mactra discors*)



1. FISHERY SUMMARY

1.1 Commercial fisheries

Trough shells (*Mactra discors*) were introduced into Quota Management System on 1 April 2004 with a combined TAC and TACC of 98 t. No allowances were made for customary or recreational usage, or for other sources of mortality. The fishing year is from 1 April to 31 March and commercial catches are measured in greenweight. Most reported landings have been from MDI 7. Between 1994 and 1996 landings of a few kgs were also reported from MDI 3 and MDI 5. No further landings were reported until 2002–03, since then the only significant reported catch has been from MDI 7, with only one other landing in MDI 1. These landings have ranged from about 0.7 t to 3.8 t. Landings and TACCs for fishstocks with historical landings are shown in Table 1, and TACCs for all fishstocks are shown in Table 2. The historical landings and TACC values for the main MDI stock are depicted in Figure 1. 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 MDI 2[1].

Table 1: TACCs and reported landings (t) of Large Trough Shell for Fishstocks with landings from 1991–92 to 2008–09 from CELR and CLR data.

	MDI 1		MDI 3		MDI 5		MDI 7		Total	
Fishstock	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1992–93	0	–	0	–	0	–	0.254	–	0.254	–
1993–94	0	–	0	–	0	–	2.198	–	2.198	–
1994–95	0	–	0	–	0.033	–	2.399	–	2.432	–
1995–96	0	–	0.049	–	0	–	0.017	–	0.066	–
1996–97	0	–	0	–	0	–	0	–	0	–
1997–98	0	–	0	–	0	–	0	–	0	–
1998–99	0	–	0	–	0	–	0	–	0	–
1999–00	0	–	0	–	0	–	0	–	0	–
2000–01	0	–	0	–	0	–	0	–	0	–
2001–02	0	–	0	–	0	–	0	–	0	–
2002–03	0	–	0	–	0	–	0.691	–	0.691	–
2003–04	0	1	0	1	0	14	2.685	26	2.685	98
2004–05	0	1	0	1	0	14	3.304	26	3.376*	98
2005–06	0.041	1	0	1	0	14	3.207	26	3.525*	98
2006–07	0	1	0	1	0	14	3.889	26	3.889	98
2007–08	0	1	0.015	1	0.001	14	1.045	26	1.061	98
2008–09	0	1	0	1	0	14	0.009	26	0.009	98

*In 2004–05 and 2005–06, 71 and 277 kg respectively were reportedly landed, but the QMA is not recorded. This amount is included in the total landings for that year.

[1] From April 2010 TACC for MDI 2 is 63t.

Table 2: TACCs from all Fishstocks

Fishstock	TACC
MDI 1	1
MDI 2	1
MDI 3	1
MDI 4	1
MDI 5	14
MDI 7	26
MDI 8	27
MDI 9	27
Total	98

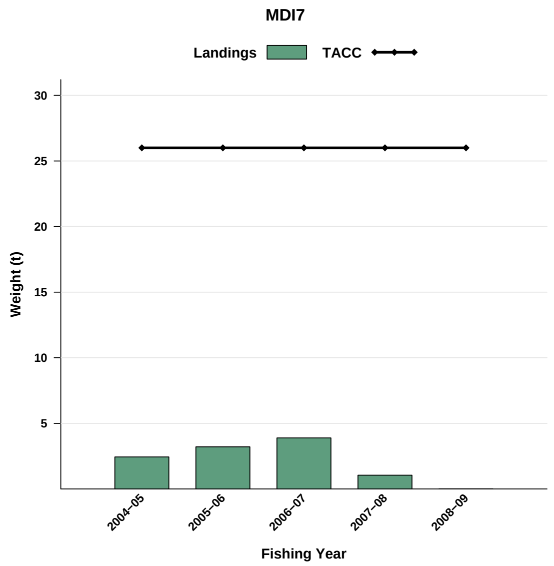


Figure 1: Historical landings and TACC for MDI7 (Challenger). Note that this figure does not show data prior to entry into the QMS.

1.2 Recreational fisheries
Offshore clams such as *M. discors* 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. discors* are likely to have been harvested for customary use only when washed ashore after storms. There are no estimates of current customary use 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. discors is most abundant in the South Island, but also occurs around the North Island and Stewart Island. It is most abundant between about 3 m and 7 m. Maximum length is variable between areas, ranging from 63 to 95 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. discors* 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. discors* 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 3.

Table 3: 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_{35})	Mean growth (g_{40})	Mean growth (g_{55})	Mean growth (g_{65})	L_∞	K
Cloudy Bay	11.01 (10.5–11.7)	–	2.69 (2.4–2.9)	–	61.5 mm	0.41
Kapiti coast	–	5.27 (3.9–6.3)	–	1.30 (0.0–2.7)	–	–

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 4.

Table 4: Von Bertalanffy growth parameter estimates from Cloudy Bay and the Kapiti coast estimated using MULTIFAN. (SE in parentheses).

Site	L_∞ (mm)	K
Cloudy Bay	68.0 (0.35)	0.41 (0.03)
Kapiti coast	60.10 (0.89)	0.35 (0.10)

Estimates of natural mortality (M) ranged from 0.32–0.38 at both Cloudy Bay and from 0.28–0.34 on the Kapiti coast (Cranfield *et al*. 1993).

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 7 and 14 years at both Cloudy Bay, and 8 and 16 years on the Kapiti Coast.

5.2 Biomass estimates

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

Table 5: 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)	55 (11)	89 (3)	195 (–)

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 8 locations (Figure 2), 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 6.

Table 6: MCY estimates (t) for *M. discors* 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	0.56	0.10
Ohope	0.56	0.198
Waitarere	0.56	1.252
Otaki	0.56	0.993
Peka Peka	0.56	0.805
Fence	0.46	0.083
Wairau	0.46	2.098
Oreti	0.46	3.487

5.4 Estimation of Current Annual Yield (CAY)

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

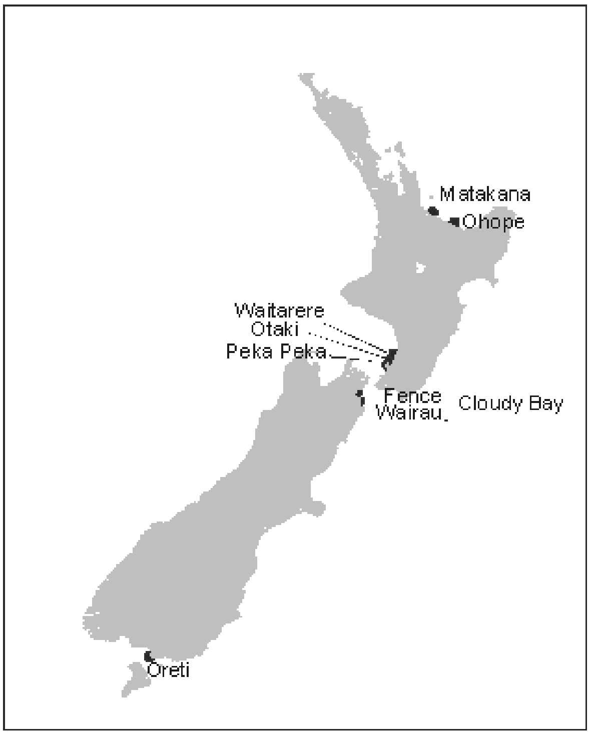


Figure 2: Location of sites surveyed.

6. STATUS OF THE STOCKS

Because of the relatively low levels of exploitation of *M. discors*, 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. 24p.

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.

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Haddon M., Willis TJ., Wear RG., Anderlini VC. 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.