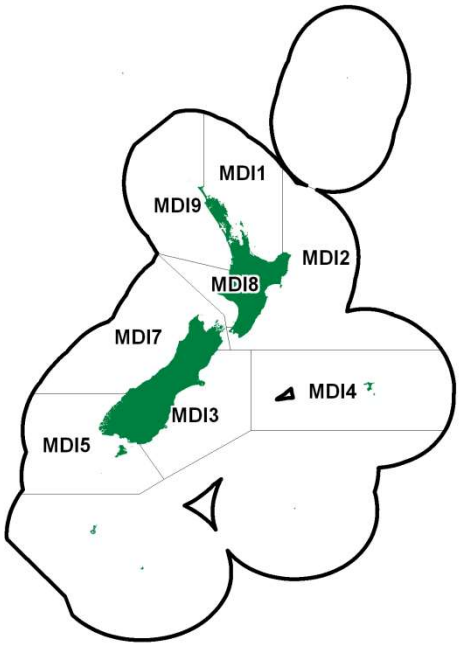
TROUGH SHELL (MDI)

(*Mactra discors*)



1. FISHERY SUMMARY

This species is part of the surf clam fishery and the reader is guided to the Introduction – surf clams chapter for information common to all relevant species.

1.1 Commercial fisheries

Trough shells (*Mactra discors*) were introduced into Quota Management System on 1 April 2004 with a total TACC of 98 t. No allowances were made for customary or recreational usage, or for other sources of mortality. New survey information for QMA 2 and 3 resulted in increases to a number of surf clam TACCs in these areas from 1 April 2010, including MDI 2. This change included an increase in TACC and a new allowance for other sources of mortality. The total TAC is currently 163 t (Table 1).

Table 1: Current TAC, TACC, and allowances for other sources of mortality for *Mactra discors*.

Fishstock	TAC (t)	TACC (t)	Other sources of mortality (t)
MDI 1	1	1	0
MDI 2	66	63	3
MDI 3	1	1	0
MDI 4	1	1	0
MDI 5	14	14	0
MDI 7	26	26	0
MDI 8	27	27	0
MDI 9	27	27	0

Most reported landings have been from MDI 7. Between 1994 and 1996, landings of a few kilograms were also reported from MDI 3 and MDI 5. No further landings were reported from any of the MDI stocks until 2002–03. Since then the only significant reported catch has been from MDI 7 during the period 2003–04 to 2007–08 when landings ranged between about 1 t and 4 t. Since 2008–09 MDI 7 landings have decreased to very low levels, with no landings recorded during several years including 2018–19. Only very low and sporadic landings of a few kilograms have been recorded from MDI 1, MDI 3, and MDI 5 since 2003–04. Landings and TACCs for Fishstocks with historical landings are shown in Table 2. The recent landings and TACC values for MDI 7 are depicted in Figure 1; landings have always remained well below the TACC.

Table 2: TACCs and reported landings (t) of trough shell for Fishstocks with landings from 1992–93 to present from CELR and CLR data. See Table 1 for TACCs of stocks that are not landed.

Fishstock	MDI 1		MDI 3		MDI 5		MDI 7		Total	
	Landing	TACC	Landing	TACC	Landing	TACC	Landing	TACC	Landing	TACC
1992–93	0	–	0	–	0	–	0.25	–	0.25	–
1993–94	0	–	0	–	0	–	2.20	–	2.20	–
1994–95	0	–	0	–	0.03	–	2.40	–	2.43	–
1995–96	0	–	0.05	–	0	–	0.02	–	0.07	–
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	–	0.69	–	0.69	–
2003–04	0	1	0	1	0	14	2.69	26	2.69	98
2004–05	0	1	0	1	0	14	3.30	26	3.38*	98
2005–06	0.041	1	0	1	0	14	3.21	26	3.53*	98
2006–07	0	1	0	1	0	14	3.89	26	3.89	98
2007–08	0	1	0.02	1	0	14	1.05	26	1.06	98
2008–09	0	1	0	1	0	14	0.01	26	0.01	98
2009–10	0	1	0.06	1	0	14	0.12	26	0.18	98
2010–11	0	1	0	1	0	14	0.01	26	0	160
2011–12	0	1	0	1	0	14	0	26	0	160
2012–13	0	1	0	1	0	14	0.13	26	0.13	160
2013–14	0	1	0.01	1	0	14	0	26	0.01	160
2014–15	0	1	0	1	0	14	0	26	0	160
2015–16	0	1	0	1	0	14	0	26	0	160
2016–17	0	1	0	1	0	14	0.01	26	0.01	160
2017–18	0	1	0	1	0	14	0.03	26	0.03	160
2018–19	0	1	0	1	0	14	0	26	0	160
2019–20	0	1	< 0 .01	1	0	14	0	26	< 0.01	160
2020–21	0	1	0	1	0	14	0	26	0	160
2021–22	0	1	0	1	0	14	0	26	0	160

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

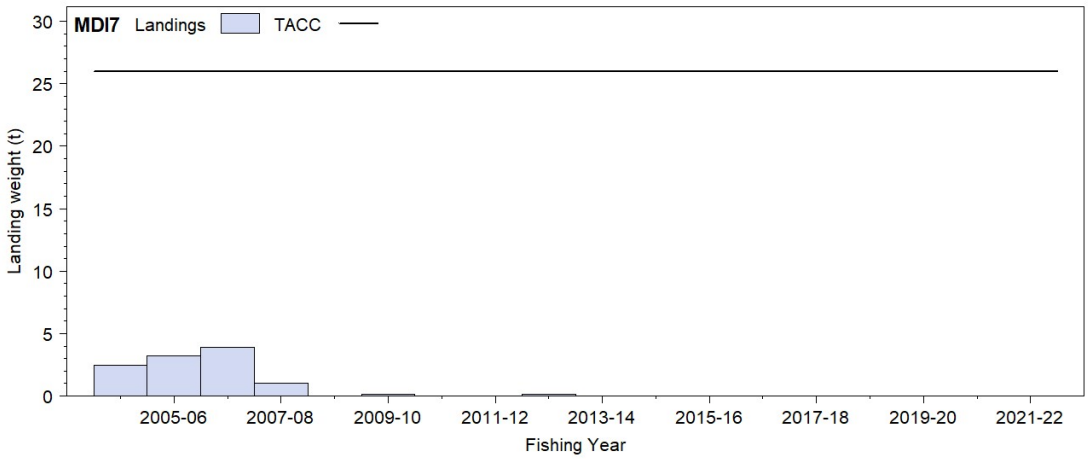


Figure 1: Reported commercial landings and TACC for MDI 7 (Challenger).

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 fisheries

Offshore clams such as *M. discors* are likely to have been harvested for customary use only when washed ashore after storms (Carkeek 1966). 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. This clam is subject to localised catastrophic mortality from erosion during storms, high temperatures and low oxygen levels in calm summer periods, toxic algae blooms, and excessive freshwater outflow (Cranfield & Michael 2001).

2. BIOLOGY

M. discors is most abundant in Southland (Te Waewae and Oreti), Otago (Blueskin Bay), Wellington, Manawatu, and Cloudy Bay. Maximum length is variable between areas, ranging from 63 mm to 95 mm (Cranfield et al 1993). The sexes are separate and the species is a broadcast spawner; 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 and recruitment between years is highly variable (Conroy et al 1993).

3. STOCKS AND AREAS

For management purposes stock boundaries are based on FMAs, 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.). Circulation patterns may isolate surf clams genetically as well as ecologically.

4. ENVIRONMENTAL AND ECOSYSTEM CONSIDERATIONS

See the Introduction – surf clams chapter.

5. STOCK ASSESSMENT

5.1 Estimates of fishery parameters and abundance

No estimates of fisheries parameters or abundance are available for this species.

5.2 Biomass estimates

Biomass has been estimated from MDI 2, 3, 7, and 8 at various times between 1994 and 2015 using stratified random surveying with a hydraulic dredge. Survey size has been expressed either as length of beach, in the earlier surveys (Table 3), or as area, in the latter surveys (Table 4), which makes comparisons over time difficult.

In 2015, White et al (2015) conducted a 2-phase stratified random sampling survey. The survey area was stratified by 4 depth strata (0–2 m, 2–4 m, 4–6 m, and 6–8 m, each with respect to Chart Datum). Each station comprised a ~50 m tow that sampled ~80 m^2 of seabed. All commercial species of subtidal surf clams caught were sorted by species. The total weight of each of these species was measured on board. Individuals from each species were collected and measured for shell length along the anterior-posterior axis (to the nearest millimetre). For tows with less than ~500 individuals, the maximum of either 20 individuals or 20% of the total was measured. For tows with higher than ~500 individuals, 10% with an upper limit of ~200 individuals per tow were measured. To subsample large catches and to avoid issues of size sorting inside the dredge, each of the bins was subsampled by tipping one bin into two bins and repeating until the requisite sub sample size was reached. The number and weight of the main bycatch species was also recorded. Both the biomass densities and biomass estimates were calculated for all the commercial species of subtidal surf clams caught.

Table 3: A summary of biomass estimates in tonnes green weight (with standard deviation in parentheses) from exploratory surveys in Cloudy Bay (Cranfield et al 1994b) and Clifford Bay in Marlborough (Michael et al 1994) and Foxton Beach on the Manawatu coast (Haddon et al 1996). –, not estimated.

Area	Cloudy Bay (MDI 7)	Clifford Bay (MDI 7)	Foxton Beach (MDI 8)
Length of beach (km)	11	21	27.5
Biomass (t)	55 (11)	89 (3)	195 (–)

Table 4: A summary of biomass estimates in tonnes green weight from the surveys in MDI 2 (Triantifillos 2008b), MDI 3 (Triantifillos 2008a), and MDI 7 (White et al 2015). Note: unless otherwise stated the CV is less than 20%.

Location	Five sites (MDI 2)	Ashley River to 6 nm south of the Waimakariri River (MDI 3)	Cloudy Bay (MDI 7)
Area surveyed (km^2)	28.0	13.4	5.7
Biomass (t)	471.2	0.0	5.9

5.3 Yield estimates and projections

Growth and mortality data from Cloudy Bay, Marlborough and the Kapiti Coast, Manawatu (Cranfield et al 1993) have been used in a yield-per-recruit model to estimate the reference fishing mortality $F_{0.1}$ (Cranfield et al 1994b, Triantifillos 2008a, 2008b). The Shellfish Working Group (SFWG) did not accept these estimates of $F_{0.1}$ because there was considerable uncertainty in both the estimates and the method used to generate them. The *MCY* estimates of Triantafillos (2008b) that use the full range of $F_{0.1}$ estimates from Cranfield et al (1993) are shown in Table 5. The SFWG recommended that *MCY* estimates are adequate to use to inform management decisions relevant to all surf clam fisheries, with the following caveats: 1) due to the uncertainty in $F_{0.1}$ values, for all species other than SAE, the *MCY* estimates should use the $F_{0.1}$ values toward the higher end of the range, and 2) there is a need to account for any substantial catch that has already come out of any surf clam fishery when estimating *MCY*; however there was no consensus on the best method.

All estimates of *MCY* were calculated using Method 1 for a virgin fishery (MPI 2015) from an estimate of virgin biomass B_0, where:

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

Table 5: *MCY* estimates (t) for *M. discors* from virgin biomass at locations within MDI 2 (Triantifillos 2008b) and MDI 7 (White et al 2015). The two $F_{0.1}$ values, which are subsequently used to calculate *MCY*, are the minimum and maximum estimates from Cranfield et al. (1993).

Location	$F_{0.1}$	*MCY*
Five sites (MDI 2)	0.46/0.64	66.1/102.7
Cloudy Bay (MDI 7)	0.46/0.64	0.7/1.0

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

The SFWG recommended moving all surf clam fisheries away from an *MCY* management strategy and towards an exploitation rate management strategy. The SFWG recognised that an exploitation rate approach is more survey intensive, but better allows for the variable nature of biomass for surf clams because it allows greater flexibility in catch (to take greater landings from available biomass) whilst keeping catches sustainable.

6. STATUS OF THE STOCKS

- **MDI 2 & 8**

Stock Status	
Year of Most Recent Assessment	2008 for MDI 2 and 1996 for MDI 8
Assessment Runs Presented	Survey biomass
Reference Points	Target: Not defined, but B_{MSY} assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0

	Overfishing threshold: -
Status in relation to Target	Unknown
Status in relation to Limits	Unknown
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status
Unknown

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Unknown
Recent Trend in Fishing Mortality or Proxy	Catches are minimal in MDI 2 and MDI 8
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	-
Probability of Current Catch or TACC causing decline below Limits	Unknown
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Absolute biomass estimates from quadrat surveys	
Assessment Dates	Latest assessment: 2008 for MDI 2 and 1996 for MDI 8	Next assessment: Unknown
Overall assessment quality rank	-	
Main data inputs (rank)	Abundance and length frequency information	
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	-	

Qualifying Comments
Stock size could fluctuate markedly as a result of catastrophic mortality from a number of causes. There is a need to review fishery parameters for this species.

Fishery Interactions
MDI can be caught together with other surf clam species and non-QMS bivalves.

- **MDI 7**

Stock Status	
Year of Most Recent Assessment	2015
Assessment Runs Presented	Survey biomass
Reference Points	Target: Not defined, but B_{MSY} assumed Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: -

Status in relation to Target	Because of the relatively low levels of exploitation of *M. discors*, it is likely that the stock is still effectively in a virgin state, therefore it is Very Likely (> 90%) to be at or above the target.
Status in relation to Limits	Very Unlikely (< 10%) to be below the soft and hard limits
Status in relation to Overfishing	Overfishing is Very Unlikely (< 10%) to be occurring

Historical Stock Status Trajectory and Current Status
Unknown

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Unknown
Recent Trend in Fishing Mortality or Proxy	Catches have been light, averaging 0.94 t from 2002–03 to 2017–18. There has not been any landing since 2018-19.
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	-

Projections and Prognosis	
Stock Projections or Prognosis	-
Probability of Current Catch or TACC causing decline below Limits	Current catches are Very Unlikely (< 10%) to cause declines below soft or hard limits in the short to medium term.
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Very Unlikely (< 10%)

Assessment Methodology and Evaluation		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Absolute biomass estimates from quadrat surveys	
Assessment Dates	Latest assessment: 2015	Next assessment: Unknown
Overall assessment quality rank	-	
Main data inputs (rank)	Abundance and length frequency information	
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	-	

Qualifying Comments
Stock size could fluctuate markedly as a result of catastrophic mortality from a number of causes. There is a need to review fishery parameters for this species.

Fishery Interactions
MDI can be caught together with other surf clam species and non-QMS bivalves.

For all other MDI stocks there is no current evidence of appreciable biomass.

7. FOR FURTHER INFORMATION

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