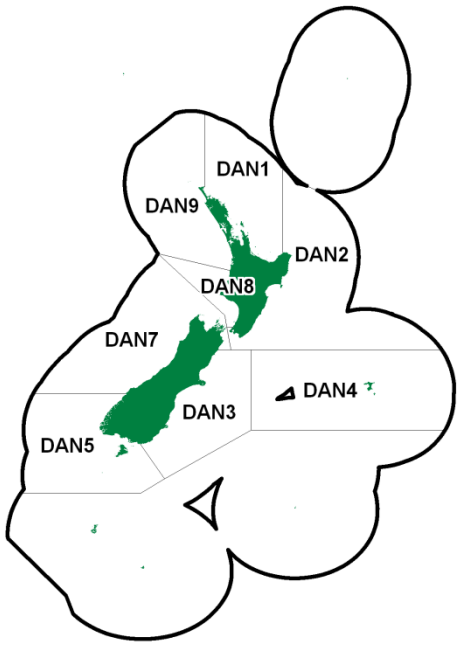
RINGED DOSINIA (DAN)

(*Dosinia anus*)



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

Ringed dosinia (*Dosinia anus*) were introduced into the Quota Management System on 1 April 2004 with a combined TAC of 112 t, with catches measured in greenweight. Biomass surveys in QMA 2 and 3 supported a TACC increase from April 2010. This increased the TACC for DAN 2 from 18 t to 61 t and DAN 3 from 4 t to 52 t. A subsequent biomass survey in DAN 8 resulted in a TACC increase in DAN 8 from 33 t to 214 t in April 2013. At the same time, allowances for customary, recreational, or other sources of mortality were introduced for DAN 8, increasing the TAC from 33 t to 236 t. Another biomass survey increased the DAN 7 TACC from 15 t to 120 t in April 2016, and allowances for customary, recreational, or other sources of mortality were introduced in 2016 increasing the TAC from 15 t to 133 t. The overall TAC is now 530 t (Table 1). There are no allowances for customary, recreational, or other sources of mortality for the other stocks.

Table 1: Total Allowable Catches (TAC, t) allowances for customary fishing, recreational fishing, and other sources of mortality (t) and Total Allowable Commercial Catches (TACC, t) for *Dosinia anus*.

Fishstock	Description	TAC (t)	Customary Allowance (t)	Recreational Allowance (t)	Other sources of mortality (t)	TACC (t)
DAN 1	Auckland	7	0	0	0	7
DAN 2	Central (East)	64	0	0	3	61
DAN 3	South East (Coast)	55	0	0	3	52
DAN 4	South East (Chatham Rise)	1	0	0	0	1
DAN 5	Southland	1	0	0	0	1
DAN 7	Challenger	133	5	1	7	120
DAN 8	Central (West)	236	10	0	12	214
DAN 9	Auckland (West)	33	0	0	0	33
Total		530	15	1	25	489

Prior to 2006–07 landings had only been reported in DAN 7 and ranged from about 10 kg to 2000 kg. Small amounts of landings (less than 1 t) were reported in DAN 3 before 2008–09 but increased to 7 t in 2014–15 and 2015–16. Since then DAN 3 landings have declined again, with only 50 kg recorded in 2019–20. From 2002–03 until 2014–15, landings in DAN 7 fluctuated between 100 kg and 5000 kg. Since

2015–16 landings increased sharply to 25 t in 2018–19 and 2019–20 and reduced after that to 10 tonnes on average (Table 2). Landings have remained well below the allocated TACCs in all years.

Table 2: TACCs and reported landings (t) of ringed dosinia by Fishstock from 1991–92 to the present day from CELR and CLR data. Fishstocks where no catch has been reported are not tabulated, but Total Landings and TACC correspond to all DAN stocks. See Table 1 for TACCs of stocks that are not landed. The fishing year is from 1 April to 31 March. Reported landings for the 2022–23 fishing year are considered preliminary.

	DAN 3		DAN 7		DAN 8		Total	
Year	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1991–92	0	–	0	–	–	–	0	
1992–93	0	–	0.16	–	–	–	0.16	–
1993–94	0	–	0.29	–	–	–	0.29	–
1994–95	0	–	0.07	–	–	–	0.07	–
1995–96	0	–	0.01	–	–	–	0.01	–
1996–97	0	–	0	–	–	–	0	–
1997–98	0	–	0	–	–	–	0	–
1998–99	0	–	0	–	–	–	0	–
1999–00	0	–	0	–	–	–	0	–
2000–01	0	–	0	–	–	–	0	–
2001–02	0	–	0	–	–	–	0	–
2002–03	0	–	0.11	–	–	–	0.11	–
2003–04	0	4	0.90	15	0	33	0.90	–
2004–05	0	4	1.98	15	0	33	2.02*	112
2005–06	0	4	1.10	15	0	33	1.02*	112
2006–07	0.09	4	2.46	15	0	33	2.55	112
2007–08	0.77	4	0.82	15	0	33	1.59	112
2008–09	1.40	4	0.16	15	0	33	1.56	112
2009–10	0.84	4	0.21	15	0	33	1.05	112
2010–11	0.77	52	2.20	15	0	33	3.02	203
2011–12	0	52	5.30	15	0	33	5.30	203
2012–13	0.55	52	3.53	15	0	33	4.08	203
2013–14	5.48	52	0.73	15	0	214	6.21	384
2014–15	7.12	52	0.31	15	0	214	7.43	384
2015–16	7.01	52	9.51	120	0.23	214	16.74	489
2016–17	2.11	52	8.80	120	0.88	214	11.79	489
2017–18	1.77	52	17.00	120	0.11	214	18.88	489
2018–19	0.06	52	25.55	120	0.64	214	26.25	489
2019–20	0.05	52	25.29	120	0.12	214	25.46	489
2020–21	1.13	52	11.35	120	0	214	12.48	489
2021–22	0	52	10.83	120	1.28	214	12.11	489
2022–23	0.09	52	8.59	120	0.95	214	9.63	489

*In 2004–05 and 2005–06, 32.4 and 90 kg were reported but the QMA was not recorded. This amount is included in the total landings for these years.

1.2 Recreational fisheries

There are no known records of recreational use of this surf clam.

1.3 Customary fisheries

Offshore clams such as *D. anus* 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 (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, although this clam is probably sometimes taken as a bycatch in inshore trawling. Harvesters claim that the hydraulic clam rake does not damage surf clams and minimises damage to the few species of other macrofauna captured. Surf clam populations also are 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

Dosinia anus is found around the New Zealand coast in sediments at depths between 5 m and 8 m around the North Island, and between 6 m and 10 m around the South Island. It is larger and rougher than *D. subrosea* and is usually found on more exposed beaches shallower in the substrate. Maximum length is variable between areas, ranging from 58 mm to 82 mm (Cranfield et al 1993). The sexes are likely to be separate, and they are likely to be broadcast spawners with planktonic larvae. Anecdotal evidence suggests that spawning is likely to occur in the summer months and spat probably recruit to the deeper water of the outer region of the surf zone. Recruitment of surf clams is thought to be highly variable between years.

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 (such as rivers and headlands). 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 at Cloudy Bay and Clifford Bay in DAN 7 and Foxton Beach in DAN 8 with a stratified random survey using a hydraulic dredge (Table 3). Survey size has been recorded as either length of beach or area, which makes comparison difficult.

In both 2012 (FMA 8) and 2015 (Cloudy Bay, FMA 7), White et al (2012, 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, sampling ~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 for *D. anus* in tonnes green weight (with standard deviation in parentheses) from exploratory surveys of Cloudy Bay (Cranfield et al 1994b[1], White et al 2015[2]), and Clifford Bay, both in Marlborough (Michael et al 1994) as well as on the Manawatu coastline (White et al 2012).

Area	Cloudy Bay[1] (DAN 7)	Cloudy Bay[2] (DAN 7)	Clifford Bay (DAN 7)	Foxton Beach (DAN 8)
Length of beach (km)	11		21	46
Area (km^2)		5.7		
Biomass (t)	72 (30)	1 270 (156)	5 (3)	3 498 (329)

5.3 Yield estimates and projections

Growth and mortality data from Cloudy Bay in Marlborough and the Kapiti Coast in 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 Triantifillos (2008a, 2008b) and White et al (2012, 2015) that use the full range of $F_{0.1}$ estimates from Cranfield et al (1993) are shown in Table 4. 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.

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

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

CAY has not been estimated for *D. anus*.

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.

Table 4: Mean *MCY* estimates (t) for *D. anus* from virgin biomass from DAN 2 (Triantifillos 2008b), DAN 3 (Triantifillos 2008a), DAN 7 (White et al 2015), and DAN 8 (White et al 2012). The two $F_{0.1}$ values, which are subsequently used to estimate *MCY*, are the minimum and maximum estimates from Cranfield et al. (1993).

Location	$F_{0.1}$	*MCY*
Five sites (DAN 2)	0.25/0.42	52.8/88.7
Ashley River to 6 nm south of the Waimakariri River (DAN 3)	0.27/0.54	63.8/127.7
Cloudy Bay (DAN 7)	0.25/0.42	79.4/133.4
Foxton Beach (DAN 8)	0.27/0.54	236.1/472.2

6. STATUS OF THE STOCKS

- **DAN 2 & 3 – Central and South East (Coast)**

The most recent survey conducted for both DAN 2 and DAN 3 was in 2008. There is no longer adequate information to inform current stock status which is therefore Unknown.

- **DAN 7 - Challenger**

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	Despite an increase in the landings since 2015-16, the exploitation levels of *D. anus* remain relatively low. It is likely that the stock is still effectively in a virgin state, therefore they are 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 Intensity or Proxy	Fishing has been light with landings averaging 1.5 t from 2002–03 to 2014–15 but increasing since, reaching 25.55 in 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		
Assessment Type	Level 2 - Partial Quantitative Stock Assessment	
Assessment Method	Absolute biomass estimates from quadrat surveys	
Main data inputs	Abundance and length frequency information	
Period of Assessment	Latest assessment: 2015	Next assessment: Unknown
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
DAN can be caught together with other surf clam species and non-QMS bivalves.

- **DAN 8 – Central (West)**

The most recent survey conducted for DAN 8 was in 2012. There is no longer adequate information to inform current stock status which is therefore Unknown.

For all other DAN Fishstocks there is insufficient information to estimate current stock status.

7. FOR FURTHER INFORMATION

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). 57 p.

Carkeek, W (1966) *The Kapiti Coast*. Reed, Wellington. 187 p.

Cranfield, H J; Doonan, I J; Michael, K P (1994b) Dredge survey of surf clams in Cloudy Bay, Marlborough. *New Zealand Fisheries Technical Report No. 39*. 18 p.

Cranfield, H J; Michael, K P (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, H J; Michael, K P; Stotter, D R (1993) Estimates of growth, mortality, and yield per recruit for New Zealand surf clams. New Zealand Fisheries Assessment Research Document 1993/20. 26 p. (Unpublished document held in NIWA library, Wellington).

Cranfield, H J; Michael, K P; Stotter, D R; Doonan, I J (1994a) Distribution, biomass and yield estimates of surf clams off New Zealand beaches. New Zealand Fisheries Assessment Research Document 1994/1. 17 p. (Unpublished document held in NIWA library, Wellington.).

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.

Michael, K; Cranfield, H; Doonan, I J; Hadfield, J D (1994) Dredge survey of surf clams in Clifford Bay, Marlborough. New Zealand Fisheries Data Report 54. 15 p. (Unpublished document held in NIWA library, Wellington).

Ministry for Primary Industries (2015). Fisheries Assessment Plenary, May 2015: stock assessments and stock status. Compiled by the Fisheries Science Group, Ministry for Primary Industries, Wellington, New Zealand. 1475 p.

Triantifillos, L (2008a) Survey of subtidal surf clams in Pegasus Bay, November–December 2007. Prepared by NIWA for Seafood Innovations Limited and SurfCo. Limited. 43 p. (Unpublished Report available from Fisheries New Zealand).

Triantifillos, L (2008b) Survey of subtidal surf clams in Quota Management Area 2, June – August 2008. Prepared by NIWA for Seafood Innovations Limited and SurfCo. Limited. 40 p. (Unpublished Report available from Fisheries New Zealand).

White, W; Millar, R; Breen, B; Farrington, G (2012) Survey of subtidal surf clams from the Manawatu Coast (FMA 8), October–November 2012. (Unpublished Report held by Fisheries New Zealand Wellington.) 35 p.+ Addendum.

White, W; Millar, R; Farrington, G; Breen, D; Selveraj, S (2015). Stock assessment of surf clams from Cloudy Bay, NZ. *Institute for Applied Ecology New Zealand Report 15/01*. Published by Applied Ecology New Zealand, an Institute of Auckland University of Technology. 34 p.