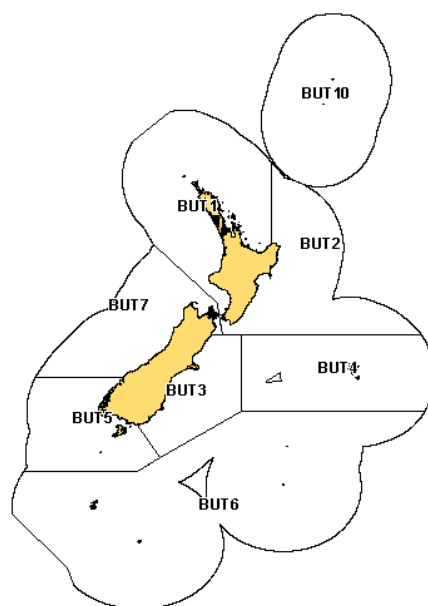


BUTTERFISH (BUT)

(*Odax pullus*)
Marari

**1. FISHERY SUMMARY**

Butterfish was introduced into the QMS from 1 October 2002 with allowances, TACCs and TACs as follows (Table 1).

Table 1: Summary of recreational and customary non-commercial allowances, TACs, and TACCs.

Fishstock	Recreational Allowance	Customary non-commercial Allowance	TACC	Other Mortality	TAC
BUT 1	10	10	3	1	24
BUT 2	80	80	63	2	225
BUT 3	65	65	3	1	134
BUT 4	4	4	10	0	18
BUT 5	10	10	45	1	66
BUT 6	0	0	0	0	0
BUT 7	15	15	38	1	69
BUT 10	0	0	0	0	0
TOTAL	184	184	162	6	537

1.1 Commercial fisheries

Butterfish is targeted by setnets in shallow coastal waters, principally around kelp-beds. The main fishery is centred on Cook Strait, between Tasman Bay, Castlepoint, and Kaikoura. There is also a smaller fishery around Stewart Island. A minimum setnet mesh size of 108 mm and a minimum fish size of 35 cm applies to commercial and recreational fishers; additional regional netting restrictions may also apply. Butterfish has a competitive quota of 30 t in FMA 5 (Southland).

Total reported landings from 1982–83 to 2000–01 ranged between 105 and 193 t. Butterfish was introduced into the QMS in 2002. Reported landings and TACCs are given in Table 2.

BUTTERFISH (BUT)

Table 2: Reported domestic landings (t) of butterfish by Fishstock and TACCs from 2001–02 to 2006–07.

Fishstock FMA	BUT 1 1,8&9		BUT 2 2		BUT 3 3		BUT 4 4		BUT 5 5	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
2001–02	<1	3	64	63	<1	3	13	10	19	45
2002–03	2	3	56	63	3	3	4	10	35	45
2003–04	1	3	51	63	2	3	3	10	43	45
2004–05	1	3	62	63	2	3	5	10	35	45
2005–06	3	3	44	63	2	3	<1	10	22	45
2006–07	3	3	51	63	2	3	<1	10	30	45
Fishstock FMA (s)	BUT 6 6		BUT 7 7		BUT 10 10		Total			
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACCs		
2001-02	0	0	25	38	0	0	121	162		
2002-03	0	0	28	38	0	0	128	162		
2003-04	0	0	25	38	0	0	125	162		
2004-05	0	0	24	38	0	0	129	162		
2005-06	0	0	24	38	0	0	95	162		
2006-07	0	0	27	38	0	0	112	162		

1.2 Recreational fisheries

Butterfish is a popular recreational catch, and is taken mainly by setnet and spear. Recreational daily bag limits were set at 30 fish in 1986, but subsequently reduced to 20 for Northern and Central and Challenger (1995), and 15 for South (1993). Survey estimates indicate that the recreational catches appear to be of similar magnitude to those of the commercial fisheries in QMAs 1, 2, 5 & 7, and substantially higher in QMA 3 (Tables 3 & 4).

Table 3: Estimated recreational harvest of butterfish by QMA and survey.

QMA	Survey	Number caught	Survey harvest (t)	Fishstock harvest (t) 1991–92
QMA 7	South	6 000	10	
QMA 7	South	4 000	5	15
QMA 3	South	36 000	65	65
QMA 5	South	8 000	10	10
				1993–93
QMA 2	Central	61 000	80	80
				1993–94
QMA 1 + 9	North	9 000	10	10
TOTAL		124 000		180

*Surveys were in different years: South 1991–92; Central 1992–93; and North 1993–94 (Teirney *et al.* 1997). Many of these estimates have high CVs, and the estimate of total harvest is a guide only because of the different survey years. Line-caught 'butterfish' in QMA 3 and QMA 5 are excluded because of apparent species misidentification; these survey totals should be slightly higher.

Table 4: Estimated number and weight of butterfish harvested by recreational fishers by Fishstock and survey. Surveys were carried out nationally in 1999/2000 (Boyd & Reilly 2005).

Fishstock	Survey	Number	CV%	Survey harvest (t)
BUT 1	National	1000	71	<1-3
BUT 2	National	23 000	39	16-36
BUT 3	National	45 000	47	27-76
BUT 5	National	17 000	42	11-27
BUT 7	National	18 000	41	12-29
BUT 8	National	1 000	100	0-2

A key component of estimating recreational harvest from diary surveys is determining the proportion of the population that fish. The Recreational Working Group has concluded that the methodological framework used for telephone interviews produced biased results for the 1996 and previous surveys. Consequently the harvest estimates derived from these surveys are considered to be considerably underestimated. However, relative comparisons can be made between stocks within these surveys. The Recreational Working Group considered that the 2000 survey using face-to-face interviews better estimated eligibility and that the derived recreational harvest estimates are believed to be more accurate. FMA 2 catches were nevertheless considered to be an over-estimate, probably because of an

unrepresentative diarist sample. The 1999/2000 harvest estimates for each Fishstock should be evaluated with reference to the coefficient of variation.

1.3 Customary non-commercial fisheries

There is no quantitative information on the current level of customary non-commercial catch.

1.4 Illegal catch

Because this is a localised small-scale fishery some sales from fishers directly to retailers may have gone unreported, but no quantitative estimate of this can be made.

1.5 Other sources of mortality

There is no quantitative information on other sources of mortality. In the past butterfish has been used as rock lobster bait and not reported.

2. BIOLOGY

Butterfish are endemic to New Zealand, and occur from North Cape to the Snares Islands. The species is also reported from the Chatham, Bounty and Antipodes Islands. Butterfish are more common from Cook Strait southwards. They inhabit rocky coastlines, and are commonly found among seaweed beds in moderately turbulent water. Their main depth range is 0–20 m. They occur shallower (to 10 m) in the north than in Cook Strait (to 20 m) and in southern waters they can be found as deep as 40 m.

Adult butterfish average 45–55 cm in length. Their maximum size is approximately 70 cm. Length/weight data are not available for whole fish, but as an interim measure a length/gutted weight relationship is given in Table 5.

Unvalidated ageing estimates suggests that butterfish grow moderately fast, and the maximum recorded age is 11 years, though longevity is likely to be older, possibly 15 years. The most likely range of natural mortality (M) is 0.30 to 0.45.

Some butterfish undergo sex change at about 40 cm; an estimated 50% of mature females develop into males. The depth distribution of butterfish differs by size and sex. Juveniles (< 30 cm) occur in the shallow weed beds, and (outside the breeding season) males occur in deeper waters than females. Consequently, sex ratios vary with locality, but females often outnumber males. The spawning season extends from July to March in Cook Strait, peaking in September and October. The spawning season in southern New Zealand appears to be shorter, likely August to January, peaking in October–January.

Butterfish are almost exclusively herbivorous, feeding on several of the larger seaweeds. The diet of butterfish varies regionally and is largely determined by the species composition of the local seaweed beds. Gut fullness is lowest in winter. Feeding activity is greatest early in the day, and the tidal state controls the accessibility of intertidal seaweeds.

Table 5: Estimates of biological parameters for butterfish.

Fishstock	Estimate						Source
1. Natural mortality (M)	0.30–0.45						Paul <i>et al.</i> (2000)
Cook Strait							
2. Weight = $a(\text{length})^b$ (Weight in g, length in cm fork length).							Ritchie (1969)
	Females		Males		Juvenile		
	a	b	a	b	a	b	
Cook Strait	67.699	1947.8	67.034	1885.9	21.205	362.28	
Linear regression, $b = \text{constant}$. Weight is gutted weight.							
3. von Bertalanffy growth parameters							Paul <i>et al.</i> (2000)
	Both sexes						
	K	t_0	L_∞				
Cook Strait	0.23	-1.7	51.8				

BUTTERFISH (BUT)

3. STOCKS AND AREAS

There is no clear information on whether biologically distinct stocks occur, although there is some evidence of regional variation in meristic characters which suggests some separation of populations. The time larval butterfish spend in the plankton before settling out into the adult habitats as postlarvae is relatively short, a factor that may cause a high level of stock separation around coastal New Zealand. The only information on movement relates to feeding behaviour involving small-scale movements within seaweed beds. There is no information on movement along the coastline within a weed-bed habitat, or potentially longer migration between such habitats separated by open coast. However, the latter seems unlikely on any substantial scale, as a result butterfish populations are probably quite localised. Butterfish populations at offshore islands (Chatham, Antipodes, Bounties, and Snares), have not been studied but may be distinct from the mainland population(s) simply because of their isolation.

4. STOCK ASSESSMENT

The first stock assessment for butterfish was undertaken in 1997. This report incorporates some subsequent age and growth information, which led to revised and new estimates of biological parameters.

4.1 Estimates of fishery parameters and abundance

No information is available.

4.2 Biomass estimates

No information is available.

4.3 Estimation of Maximum Constant Yield (MCY)

The method $MCY = cY_{AV}$ (Method 4) was evaluated. However, this method was rejected due to a lack of reliable information on changes in fishing effort and/or mortality over the history of the fishery. MCY for butterfish cannot be determined.

4.4 Estimation of Current Annual Yield (CAY)

Cannot be determined.

4.5 Other yield estimates and stock assessment results

A study of setnet mesh selectivity in relation to the current legal minimum fish size showed that 108 mm mesh retained few undersized fish (immature). This provides a level of protection to butterfish stocks and their recruitment. A yield per recruit analysis showed that a modest yield increase could be obtained by using a smaller mesh and taking younger (2–3 year old) fish. However, this theoretical gain would be counter-balanced by the capture of relatively more juveniles and young females, and almost certainly a higher bycatch of other reef fishes.

5. STATUS OF THE STOCKS

No estimates of current and reference biomass are available. It is not known whether recent catch levels will allow the stock to move towards B_{MSY} . Butterfish populations are susceptible to localised depletion.

Reported landings and TACCs are summarised in Table 6.

Table 6: Summary of reported landings (t) and TACCs by FMA for the most recent fishing year.

Fishstock		FMA	2006–07	2006–07
			Actual TACC	Reported landings
BUT 1	Auckland (East)(West), Central (West)	1,8&9	3	3
BUT 2	Central (East)	2	63	51
BUT 3	South-east coast	3	3	2
BUT 4	Chatham	4	10	<1
BUT 5	Southland	5	45	30
BUT 6	Sub-Antarctic	6	0	0
BUT 7	Challenger	7	38	27
BUT 10	Kermadec	10	0	0
TOTAL			162	112

6. FOR FURTHER INFORMATION

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