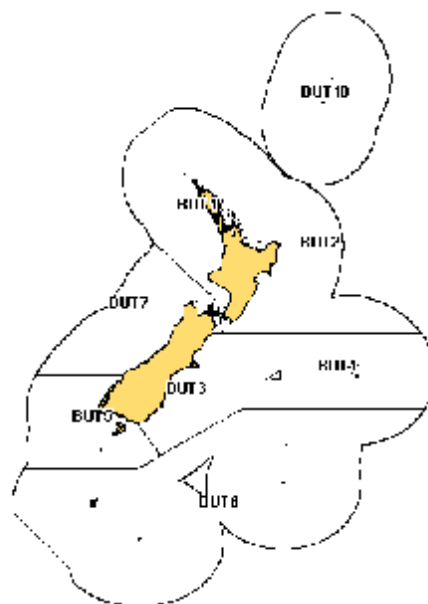


BUTTERFISH (BUT)*(Odax pullus)***1. FISHERY SUMMARY**

Butterfish was introduced into the QMS from 1 October 2002 with allowances, TACCs and TACs as follows:

<u>Fishstock</u>	<u>Recreational Allowance</u>	<u>Māori Customary Allowance</u>	<u>TACC</u>	<u>TAC</u>
BUT 1	10	10	3	24
BUT 2	80	80	63	225
BUT 3	65	65	3	134
BUT 4	4	4	10	18
BUT 5	10	10	45	66
BUT 6	0	0	0	0
BUT 7	15	15	38	69
BUT 10	0	0	0	0

(a) 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 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 landing and TACCs are given in table 1.

Table 1: Reported domestic landings (t) of butterfish by Fishstock and TACC from 2001-02 to 2004-05.

Fishstock FMA	BUT 1 1,8&9		BUT 2 2		BUT 3 3		BUT 4 4		BUT 5 5	
	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC
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

Table 1: (Continued)

Fishstock FMA (s)	BUT 6		BUT 7		BUT 10		Total	
	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC
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

(b) Recreational fisheries

Butterfish is popular with recreational fishers, and taken mainly by setnet and spear. Recreational daily bag limits were set at 30 fish in 1986, but subsequently reduced to 20 for Northern, 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 2&3).

Table 2: Estimated harvest tonnage of butterfish caught by recreational fishers by QMA and survey. 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 *c.v.s*, 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.

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

Table 3: Estimated number and weight of butterfish harvested by recreational fishers by Fishstock and survey. Surveys were carried out Nationally in 1999-00 (Boyd and Reilly 2005).

Fishstock	Survey	Number	<i>c. v. %</i>	Survey harvest (t)
1999-00				
BUT 1	National	1 000	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 the 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 incorrect eligibility figures for the 1996 and previous surveys. Consequently the harvest estimates derived from these surveys are considered to be considerably underestimated and not reliable. 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. FMA2 catches are nevertheless considered to be 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.

(c) Maori customary fisheries

There is no quantitative information on the current level of Maori customary take.

(d) 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.

(e) 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, 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 4.

Unvalidated ageing research 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 reversal at about 40 cm; an estimated 50% of mature females transforming into males. The depth distribution of butterfish differs by size and sex. Juveniles (to 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-October. The spawning season in southern New Zealand appears to be shorter, likely August to January, peaking in October-January. Postlarvae quickly settle out from the plankton.

Butterfish are almost exclusively herbivorous, feeding on several of the larger seaweeds. The diet of butterfish varies regionally, 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 4: Estimates of biological parameters for butterfish.

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

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, and 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 made in 1997. This report incorporates some subsequent age and growth information, which led to revised and new estimates of biological parameters.

(a) **Estimates of fishery parameters and abundance**

No information is available.

(b) **Biomass estimates**

No information is available.

(c) **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.

(d) **Estimation of Current Annual Yield (CAY)**

Cannot be determined.

(e) **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 released virtually all sublegal fish (immatures). 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. Landings from this fishery have been reasonably stable for the last 15 years and appear to be sustainable, but measures of effort are not available. It is not known whether recent catch levels will allow the stock to move towards a size that will support the maximum sustainable yield. Butterfish populations are almost certainly susceptible to localised depletion.

Summary of TACCs (t) and reported landings (t) of butterfish for the most recent fishing year.

Fishstock	FMA	2004-05	2004-05
		Actual TACC	Reported landings
BUT 1	Auckland (East)(West), Central (West)	1,8&9 3	1
BUT 2	Central (East)	63	62
BUT 3	South-east coast	3	2
BUT 4	Chatham	10	5
BUT 5	Southland	45	35
BUT 6	Sub-antarctic	0	0
BUT 7	Challenger	38	24
BUT 10	Kermadec	0	0
Total		162	129

6. FOR FURTHER INFORMATION

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