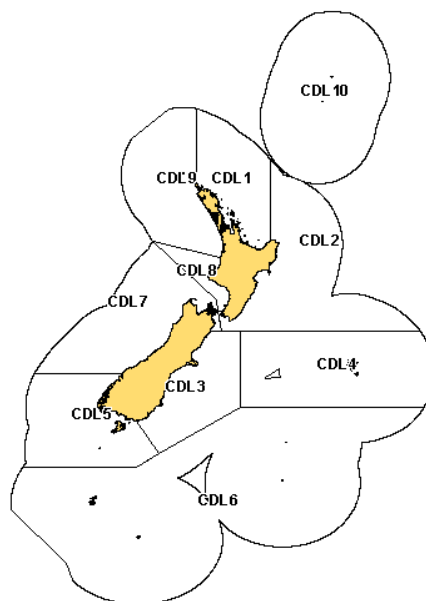


## BLACK CARDINALFISH (CDL)

(*Epigonus telescopus*)



### 1. FISHERY SUMMARY

#### (a) Commercial fisheries

Several species of *Epigonus* are widely distributed in New Zealand waters, but only black cardinalfish (*E. telescopus*) reaches a marketable size and is found in commercial concentrations. It occurs throughout the New Zealand EEZ at depths of 300–1100 m, mostly in very mobile schools up to 150 m off the bottom over hills and rough ground. Black cardinalfish have been caught since 1981 by research and commercial vessels, initially as a bycatch of target trawling for other high value species. The preferred depth range of schools (600–900 m) overlaps the upper end of the depth range of orange roughy and the lower end of alfonsino and bluenose. The exploitation of these species from 1986 resulted in the development of the major cardinalfish fishery in QMA 2.

It is sold on the domestic rather than the export market due to the short freezer life of fillets. The species has a section of dark flesh under the lateral line that has caused problems with overseas marketing. The fillets can be tainted if this flesh is not removed quickly.

Estimated landings available from various sources (since 1982–83) are summarised by fishing year in Table 1. For the 1982–83 to 1985–86 fishing years, the best estimate of landings was the sum of the FSU Inshore and FSU Deepwater, (i.e. FSU Total) catch returns. For 1986–87 to 1988–89 the best estimate was taken as the greater value of either the FSU Total or the LFRR. From the 1989–90 fishing year, the best estimate was taken as the higher of either the LFRR or the sum of the CLR and CELR Landed data. In theory, the CELR estimated and landed values produced by the smaller (generally inshore) vessels should be approximately equal. Larger (deep water) vessels provide TCEPR estimated and processed totals and a CLR total which should also be comparable. However, there are numerous reasons for differences between these columns of data (see Field et al., 1997). Landings for 1998–99 to 2003–04 are from QMR totals following introduction of the species into the QMS for 1998–99. The best estimate of total landings derived above was split between the nine QMAs and ET (outside the EEZ) based on FSU and QMS data (Table 2). For FSU data (1982–83 to 1987–88 fishing years), catch where area was unknown was pro-rated to QMAs according to the catch level where area was reported. For QMS data (1988–89 to 1994–95 fishing years), catch by area in CELR Landed and CLR reports were scaled to equal the best estimate of the total catch presented in Table 1. Commercial landings of black cardinalfish have been made in QMAs 1–9 and outside the EEZ (ET).

In most years since 1982 more than 65% of black cardinalfish landings were from the east coast of the North Island (QMA 2). The large increase in landings from this area in 1986–87 was associated with the development of the orange roughy fishery around the Ritchie Banks and Tuaheni High, and an increase in targeted fishing to establish a catch history when it was anticipated to become a quota species. Landings from the Bay of Plenty (QMA 1) have fluctuated since 1988. The relatively large landings in 1990–91 were a combination of bycatch of the orange roughy fishery and target fishing for black cardinalfish. Since 1992 large catches have been taken from outside the EEZ on the northern Challenger Plateau and the Lord Howe Rise.

Black cardinalfish was introduced into the QMS on 1 October 1998 and quotas were set for QMAs 2–8. Quotas for QMAs 1 and 9 were subsequently set for 1999–00. TACCs were increased from 1 October 2006 in CDL 4 to 66 t and in CDL 5 to 22 t. In these stocks landings were above the TACC for a number of years and the TACCs have been increased to the average of the previous 7 years plus an additional 10%.

**Table 1: Reported landings (t) of black cardinalfish by fishing year, from various sources. –, no data.**

Year	FSU		FSU Total	CELR		TCEPR		CLR	LFRR	Best Estimate
	Inshore	Deepwater		Estimated	Landed	Estimated	Processed			
1982–83	<1	77	78	–	–	–	–	–	–	78
1983–84	30	190	220	–	–	–	–	–	–	220
1984–85	54	478	532	–	–	–	–	–	–	532
1985–86	209	83	292	–	–	–	–	–	–	292
1986–87	972	131	1 103	–	–	–	–	–	1814	1814
1987–88	572	1066	1 638	–	–	–	–	–	1427	1638
1988–89	351	577	928	35	25	133	133	244	1800	1800
1989–90	–	–	–	2499	1633	329	3	714	2385	2385
1990–91	–	–	–	2186	1353	152	57	2958	4284	4311
1991–92	–	–	–	187	199	987	120	1639	1653	1838
1992–93	–	–	–	211	113	1 536	175	2051	2366	2366
1993–94	–	–	–	348	210	2 692	154	3591	3793	3801
1994–95	–	–	–	231	153	2 621	78	3218	3710	3710

**Table 2: Reported landings (t) of black cardinalfish by QMA and fishing year (1 October to 30 September) from 1982–83 to 2004–05. The data in this table has been updated from that published in previous Plenary Reports by using the data through 1996–97 in table 32 on p. 262 of the “Review of Sustainability Measures and Other Management Controls for the 1998–99 Fishing Year – Final Advice Paper” dated 6 August 1998. Data for 1997–98 based on catch and effort returns, since 1998–99 on QMR records. –, no data.**

Year	QMA									Total (EEZ)	ET	Total
	1	2	3	4	5	6	7	8	9			
1982–83	–	76	<1	<1	–	–	<1	–	–	78	–	78
1983–84	–	212	7	<1	–	–	<1	–	–	220	–	220
1984–85	<1	189	341	<1	–	–	1	–	–	532	–	532
1985–86	<1	238	50	3	2	–	<1	–	45	292	–	292
1986–87	1	1738	72	2	<1	<1	<1	–	–	1814	–	1814
1987–88	3	1556	28	1	3	–	2	<1	<1	1638	–	1638
1988–89	305	1434	57	4	–	–	2	–	–	1798	2	1800
1989–90	613	1718	20	18	–	–	15	–	–	2385	<1	2385
1990–91	233	3473	598	1	4	–	1	<1	–	4311	–	4311
1991–92	7	1652	146	3	<1	2	11	–	–	1821	17	1838
1992–93	23	1550	519	2	<1	–	2	–	–	2096	270	2366
1993–94	364	2310	277	10	5	–	6	–	–	2972	829	3801
1994–95	1162	2207	51	7	1	<1	51	–	<1	3479	231	3710
1995–96	1418	2621	57	4	10	–	26	–	–	4150	340	4490
1996–97	2001	1910	100	7	–	–	27	–	–	4045	522	4567
1997–98	995	1176	40	351	–	–	76	–	108	2338	405	2743
1998–99	24	1268	181	41	–	<1	16	<1	<1	1531	390	1921
1999–00	980	2158	215	36	<1	<1	27	0	<1	3415	962	4377
2000–01	294	1135	99	35	74	<1	2	0	3	1642	571	2213
2001–02	455	1693	146	29	18	<1	3	0	5	2349	490	2839
2002–03	583	1845	172	80	9	<1	27	0	5	2721	275	2996
2003–04	481	966	96	148	27	<1	2	0	6	1727	58	1785
2004–05	267	1102	43	49	15	<1	2	0	1	1479	204	1683
2005–06	643	2153	50	53	<1	<1	<1	0	2	2901	44	2945
TACC	1200	2 223	196	5	2	1	39	0	4	3670	–	3670

**(b) Recreational fisheries**

There is no known current recreational fishery for black cardinalfish.

**(c) Maori customary fisheries**

Quantitative information on the current level of Maori customary take is not available.

**(d) Illegal catch**

Quantitative information on the level of illegal catch is not available.

**(e) Other sources of mortality**

A known source of mortality for black cardinalfish has been the discarding at sea of this species while target fishing for higher value species.

**2. BIOLOGY**

The average size of black cardinalfish landed by the commercial fishery is about 50–60 cm fork length (FL). Length frequency distributions from research surveys are unimodal with a peak at 55–65 cm FL. They reach a maximum length of about 75 cm FL. Unvalidated otolith readings from over 700 fish from QMA 2 indicate that this species is relatively slow-growing and long lived. Maximum ages of over 100 years were reported, with the bulk of the commercial catch being between 35 and 55 years of age. Life history parameters are given below in Table 3.

**Table 3: Life history parameters for black cardinalfish (derived from fish in QMA 2).**

Parameter	Symbol	All	Female	Male
Natural mortality	$M$	0.034	–	–
Age at recruitment	$A_r$	45	–	–
Age at maturity	$A_s$	45	–	–
Gradual recruitment	$S_r$	13	–	–
Gradual maturity	$S_m$	13	–	–
Von Bertalanffy parameters	$L_{inf}$	70.8	70.9	67.8
	$K$	0.034	0.038	0.034
	$t_0$	-6.32	-4.62	-8.39
Length-weight parameters	$a$	0.027	–	–
	$b$	2.87	–	–
Recruitment variability	$\sigma_R$	1.2	–	–
Recruitment steepness		0.75	–	–

The reproductive biology of black cardinalfish is not well known. Indications from research survey and Observer Programme data are that spawning may occur in May–June. A probit analysis indicates fish become sexually mature at around 50 cm length, at an age of approximately 35 years.

Prey items from research trawl samples include mesopelagic fish, natant decapod prawns and octopus.

Elevated levels of mercury (Hg) have been recorded in a sample of black cardinalfish from the Bay of Plenty. The mean mercury level was 1.47 mg.kg<sup>-1</sup> (range 0.59–2.15), which is well above the maximum permissible level of 0.5 mg.kg<sup>-1</sup> set by the New Zealand Department of Health.

**3. STOCKS AND AREAS**

It is not known if there is more than one stock of black cardinalfish in New Zealand. There are no data on genetics, distribution of spawners, or movement of black cardinalfish which indicate possible stock boundaries.

#### 4. STOCK ASSESSMENT

The first stock assessment for black cardinalfish was conducted in 1997, although no estimates of biomass or yield were made. A new assessment for QMA 2 was attempted in 2001 using abundance indices from a new standardised CPUE analysis and new estimates of age and growth from QMA 2 fish. However, this assessment was not accepted by the Plenary.

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

Standardised CPUE indices were calculated for the cardinal fishery in QMA 2. A regression analysis was applied to three sets of catch-effort data: raw CPUE, standardised analysis of success rate and standardised analysis of the catch rates when fishing was successful. However, the analysis was very uncertain and the model accounted for only 17% of the variance in catch rates. The results of the standardised analysis were not accepted by the Plenary.

Unstandardised CPUE (t/tow) are given in Table 4.

**Table 4: Summary of total number of tows with unsuccessful tows (no CDL catch) and unstandardised CPUE (t/tow) for cardinalfish in the target cardinalfish fishery in QMA 2.**

Fishing year	Total tows	Zero tows	P(zero)	Unstandardised CPUE
1989–90	93	43	0.46	4.15
1990–91	251	134	0.53	6.53
1991–92	143	89	0.62	4.58
1992–93	176	93	0.53	4.21
1993–94	273	179	0.66	2.73
1994–95	256	136	0.53	3.52
1995–96	549	254	0.46	1.85
1996–97	423	234	0.55	2.19
1997–98	356	176	0.49	2.12
1998–99	453	263	0.58	1.51

##### (b) Biomass estimates

Estimates of current and reference biomass are not available for QMA 2.

A deterministic stock reduction analysis technique (after Francis, 1990) was applied to several indices from CPUE analyses to estimate virgin ( $B_0$ ) and current ( $B_{1999-2000}$ , mid-season 1999–2000) biomass. However, the stock reduction analysis using the standardised CPUE index was not accepted by the Plenary because (1) the results of the CPUE analysis were uncertain and indicated a decline in biomass that was inconsistent with the unstandardised CPUE data and the estimated broad age structure of the catch; and (2) the results of the stock reduction analysis suggested a stock biomass during recent years that was incompatible with the level of removals during the period and the estimated broad age structure of the catch.

##### (c) Estimates of Maximum Constant Yield (MCY) and Current Annual Yield (CAY)

MCY and CAY have not been determined.

#### 5. STATUS OF THE STOCKS

Estimates of current and reference biomass are not available.

##### QMA 2

The status of the stock is unknown, and it is not known if recent catches or the current TACC are sustainable or will allow the stock to move towards the size that will support the MSY. Unstandardised CPUE indices showed a decreasing trend from 1990 to 1999 with catch rates at the end of this period (1.5–2 t/tow) being less than one-half those recorded in the early years of the fishery.

## Other QMAs

There is no information on the status of cardinalfish stocks in other QMAs.

TACCs and reported landings for the 2005/06 fishing year are summarized in Table 5.

**Table 5: Summary of TACCs (t) and reported landings (t) for black cardinal fish for the most recent fishing year.**

Fishstock	QMA	FMA	2005-06	2005-06
			Actual TACC	Estimated landings
CDL 1	Auckland (East)	1	1200	643
CDL 2	Central (East)	2	2223	2153
CDL 3	South-east (Coast)	3	196	50
CDL 4	South-east (Chatham)	4	5	53
CDL 5	Southland	5	2	<1
CDL 6	Sub-antarctic	6	1	<1
CDL 7	Challenger	7	39	<1
CDL 8	Central (West)	8	0	0
CDL 9	Auckland (West)	9	4	2
CDL 10	Kermadec	10	-	-
Total			3670	2945

## 6. FOR FURTHER INFORMATION

Clark, M.R.; King, K.J. (1989). Deepwater fish resources off the North Island, New Zealand: results of a trawl survey, May 1985 to June 1986. *N.Z. Fisheries Technical Report 11*. 55 p.

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