JOHN DORY (JDO)
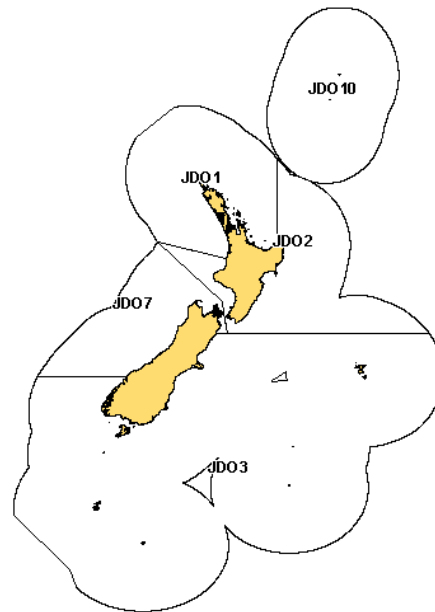
(*Zeus faber*)
Kuparu

1. FISHERY SUMMARY

1.1 Commercial fisheries

John dory are taken mainly as a bycatch of the trawl and Danish seine fisheries. In recent years, around 50-65% of the total reported catch has been taken in JDO 1, and around 20% taken in JDO 2. Recent reported landings by Fishstock are shown in Table 1.

The increase in JDO 1 landings since 1986–87 is largely attributed to increased targeting of John dory by trawl and Danish seine. The TACC in JDO 1 was exceeded (slightly) in 1994–95, but in the following years landings steadily decreased, reaching a low of 440 t in 2002–03. Landings have increased in recent years, with 544 t being caught in 2006–07. It is estimated that during the 1990s about 10–20% of the annual JDO 1 landings were taken in QMA 9, mainly as bycatch in fisheries targeting snapper and trevally. Landings from the eastern part of JDO 1 (QMA 1) are taken primarily in target fisheries for John dory and snapper. However, since 1990 there has been a steady trend of increased target fishing directed at John dory and decreased landings of this species from the snapper fishery.

Annual landings in JDO 2 have never exceeded the TACC and in the mid 90's, were around 50% of the TACC in each year. From 1999–00 to 2002–03 landings were above 200 t, but in recent years landings have decreased. Landings from JDO 2 are considered to be approximately equally split between QMAs 2 and 8. Substantial proportions of John dory landings are taken as bycatch in target trawl fisheries for jack mackerels in QMA 8, and as tarakihi and red gurnard bycatch in QMA 2.

The JDO 7 catch has exceeded the TACC during the last six fishing years. Substantial increases in landings from this Fishstock since 1999 are attributed to increased abundance in response to environmental influences on recruitment and stock displacement. JDO 7 is taken largely as a bycatch by FMA 7 trawl fisheries. The JDO 7 TACC was increased to 114 t under the Low Knowledge Bycatch Framework in October 2004. The overall TAC of 120 t includes 1 t for customary interests, 2 t for recreational interests and 3 t for other sources of fishing-related mortality.

JOHN DORY (JDO)

Table 1: Reported landings (t) of John dory by Fishstock from 1983–84 to 2006–07 and actual TACCs (t) for 1986–87 to 2006–07.

Fishstock QMA (s)	JDO 1 1 & 9		JDO 2 2 & 8		JDO 3 3, 4, 5 & 6		JDO 7 7	
	Landings	TACC	Landings	TAC	Landings	TACC	Landings	TACC
1983–84*	659	–	131	–	1	–	35	–
1984–85*	620	–	110	–	0	–	36	–
1985–86*	531	–	158	–	1	–	45	–
1986–87†	409	510	168	240	3	30	57	70
1987–88†	476	633	192	246	1	30	89	75
1988–89†	480	662	151	253	6	30	47	82
1989–90†	494	704	152	262	1	30	54	88
1990–91†	505	704	171	269	1	31	53	88
1991–92†	562	704	214	269	1	31	60	88
1992–93†	578	704	217	269	8	31	50	91
1993–94†	640	704	186	269	2	32	37	91
1994–95†	721	704	140	270	3	32	30	91
1995–96†	696	704	139	270	<1	32	42	91
1996–97†	689	704	140	270	<1	32	35	91
1997–98†	651	704	134	270	<1	32	26	91
1998–99†	672	704	182	270	<1	32	34	91
1999–00†	519	704	235	270	<1	32	71	91
2000–01†	497	704	217	270	1	32	104	91
2001–02†	453	704	240	270	4	32	124	91
2002–03†	440	704	239	270	2	32	114	91
2003–04†	492	704	184	270	<1	32	155	91
2004–05†	561	704	182	270	1	32	133	114
2005–06†	549	704	159	270	1	32	124	114
2006–07†	544	704	143	270	1	32	124	114

Fishstock QMA (s)	JDO 10 10		Total	
	Landings	TACC	Landings	TACC
1983–84*	0	–	826	–
1984–85*	0	–	766	–
1985–86*	0	–	735	–
1986–87†	<1	10	638	860
1987–88†	0	10	758	994
1988–89†	0	10	684	1 037
1989–90†	0	10	701	1 094
1990–91†	0	10	730	1 102
1991–92†	0	10	837	1 102
1992–93†	0	10	853	1 105
1993–94†	0	10	865	1 106
1994–95†	0	10	894	1 107
1995–96†	0	10	877	1 107
1996–97†	0	10	864	1 107
1997–98†	0	10	811	1 107
1998–99†	0	10	889	1 107
1999–00†	0	10	826	1 107
2000–01†	0	10	819	1 107
2001–02†	0	10	819	1 107
2002–03†	0	10	795	1 107
2003–04†	0	10	832	1 107
2004–05†	0	10	877	1 129
2005–06†	0	10	833	1 129
2006–07†	0	10	815	1 129

* FSU data.

† QMS data.

2 Recreational fisheries

John dory is an important recreational species in the north of New Zealand. Annual recreational take estimated from diary surveys conducted during the 1990s are given in Table 2. The most recent nationwide recreational survey was undertaken in 2001, but the results are still under review and are not currently available.

Table 2: **Estimated number and weight of John dory harvested by recreational fishers by Fishstock and survey. Surveys were carried out in different years in the Ministry of Fisheries regions: South in 1991–92, Central in 1992–93, North in 1993–94 (Teirney *et al.* 1997) and National in 1996 (Bradford 1998) and Dec 1999–Nov 2000 (Boyd & Reilly 2002).**

Fishstock	Survey	Number	Total CV (%)	Estimated harvest range (t)	Point estimate (t)
1992–94					
JDO 1	North	49 000	12	75–95	–
JDO 1	Central	2000	–	0–5	–
1996					
JDO 1	National	46 000	9	80–100	87
1999/2000	National				
JDO 1		129 000	23	174-280	227
JDO 2		9000	41	10-23	16

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 eligibility figures for the 1996 and previous surveys. Consequently the harvest estimates derived from these surveys are considered to be unreliable. 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-estimated, 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.

The JDO 1 recreational harvest estimated during the 1999/2000 survey was approximately 44% of the commercial catch over that period.

1.3   Customary non-commercial fisheries
No quantitative information is available on the current level of Maori customary non-commercial catch.

1.4   Illegal catch
No quantitative information is available.

1.5   Other sources of mortality
No quantitative information is available.

2.   BIOLOGY

John dory are widespread, being found in the eastern Atlantic Ocean, the Mediterranean Sea and around New Zealand, Australia and Japan. They are common in the inshore coastal waters of northern New Zealand and to a lesser extent in Tasman Bay, to depths of 50 m. In the Hauraki Gulf, adults move to deeper waters during summer, and occasional feeding aggregations occur during winter.

John dory are serial spawners (spawning more than once in a season). There appears to be substantial variation in the time of spawning throughout New Zealand, with spawning occurring between December and April on the northeast coast. The eggs are large and pelagic, taking 12–14 days to hatch. Initially John dory grow rapidly with both males and females reaching 12 to 18 cm standard length (SL) after the first year. From the second year onwards females grow faster than males and reach a greater maximum length. Females mature at a size of 29 to 35 cm SL and in general, larger females mature earlier in the season and are more fecund. Males mature at 23 to 29 cm SL.

M was estimated using the equation $M = \log_e 100/\text{maximum age}$, where maximum age is the age to which 1% of the population survives in an unexploited stock. Using a maximum observed age of 12 years, M was estimated to equal 0.38.

Biological parameters relevant to the stock assessment are shown in Table 3.

Table 3: Estimates of biological parameters of John dory.

Fishstock	Estimate						Source
Weight = a (length)^b (Weight in g, length in cm total length)							
Combined sexes							
	a	b					
JDO 1	0.048	2.7					from *Ikatere* 8003
2. von Bertalanffy growth parameters							
	Females			Males			
	K	t_0	L∞	K	t_0	L∞	
JDO 1	0.425	-0.223	41.13	0.48	-0.251	36.4	Hore (1982)

3. STOCKS AND AREAS

No information is available to assess the separation of stocks of John dory within New Zealand waters. Current fishstocks are based on an administrative division by FMA. There are no new data which would alter the stock boundaries given in previous assessment documents.

4. STOCK ASSESSMENT

The yield estimates are based on commercial landings data only and have not changed since the 1992 Plenary Report.

4.1 Estimates of fishery parameters and abundance

Relative abundance indices have been obtained from trawl surveys of the Bay of Plenty, west coast North Island and Hauraki Gulf within the JDO 1 Fishstock (Table 4). However, there was a change in the configuration of the trawl gear following the 1988 trawl survey. Modifications to the trawl gear may have resulted in a change in the catchability of John dory part way through the time series. Therefore, surveys conducted between 1982 and 1988 and from 1989 onwards should be considered separately for comparisons of biomass indices to be valid.

For the west coast North Island (QMA 9), Bay of Plenty and Hauraki Gulf (both JDO 1), there appears to be no trend in the abundance indices since 1988.

Relative abundance indices have also been derived for JDO 2 from trawl surveys of the North Island east coast (QMA 2) and North Island west coast (QMA 8) (Table 4, Figure 1). Similarly, the indices from both of these time series show no trend.

Table 4: Estimates of John dory biomass (t) from _Kaharoa_ trawl surveys.

| Year	Trip Code	Biomass	CV (%)
Bay of Plenty			
1983	KAH8303	113	24
1985	KAH8506	128	12
1987	KAH8711	155	38
1990	KAH9004	157	16
1992	KAH9202	236	12
1996	KAH9601	193	44
1999	KAH9902	176	14
North Island west coast (QMA 8)			
1989	KAH8918	68	25
1991	KAH9111	142	62
1994	KAH9410	33	47
1996	KAH9615	19	38
North Island west coast (QMA 9)			
1986	KAH8612	155	35
1987	KAH8715	160	16
1989	KAH8918	148	16
1991	KAH9111	216	37
1994	KAH9410	102	47
1996	KAH9615	147	15
1999	KAH9915 (QMAs 8 & 9 combined)	374	9
Hauraki Gulf			
1984	KAH8421	292	22
1985	KAH8517	245	20
1986	KAH8613	211	25
1987	KAH8716	181	12
1988	KAH8810	477	32
1989	KAH8917	250	22
1990	KAH9016	322	13
1992	KAH9212	227	35
1993	KAH9311	374	24
1994	KAH9411	288	17
1997	KAH9720	387	18
2000	KAH0012	260	26
North Island east coast			
1993	KAH9304	265	17
1994	KAH9402	268	31
1995	KAH9502	170	18
1996	KAH9605	172	48
West Coast South Island			
1992	KAH9204	102	29
1994	KAH9404	59	26
1995	KAH9504	27	36
1997	KAH9701	17	31
2000	KAH0004	141	16
2003	KAH0304	288	19
2005	KAH0503	222	14
2007	KAH0704	174	26
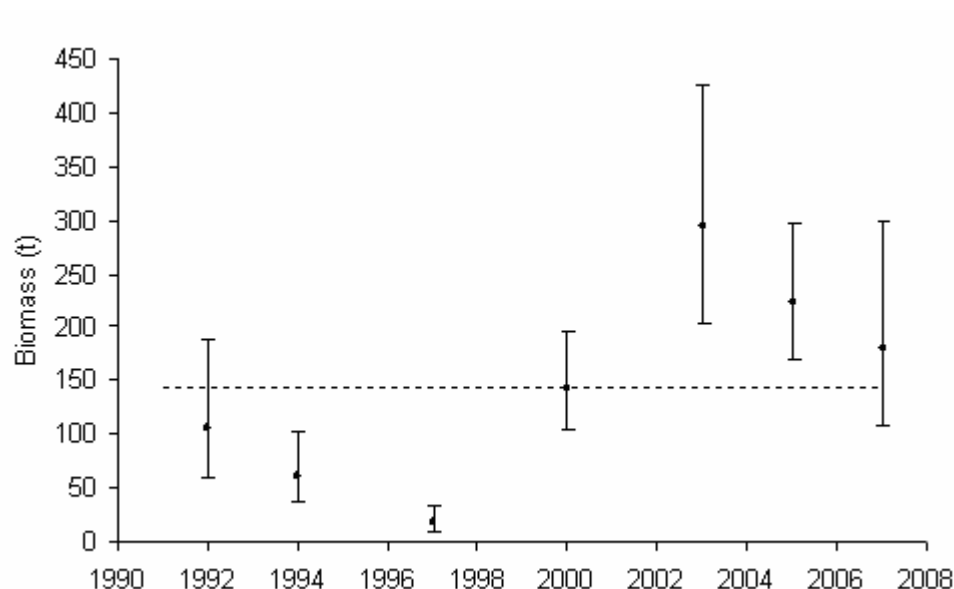
Figure 1: Biomass trends ±95% CI (estimated from survey CV's assuming a lognormal distribution) and the time series mean (dotted line) from the West Coast South Island trawl surveys.

4.2   Biomass estimates

Estimates of absolute reference and current biomass are not available.

4.3   Estimation of Maximum Constant Yield (MCY)

There was a steady increase in reported landings of John dory from 1974–82, with a relatively stable catch after 1980. At that time there were none of the marked fluctuations expected of a short lived species subject to heavy fishing pressure. This may be due to John dory principally being a bycatch species.

MCY was estimated using the equation, MCY = cY_{AV} (method 4). Y_{AV} is the average annual catch for the period 1983–84 to 1985–86. The value of c was set equal to 0.6 based on the estimate of $M = 0.38$. Estimates of MCY are shown in Table 5. The estimates of MCY are probably conservative because John dory has probably not been fully exploited in the past, as they are predominantly a bycatch species that is not specifically targeted.

Table 5:   Estimates of MCY (t) rounded to the nearest 5 t.

Fishstock	QMA		Y_{AV}	MCY
JDO 1	Auckland (East) (West)	1 & 9	600	360
JDO 2	Central (East) (West)	2 & 8	130	80
JDO 3	South-East (Coast) (Chatham),	3, 4,		
	Southland, Sub-Antarctic	5 & 6	1	5
JDO 7	Challenger	7	40	25
JDO 10	Kermadec	10	–	–
Total			771	470

The level of risk to the stock by harvesting the population at the estimated MCY value cannot be determined.

4.4   Estimation of Current Annual Yield (CAY)

No estimates of current biomass are available which would permit the estimation of CAY.

4.5   Other yield estimates and stock assessment results

Current estimates of yield are based upon commercial landings only and are assumed to be independent of the non-commercial catch. There was no indication that John dory were overfished at the time of the introduction of the QMS. There has been no apparent change in the fishing patterns for JDO over the last decade.

5. STATUS OF THE STOCKS

Estimates of absolute current and reference biomass are not available.

John dory is principally a bycatch species and, as such, estimates of MCY based on catch statistics are uncertain. Under such conditions it is difficult to determine whether changes in the reported catches indicate actual changes in the stocks or simply changes in the catches of the target species.

In 1994–95, the TACC for JDO 1 was slightly overcaught for the first time since the start of the QMS. The 1994–95 landings follows a consistent trend of increasing catches, probably due to increased targeting for John dory. However, other factors, such as increased abundance or changing fishing practices, may also have contributed to JDO 1 catch increases but trawl surveys in sub-areas of JDO 1 reveal no apparent trend in John dory biomass. Since 1994–95, the TACC for JDO 1 has been undercaught.

For JDO 1 recent catch levels and the current TACC are likely to be sustainable at least in the short-term. It is not known if recent catch levels and the current TACC are sustainable in the long-term. For all other JDO stocks it is not known if the recent catch levels and current TACCs are sustainable. For all Fishstocks it is unknown if recent catches or the current TACCs are at levels that will allow the stocks to move towards a size that will support the MSY.

Yield estimates, TACCs and reported landings are summarised in Table 6.

Table 6: Summary of yields (t), TACCs (t) and reported landings (t) of John dory for the most recent fishing year.

Fishstock	QMA		MCY	2006–07 Actual TACC	2006–07 Reported landings
JDO 1	Auckland (East) (West)	1 & 9	360	704	544
JDO 2	Central (East) (West)	2 & 8	80	270	143
JDO 3	South-East (Coast) (Chatham),	3 & 4			
	Southland, Sub-Antarctic	5 & 6	5	32	1
JDO 7	Challenger	7	25	114	127
JDO 10	Kermadec	10	–	10	0
Total			470	1130	815

6. FOR FURTHER INFORMATION

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