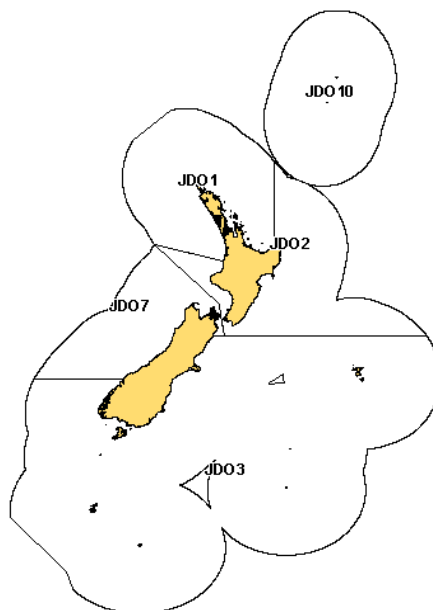


## JOHN DORY (JDO)

(*Zeus faber*)



### 1. FISHERY SUMMARY

#### (a) 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, with around 20% taken in JDO 2

Recent reported landings by Fishstock are shown in Table 1.

**Table 1: Reported landings (t) of John dory by Fishstock from 1983–84 to 2005–06 and actual TACCs (t) for 1986–87 to 2005–06.**

Fishstock QMA (s)	JDO 1		JDO 2		JDO 3		JDO 7		JDO 10		Total	
	1 & 9		2 & 8		3, 4, 5 & 6		7		10		Landings	TAC
	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC
1983–84*	659	–	131	–	1	–	35	–	0	–	826	–
1984–85*	620	–	110	–	0	–	36	–	0	–	766	–
1985–86*	531	–	158	–	1	–	45	–	0	–	735	–
1986–87†	409	510	168	240	3	30	57	70	<1	10	638	860
1987–88†	476	633	192	246	1	30	89	75	0	10	758	994
1988–89†	480	662	151	253	6	30	47	82	0	10	684	1037
1989–90†	494	704	152	262	1	30	54	88	0	10	701	1094
1990–91†	505	704	171	269	1	31	53	88	0	10	730	1102
1991–92†	562	704	214	269	1	31	60	88	0	10	837	1102
1992–93†	578	704	217	269	8	31	50	91	0	10	853	1105
1993–94†	640	704	186	269	2	32	37	91	0	10	865	1106
1994–95†	721	704	140	270	3	32	30	91	0	10	894	1107
1995–96†	696	704	139	270	<1	32	42	91	0	10	877	1107
1996–97†	689	704	140	270	<1	32	35	91	0	10	864	1107
1997–98†	651	704	134	270	<1	32	26	91	0	10	811	1107
1998–99†	672	704	182	270	<1	32	34	91	0	10	889	1107
1999–00†	519	704	235	270	<1	32	71	91	0	10	826	1107
2000–01†	497	704	217	270	1	32	104	91	0	10	819	1107
2001–02†	453	704	240	270	4	32	124	91	0	10	819	1107
2002–03†	440	704	239	270	2	32	114	91	0	10	795	1107
2003–04†	492	704	184	270	<1	32	155	91	0	10	832	1107
2004–05†	561	704	182	270	1	32	133	114	0	10	877	1130
2005–06†	549	704	159	270	1	32	124	114	0	10	833	1130

\* FSU data.

† QMS data.

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 549 t being caught in 2005–06. 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.

#### (b) 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	Total		Estimated harvest range (t)	Point estimate (t)
		Number	CV (%)		
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					
JDO 1	National	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.

(c) **Maori customary fisheries**

No quantitative information is available on the current level of Maori customary take.

(d) **Illegal catch**

No quantitative information is available.

(e) **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) <sup>b</sup> (Weight in g, length in cm total length)						
Combined sexes	a	b				
JDO 1	0.0480	2.70		from <i>Ikatere</i> 8003		
2. von Bertalanffy growth parameters						
	Females			Males		
	K	t <sub>0</sub>	L <sub>∞</sub>	K	t <sub>0</sub>	L <sub>∞</sub>
JDO 1	0.425	-0.223	41.13	0.480	-0.251	36.40
						Hore (1982)

**3. STOCKS AND AREAS**

There are no new data which would alter the stock boundaries given in previous assessment documents.

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.

#### 4. STOCK ASSESSMENT

There are no new data that would alter the yield estimates given in the 1997 Plenary Report. The yield estimates are based on commercial landings data only and have not changed since the 1992 Plenary Report.

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

Relative abundance indices have been obtained from recent trawl surveys of the Bay of Plenty, west coast North Island and Hauraki Gulf within the JDO 1 Fishstock (Table 4). However, for each time series 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). 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 (%)
<b>Bay of Plenty</b>			
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
<b>North Island west coast (QMA 8)</b>			
1989	KAH8918	68	25
1991	KAH9111	142	62
1994	KAH9410	33	47
1996	KAH9615	19	38
<b>North Island west coast (QMA 9)</b>			
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
<b>Hauraki Gulf</b>			
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
<b>North Island east coast</b>			
1993	KAH9304	265	17
1994	KAH9402	268	31
1995	KAH9502	170	18
1996	KAH9605	172	48

**(b) Biomass estimates**

Estimates of absolute reference and current biomass are not available.

**(c) 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. 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, being a bycatch species that has not been 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), Southland, Sub-Antarctic	3, 4, 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.

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

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

**(e) 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 total 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	2005–06 Actual TACC	2005–06 Reported landings
JDO 1	Auckland (East) (West)	1 & 9	360	704	549
JDO 2	Central (East) (West)	2 & 8	80	270	159
JDO 3	South-East (Coast) (Chatham), Southland, Sub-Antarctic	3 & 4 5 & 6	5	32	1
JDO 7	Challenger	7	25	114	124
JDO 10	Kermadec	10	–	10	0
Total			470	1130	833

## 6. FOR FURTHER INFORMATION

Boyd, R.O., Reilly, J.L. (2005). 1999/2000 national marine recreational fishing survey: harvest estimates. *Draft New Zealand Fisheries Assessment Report 2005/XX xpp*.

Bradford, E. (1998). Harvest estimates from the 1996 national recreational fishing surveys. *N.Z. Fisheries Assessment Research Document 1998/16*. 27p.

Hore, A.J. (1982). The age growth and reproduction of the John dory, *Zeus faber*. (Unpublished MSc thesis, University of Auckland.)

Hore, A.J. (1985). John dory *In*: Colman, J.A.; McKoy, J.L.; Baird, G.G. (1985). Background papers for the 1985 Total Allowable Catch recommendations, pp. 117–122. (Unpublished report, held in NIWA library, Wellington.)

Teirney, L.D.; Kilner, A.R.; Millar, R.E.; Bradford, E.; Bell, J.D. (1997). Estimation of recreational catch from 1991/92 to 1993/94 N.Z. Fisheries Assessment Research Document 97/15. 43 p.