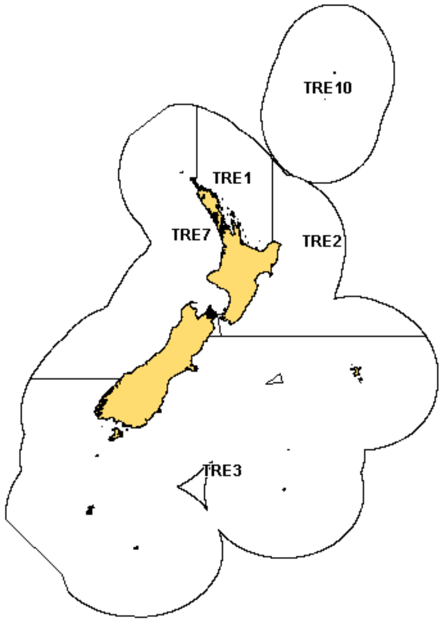
TREVALLY (TRE)

(*Pseudocaranx dentex*)



1. FISHERY SUMMARY

Trevally was introduced into the QMS in 1986 with five QMAs. The TAC was set under the provisions of the 1983 Fisheries Act and accordingly refers to only the commercial catch limit. Allowances for customary fishers, recreational fishers and an allowance for others sources of mortality have not yet been set.

(a) Commercial fisheries

Trevally is caught around the North Island and the north of the South Island, with the main catches from the northern coasts of the North Island. Trevally is taken in the northern coastal mixed trawl fishery, mostly in conjunction with snapper. Since the mid 1970s trevally has been taken by purse seine, mainly in the Bay of Plenty, in variable but often substantial quantities. Setnet fishermen take modest quantities. Recent reported trevally landings and actual TACs are shown in Table 1.

Table 1: Reported landings (t) of trevally by Fishstock from 1983 to 2003–04 and actual TACs (t) from 1986–87 to 2004–05.

Fishstock	TRE 1		TRE 2		TRE 3		TRE 7		TRE 10			
QMA (s)	1		2		3, 4, 5, 6		7, 8, 9		10		Total	
	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC
1983*	1534	–	77	–	3	–	2165	–	0	–	3779	–
1984*	1798	–	335	–	1	–	1707	–	0	–	3841	–
1985*	1887	–	162	–	1	–	1843	–	0	–	3893	–
1986*	1431	–	161	–	3	–	1830	–	0	–	3425	–
1986–87†	982	1210	237	190	<1	20	1626	1800	0	10	2845	2230
1987–88†	1111	1210	267	219	<1	20	1752	1800	0	10	3131	3259
1988–89†	818	1413	177	235	<1	20	1665	2010	0	10	2651	3688
1989–90†	1240	1493	275	237	18	20	1589	2146	0	10	3122	3906
1990–91†	1011	1495	273	238	8	22	2016	2153	0	10	3308	3918
1991–92†	1169	1498	197	238	<1	22	1367	2153	<1	10	2733	3921
1992–93†	1328	1505	247	241	<1	22	1796	2153	<1	10	3371	3931
1993–94†	1162	1506	230	241	<1	22	2231	2153	0	10	3624	3932
1994–95†	1242	1506	179	241	<1	22	2138	2153	0	10	3559	3932
1995–96†	1175	1506	211	241	<1	22	2019	2153	0	10	3405	3932
1996–97†	1174	1506	317	241	<1	22	1843	2153	0	10	3333	3932
1997–98†	1027	1506	223	241	3	22	2102	2153	0	10	3355	3932
1998–99†	1469	1506	284	241	24	22	2148	2153	0	10	3925	3932
1999–00†	1 424	1506	309	241	3	22	2254	2153	0	10	3989	3932

Table 1: (*Continued*)

Fishstock	TRE 1		TRE 2		TRE 3		TRE 7		TRE 10			
QMA (s)	1		2		3, 4, 5, 6		7, 8, 9		10		Total	
	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC
2000–01†	1049	1506	211	241	<1	22	1888	2153	0	10	3148	3932
2001–02†	1085	1506	243	241	<1	22	1856	2153	0	10	3185	3932
2002-03†	1014	1506	270	241	<1	22	2029	2153	0	10	3313	3932
2003-04†	1111	1506	251	241	<1	22	2186	2153	0	10	3548	3932
2004-05†	977	1506	319	241	<1	22	1945	2153	0	10	3241	3932
2005-06†	1149	1506	417	241	<1	22	1957	2153	0	10	3524	3932

* FSU data.
† QMS data.

When compared to the TAC, commercial catches have typically been lower than the TAC in TRE 1 (about 30%) and TRE 7 (10%), but have exceeded the TAC in TRE 2 for the past five fishing years. In the past two years, catches in TRE 2 have exceeded the TAC by 30% and 70%.

(b) Recreational fisheries

Recreational fishers catch trevally by setnet and line. Although highly regarded as a table fish, some trevally may be used as bait. There is some uncertainty with all recreational harvest estimates for trevally as presented in Table 2.

Table 2: Estimated number of trevally harvested by recreational fishers by Fishstock. (Source: Tierney et al., 1997; Bradford, 1997; Bradford, 1998; Boyd & Reilly, 2002; Boyd et al., 2004).

	TRE 1				TRE 7			
Survey Year	Number	CV (%)	Range	Estimated Harvest (t)	Number	CV (%)	Range	Estimated Harvest (t)
1992	186 000	-	240-280	260	68 000	-	65-120	92.5
1994	180 000	9	-	228#	62 000	18	-	78.5
1996	194 000	7	215-255	234	67 000	11	60-80	70
2000	701 000	13	590.9-764	677.4	69 000	27	58.8-102.6	80.7
2001	449 000	19	-	434.2	107 000	21	-	124.3

	TRE 2				TRE 3			
Survey Year	Number	CV (%)	Range	Estimated Harvest (t)	Number	CV (%)	Range	Estimated Harvest (t)
1992	10 000	-	15-25	20	6 000	-	-	7.6#
1994	-	-	-	-	-	-	-	-
1996	9 000	19	10-15	13	2 000	-	-	2.5#
2000	153 000	60	63.2-256.6	159.9	10 000	45	5.6-14.8	10.2
2001	32 000	23	-	33.9	2 000	46	-	1.7

#No harvest estimate available in the survey report, estimate presented is calculated as average fish weight for all years and areas by the number of fish estimated caught.

Recreational harvest estimates by fish stock have been obtained from national telephone diary surveys undertaken in 1996 and 2000, with a follow up survey in 2001. Regional telephone diary surveys were undertaken in 1991/92 in the South Region, 1992/93 in the Central Region and in 1993/4 in the North Region.

A telephone diary or personal interview diary survey (2000 and 2001) has three main components: i) the population that fishes recreationally, the group eligible to complete diaries; ii) a diary survey which generates the mean catch in the eligible population; and, iii) the mean weight of the catch, usually estimated from boat ramp surveys. The RTWG has concluded that the methodological framework used for telephone interviews produced low eligibility figures for the 1996 and previous surveys. Consequently the harvest estimates derived from these surveys are unreliable.

Comparisons between boat ramp and diary estimates of snapper catch per fisher-trip indicate that there are inconsistencies between the observational and diary information. These inconsistencies, suggest to the RTWG that the diary methodology used in these surveys produces unreliable estimates of total catch. In addition, there was concern expressed by the RTWG about very high estimates from the 2000 survey in FMA 2 (TRE 2). Relative comparisons may be possible between stocks within these surveys.

Mean weight, the third component of the diary survey, introduces uncertainty in the estimates of total weight of recreational catch. However, it is possible to bypass this problem by using the estimated catch in numbers.

The RTWG recommends that the harvest estimates from the diary surveys should be used only with the following qualifications: a) they may be very inaccurate; b) the 1996 and earlier surveys contain a methodological error; and, c) the 2000 and 2001 estimates are implausibly high for many important fisheries.

Survey results suggest annual recreational catches from TRE 1 and TRE 7 are around 250-500 t and 70-110 t, respectively. Recreational catch levels as a percentage of total removals are likely to be in to order of ~5% for TRE 7 and ~20% for TRE 1.

(c) <u>Maori customary fisheries</u>

Trevally is an important traditional and customary food fish for Maori. No quantitative information is available on the current level of customary take.

(d) <u>Illegal catch</u>

No quantitative information is available on the level of illegal trevally catch. An estimate of historic illegal catch is incorporated in the TRE 7 stock assessment model catch history (see Table 5).

(e) <u>Other sources of mortality</u>

No quantitative estimates are available regarding the impact of other sources of mortality on trevally stocks. Trevally are known to occur in sheltered harbour and estuarine ecosystems particularly as juveniles. Some of these habitats are known to have suffered substantial environmental degradation.

2. BIOLOGY

Trevally are both pelagic and demersal in behaviour. Juvenile fish up to 2 years old are found in shallow inshore areas including estuaries and harbours. Young fish enter a demersal phase from about 1 year old until they reach sexual maturity. At this stage adult fish move between demersal and pelagic phases. Schools occur at the surface, in mid-water and on the bottom, and are often associated with reefs and rough substrate. Schools are sometimes mixed with other species such as koheru and kahawai. The occurrence of trevally schools at the surface appears to correlate with settled weather conditions rather than with a specific time of year.

Surface schooling trevally feed on planktonic organisms, particularly euphausids. On the bottom, trevally feed on a wide range of invertebrates.

Trevally are known to reach in excess of 40 years of age. The growth rate is moderate during the first few years, but after sexual maturity at 32 to 37 cm fork length (FL), the growth rate becomes very slow. The largest fish are typically around 60 cm FL and weigh about 4.5 kg, however much larger fish of 6–8 kg are occasionally recorded.

Fecundity is relatively low until females reach about 40 cm FL. They appear to be partial spawners, releasing small batches of eggs over periods of several weeks or months during the summer. Biological parameters relevant to stock assessment are shown in Table 3.

Table 3: Estimates of biological parameters.

Fishstock	Estimate			Source
1. Natural mortality (M)				
See Section 4.1.4				
2. Weight = a (length)^b (Weight in g, length in cm fork length)				
Both sexes combined				
TRE 1	a = 0.016 b = 3.064			James (1984)
3. von Bertalanffy growth parameters				
	K	**t_0**	**L_∞**	
TRE 1	0.29	-0.13	47.55	Walsh et al. (1999)
TRE 7	0.28	-0.25	46.21	

3. STOCKS AND AREAS

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

4. STOCK ASSESSMENT

Yield estimates for TRE 7 have been updated in 2005 on the basis of recent catch information, abundance indices, two new proportions-at-age series, improvements to the CPUE index, improvements in model structure and stock assessment modelling. There are no new data that would alter the yield estimates given in the 1999 Plenary Report for the other trevally stocks. A stock assessment was attempted for TRE 1, but was not accepted by the PELWG as no abundance index was available. Subsequently, the TRE 1 yield estimates are based on commercial landings data and the results of a historical stock reduction analysis. Yield estimates for TRE 2 and TRE 3 were derived from commercial landings data.

Estimates of absolute biomass are not available for any stock. Biomass indices are available from *Kaharoa* trawl surveys of the Hauraki Gulf, Bay of Plenty, east Northland, and the west coast of the North Island. These relative indices are unlikely to be directly proportional to true stock abundance due to the following factors: (a) the mixed demersal-pelagic nature of trevally; (b) trawl survey gear efficiency is not optimal for the sampling of trevally; and (c) a direct correlation has been found to exist between sea surface temperature during surveys and relative biomass. These factors are most likely to confound any visible trend in the relative abundance indices for trevally produced from past trawl surveys.

4.1 Challenger, Central West and Auckland West (TRE 7)

4.1.1 CPUE

Four CPUE indices have previously been considered in TRE 7; a psuedo-standardised index from 1977/78, a trevally target index from 1989/90, a snapper bycatch index from 1989/90, and a combined CPUE index from 1990 to 2002 which included a target predictor variable (either trevally or snapper) and area-month interaction. In the last assessment two standardised indices were used: (a) the pseudo-standardised index, and (b) the combined CPUE index, which was felt to more likely to be tracking changes in abundance then the trevally target or snapper bycatch indices, as it exhibited less inter-annual variability then them.

In the most recent assessment only the combined CPUE index was used (updated to 2004), with the pseudo-standardised index being dropped, as fitting it in the model led to highly implausible biomass estimates. After exploration of the CPUE standardization, the WG adopted the revised combined CPUE for use in the model (Table 4).

Table 4: Standardised CPUE indices (relative year effects) with number of vessel days fished from 1989-90 to 2003-04.

	Year	CPUE index	CV	Number of days
1989-90	1990	145.5	0.14	525
1990-91	1991	142.5	0.14	477
1991-92	1992	103.8	0.14	661
1992-93	1993	77.1	0.13	1 145
1993-94	1994	92.9	0.13	905
1994-95	1995	100.1	0.13	852
1995-96	1996	86.8	0.13	994
1996-97	1997	87.8	0.13	1 046
1997-98	1998	74.2	0.12	1 490
1998-99	1999	78.1	0.13	1 278
1999-00	2000	73.5	0.13	1 049
2000-01	2001	69.8	0.13	1 044
2001-02	2002	75.0	0.13	955
2002-03	2003	95.1	0.13	673
2003-04	2004	93.3	0.13	833

4.1.2 Catch History

Commercial catch records for TRE 7 date back to 1944. Before that time the stock is assumed to have been lightly exploited and close to its virgin state. It is likely that reported catches prior to 1970 are underestimates of the true catch due to large-scale discarding of fish (James, 1984).

Over the period since 1944, there has also been a recreational and customary catch as well as an illegal or non-reported catch. For the purposes of modelling the TRE 7 stock, it is necessary to make allowance for mortality due to discarded fish, recreational catch, customary catch, and non-reported catch. The agreed catch history for the model is given in Table 5.

Table 5: Catch history (t) for the TRE 7 fishery including total annual reported commercial catch, estimated discarded commercial catch, estimated non-reported commercial catch, recreational catch, and customary catch. (The year denotes the year at the end of the fishing year).

Year	Reported landings	Discarded	Under-reported catch	Rec. catch	Cust. catch	Total	Year	Reported landings	Discarded	Under-reported catch	Rec. catch	Cust. catch	Total
1944	3	2	1	14	15	34	1975	1598	0	320	70	10	1998
1945	3	2	1	16	15	36	1976	1894	0	379	70	10	2353
1946	3	2	1	18	15	38	1977	2113	0	423	70	10	2616
1947	14	7	3	20	15	59	1978	2322	0	464	70	10	2866
1948	8	4	2	23	15	52	1979	2600	0	520	70	10	3200
1949	7	4	1	25	15	52	1980	2493	0	499	70	12	3074
1950	15	8	3	27	15	68	1981	2844	0	569	70	12	3495
1951	36	18	7	29	15	105	1982	2497	0	499	70	12	3078
1952	31	16	6	31	15	99	1983	2165	0	433	70	12	2680
1953	103	52	21	33	15	223	1984	1707	0	341	70	12	2130
1954	78	39	16	36	15	184	1985	1843	0	369	70	12	2294
1955	138	69	28	38	15	288	1986	1678	0	336	70	12	2095
1956	130	65	26	40	15	276	1987	1626	0	163	70	12	1871
1957	296	148	59	42	15	560	1988	1752	0	175	70	12	2009
1958	343	172	69	44	15	642	1989	1665	0	167	70	12	1914
1959	351	176	70	46	15	658	1990	1589	0	159	70	12	1830
1960	595	128	119	48	10	900	1991	2016	0	202	70	12	2300
1961	471	101	94	51	10	727	1992	1367	0	137	70	12	1586
1962	543	116	109	53	10	831	1993	1796	0	180	70	12	2058
1963	662	142	132	55	10	1001	1994	2231	0	223	70	12	2536
1964	534	114	107	57	10	822	1995	2138	0	214	70	12	2434
1965	544	117	109	59	10	839	1996	2019	0	202	70	12	2303
1966	1 080	60	216	61	10	1427	1997	1844	0	184	70	12	2110
1967	1 493	83	299	64	10	1949	1998	2103	0	210	70	12	2395
1968	1 515	84	303	66	10	1978	1999	2148	0	215	70	12	2445
1969	1 322	73	264	68	10	1737	2000	2254	0	225	70	12	2561
1970	1 682	0	336	70	10	2098	2001	1888	0	189	70	12	2159
1971	2 037	0	407	70	10	2524	2002	1810	0	181	70	12	2003
1972	2 226	0	445	70	10	2751	2003	2050	0	205	70	12	2337
1973	2 320	0	464	70	10	2864	2004	2156	0	216	70	12	2454
1974	2 024	0	405	70	10	2509							

4.1.3 Catch at Age

The last assessment included annual age frequency distributions available from the target TRE 7 single trawl fishery from 1997–98 to 2000–01. There is only one year of catch-at-age data available for the pair trawl method (1997–98). These data did not suggest a significant difference in the age composition of the catch between pair and single trawl methods (Hanchet, 1999).

In order to determine if the natural mortality could be better estimated, two additional proportions-at-age series from earlier in the fishery were included in the model: (1) a series covering the years 1971–1974 derived from research sampling carried out by the vessel *James Cook*, and (2) a series derived from market sampling carried out in the 1974–1976 and 1978–1979 fishing years. These data were useful in the assessment, but require further exploration is needed with respect to the sampling protocols, data validation, and the weighting given to the data.

No age-frequency data are available from the recreational and customary catches.

4.1.4 Estimate of Natural Mortality (M)

James (1984) estimated total mortality of trevally caught by research trawl in the western Bay of Plenty using catch curve analysis. He obtained estimates ranging from 0.61 to 0.76 for younger fish (ages 0–6), 0.03 for older fish (ages 7–34) and 0.3 for the oldest fish (ages 35–46). A recent unpublished estimate of M based on catch curve analysis for snapper, a species with similar growth characteristics and slightly higher lifespan than trevally, equalled 0.075 (in Annala et al., 1999).

Exploratory model fits in which it was attempted to estimate natural mortality were unreliable, and it was decided to set natural mortality at 0.10 (the same value as for the last assessment). Sensitivity tests were conducted using a variety of M values (0.05 and 0.15). An M value of 0.05 gives a more pessimistic assessment result, whilst an M value of 0.15 gave implausible assessment results. When M was estimated within the model it gave a value of 0.073. In this respect the additional years of catch sampling data have provided additional information, although further exploration of M is still required.

4.1.5 Model Structure

In 2005 the observational data were incorporated into an age-based Bayesian stock assessment to estimate stock size. The stock was considered to reside in a single area, with no partition by sex or maturity. In the model age groups were 1-20 years, with a plus group of 20+. The model covers the period 1944–2005 (recorded catch begins in 1944).

There is a single time step in the model, in which the order of processes is ageing, recruitment, maturation, growth, and mortality (natural and fishing). Recruitment numbers followed a Beverton-Holt relationship with steepness of 0.75. All fish in the model are assumed to be mature, and growth follows a von Bertalanffy curve.

The model was fitted to: (a) a combined (either trevally or snapper targeted) CPUE index for the years 1990–2004, (b) a research sampling proportions-at-age series for 1971–1974, (c) a market sampling proportions-at-age series covering 1974–1976 and 1978–1979 (d) a commercial proportions-at-age series for 1997–2000.

Selectivity was modeled with a double half normal selectivity, with the mode fixed. Separate selectivity curves were used for the research survey data and commercial.

The limbs for the double normal selectivities were estimated (2 parameters for each), as was virgin recruitment, the scaling constant between CPUE and biomass, and the year class strengths for 1960–1997. Exploratory model fits in which it was attempted to estimate natural mortality were unsuccessful, and it was set at 0.10 (the same value as for the last assessment).

Sensitivity analyses were carried out to examine the sensitivity of the model results to alternative model assumptions including relative weightings given to the proportions-at-age and CPUE data, the value used for the natural mortality, and the exclusion of individual observational data sets.

4.1.6 Results

The revised base case analysis estimated that the spawning biomass gradually declined during the 1940s and 1950s (Figure 1). The rate of decline increased in the 1960s and 1970s consistent with the increase in the total annual catch. In the late 1980s and early 1990s, there was a small increase in the biomass as annual catches declined following the introduction of TRE 7 to the QMS and the establishment of the TAC. There was also a coincidental increase in estimated recruitment during the same period. Since the mid-1990s, the spawning stock biomass is predicted to have declined slightly.

In the base case the current biomass is estimated to be 45% of virgin biomass (Table 6). When either the market sampling data or James Cook research data is dropped the estimated current biomass drops. With natural mortality set at 0.05 the current biomass is estimated to be 30% of the virgin biomass. With a natural mortality of 0.15 the biomass trajectory is implausibly flat, and current biomass is estimated to be 113% of the virgin biomass.

Table 6: Biomass estimates (medians, with 95% confidence intervals in parentheses) for the base model run. $B_{current}$ is the mid-year biomass in 2005. Estimates are derived from MCMC analysis.

Run	B_0(t)	$B_{current}$(t)	%B_0
Base	62 900 (56 700–74 600)	28 300 (19 500–45 900)	45 (34–61)

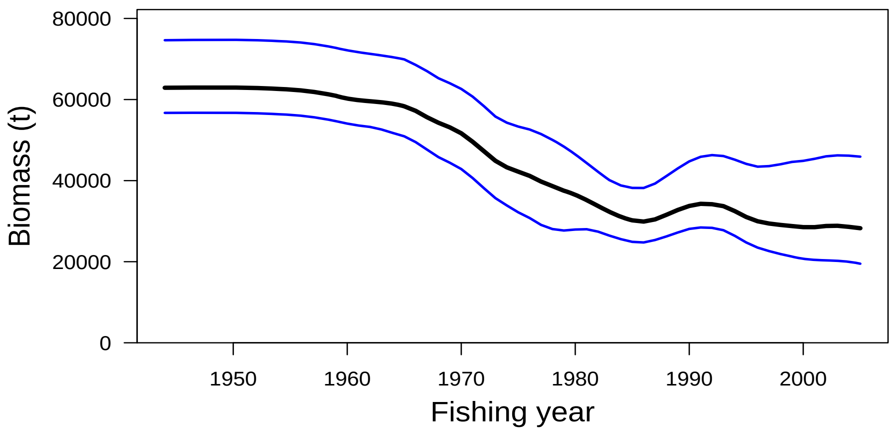


Figure 1: Total biomass trajectories from the MCMC analysis for the base case. The thin lines represent the 5th and 95th percentiles.

4.2 Yield Estimates for all stocks

(a) Estimation of Maximum Constant Yield (MCY)

The estimates of MCY are summarised in Table 8 and detailed in the following sections for each stock. The level of risk to the stock by harvesting the population at the estimated MCY value has not been determined.

(i) TRE 1

An estimate of current surplus production (CSP) is available from a stock reduction analysis of the Bay of Plenty fishery using data from 1973 to 1983. The stock was estimated to have fallen to between 0.3 and 0.7 of its initial size in the period. Using a modified estimate of absolute stock size from a tagging experiment in 1977 and conservative net stock productivity values (0.02–0.06 y^{-1}) the estimate for CSP in 1984 was 600 t. No new information has become available to permit updating the stock reduction analysis estimate of CSP made in 1984. Although not an estimate of equilibrium surplus production, this value for CSP was used to estimate MCY using the equation MCY = 2/3 CSP (Method 3). This is believed to be a conservative estimate of MCY.

MCY = 2/3* 600 t = 400 t.

MCY was estimated using the equation MCY = cY_{av} (Method 4) for the Hauraki Gulf and North east coast sub-areas. Y_{av} was set equal to the mean annual commercial landings for the decade 1977–86 and equalled 924 t. Based on an estimate of M = 0.1, c was set equal to 0.9.

MCY = 0.9 * 924 t = 830 t.

These MCY values were combined to provide the overall MCY estimate for TRE 1 of 1230 t. This estimate of MCY has not changed since the 1992 Plenary Report.

(ii) TRE 2 and TRE 3

MCY estimates using the equation MCY = cY_{av} (Method 4) with mean annual commercial landings for the decade 1977–86 and the natural variability factor c, set equal to 0.9 for these areas, has not changed since the 1989 Plenary Report.

(b) Other yield estimates and stock assessment results

(i) TRE 7

For the base case assessment, and the more plausible sensitivity analyses, current biomass is estimated to be above the B_{MSY} level. The base case estimates biomass in 2005 as 45% of B0. The MSY is calculated under deterministic recruitment with a Beverton-Holt stock recruitment relationship. For the base case MSY = 2 300 t (29% B_0). For the Bayesian analysis $P(B_{2005} < B_{MSY}) = 0.00$ and the median value of $B_{2005}/B_{MSY} = 1.54$.

Forward projections were carried out for the base case model over a 5-year period using two constant-catch options. For each constant-catch option, three measures of fishery performance were calculated for each year in the projection period: (1) the median biomass (expressed as a percentage of B_0), (2) the probability that the biomass is less than that in 2005, and (3) the probability that the biomass is less than 29% B_0 (the maximum sustainable yield biomass).

In the first constant-catch option the future commercial catch was maintained at the TAC, in the second the future commercial catch was set at the average level of reported commercial catch from 2001–2004. In both cases an estimated unreported commercial catch of 10% of the reported commercial catch was added, and an additional 82 t for the estimated recreational and customary catch. For all projections, future deviations from the spawner-recruit curve were assumed to be log-normally distributed, with a variance equal to that from the historical estimates. Estimates back to 2004 were replaced with random recruitment because these had not been estimated in the model.

For both scenarios, the biomass slowly decreased over the 5-year projection period, but was very unlikely to move below the biomass at maximum sustainable yield (Table 7).

Table 7: Forward projections to 2010. The labels are: B_{med} = median biomass (as $\%B_0$), P_{2005} = P(biomass $< B_{2005}$), P_{MSY} = P(biomass $< 29\%B_0$). Annual future catches are 2 450 t (TAC scenario) or 2 260 t ($Mean_{2001–2004}$ scenario). For both scenarios B_{med} is 44.8% for 2005.

	TAC			$Mean_{2001–2004}$		
	B_{med}	P_{2005}	P_{MSY}	B_{med}	P_{2005}	P_{MSY}
2006	44.2	0.90	0.00	44.6	0.86	0.00
2007	43.8	0.86	0.00	44.3	0.79	0.00
2008	43.2	0.83	0.01	44.0	0.75	0.00
2009	42.6	0.82	0.01	43.9	0.73	0.01
2010	42.2	0.80	0.02	43.6	0.70	0.02

(c) Other Factors

Trevally are caught by trawling, together with other species such as snapper, red gurnard and John dory. Mismatches between the proportions of quota held for these species in any year for individual quota holders may affect landings in any one year. As a result of the interaction between snapper and trevally in the TRE 7 trawl fishery, the trevally catch is sometimes constrained by the availability of snapper quota.

Catch sampling of the TRE 1 purse seine catch was carried out annually from 1997–98 to 2002–03. All TRE 1 and TRE 7 catch-at-age compositions comprise a broad range of age classes and a consistently high proportion (5–10%) of fish 20 years and older suggesting that recent and current exploitation rates are not high. In the TRE 1 fishery it is difficult to determine any consistent trend in the progression of year classes in the age compositions from one year to the next. Year class strength progression in TRE 7 is more apparent for some year classes, especially for groups of year classes with relatively similar strengths. A recent catch sampling review (Walsh & McKenzie, in press) suggests spatial variation in population age structure and otolith reading ambiguities are the likely main causes of the lack of consistency in trevally age data. The report recommends that in future the collection and analyses of trevally age data is made with explicit regard to sub-area. The presence of significant sub-area differences in age composition may have implications in future TRE 1 and TRE 7 stock assessments

5. STATUS OF THE STOCKS

Estimates of absolute current and reference biomass are not available.

TRE 1

The assessment for TRE 1 was not accepted due to the lack of a reliable abundance index, therefore there is no current information to change previous views on the status of the stock. Recent catches reported for TRE 1 are less than the estimated MCY levels and below the TAC. The TAC is probably sustainable, probably allowing the stock to attain a size at or above B_{MSY}. This hypothesis is supported in TRE 1 by the results of catch sampling from the TRE 1 purse seine fishery.

TRE 2

Over the past five years reported catches for TRE 2 have been in excess of the TAC and have also exceeded the estimated MCY level in the past two years. It is not known if these recent catches are sustainable or will allow the stock to attain a size at or above $B_{MSY.}$

TRE 7

The current stock size is considered to be above B_{MSY}. Catches at the level of the TAC and current catches are likely to be sustainable in the short-term, with a high probability of allowing the stock to be maintained at or above B_{MSY}. However, it is uncertain as to whether catches at the level of the TAC are sustainable in the longer term.

Yield estimates, TACCs and reported landings by Fishstock are summarized in Table 8.

Table 8: Summary of yields (t), TACs (t) and reported landings (t) of trevally for the most recent fishing year.

Fishstock	QMA		MCY	2005–06 Actual TAC	2005–06 Commercial landings
TRE 1	Auckland (East)	1	1230	1506	1149
TRE 2	Central (East)	2	310	241	417
TRE 3	South–East, Chatham, Southland and Sub–Antarctic	3, 4, 5, 6	5	22	<1
TRE 7	Auckland (West), Central (West), Challenger	7, 8, 9	*see assessment	2153	1 957
TRE 10	Kermadec	10	0	10	0
Total				3932	3524

6. FOR FURTHER INFORMATION

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