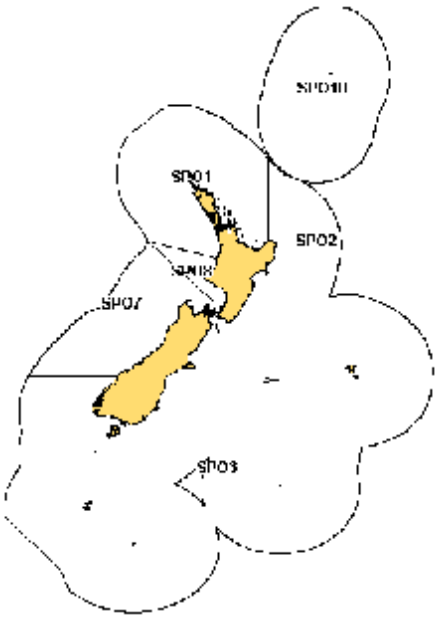
RIG (SPO)

(Mustelus lenticulatus)



1. FISHERIES SUMMARY

(a) Commercial fisheries

Rig are caught in coastal waters throughout New Zealand. Most of the catch is taken from water less than 50 m deep during spring and summer, when rig aggregate inshore. Before the introduction of the QMS in 1986, 80% of the commercial catch was taken by bottom set net, and most of the remainder by trawl. Since then, a larger proportion has been taken by trawlers as bycatch, but the exact split by method is unknown (because method data were available only for a portion of the rig catch in the CELR database). The most important bottom set net fisheries are at 90-Mile Beach, Kaipara Harbour, Manukau Harbour, South Taranaki Bight – Tasman/Golden` Bay, Canterbury Bight, Kaikoura and Hauraki Gulf.

Total reported landings of rig increased rapidly during the 1970s, and averaged about 3200 t per year during the late 1970s and early 1980s (Table 1).

Table 1: Reported total New Zealand landings (t) of rig for the calendar years 1965 to 1985. Sources: MAF and FSU data.

Year	Landings	Year	Landings	Year	Landings	Year	Landings
1965	723	1971	1 120	1977	3 281	1983	3 826
1966	850	1972	1 011	1978	3 300	1984	3 562
1967	737	1973	–	1979	2 701	1985	3 222
1968	677	1974	2 040	1980	3 000		
1969	690	1975	1 841	1981	3 006		
1970	930	1976	2 610	1982	3 425		

Following the introduction of the QMS, landings declined to less than half those of the previous decade. Since 1986–87, landings have generally increased in response to TAC increases (Table 2). TACCs for all Fishstocks except SPO 10 were increased by 20% for the 1991–92 fishing year under the adaptive management programme. Another TACC increase (from 454 t to 600 t) was implemented in SPO3 for the 2000–01 fishing year. The TACCs for SPO 1, SPO 2 and SPO 8 reverted to the pre-adaptive management programme levels for the 1997–98 fishing year, when these Fishstocks were removed from the AMP in July 1997. The TACC for SPO 2 was increased from 72 t to 86 t from 1 October 2004 under the low knowledge bycatch framework.

In October 1992, the conversion factors for headed and gutted, and dressed, rig were reduced from 2.00 to 1.75. Since most rig are landed in these states, this reduction would have produced a maximum increase in removals of about 14% for the same nominal TACC. Landings prior to 1992–93 have not been adjusted for the change in the conversion factor. The combined effect of adaptive management and conversion factor changes was a 37% increase in allowable commercial removals from all main stocks between 1991 and 1993.

Table 2: Reported landings (t) of rig by Fishstock from 1985–86 to 2004–05 and actual TACs (t) from 1986–87 to 2004–05.

Fishstock	SPO 1		SPO 2		SPO 3		SPO 7		SPO 8		SPO 10			
FMA (s)	1 & 9		2		3,4,5, & 6		7		8		10		Total	
	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings§	TAC
1985–86*	845	–	96	–	921	–	367	–	465	–	0	–	2 906	–
1986–87†	366	540	55	60	312	330	233	240	125	240	0	10	1 091	1 420
1987–88†	525	614	66	68	355	347	262	269	187	261	0	10	1 395	1 569
1988–89†	687	653	68	70	307	352	239	284	212	295	0	10	1 513	1 664
1989–90†	689	687	61	70	292	359	266	291	206	310	0	10	1 514	1 727
1990–91†	656	688	63	71	284	364	268	294	196	310	0	10	1 467	1 737
1991–92†	878	825	105	85	352	430	290	350	145	370	0	10	1 770	2 070
1992–93†	719	825	90	86	278	432	324	350	239	370	0	10	1 650	2 072
1993–94†	631	829	96	86	327	452	310	350	255	370	0	10	1 619	2 097
1994–95†	666	829	88	86	402	454	341	350	273	370	0	10	1 769	2 098
1995–96†	603	829	107	86	408	454	400	350	330	370	0	10	1 848	2 098
1996–97†	681	829	99	86	434	454	397	350	277	370	0	10	1 888	2 098
1997–98†	621	692	85	72	442	454	325	350	287	310	0	10	1 760	1 888
1998–99†	553	692	86	72	426	454	336	350	235	310	0	10	1 635	1 888
1999–00†	608	692	86	72	427	454	330	350	219	310	0	10	1 670	1 888
2000–01†	554	692	81	72	458	600	338	350	174	310	0	10	1 607	2 034
2001–02†	436	692	86	72	391	600	282	350	216	310	0	10	1 411	2 034
2002–03†	477	692	86	72	417	600	264	350	209	310	0	10	1 453	2 034
2003–04†	481	692	81	72	354	600	293	350	203	310	0	10	1 412	2 034
2004–05†	429	692	108	86	366	600	266	350	208	310	0	10	1 377	2 048

* FSU data.
† QMS data.
§ Includes landings from unknown areas before 1986–87.

(b) Recreational fisheries

Rig are caught by recreational fishers throughout New Zealand. Less that 3% of the recaptures of rig tagged around the South Island and Manawatu coasts in 1982–84 were returned by recreational fishers. Estimates of recreational landings obtained from three surveys, 1991–92 to 1993–94, 1996 and 1999-00 are given in Table 3. Recreational landings between 1991 and 1994 comprised only a small proportion (<15%) of the total rig harvest in all Fishstocks.

Table 3: Estimated number and weight of rig 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 Nationally in 1996 (Bradford, 1998) and 1999-00 (Boyd & Reilly, 2002). Survey harvests are presented as a range to reflect the uncertainty in the estimates.

Fishstock	Survey	Number	*c. v.%*	Harvest Range (t)	Point estimate (t)
1991-92					
SPO 3	South	12 000	22	15-30	-
1992-93					
SPO 2	Central	5 000	-	5-15	-
SPO 7	Central	8 000	39	10-25	
SPO 8	Central	18 000	43	20-60	-
1993-94					
SPO 1	North	11 000	21	5-25	-
SPO 8	North	1 000	-	0-5	
1996					
SPO 1	National	28 000	31	25-45	35
SPO 2	National	4 000	-	-	-
SPO 3	National	12 000	20	10-20	15
SPO 7	National	19 000	20	20-30	24
SPO 8	National	7 000	-	-	-

Table 3: (*continued*)

Fishstock	Survey	Number	*c. v.%*	Harvest Range (t)	Point estimate (t)
1999-00					
SPO 1	National	13 000	30	12-23	-
SPO 2	National	16 000	58	9-33	-
SPO 3	National	43 000	32	39-75	-
SPO 7	National	33 000	38	21-46	-
SPO 8	National	7 000	48	5-13	-

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-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.

(c) Maori traditional fisheries

Maori fishers traditionally caught large numbers of "dogfish" during the last century and early this century. Rig was probably an important species, though spiny dogfish and school shark were also taken. The early practice of having regular annual fishing expeditions, during which thousands of dogfish were sun-dried on wooden frames, has died out. However, rig are still caught in small quantities by Maori in parts of the North Island, especially the harbours of the Auckland region. 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

Unknown quantities of juvenile rig are caught by set nets placed in harbours and shallow bays. Quantitative information on the level of other sources of mortality is not available.

2. BIOLOGY

Rig are born at a total length (TL) of 25–30 cm. On the South Island male and female rig attain maturity at 5-6yrs (~85cm) and 7/8yrs (~100 cm), respectively (Francis and O'Maolagain 2000). Rig in the Hauraki Gulf mature earlier – 4yrs for males and 5 yrs for females - and at smaller sizes (Francis and Francis 1992). Longevity is not known because few large fish have been aged, but a male rig that was mature at tagging was recaptured after nearly 14 years of liberty, suggesting a longevity of 20 years or longer. Females reach a maximum length of 151 cm and males 126 cm TL.

Rig give birth to young during spring and summer following a 10–11 month gestation period. Most females begin a new pregnancy immediately after the birth of the previous litter, and therefore breed every year. The number of young produced increases exponentially with the length of the mother, and ranges from 2 to 37 (mean about 11). Young are generally born in shallow coastal waters, especially in harbours and estuaries, throughout North and South Islands. They grow rapidly during their first summer, and then disappear as water temperatures drop in autumn-winter. They presumably move into deeper water.

Rig make extensive coastal migrations, with one tagged female moving a least 1160 km. Over half of the tagged rig that were recaptured had moved over 50 km, and over half of the females had moved more than 200 km. Females travel further than males, and mature females travel further than immature females.

Biological parameters relevant to stock assessment are shown in Table 4.

Table 4: Estimates of biological parameters for rig.

Fishstock	Estimate						Source
1. Natural mortality (M)							
All	0.2–0.3						Francis and Francis (1992a)
2. Weight = a (length)^b (Weight in kg, length in cm total length)							
	Females			**Males**			
	a	**b**		**a**	**b**		
SPO 3	3.67×10^{-7}	3.54		1.46×10^{-6}	3.22		Francis (1979)
SPO 7 & 8	9.86×10^{-7}	3.32		3.85×10^{-6}	3.01		R. Blackwell (unpubl. data)
3. von Bertalanffy growth parameters*							
	Females			**Males**			
	K	**t_0**	**L_∞**	**K**	**t_0**	**L_∞**	
SPO 1	0.42	-0.77	90.7	0.16	-2.02	118.7	Francis and Francis (1992a)
SPO 3	0.40	-0.68	87.0	0.11	-1.91	161.1	Francis and Francis (1992a)
	Males and females combined						
	K	**t_0**	**L_∞**				
SPO 3 & 7	0.119	-2.35	147.2				Francis and Ó Maolagáin (2000)

3. STOCKS AND AREAS

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

Five biological rig stocks are recognised: northeast coast North Island (NECNI), statistical areas 1–11; southeast coast North Island (SECNI), 12–15; east coast South Island (ECSI), 18–30; west coast South Island (WCSI), 17, 31–36, 38; west coast North Island (WCNI), 16, 37, 39–48. ECSI and WCSI boundaries were determined from tagging studies; NECNI and SECNI were separated on the basis of differing CPUE trends before 1986; and WCNI was arbitrarily defined to be similar in size to the South Island stocks.

Fishstocks SPO 2, SPO 3 and SPO 7 correspond closely with SECNI, ECSI and WCSI biological stocks respectively. SPO 8 consists of part of the WCNI stock, and SPO 1 consists of part of the WCNI stock and the NECNI stock.

4. STOCK ASSESSMENT

There are no new data which would alter the yield estimates given in the 1997 Plenary Report. The yield estimates are based on commercial landings data only.

(a) Estimates of fishery parameters and abundance

Standardised CPUE (kg/km net) indices were calculated for SPO 8 and for five sub-areas in SPO 1 by modelling (GLM) non-zero catches by core vessels targeting rig with setnets between 1989-90 and 2003-04 (Blackwell et al. 2006). Catches were adjusted prior to the analysis to account for changes in conversion factors over this period. Standardized CPUE series in SPO 8 and all sub-areas in SPO 1, apart from Manakau Harbour, were flat, suggesting no sustainability concern and that the current catches were sustainable (Figs 1 & 2). Although standardized CPUE in the Manakau harbour declined, rig in this harbour do not comprise a separate population; this observation is therefore more likely to reflect changes in local conditions than a decline in the abundance of the SPO 1 west coast stock.

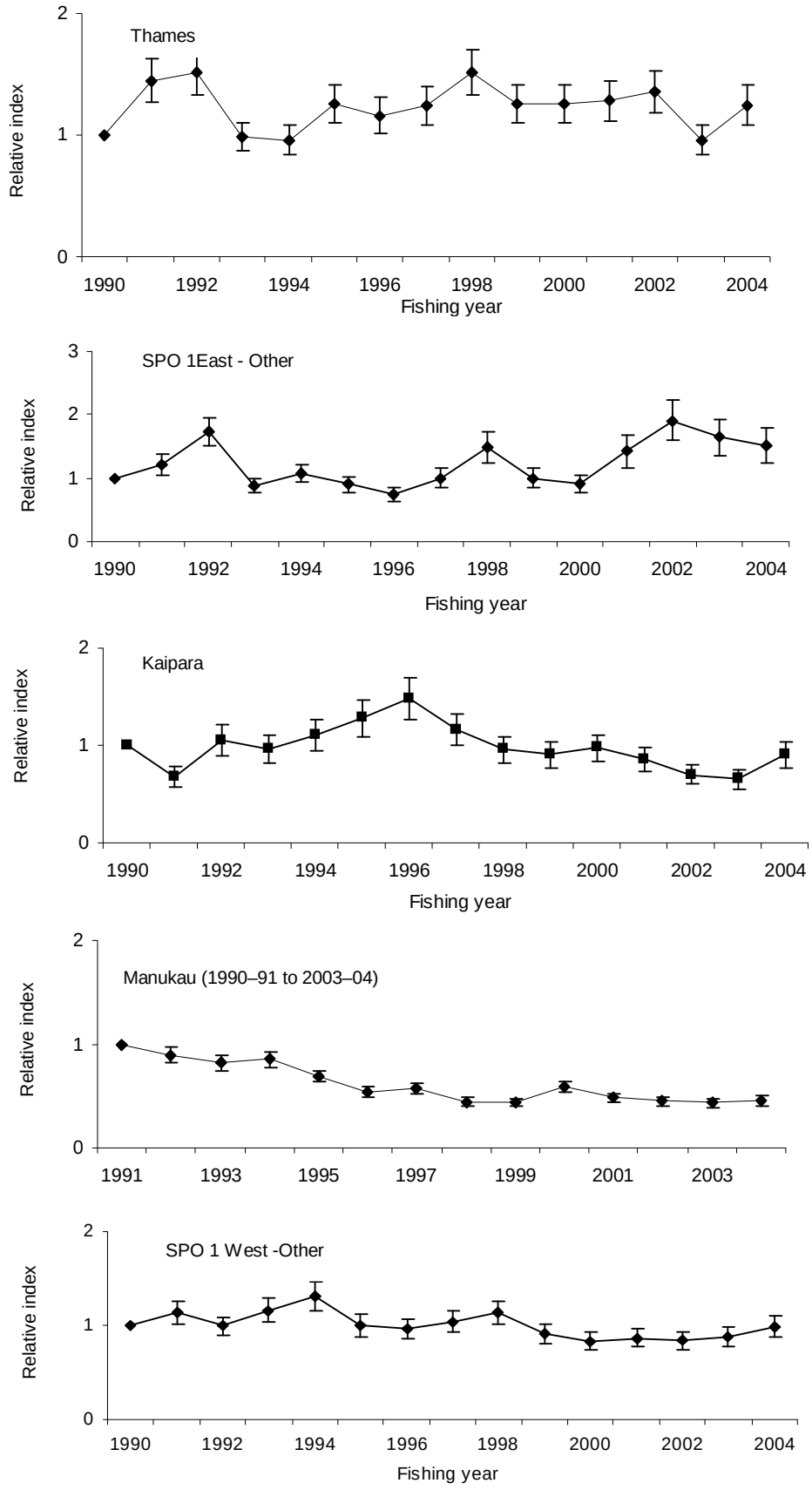


Figure 1: CPUE series, based on lognormal standardization of non-zero, core vessel, set-net catches (calculated green weight), for five sub-regions in SPO 1 (1989/90 – 2003/04). Error bars represent 1 s.e. (Blackwell et al. 2006).

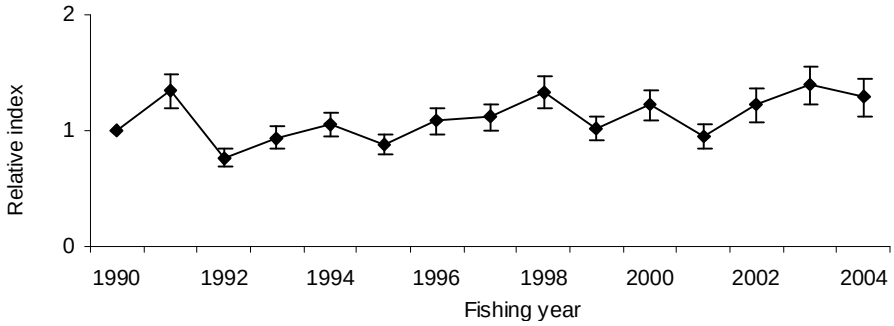


Figure 2: Standardized CPUE indices, based on non-zero, core-vessel set-net catches (calculated green weight) for SPO 8 (Blackwell et al. 2006). Error bars represent 1 s.e.

Revised indices of abundance for SPO 3 (1989/90 to 2003/04) and SPO 7 (1989/90 – 2004/05) stocks were reported as part of the Adaptive Management Programme (SeaFIC 2005a, Starr et al. 2006), using standardised CPUE data from rig-target set-net fisheries. The analyses assumed that set net mesh selectivity had remained the same over the whole time period. Although there was no overall trend in CPUE indices for SPO 3 (Fig. 3), the AMP WG concluded (in 2005) that recent declines in CPUE, annual landings and mean size of males and females suggest that abundance of SPO3 may have declined over the last six years.

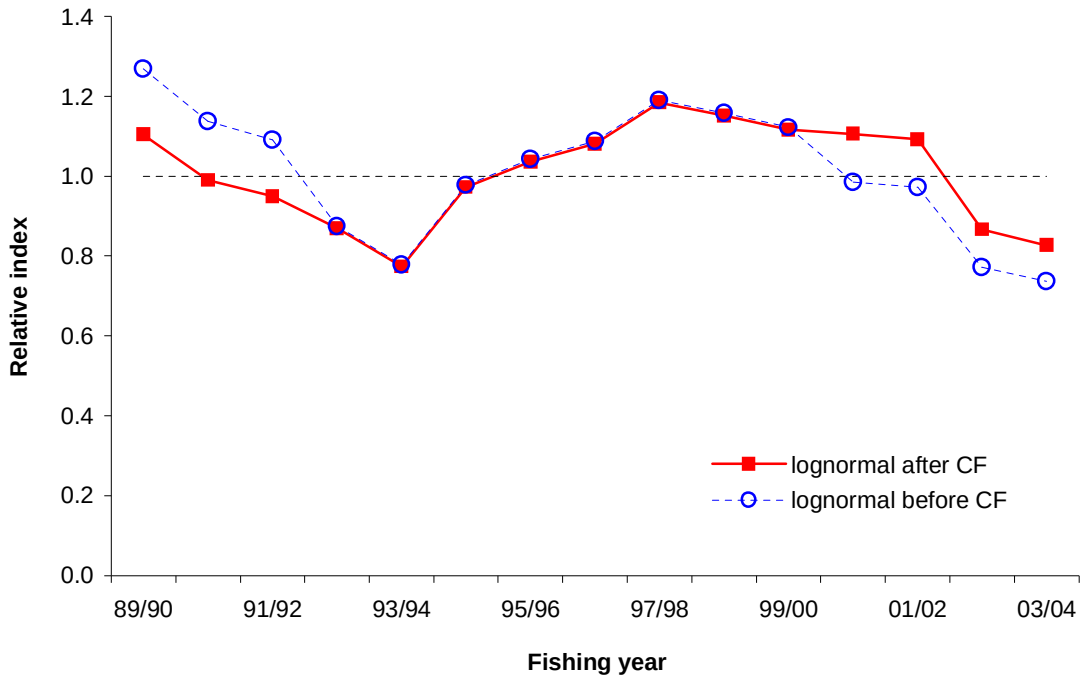


Figure 3: Lognormal standardization of non-zero setnet catches of SPO 3, both with and without conversion factor (CF) correction (see full-term review of SPO 3 AMP for more details). A line indicating the geometric mean of both series is provided for reference.

Lognormal standardisation of non-zero set-net catches for core vessels on the west coast of the South Island (SPO 7) produced an annual index that peaked in 1995/96 and although fluctuating depicted no clear trend since then. A similar index for Tasman and Golden Bays (stat. area 038), where about half of the annual SPO 7 catch is taken, produced an annual index that declined consistently since 1989/90 (Fig. 4). Nominal CPUE (kg/100m of

set net) for core vessels in area 038 declined by approximately 66% between 1976/77 and 1984/85 (Francis and Smith 1988), suggesting that there had been substantial decline in abundance in Tasman and Golden Bays prior to the current analysis. Although large rig are not effectively targeted with bottom trawl gear, the WCSI trawl survey is believed to provide reliable indices of the relative biomass of males and younger females in SPO 7. Relative biomass indices declined by more than 50% between 1995 and 2005 (Fig. 5)

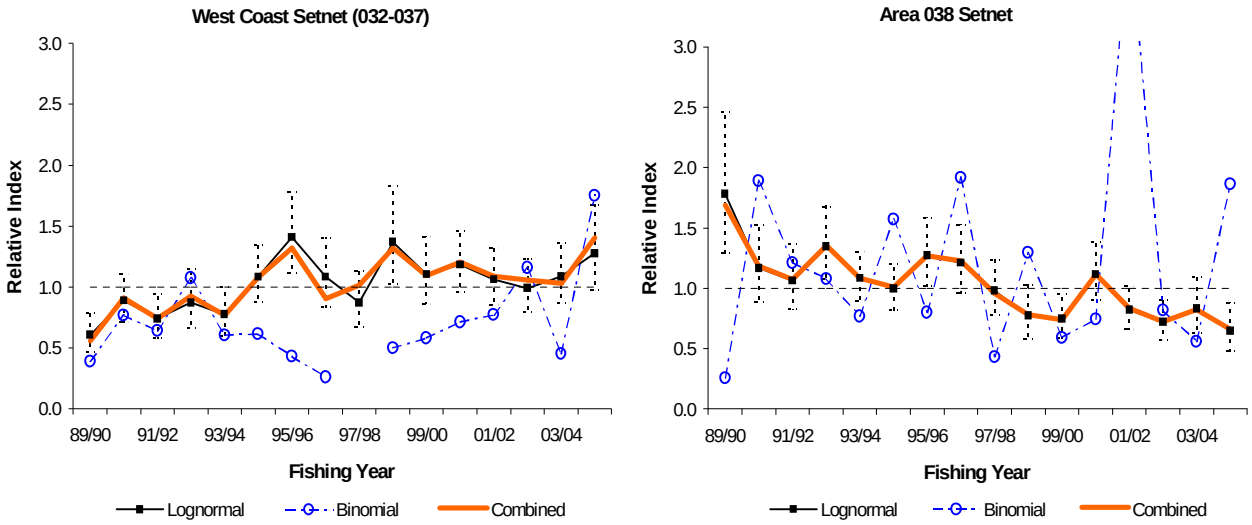


Figure 4. Plot of three standardised CPUE models: [left panel] the west coast South Island setnet fishery and [right panel] the Area 038 setnet fishery. a) a lognormal model using non-zero landings as the dependent variable (with associated 95% lognormal error bars); b) a binomial (logistic) model using a binary variable indicating a successful or zero catch of rig and c) a combined model which summarises the two sets of indices into a single trajectory.

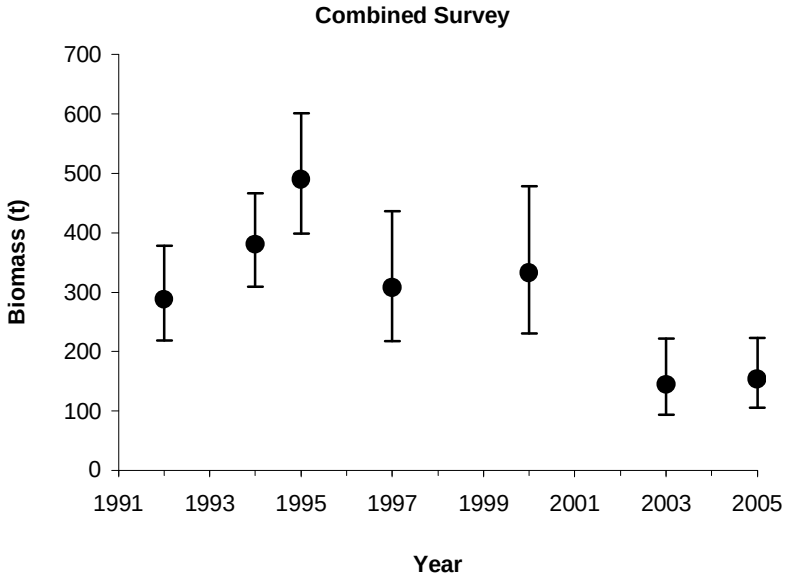


Figure 5. Plots of biomass estimates (t) for rig from the west coast South Island trawl survey by year. Error bars are approximated from the CVs assuming a lognormal distribution.

(b) Biomass estimates

ECSI and WCSI biomass estimates were calculated by dividing the mean reported commercial landings for the period 1981–83 by estimates of the exploitation rates in 1982–84 obtained from tagging studies. Biomass estimates were 4700–5600 t for ECSI and 3250 t for WCSI. These estimates are now out of date. Estimates of current biomass are not available.

(c) Estimation of Maximum Constant Yield (MCY)

(i) ECSI and WCSI stocks

MCY was previously estimated using the equation MCY = $0.5*M*B_{av}$ (Method 2). However, recent work has shown that populations fished at this level have a high probability of stock collapse (i.e., falling below 20% virgin biomass) if their recruitment steepness is less than or equal to 0.5 (Francis and Francis, 1992a). Rig, like all elasmobranchs, have very low fecundity. In addition, fecundity declines with the size of the mother. Therefore, it is likely that rig have a close relationship between recruitment and spawning stock biomass. It is therefore unsafe to use Method 2 for estimating MCY for rig. MCY can only be estimated using this method if an estimate of virgin biomass becomes available (in which case MCY can be determined as a percentage of B_0 as described by Francis and Francis 1992a).

No estimates of MCY are available for these stocks. This conclusion has not changed since the 1992 Plenary Report.

(ii) WCNI Stock

MCY was estimated using the equation MCY = cYav (Method 4). The period 1977–78 to 1981–82 appeared to have relatively constant effort (± 30%) and no trend in landings, so landings during these years were averaged to estimate Y_{av}. M lies in the range 0.2–0.3, leading to a value of 0.7 or 0.8 for c (the natural variability factor). However, natural variability in year class strength is probably low in view of very low fecundity, so c was set at 0.9.

MCY = 0.9* 680 t = 612 t (rounded to 610 t).

Targeted set net cpue declined in 3 of the 4 statistical areas examined over the period used for MCY estimation, indicating that landings or effort or both varied. Therefore, this method may be inappropriate, and MCY may be less than 610 t.

The estimate of MCY has not changed since the 1989 Plenary Report.

(iii) NECNI Stock

MCY was estimated using the equation MCY = cY_{av} (Method 4). The period 1977–78 to 1980–81 had relatively constant effort (± 15%) and no trend in landings in the Hauraki Gulf (the part of the stock range that accounts for most of the catch), so landings during these years were averaged to estimate Y_{av}. c was set equal to 0.9.

MCY = 0.9 * 318 t = 286 t (rounded to 290 t).

The estimate of MCY has not changed since the 1988 Plenary Report.

(iv) SECNI Stock

MCY cannot be estimated explicitly. However, based on the catch history for this stock before the introduction of the QMS, the MCY is likely to be less that 70 t.

MCY < 70 t.

The estimate of MCY has not changed since the 1992 Plenary Report.

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)

CAY can not be determined with available data.

Yield estimates are summarised in Table 5.

Table 5: Yield estimates (t) of rig by stock.

Parameter	Fishstock	Estimates
MCY	SPO 1 (WCNI + NECNI)	630*
	SPO 2 (SECNI)	< 70
	SPO 3 (ECSI)	Cannot be determined
	SPO 7 (WCSI)	Cannot be determined
	SPO 8 (WCNI)	270*
	SPO 10	Cannot be determined
CAY	All	Cannot be determined

* MCY estimate for the WCNI stock was apportioned pro-rata between SPO 1 and SPO 8 Fishstocks on the basis of historical catches.

(e) Other factors

Stock mixing occurs in the South Taranaki Bight – Cook Strait and South Westland regions, and probably elsewhere as well. Some regional fisheries therefore exploit more than one stock. Also, biological stock boundaries do not always coincide with Fishstock boundaries. Consequently, management by quota within Fishstocks is likely to be sub optimal for individual stocks.

The use of small mesh commercials set nets (125 mm) in the Auckland FMA probably results in a large proportion of the rig catch being immature fish. Elsewhere, the minimum size is 150 mm.

Greenweight landings prior to 1992–93 were estimated using an old and incorrect conversion factor (2.00). The currently accepted conversion factor (1.75) has been applied since 1992–93. Therefore, landings prior to 1992–93 (see Table 2), and the MCY estimates for SPO 1, 2 and 8 (Table 6), have been overestimated. The actual values are 87.5% of the reported values.

5. ANALYSIS OF ADAPTIVE MANAGEMENT PROGRAMMES (AMP)

The Ministry of Fisheries revised the AMP framework in December 2000. The AMP framework is intended to apply to all proposals for a TAC or TACC increase, with the exception of fisheries for which there is a robust stock assessment. In March 2002, the first meeting of the new Adaptive Management Programme Working Group was held. Two changes to the AMP were adopted:

- a new checklist was implemented with more attention being made to the environmental impacts of any new proposal;
- the annual review process was replaced with an annual review of the monitoring requirements only. Full analysis of information is required a minimum of twice during the 5 year AMP.

SPO 3

The first SPO 3 TACC increase (from 364 t to 430 t) took effect in the 1991–92 fishing year under the adaptive management programme (AMP). A subsequent increase to 600 t was granted in 2000 for the 2000–01 fishing year. The SPO 3 AMP (and 600 t TACC) was extended for an additional year i.e. 2004/05 when the previous 5-year term ended.

Full-term Review of SPO 3 AMP in 2005

In 2003 the AMP FAWG reviewed the performance of the AMP after 4 years at the higher TACC level (SeaFIC 2005a). The WG noted:

Characterisation

- Despite the increased in TACC to 600t in October 2000, reported annual landings declined from 458 t in 2000/01 to 354 t in 2003/04.
- Approximately 75% of the SPO 3 catch is taken by setnet, with the remainder taken as a bycatch in the mixed species bottom-trawl fishery. Most of the setnet catch is targeted at SPO, although a substantial proportion is taken when targeting other shark species (SCH, SPD and ELE).

CPUE standardization

- The accepted index of abundance for SPO 3 is based on non-zero catches recorded by the shark set-net fishery. Lognormal GLM standardization produced a trend that declined from 1989/90, increased to 1997/98 and then declined to 2003/04. Coefficients of variation were low and the index was encouragingly smooth (i.e. low interannual variation). The diagnostic plots were also acceptable
- Although CPUE of non-zero catches declined over the last 6 years, the proportion of zero catches has declined over this period. Standardization of the annual proportion of zero catches using a binomial model produced a highly variable but generally increasing index of abundance. Combining the log normal and binomial indices produced a trend that was similar to that of the lognormal model but with considerably more interannual variation.
- SEFMC also standardized the CPUE of SPO 3 in the flatfish and mixed bottom trawl fisheries. In both cases the index based on non-zero catch depicted a flat or slightly declining trend. The effect of combining this with a binomial index of zero catches resulted in abundance trends that overall increased slightly from 1989 to 2003/04. Larger rig do not appear to be vulnerable to trawling with the result that these trends cannot reflect the abundance of the entire SPO 3 population.
- During the Inshore WG meeting on the 28 April, it was established that although the conversion factor for rig had changed twice during the analysis period the landings for the earlier part of the series had not been recalculated so that the greenweight landings would be equivalent across the entire series. The lognormal CPUE standardization of setnet catch was repeated with corrected landed catches and the results presented to the AMP FAWG on 29 April 2005 (AMP-WG-05/25). The revised series showed some structure but showed no overall trend over the 15-year period.

Effects of fishing

- Voluntary set net codes of practice, including closed areas, have been introduced by SEFMC to reduce interactions with dolphins and penguins. The code of practice is updated every year.
- DOC are monitoring hectors dolphin and seabird interactions. The current season has 100 observer days allocated to the set net fishery.
- Catch rates of seabirds and marine mammals were not reported.
- The NPOA for Seabirds does not require information on capture rates of seabirds for this fishery.

Log Book Programme

- The logbook programme covers the set-net fishery since it catches 75% of annual landings.
- Logbook coverage of the setnet fishery was 23, 13 and 24% of the catch and 22,12 and 17% of effort during the last three fishing years based on the simple ratio of catch weights. Coverage ranged between 59 and 72% when the sampling was stratified by month and statistical area.
- The number of participating vessels dropped from 13 to 9 during this period.
- With the exception of 2003/04, annual areal coverage had been relatively poor – statistical areas 22 and 24 were generally over represented. Improvement in 2003/04 is attributed to increased participation in the FMA 5 set-net logbook programme. Temporal coverage of the logbook programme was shown to be adequate in most years of the programme.
- Spatial analysis of logbook catch information revealed that the setnet SPO 3 catch was taken from three distinct areas: Pegasus Bay, the Cantebury Bight and Southland/Stuart Island. Given the large area of SPO 3 and the substantial annual variability in size composition and sex ratio, the AMP FAWG requested in 2004 that "future analyses of biological information from this logbook should be stratified by area and season".
- Analysis of the size composition of the SPO 3 catch in statistical area 022 indicated that the size of both males and females had declined.

- The size of females appears also to have declined along the south coast of the South Island.
- Sex ratios were provided based on weight instead of number and the WG requested that these should also be presented in terms of numbers.

Conclusion

- Declines in CPUE, annual landings and mean size of males and females suggest that abundance of SPO3 may have declined over the last six years
- Without a stock assessment, it is not possible to determine whether the stock is above or below Bmsy. It is not sure whether a robust stock assessment is achievable, given the relatively low contrast in the abundance index.
- The WG agreed that the logbook programme was adequate, particularly in the most recent fishing year.
- The Lognormal model of non-zero setnet CPUE should remain the accepted index of abundance.
- Estimates of annual catch of seabirds and marine mammals by set net should be reported.
- The AMP should not be referred to the Plenary.

Annual Review of SPO 3 AMP in 2006

In 2006 the AMP FAWG reviewed the performance of the logbook monitoring programme (Lydon et. al. 2006). The WG noted:

- Although the TACC was increased from 454 t to 600 t under AMP management in October 2000, the annual reported catch for the fishing years 2000/01 to 2004/05 ranged between 354 and 458t.
- The logbook programme aims to collect length measurements (males and females separate) and detailed catch and effort information for every set (i.e. 100% coverage) of the set-net fishery targeting elephant fish, school shark and rig.
- Approximately 12% of the setnet catch was sampled by the logbook programme in 2004/05.
- The number of participants and consequently coverage levels and the number of fish measured had dropped substantially over the last three fishing years.
- Current levels of coverage were probably considerably lower than that necessary to effectively monitor SPO 3. Log book coverage should therefore be substantially improved.

SPO 7

The SPO 7 TACC was increased from 294 t to 350 t (beginning with the 1991–92 fishing year) under the Adaptive Management Programme (AMP). The stock assessment criteria, decision rules and monitoring programme were revised in 2000 and 2001.

Full-term Review of SPO 7 AMP in 2006

In 2006 the AMP FAWG reviewed the performance of the AMP after 4 years in its current 5-year term and 12 years at the higher (350 t) TACC (Starr et al. 2006a). A stock assessment was also presented and reviewed (Starr et al. 2006b) The WG noted:

Characterisation

- Sixty-two percent of SPO 7 catch is taken by setnet and 37% by bottom trawl. Whilst most trawled rig are taken by vessels targeting flatfish or barracouta, the setnet catch is largely targeted at rig. Half the setnet catch and a third of the bottomed trawled catch of rig comes from statistical area 038 (Tasman and Golden Bays).

- Annual catches have ranged between 264t and 293t over the last four fishing years and have thus been below the level of the pre-AMP TACC (294t). However, conversion factors for rig have dropped twice since 1989–90 and these changes would exagerate the discrepancy between early and present catches.

CPUE standardisation

- Data preparation/grooming was substantially improved during the 2004 analysis and has been further refined since then. It is important to note that catches were adjusted to account for temporal changes in conversion factor.
- Standardised CPUE for the set-net fishery appeared to reflect the abundance of SPO7.
- Lognormal standardisation of non-zero set-net catches for core vessels on the west coast produced an annual index that peaked in 1995/96 and although fluctuating depicted no clear trend since then. Logistic modelling of zero catches had little effect on the combined index.
- Lognormal standardisation of non-zero set-net catches for core vessels operating in stat. area 038 produced an annual index that declined consistently since 1989/90. Logistic modelling of zero catches produced an annual index that, although highly variable, also showed a general decline. The trend of the combined index was very similar to that based on non-zero catches.

Effects of fishing

- A set net code of practice was implemented in 2002 by Challenger Finfish.
- Non-fish bycatch was recorded for the first time in 2005/06 via DOC CSP observer coverage. Three shags were recorded in 25 days of fishing.
- Non-fish by-catch was not currently reported by fishers but would be reported once the Mfish non-fish bycatch form has been implemented.

Log Book Programme

- Logbook coverage of the SPO7 catch had been good during the current term 2001/02 to 2004/05. Between 53 and 85% of set-net catch and 14 and 25% of the bottom trawl catch was biologically sampled each year through log book coverage. Analysis of this data revealed good spatial and temporal coverage.

Stock Assessment

- This was the first stock assessment completed within an AMP programme and was also the first chondrichthyan assessment completed in New Zealand.
- The age structured Bayesian stock assessment had the following key inputs: standardized CPUE abundance series for the 038 set net fishery, relative abundance indices from the WCSI trawl survey, size composition from commercial set net and bottom trawl fisheries, size composition of the survey catch.
- Methods, including data processing and model structure, were commendable.
- The results were satisfactory

Conclusions

- The SPO 7 stock was almost certainly below Bmsy. There was however some uncertainty as to where the stock was in relation to B0. It was therefore not possible to produce reliable stock projections necessary to derive an assessment based TACC.
- Based on declining indices of abundance, current catches and the TACC (which has been substantially under caught for the last five years) are not sustainable.
- The stock assessment should be repeated once the results of the 2007 WCSI survey become available. The results should be presented to the AMP FAWG in March 2008.
- The 2008 stock assessment should include the following:
    - § Sensitivity runs based on higher historical catches prior 1975 to account for probable dumping by trawlers.
    - § Length-at-age data for large females. Additional animals would therefore need to be aged.
    - § Length composition of the commercial catch (trawl and set net).

- § An evaluation of appropriate stock recruit relationships for sharks.
- § 5-year stock projections

- A major uncertainty in this stock assessment is the relationship of rig stocks between areas: is SPO 7 a unit stock? If not, what is the correct relationship of sub-areas within SPO 7 or with SPO 3 or SPO 8? The WG agreed that there was uncertainty in this issue and that information should be collected to address this problem.
- Rig could be opportunistically tagged on both ECSI and WCSI inshore surveys to gain a better understanding of stock relationships. Tag returns should be interpreted in relation to the spatial distribution of effort available from the new set-net form.

Annual Review of SPO 3 AMP in 2004

In 2005 the AMP FAWG reviewed the performance of the logbook monitoring programme (SeaFIC 2005b). The WG noted:

Log Book Programme

- The number of bottom trawlers participating in the logbook programme declined from 19 in 2002/03 to 13 in 2003/04, and the estimated catch samples dropped from 28 to 17.4t. The number of trawled rig biologically sampled nevertheless remained similar.
- Set net coverage remained similar in terms of the number of participants, the catch sampled and the number of fish measured. The number of set net participants (n=10) remained unchanged.
- Logbook coverage of SPO 7 appeared to be adequate.

Effects of Fishing

- Information on non-fish bycatch was not reported.

6. STATUS OF THE STOCKS

No estimates of current and reference biomass are available.

SPO 1

For SPO 1, landings have generally declined since 1991–92. This decline may be partially due to quota distribution problems. Pattern in relative abundance suggest that recent catch levels are probably sustainable. However, it is unknown whether the current TACC is sustainable, or whether the recent catch levels and the current TACC are at levels that will allow the stock to move towards a size that would support the maximum sustainable yield.

SPO 2

For SPO 2, landings have exceeded the TACC every year since 1991–92. In 1997, agreement could not reached on whether recent catch levels or the current TACC are sustainable. It is not known whether recent catches and the current TACC are at levels that will allow the stock to move towards a size that would support the maximum sustainable yield.

SPO 3

SPO 3 is being managed within an adaptive management programme (the TACC was increased to 600 t in 2000–01) with a decision rule relating to CPUE. Recent catch levels and the current TACC appear sustainable, but it is unknown if they are at levels that will allow the stock to move towards a size that would support the maximum sustainable yield.

SPO 7

SPO 7 is being managed within an adaptive management programme (TACC increased from 294 to 350 t in 1991/92). The AMP FAWG concluded based on a stock assessment, and trends in abundance indices, that SPO7 was below Bmsy and that neither current catches nor the TACC were sustainable.

SPO 8

For SPO 8, landings increased until 1995–96 and then have declined steadily; the current catch was 216 t in 2001–02. All recorded landings have been less than the TACC. Recent catch levels are probably sustainable. However, it is unknown whether the current TACC is sustainable, or whether the recent catch levels and the current TACC are at levels that will allow the stock to move towards a size that would support the maximum sustainable yield.

Summary of yield estimates (t), TACCs (t) and reported landings (t) of rig for the most recent fishing year.

Fishstocks		FMA	MCY	2004–05 Actual TACC	2004–05 Reported landings
SPO 1	Auckland (East) (West)	1 & 9	630	692	429
SPO 2	Central (East)	2	< 70	86	108
SPO 3	South-East (Coast) (Chatham), Southland and Sub-Antarctic	3, 4, 5 & 6	–	600	366
SPO 7	Challenger	7	–	350	266
SPO 8	Central (West)	8	270	310	208
SPO 10	Kermadec	10	–	10	0
Total				2 048	1 377

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