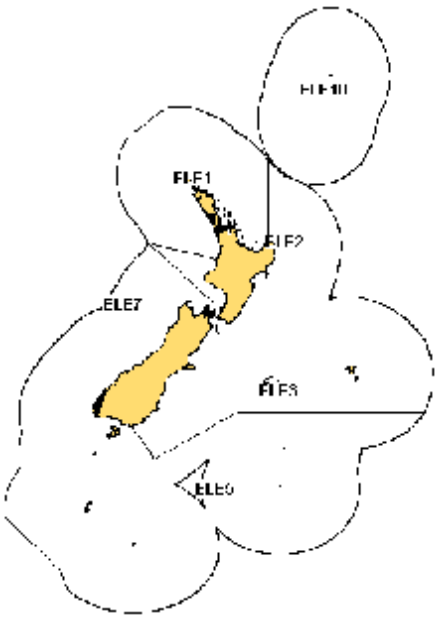
ELEPHANT FISH (ELE)

(*Callorhinchus milii*)



1. FISHERY SUMMARY

(a) Commercial fisheries

Reported landings since 1936 are shown in Tables 1 and 2. From the 1950s to the 1980s, landings of elephantfish of around 1000 t were common. Most of these landings were from the area now encompassed by ELE 3 but fisheries for elephantfish also developed on the south and west coasts of the South Island in the late 1950s and early 1960s, with average catches of around 70t per year in the south (in the 1960s to the early 1980s) and 10-30t per year on the west coast. Total annual landings of elephantfish dropped considerably in the early 1980s (between 1982-83 and 1994-96 they ranged between 500 and 700t) but later increased again so the point that they have exceeded 1000t since 1995–96.

Table 1: Reported total landings of elephantfish for calendar years 1936 to 1982. Sources: MAF and FSU data.

Year	Landings (t)	Year	Landings (t)	Year	Landings (t)	Year	Landings (t)	Year	Landings (t)	Year	Landings (t)
1936	116	1944	270	1952	459	1960	1 163	1968	862	1976	705
1937	184	1945	217	1953	530	1961	983	1969	934	1977	704
1938	201	1946	235	1954	853	1962	1 156	1970	1 128	1978	596
1939	193	1947	188	1955	802	1963	1 095	1971	1 401	1979	719
1940	259	1948	230	1956	980	1964	1 235	1972	1 019	1980	906
1941	222	1949	310	1957	1 069	1965	1 111	1973	957	1981	690
1942	171	1950	550	1958	1 238	1966	1 112	1974	848	1982	661
1943	220	1951	602	1959	1 148	1967	934	1975	602	–	–

The TACC for ELE 3 has, with the exception of 2002-03, been consistently exceeded since 1986-87. The ELE 3 TACC was consequently increased to 500 t for the 1995–96 fishing year, and then increased twice more under AMP management: initially to 825 t in October 2000 and then to 950t in October 2002. This new TACC combined with the allowances for customary and recreational fisheries (5 t each), brings the new TAC for the 2002–03 fishing year in ELE 3 to 960 t. The ELE 3 fishery is seasonal, mostly over spring and summer in inshore waters. Most of the recent increase in catch from the ELE 3 fishery has been taken as a bycatch of the RCO 3 trawl fishery (Raj and Voller 1999). During the 1989–90 to 1997–98 period, the level of elephantfish bycatch from the RCO 3 fishery increased from around 50 t to 300 t (Raj and Voller 1999). There was also a steady increase in the level of ELE 3 by-catch from the FLA 3 trawl fishery, with catches increasing from around 50 t in 1994–95 to 150 t in 1997–98. The fishery in ELE 5 is mainly a trawl fishery targeted at the flatfish species and

to a lesser extent giant stargazer.
Very little catch in ELE 5 is taken by target setnet fisheries. The ELE 5 TACC for was increased from 71 t to 100 t under an AMP in October 2001. The TACC was further increased under AMP Management to 120 t in October 2004.

Table 2: Reported landings (t) of elephantfish by Fishstock from 1983–84 to 2004–05 and actual TACCs (t) from 1986–87 to 2004–05.

Fishstock	ELE 1		ELE 2		ELE 3		ELE 5		ELE 7		ELE 10			
FMA (s)	1 & 9		2 & 8		3 & 4		5 & 6		7		10		Total	
	Landings	TACC	Landings	TACC	Landings	TAC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1983–84*	<1	–	5	–	605	–	94	–	60	–	0	–	765	–
1984–85*	<1	–	3	–	517	–	134	–	50	–	0	–	704	–
1985–86*	<1	–	4	–	574	–	57	–	46	–	0	–	681	–
1986–87†	<1	10	2	20	506	280	48	60	29	90	0	10	584	470
1987–88†	<1	10	3	20	499	280	64	60	44	90	0	10	610	470
1988–89†	<1	10	1	22	450	415	49	62	43	100	0	10	543	619
1989–90†	<1	10	3	22	422	418	32	62	55	101	0	10	510	623
1990–91†	<1	10	5	22	434	422	55	71	59	101	0	10	553	636
1991–92†	<1	10	11	22	450	422	58	71	78	101	0	10	597	636
1992–93†	<1	10	5	22	501	423	39	71	61	102	0	10	606	638
1993–94†	<1	10	6	22	475	424	46	71	41	102	0	10	568	639
1994–95†	<1	10	5	22	580	424	60	71	39	102	0	10	684	639
1995–96†	<1	10	7	22	688	500	72	71	93	102	0	10	862	715
1996–97†	<1	10	9	22	734	500	74	71	94	102	0	10	912	715
1997–98†	<1	10	12	22	910	500	95	71	66	102	0	10	1 082	715
1998–99†	<1	10	9	22	842	500	129	71	117	102	0	10	1 098	715
1999–00†	<1	10	6	22	950	500	105	71	87	102	0	10	1 148	715
2000–01†	2	10	7	22	956	825	153	71	90	102	0	10	1 207	1 040
2001–02†	<1	10	9	10	852	825	105	100	88	102	0	10	1 053	1 057
2002–03†	1	10	9	10	950	950	106	100	59	102	0	10	1 125	1 182
2003–04†	<1	10	10	10	984	950	102	100	42	102	0	10	1 139	1 182
2004–05†	<1	10	13	10	972	950	125	120	74	102	0	10	1 184	1 202

* FSU data.
† QMS data.

(b) Recreational fisheries

Catches of elephantfish by recreational fishers are low compared to those of the commercial sector. Recreational fishing surveys carried out by the Ministry of Fisheries in the early 1990s estimated the recreational catch of elephantfish in the South region of ELE 3 in 1991–92 at 3000 fish, 1000 fish in the Central region of ELE 7 in 1992–93, and no catch was reported in the North region in 1993–94 (Teirney et al., 1997). The national diary survey of recreational fishers in 1996 estimated that recreational catches of elephantfish were less than 500 fish in ELE 2, 1000 fish in ELE 3 and less than 500 fish in ELE 7 (Bradford, 1998). Estimates from the 1999/2000 recreational survey were 1000 fish in ELE 2, 2000 fish in ELE 3 and less than 500 in ELE 7 (Boyd and Reilly 2002). Owing to biases inherent to telephone v.s. face-to-face interviews, the 1999/2000 estimate is regarded to be the most accurate.

(c) Maori customary fisheries

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

(d) Illegal catch

There are reports of discards of juvenile elephantfish by trawlers from some areas. However, no quantitative estimates of discards are available.

(e) Other sources of mortality

The significance of other sources of mortality has not been documented.

2. BIOLOGY

Elephantfish are uncommon off the North Island, occurring south of East Cape on the east coast and south of Kaipara on the west coast. They are most plentiful around the east coast of the South Island.

Males mature at a length of 50 cm fork length (FL) at an age of 3 years, females at 70 cm FL at 4 to 5 years of age. The maximum age cannot be reliably estimated, but appears to be at least 9 years and may be as high as 15 years. The M value of 0.35 used is based on unvalidated ageing work indicating a maximum age of 13 years. This results from use of 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.

Mature elephantfish migrate to shallow inshore waters in spring and aggregate for mating. Eggs are laid on sand or mud bottoms, often in very shallow areas. They are laid in pairs in large yellow-brown egg cases. The period of incubation is at least 5–8 months, and juveniles hatch at a length of about 10 cm FL. Females are known to spawn multiple times per season. After egg laying the adults appear to disperse and are difficult to catch; however, juveniles remain in shallow waters for up to 3 years. During this time juveniles are vulnerable to incidental trawl capture, but are of little commercial value.

Biological parameters analysis relevant to the stock assessment are shown in Table 3. Provisional Von Bertalanffy growth curves based on MULTIFAN are available for Pegasus Bay and Canterbury Bight in 1966–68 and 1983–88. Because the growth curves were based on a MULTIFAN analysis of length-frequency data, the ages of the larger fish were probably underestimated and the growth curves are only reliable to about 4–5 years. Fish appear to be growing faster in the 1980's than in the 1960's.

Table 3: Estimates of biological parameters for elephant fish.

Fishstock	Estimate			Source
1. Natural mortality (M)				
All	0.35			M.P. Francis (1997)
2. Weight = a (length)^b (Weight in g, length in cm fork length)				
ELE 3 both sexes combined	$a = 9.1 \times 10^{-3}$ b = 3.02			Gorman (1963)
3. Von Bertalanffy Growth Function				
	Pegasus Bay 1966–68		**Canterbury Bight 1966–68**	
	Males	**Females**	**Males**	**Females**
K (yr^{-1})	0.231 ± 0.002	0.096 ±0.001	0.089 ± 0.002	0.060 ± 0.001
L_∞ (cm)	74.7 ± 0.12	156.9 ± 1.38	141.5 ± 2.28	203.6 ± 3.2
t_0 (yr)	-0.78 ± 0.008	-0.87 ± 0.006	-0.96 ± 0.008	-1.06 ± 0.009
	Pegasus Bay 1983–84		**Canterbury Bight 1988**	
	Males	**Females**	**Males**	**Females**
K (yr^{-1})	0.473 ± 0.009	0.195 ±0.008	0.466 ± 0.008	0.224 ± 0.001
L_∞ (cm)	66.9 ± 0.52	113.9 ± 2.89	62.7 ± 0.23	94.1 ± 0.26
t_0 (yr)	-0.24 ± 0.017	-0.53 ± 0.023	-0.38 ± 0.015	-0.69 ± 0.006

3. STOCKS AND AREAS

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

There is only limited information available to support existing stock boundaries. Results from tagging studies conducted during 1966–69 indicate that elephantfish tagged in the Canterbury Bight remained in ELE 3. Separate spawning grounds to maintain each ‘stock’ have not been identified. The boundaries used are related to the historical fishing pattern when this was a target fishery.

4. STOCK ASSESSMENT

There are no new data which would alter the yield estimates given in the 1996 Plenary Report. The yield estimates are based on commercial landings data only and have not changed since the 1988 Plenary Report.

(a) Estimates of fishery parameters and abundance

(i) Trawl survey biomass indices

Indices of relative biomass are available from recent trawl surveys (Table 4). These have not been used to estimate absolute biomass or yields as historically, these trawl surveys have given variable abundance and high c.v.'s for elephantfish, and probably have not monitored their biomass very well. A pilot survey off the east coast of the South Island was undertaken in the summer of 1996–97 and was repeated in 1997–98, 1998–99, 1999–00 and 2000–01. This survey was initiated for several reasons, including a need to better survey elephantfish in ELE 3 in view of the recent TACC increase. In February 1999, the Inshore Fishery Assessment Working Group concluded that it was not clear whether the ECSI trawl survey was adequately sampling elephantfish, as the commercial fishery for this species included depths <10 m and the *Kaharoa* is unable to trawl in such areas. Subsequently, in 1999–00 and 2000–01 the commercial vessel *Compass Rose* carried out surveys (concurrently) with the *Kaharoa* in which it fished areas inside 10 m. In 2001 the Inshore FAWG recommended that the east coast South Island trawl survey be discontinued due to the extreme variability in the catchability of the target species. A workshop to review the monitoring of inshore finfish (May 2006) concluded that the ECSI winter survey series should be reinstated, as based on simulations using existing data, it was predicted to provide useful relative biomass estimates for many species (excluding elephantfish). The workshop concluded that ELE 3 relative biomass should be estimated using industry run "hybrid" surveys.

Table 4: Relative biomass indices (t) and coefficients of variation (c.v.) for elephant fish for east coast South Island (ECSI) – summer and winter, west coast South Island (WCSI) and the Stewart-Snares Island survey areas assuming areal availability, vertical availability and vulnerability equal 1.0. Biomass is only estimated outside 10 m depth except for COM9901 and CMP0001. Note: because trawl survey biomass estimates are indices, comparisons between different seasons (e.g., summer and winter ECSI) are not strictly valid.

Region	Fishstock	Year	Trip number	Biomass estimate	c.v. (%)
ECSI(winter)	ELE 3	1991	KAH9105	300	40
		1992	KAH9205	176	32
		1993	KAH9306	481	33
		1994	KAH9406	152	33
		1996	KAH9606	858	30
ECSI(summer)	ELE 3	1996–97	KAH9618	1 127	31
		1997–98	KAH9704	404	18
		1998–99	KAH9809	1 718	28
		1999-00	KAH9917	1 097	25
		1999–00	COM9901	802	73
				+475	(inside 10m) 79
		2000-01	KAH0014	693	18
		2000-01	CMP0001	1 229	29
				+84	(inside 10m) 23
WCSI	ELE 7	1992	KAH9204	38	42
		1994	KAH9404	167	33
		1995	KAH9504	85	35
		1997	KAH9701	94	33
		2000	KAH0004	42	63
Stewart-Snares	ELE 5	1993	TAN9301	219	33
		1994	TAN9402	177	47
		1995	TAN9502	69	49
		1996	TAN9604	137	46

(ii) CPUE biomass indices

ELE 3 is monitored using standardized CPUE, based on non-zero catches recorded by bottom trawl fishery targeting RCO, as an index of relative abundance. The CPUE trend was updated to 2003/04 as part of the ELE 3 AMP in 2005 (SeaFIC 2005).

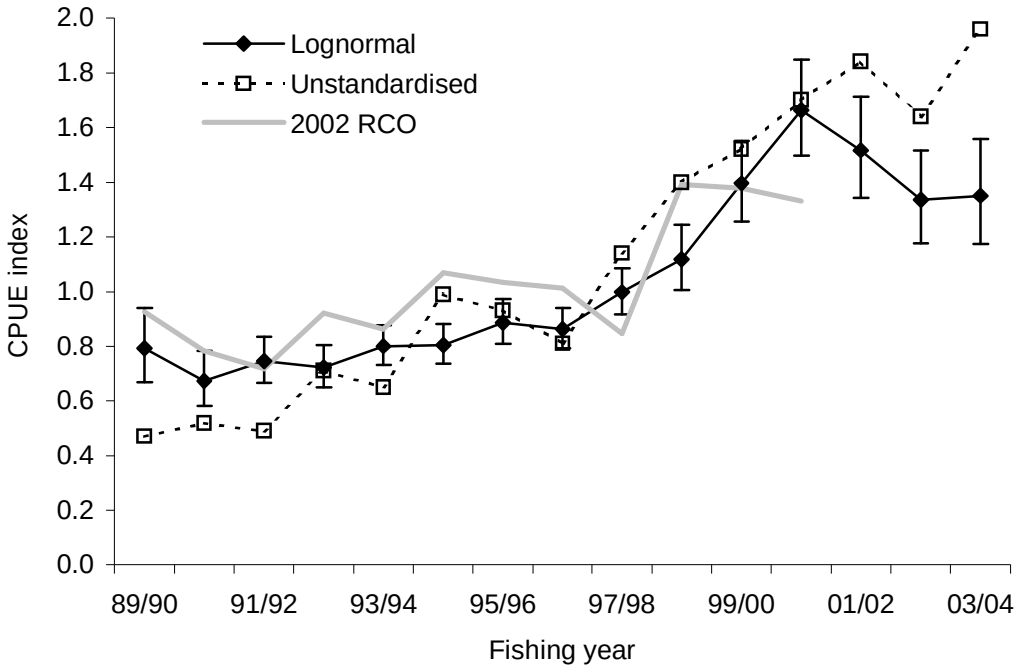


Figure 1: Relative CPUE indices for ELE 3 using the loglinear non-zero model based on the bycatch in the RCO3 target trawl fishery. Error bars are ± 2*SE. The equivalent series from the 2002 RCO3 target fishery is also shown as a thick grey line.

(b) Biomass Estimates

Estimates of current and reference absolute biomass are not available.

(c) Estimation of Maximum Constant Yield (MCY)

MCY was estimated from the equation MCY = cY_{av} (Method 4). The value c was set equal to 0.7 based on the estimate of M = 0.35. Mean catches for the years 1983–84 to 1985–86 were used to estimate MCY because the fishery appeared to stabilise after an earlier period of decline.

(i) South–East (Coast) and South–East (Chatham Rise) (ELE 3)

MCY = 0.7 * 565.5 t = 396 t (rounded to 400 t).

(ii) Southland and Sub–Antarctic (ELE 5)

MCY = 0.7 * 94.9 t = 66 t (rounded to 70 t).

(iii) Challenger/Central (Plateau) (ELE 7)

MCY = 0.7 * 52.3 t = 37 t (rounded to 40 t).

The estimate of M is uncertain and recruitment variability may be low, so the estimate of c is uncertain. The MCY estimates are considered approximate and are probably conservative.

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 cannot be determined.

Yield estimates are summarised in Table 5.

Table 5: Yield estimates (t) for elephant fish.

Parameter	Fishstock	Estimate
MCY	ELE 3	400
	ELE 5	70
	ELE 7	40
	Total	510
CAY	All	Cannot be determined

(e) Other yield estimates and stock assessment results

No other yield estimates are available.

(f) Other Factors

The amount of quota allocated was below historic catch levels and has reduced elephantfish mainly to a trawl bycatch for inshore vessels. On the east coast of the South Island the availability of elephantfish since the start of the QMS appears to have been high, and many individual fishers have exceeded their quotas. As a result, deeming and bycatch trading of this species has increased.

Target fishing for elephantfish using set nets has decreased since the introduction of the QMS. The distribution of the target trawl species such as red cod, barracouta and flatfish influences the likelihood of fishers encountering elephantfish.

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.

ELE 3

The ELE 3 TACC has been increased twice under AMP management: from 500 to 825t in October 2000 and from 825 to 950t in October 2002.

Mid-term Review of ELE 3 AMP in 2005

In 2005 the AMP FAWG reviewed the performance of the AMP after 2 years in its current 5-year term (SeaFIC 2005). The WG noted:

Characterisation

- Landings rose sharply from 1994/95 to 1999/2000 and the TACC was substantially overcaught during this period. Annual landings over the last two fishing years have however closely approximated the new TACC. Most of the annual catch is taken by bottom trawl (84 %) with a

significant proportion (16%) by setnet. ELE 3 is mainly caught in spring and summer at depths <100m.

CPUE standardization

- The accepted index of abundance for ELE 3 is based on non-zero catches recorded by the bottom trawl fishery targeted at RCO. Lognormal GLM standardization produced a trend that increased monotonically from about 0.7 in 1990/91 to 1.7 in 2000/01. This index declined to 1.3 in 2003/04. Combining the lognormal index with a binomial index based on zero catches created a higher peak in 2000/01 and a steeper decline since then.
- Two alternative indices - one from the shark setnet fishery and the other from the FLA bottom trawl fishery - were also presented. Trends were similar to that for the RCO bottom trawl fishery but peaks occurred a year earlier (ie 1999/2000) for the FLA index and a year later (i.e. 2001/02) for the setnet index.
- It is not clear whether these declines are driven by trends in abundance or by a response to management changes in these fisheries. For example the voluntary implementation of a considerable inshore closed area (south of Banks Peninsula) in 2000 and the avoidance of areas of high ELE 3 abundance (by operators with insufficient ACE) may have contributed to the trend. Increasing unstandardized and decreasing standardized CPUE trends indicates that there could possibly be a year/vessel interaction (ie behavioural change).

ELE 3 Decision Rule (current)

- If the CPUE biomass index based on non-zero landings of ELE 3 in the target RCO 3 bottom trawl fishery should remain above the average index for the period 1989–90 to 1993–94.
- The decision rule was not triggered in 2005.

Log Book Programme

- The ELE 3 AMP has two logbook programmes: one is a setnet logbook programme targeted at the shark setnet fishery in QMAs 3 and 5 and the other is bottom trawl programme targeted at the mixed species fishery in QMA 3. Each of these logbook programmes has two components: 1) detailed catch and effort information, including high resolution catch position and depth for most reports, and 2) biological information on the size composition of male and female elephant fish in the catch.
- Approximately 20 and 26% of the setnet catch was sampled, and 670 and 681 fish measured in 2002/03 and 2003/04, respectively. Coverage of 85 and 89% of the catch was estimated when stratified by month and statistical area.
- The number of participating vessels dropped from 13 in 2000/01 to 9 in 2003/04.
- Spatial and temporal coverage of the setnet catch has generally been good since1995/96. Temporal coverage was however inadequate in 2003/04.
- The trawl logbook programme was implemented in 2001/02. The number of participating vessels has increased from 2 in 2001/02 to 11 in 2003/04. The number of fish measured has increased from 379 to 6953 over this period.
- Although spatial coverage has been good since 2002/03, the temporal coverage is not as good in reflecting the patterns in the catch. Coverage was estimated at 22% of the ELE 3 catch by weight or at 67% of the stratified month and statistical area catch in 2003/04, the first year of reasonable coverage from this programme.

Effects of fishing

- ELE 3 is predominantly taken as a bycatch in the mixed species bottom trawl fishery. This fishery has had a long history and the increase in ELE 3 TACC may not have resulted in new areas fished or significant increases in effort.
- On the other hand the introduction of closed areas (voluntary or statutory) is likely to have displaced some effort and this should be addressed in future presentations .

Conclusion

- Given concerns over the ability of standardized CPUE to track abundance, the standardization of logbook CPUE (ie with higher spatial resolution) should be considered in future analyses. This would allow spatial trends and the impact of targeting different portions of the population (e.g. juveniles or adults) to be accounted for.
- Although the trawl logbook programme has improved dramatically over the last three years, more attention should be paid to temporal and spatial coverage.
- It is not known whether the stock is above or below Bmsy.

Annual Review of ELE 3 AMP in 2006

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

Logbook Programme

- There are two logbook programmes collecting biological information on ELE 3. One is a setnet logbook programme targeted at the shark setnet fishery in QMAs 3 and 5 and the other is bottom trawl programme targeted at the mixed species fishery in QMA 3.
- The setnet programme aims to collect length measurements (males and females separately) 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.
- Despite the target coverage of 100%, about 10% of the setnet catch of ELE 3 was sampled by the logbook programme. The number of participants, the number of sets and proportion of catch covered, and the number of fish measured have all dropped markedly over the last three fishing years.
- Approximately 84% of the annual ELE 3 catch is taken by bottom trawl.
- The proportion of the annual trawl catch sampled by the logbook programme dropped from about 20% in 2003/04 to 5% in 2004/05 because one participant who recorded a large number of target ELE tows did not participate in 2004/05.
- Logbook coverage of both setnet and trawl catch requires improvement.

ELE 5

The ELE 5 TACC for was increased from 71 t to 100 t under an AMP in October 2001. The TACC was further increased under AMP Management to 120 t in October 2004.

Review of ELE 5 AMP in 2003

The AMP Plenary reviewed a proposal from the South East Finfish Management Company (SEFMC) in 2003 to further increase the ELE 5 TACC from 100 to 120t (20%) to cover current overcatch on the grounds that ELE 5 is an unavoidable bycatch of the FLA 3 bottom trawl fishery.

Stock Assessment Criteria

- Although standardized CPUE has declined in both of the relevant statistical areas (025 and 030) since the 1999/2000 fishing year (SEFMAC 2003), industry argued that high deemed values for ELE 5 had resulted in avoidance or discarding, and therefore a negative bias in CPUE (as an index of abundance).
- Owing to the low spatial resolution of effort data, the Plenary could also not establish the extent to which the increase in ELE5 catch could have been caused by a shift in fisher behaviour. Trawl fisheries mainly targeting flatfish species account for approximately 90% of the annual catch during the current AMP for ELE 5, but have provided no additional information beyond the catch and effort logs required by the Ministry of Fisheries.
- Given the current circumstances the Plenary concluded that there is no reliable index of abundance for ELE 5. Without an index of abundance the Plenary was not in a position to

evaluate:

1. The likelihood that current biomass was above Bmsy.
2. Whether the proposed TAC would allow the stock to move towards Bmsy
3. Whether stock abundance had remained stable at current catch levels.

- It was noted that annual catches of ELE 5 had exceeded 120 t only 3 times during the last 50 years. However, the current TACC of 100 t has been exceeded in each of the most recent five fishing years.

Monitoring

The Plenary agreed that the following monitoring measures would be necessary:

- Trawl by-catch CPUE as a measure of abundance for ELE 5. The industry argue that given the requested increase in TACC, fishers would no longer need to avoid/discard elephant fish and that trawl CPUE would therefore improve as an index of abundance.
- A logbook programme providing high spatial resolution for ELE 5 catch and effort.
- Biological sampling of the set-net catch is not useful given the small amount taken by that method. Sampling the trawl catch, while difficult, would be beneficial. Up till now there has been no biological sampling of the trawl catch.

Decision Rule Criteria

Decision rules are not considered necessary. A full analysis of all information every 2-3 years is a more effective way to review the performance of the stock.

Environmental Considerations.

Given that the increase in TACC is requested to cover over-catch in the trawl fishery, no increase in effort or environmental impact is anticipated for either the trawl or the set-net fisheries.

Annual review of ELE 5 AMP in 2006

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

Logbook Programme

- There are two logbook programmes collecting biological information on ELE 3. One is a setnet logbook programme targeted at the shark setnet fishery in QMAs 3 and 5 and the other is bottom trawl programme targeted at the mixed species fishery in QMA 3.
- Approximately 10% of the ELE 5 annual catch is taken by setnet. Elephant fish are essentially a small bycatch of the setnet fishery for rig and school shark. The number of sets with associated logbook returns has declined by 50% since 2002/03. No elephant fish were measured.
- About 90% of the annual ELE 5 catch is taken by bottom trawl. Approximately 10% of the trawl catch was biologically sampled in 2004/05 and 1607 fish were measured.
- Although trawl logbook coverage is reasonable, attempts should be made to increase this to 20%.

6. STATUS OF THE STOCKS

No estimates of current and reference biomass are available.

ELE 2

It is not known if recent catch levels or the current TACC are sustainable or if they are at levels that will allow the stock to move towards a size that will support the maximum sustainable yield.

ELE 3

ELE 3 is currently being managed within an adaptive management programme with monitoring of a CPUE index derived from elephantfish landings in the red cod bottom trawl fishery. Before the introduction of the QMS, elephantfish off the south east coast of the South Island were considered severely overfished, and TACs were initially set at low levels to facilitate stock recovery. It now appears that this stock has rebuilt considerably since the mid-1980s, based on the observed catches, on the increasing biomass trend from the CPUE analysis. The TACC for ELE 3 was increased to 950 t for the 2002–03 fishing year under the AMP. Recent catch levels substantially exceeded the TACC and the MCY; but the MCY estimate is probably conservative. It cannot be determined if the current TACC of 950 t is sustainable in the long-term or will allow the stock to move towards the size that will support the maximum sustainable yield.

ELE 5

Before the introduction of the QMS elephantfish in Southland were considered severely overfished, and TACs were initially set at low levels to facilitate stock recovery. The TACC for ELE 5 was increased twice within the AMP - first to 100 t in October 2001 and then to 120t in October 2004 - as there was a reasonable probability that the stock was above the size that would support the MSY. However it is not known if recent catch levels and current TACCs are sustainable or if they are at levels that will allow the stocks to move towards a size that will support the MSY.

ELE 7

In ELE 7 catches since 1987–88 have been above the MCY and below the TAC. It is not known if recent catch levels and current TACCs are sustainable or if they are at levels that will allow the stocks to move towards a size that will support the MSY.

Summary of yields (t), TACCs (t), and reported landings (t) for elephant fish for the most recent fishing year.

Fishstock	QMA		MCY	2004–05 Actual TACC	2004-05 Reported landings
ELE 1	Auckland (East) (West)	1 & 9	–	10	<1
ELE 2	Central (East) (West)	2 & 8	–	10	13
ELE 3	South-East (Coast) (Chatham)	3 & 4	400	950	972
ELE 5	Southland and Sub-Antarctic	5 & 6	70	120	125
ELE 7	Challenger	7	40	102	74
ELE 10	Kermadec	10	–	10	0
Total			510	1 202	1 184

7. FOR FURTHER INFORMATION

Boyd, R.O., Reilly, J.L. (2002). 1999/2000 national marine recreational fishing survey: harvest estimates. *Draft New Zealand Fisheries Assessment Report*

Bradford, E. (1998). Harvest estimates from the 1996 national recreational fishing surveys. *N.Z. Fisheries Assessment Research Document 98/16* 27p.

Coakley, A. (1971). The biological and commercial aspects of the elephantfish. *Fisheries Technical Report No. 76*. 29 p.

Francis, M.P. (1996). Productivity of elephantfish – has it increased? Seafood NZ Feb 96: 22–25.

Francis, M.P. (1997). Spatial and temporal variation in the growth rate of elephantfish (*Callorhinchus milii*). *N.Z. Journal of Marine and Freshwater Research 31(9–23).*

Gorman, T.B.S. (1963). Biological and economic aspects of the elephantfish, *Callorhynchus milii* Bory, in Pegasus Bay and the Canterbury Bight. *Fisheries Technical Report No. 8*. 54 p.

Langley, A.D. (2001). The analysis of ELE 3 catch and effort data from the RCO 3 target trawl fishery, 1989–90 to 1999–2000. *New Zealand Fisheries Assessment Report 2001/66.* 33 p.

Lydon, G.J.; Middleton, D.A.J.; Starr, P.J. (2006). Performance of the ELE 3 and ELE 5 Logbook Programmes. AMP-WG-06/18. (Unpublished manuscript available from the NZ Seafood Industry Council, Wellington.)

McClatchie, S.; Lester, P. (1994). Stock assessment of the elephantfish (*Callorhinchus milii). N.Z. Fisheries Assessment Research Document 94/6.* 17 p.

Raj, L.; Voller, R. (1999). Characterisation of the south-east elephantfish fishery–1998. 55 p. (Report held by Ministry of Fisheries, Dunedin, New Zealand.)

SeaFIC (2000). Proposal to the Inshore Fishery Assessment Working Group. Placement of the ELE 3 into Adaptive Management Programme dated 23 March 2000 (presented to the Inshore Fishery Assessment Working Group 28 March 2000). Copies held by MFish.

SeaFIC (2002). Report to the Inshore Fishery Assessment Working Group: Performance of the ELE 3 Adaptive Management Programme (dated 25 February 2002). Copies held by MFish.

SeaFIC (2003a). 2003 performance report: ELE 3 Adaptive Management Programme. AMP-WG-2003/06 3p. Copies held by MFish.

SeaFIC (2003b). Report to the Adaptive Management Fishery Assessment Working Group: Performance of the ELE 5 Adaptive Management Programme and request for an additional increase in ELE 5. AMP-WG-2003/07 39 p. Copies held by MFish.

SeaFIC (2005a). 2005 Report to the Adaptive Management Programme Fishery Assessment Working Group: Performance of the ELE 3 Adaptive Management Programme. AMP-WG-2005/16. Copies held by MFish.

SeaFIC (2005b). 2005 Report to the Adaptive Management Programme Fishery Assessment Working Group: Performance of the ELE 5 Logbook Programme. AMP-WG-05/23. Copies held by MFish.

SEFMC (2002a). (Southeast Finfish Management Company) 2002 Report to the Inshore Fishery Assessment Working Group. Performance of the ELE 3 Adaptive Management Programme (dated 25 February 2002). Copies held by MFish.

SEFMC (2002b). (Southeast Finfish Management Company) 2002 Report to the Inshore Fishery Assessment Working Group. Performance of the ELE 5 Adaptive Management Programme (dated 25 February 2002). Copies held by MFish.

SEFMC (2003). (Southeast Finfish Management Company) 2003 Report to the Inshore Fishery Assessment Working Group. Performance of the ELE 5 Adaptive Management Programme and request for an increase in ELE 5 (dated 13 Nov 2003). Copies held by MFish.

Starr, P. J. (in prep.). Stock assessment of east coast South Island elephantfish (ELE 3). *Draft NZ Fisheries Assessment Report. 32 p.*

Sullivan, K.J. (1977). Age and growth of the elephantfish *Callorhinchus milii* (Elasmobranchii: Callorhynchidae). *N.Z. Journal of Marine and Freshwater Research 11*: 745–753.

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.