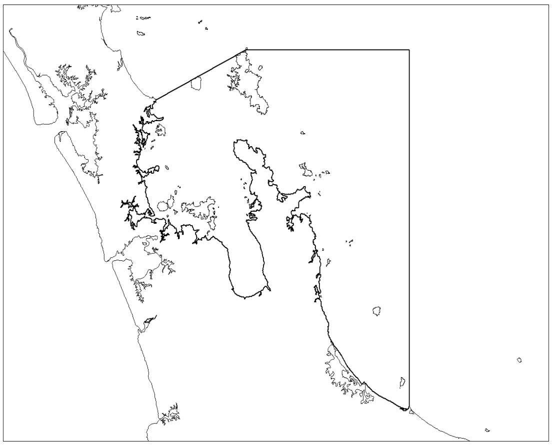
SCALLOPS COROMANDEL (SCA CS)

(*Pecten novaezelandiae*)
Kuakua, Tipa



1. FISHERY SUMMARY

1.1 Commercial fisheries

Scallops support regionally important commercial fisheries between Tauranga and Cape Rodney, the limits of the Coromandel fishery. Fishing is conducted within a number of discrete beds around Little Barrier Island, east of Waiheke Island (though not in recent years), at Colville, north of Whitianga (to the west and south of the Mercury Islands), and in the Bay of Plenty (principally off Waihi, and around Motiti and Slipper Islands). All commercial fishing is by dredge, with fishers preferring self-tipping "box" dredges to the "ring bag" designs used in Challenger and Chatham Island fisheries. The Coromandel commercial scallop fishing season runs from 15 July to 21 December each year.

A wide variety of effort controls and daily catch limits have been imposed in the past, but, since 1992, the fishery has been limited by explicit seasonal catch limits specified in meatweight (adductor muscle with roe attached), together with some additional controls on dredge size, fishing hours and non-fishing days. Catch and catch rates from the Coromandel fishery are variable both within and among years, a characteristic typical of scallop fisheries worldwide. Catch rates typically decline as each season progresses, but such declines are highly variable and depletion analysis cannot be used to assess start-of-season biomass.

Until the 1994 season, the minimum legal size for scallops taken commercially in northern (Coromandel and Northland) scallop fisheries was 100 mm shell length. From 1995 onwards, a new limit of 90 mm shell length was applied in the Coromandel (but not the Northland) fishery as part of a management plan comprising several new measures. Since 1980 when the fishery was considered to be fully-developed, landings have varied more than 30-fold from less than 50 t to over 1500 t (greenweight). The two lowest recorded landings were in 1999 and 2000.

Coromandel scallops were introduced into the QMS on 1 April 2002, with a TAC of 48 t, a TACC of 22 t, allowances of 7.5 t for recreational fisheries and 7.5 t for customary fisheries, and an allowance of 11 t for other sources of mortality. Northern scallop fisheries are managed under the QMS using individual transferable quotas (ITQ) that are proportions of the Total Allowable Commercial Catch (TACC). Catch limits and landings from the Coromandel fishery are shown in Table 1, while the landings and TACC for this stock are depicted in Figure 1. Both northern scallop fisheries have been gazetted on the Second Schedule of the Fisheries Act 1996 which specifies that, for certain "highly variable" stocks, the Annual Catch Entitlement (ACE) can be increased within a fishing season. The TACC is not changed by this process and the ACE reverts to the "base" level of the TACC at the end of each season.

Table 1: Catch limits and landings (t meatweight or greenweight) from the Coromandel fishery since 1974. The Coromandel commercial scallop season runs from 15 July to 21 December, inclusive. Data before 1986 are from Fisheries Statistics Unit (FSU) forms. Landed catch figures come from Monthly Harvest Return (MHR) forms, Licensed Fish Receiver Return (LFRR) forms, and from the landed section of Catch Effort and Landing Return (CELR) forms, whereas estimated catch figures come from the effort section of CELRs and are pro-rated to sum to the total CELR greenweight. "Hauraki" = 2X and 2W, "Mercury" = 2L and 2K, "Barrier" = 2R, 2S, and 2Q, "Plenty" = 2A–2I. Seasonal catch limits (since 1992) have been specified as ACE or on permits in meatweight ("Green" assumes the gazetted meatweight recovery conversion factor of 12.5% and probably overestimates the actual greenweight taken in most years). * 1991 landings include about 400 t from Colville; –, no catch limits set, or no reported catch.

			Landings (t)							
	Catch limits (t)		MHR	LFRR	CELR		Estimated catch (t green)			
Season	Meat	"Green"	Meat	Meat	Meat	Green	Hauraki	Mercury	Barrier	Plenty
1974	–	–	–	–	–	26	0	26	0	0
1975	–	–	–	–	–	76	0	76	0	0
1976	–	–	–	–	–	112	0	98	0	14
1977	–	–	–	–	–	710	0	574	0	136
1978	–	–	–	–	–	961	164	729	3	65
1979	–	–	–	–	–	790	282	362	51	91
1980	–	–	–	–	–	1 005	249	690	23	77
1981	–	–	–	–	–	1 170	332	743	41	72
1982	–	–	–	–	–	1 050	687	385	49	80
1983	–	–	–	–	–	1 553	687	715	120	31
1984	–	–	–	–	–	1 123	524	525	62	12
1985	–	–	–	–	–	877	518	277	82	0
1986	–	–	–	162	–	1 035	135	576	305	19
1987	–	–	–	384	–	1 431	676	556	136	62
1988	–	–	–	182	–	1 167	19	911	234	3
1989	–	–	–	104	–	360	24	253	95	1
1990	–	–	–	153	–	903	98	691	114	0
1991	–	–	–	203	–	1 392	*472	822	98	0
1992-93	154	1 232	–	147	–	901	67	686	68	76
1993-94	132	1 056	–	62	–	455	11	229	60	149
1994-95	66	528	–	49	–	323	17	139	48	119
1995-96	86	686	–	88	79	574	25	323	176	50
1996-97	88	704	–	81	80	594	25	359	193	18
1997-98	105	840	–	94	89	679	26	473	165	15
1998-99	110	880	–	37	19	204	1	199	2	1
1999-00	31	248	–	8	7	47	0	12	17	18
2000-01	15	123	–	7	10	70	0	24	2	44
2001-02	22	176	–	22	20	161	1	63	85	12
2002-03	35	280	28	32	31	204	0	79	12	112
2003-04	58	464	58	58	56	451	63	153	13	223
2004-05	78	624	78	78	78	624	27	333	27	237
2005-06	118	944	119	119	121	968	21	872	75	0
2006-07	118	944	118	118	117	934	28	846	60	0
2007-08	108	864	59	–	59	471	51	373	45	2

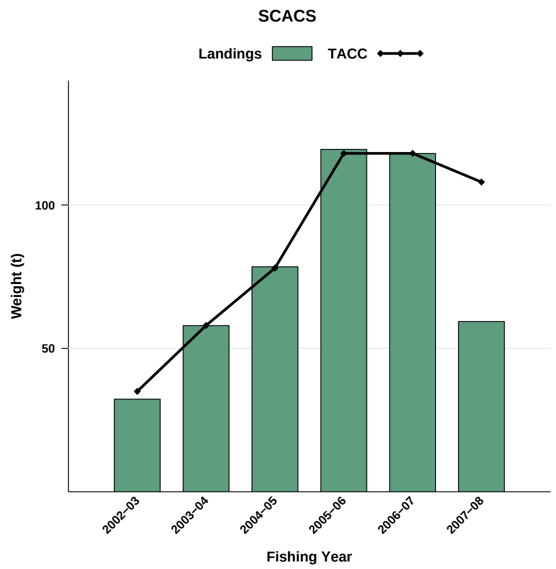


Figure 1: Historical landings and TACC for SCACS (Coromandel). Note that this figure does not show data prior to entry into the QMS.

1.2 Recreational fisheries

There is an intense non-commercial (recreational and Maori) interest in scallops throughout the Coromandel and Northland fisheries. Non-commercial fishing for scallops occurs in suitable areas throughout the two fisheries, mostly in enclosed bays and harbours. Scallops are usually taken by diving using snorkel or SCUBA, although considerable amounts are also taken using small dredges. In some areas, especially in harbours, scallops can be taken by hand from the shallow subtidal and even the low intertidal zones (on spring tides), and, in storm events, scallops can be cast onto lee beaches in large numbers. To some extent, management of northern scallop fisheries has concentrated on spatial separation of commercial and amateur fisheries through the closure of harbours and enclosed waters to commercial dredging. There remain, however, areas of contention and conflict, some of which have been addressed using additional voluntary or regulated closures. Recreational regulations restrict the daily harvest (bag limit) to 20 per person, there is a minimum legal size of 100 mm shell length. Until 2006, the recreational scallop season ran from 15 July to 14 February, but in 2007 the season was changed to run from 1 September to 31 March.

Currently, there are no reliable estimates of non-commercial harvest of scallops from the Coromandel or Northland fisheries. Estimates of catch by recreational fishers from the two northern scallop fisheries have been made on four occasions as part of recreational fishing (telephone and diary) surveys (Table 2). The Marine Recreational Fisheries Technical Working Group (FTWG) reviewed these surveys and recommended "that the telephone-diary estimates be used only with the following qualifications: 1) they may be very inaccurate; 2) the 1996 and earlier surveys contain a methodological error; and 3) the 1999–2000 and 2000–01 estimates are implausibly high for many important fisheries."

Given the above concerns about the reliability of non-commercial harvest estimates, it is difficult to make comparisons between the levels of commercial and non-commercial harvest. However, in 1993–94 the recreational harvest estimate was 60–70 t (greenweight) from the area shared with the Coromandel commercial fishery (Bradford 1997). These estimates may include some Maori customary catch. Commercial landings from the Coromandel controlled fishery in the most comparable period (July to December 1994 scallop season) were 323 t, suggesting that, in that year, the recreational catch of scallops was about 16–18% of total removals. It is not known if these estimates are typical of the recreational catch, but the commercial catch was very low and 1993–94 may not have been a typical year.

Table 2: Harvest estimates (number and greenweight) of scallops taken by recreational fishers in Coromandel and Northland (QMA 1) from the telephone-diary surveys conducted in 1993–94, 1996, 1999–00, and 2000–01. The Marine Recreational Fisheries Technical Working Group considered that these estimates may be very inaccurate.

	Coromandel			QMA 1 (Northland)			
Year	No. of scallops	CV	Weight (t, green)	No. of scallops	CV	Weight (t, green)	Reference
1993–94	626 000	0.14	60.0–70.0	374 000	0.17	40.0–60.0	Bradford (1997)
1996	614 000	0.12	62.0	272 000	0.18	32.0	Bradford (1998)
1999–00	257 000	1.01	30.1	634 000	0.34	69.8	Boyd and Reilly (2002)
2000–01	472 000	0.47	55.3	820 000	0.31	90.3	Boyd *et al.* (2004)

1.3 Customary non-commercial fisheries

Scallops were undoubtedly used traditionally as food by Maori, although quantitative information on the level of customary non-commercial take is not available.

1.4 Illegal catch

There is no quantitative information on the level of illegal catch.

1.5 Other sources of mortality

The box dredges in use throughout the Coromandel fishery have been found to be considerably more efficient than ring-bag or Keta-Ami dredges in the generally sandy conditions prevalent in the fishery. However, scallops encountered by box dredges showed modest reductions in growth rate compared with scallops collected by divers, and their mortality was high (up to about 50% for larger size classes). Stochastic modelling suggested that, of the three dredge designs tested, box dredges would generate the greatest yield-per-recruit and catch rates. The incidental mortality caused by dredging substantially changed the shape of yield-per-recruit curves for Coromandel scallops, causing generally asymptotic curves to become domed, and decreasing estimates of F_{MAX} and $F_{0.1}$. More recent field experiments and modelling suggest that dredging reduces habitat heterogeneity, increases juvenile mortality, makes yield-per-recruit curves even more domed, and decreases estimates of F_{MAX} and $F_{0.1}$ even further.

2. BIOLOGY

Pecten novaezelandiae is one of several species of "fan shell" bivalve molluscs found in New Zealand waters. Others include queen scallops and some smaller species of the genus *Chlamys*. *P. novaezelandiae* is endemic to New Zealand, but is very closely related to the Australian species *P. fumatus* and *P. modestus*. Scallops of various taxonomic groups are found in all oceans and support many fisheries world-wide. Most undergo large population fluctuations.

Scallops are found in a variety of coastal and intertidal habitats, but particularly in semi-enclosed areas where circulating currents are thought to retain larvae. After the planktonic larval phase and a relatively mobile phase as very small juveniles, scallops are largely sessile and move actively mainly in response to predators. They may, however, be moved considerable distances by currents and storms and are sometimes thrown up in large numbers on beaches.

Scallops are functional hermaphrodites, and become sexually mature at a size of about 60–70 mm shell length. They are extremely fecund and may spawn several times each year. Fertilisation is external and larval development lasts for about 3 weeks. Initial settlement occurs when the larva attaches via a byssus thread to filamentous material or dead shells on or close to the seabed. The major settlement of spat in northern fisheries usually takes place in early January. After growth to about 5 mm, the byssus is detached and, after a highly mobile phase as a small juvenile, the young scallop takes up the relatively sedentary adult mode of life.

The very high fecundity of this species, and likely variability in the mortality of larvae and pre-recruits, leads to great variability in annual recruitment. This, combined with variable mortality and growth rate of adults, leads to scallop populations being highly variable from one year to the next, especially in areas of rapid growth where the fishery may be supported by only one or two year classes. This variability is characteristic of scallop populations world-wide, and often occurs independently of fishing pressure.

The growth of scallops within the Coromandel fishery is variable among areas, years, seasons and depths, and probably among substrates. In the Hauraki Gulf scallops have been estimated to grow to 100 mm shell length in 18 months or less whereas this can take three or more years elsewhere. In some years, growth is very slow, whereas in others it is very rapid. There is a steep relationship with depth and scallops in shallow water grow much faster than those in deeper water. This is not a simple relationship, however, as scallops in some very deep beds (e.g., Rangaunu Bay and Spirits Bay in the far north, both deeper than 40 m) appear to grow at least as fast as those in favourable parts of the Coromandel fishery. Food supply undoubtedly plays a role.

A variety of studies suggest that average natural mortality in the Coromandel fishery is quite high at $M = 0.50\ y^{-1}$ (instantaneous rate), and maximum age in unexploited populations is thought to be about 6 or 7 years.

Table 3: Estimates of biological parameters

Stock	Estimates		Source
1. Natural mortality, *M*			
Motiti Island	0.4–0.5		Walshe 1984
Coromandel Fishery	Mean 0.5		Cryer 2001
2. Weight = a(length)^b			
	a	b	
Coromandel fishery	0.00042	2.662	Cryer & Parkinson 1999
von Bertalanffy parameters			
	L_∞	K	
Motiti Island (1981–82)	140.6	0.378	Walshe 1984
Hauraki Gulf (1982–83)	115.9	1.200	Walshe 1984
Whitianga (1982)	114.7	1.210	Data of L.G. Allen, analysed by Cryer & Parkinson 1999
Whitianga (1983)	108.1	1.197	Data of L.G. Allen, analysed by Cryer & Parkinson 1999
Whitianga (1984)	108.4	0.586	Data of L.G. Allen, analysed by Cryer & Parkinson 1999
Coromandel fishery (1992–97)	108.8	1.366	Cryer & Parkinson 1999
Whitianga mean depth 10.6 m	113.5	1.700	Cryer & Parkinson 1999
Whitianga mean depth 21.1 m	109.0	0.669	Cryer & Parkinson 1999
Whitianga mean depth 29.7 m	110.3	0.588	Cryer & Parkinson 1999

3. STOCKS AND AREAS

Scallops are distributed throughout the Coromandel fishery area in suitable habitat, although some of the beds are persistent and others are ephemeral. Scallops inhabit waters of up to about 60 m deep (apparently up to 85 m at the Chatham Islands), but are more common in depths of 10 to 45 m on substrates of shell gravel, sand or, in some cases, silt. The extent to which the various beds or populations are separate reproductively or functionally is not known.

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

Fishing mortality has sometimes been quite high in the Coromandel fishery. The average direct fishing mortality on scallops 100 mm or longer in the Mercury Bay beds (1978–1992) was estimated at $F_{EST} = 1.0$ y^{-1} (instantaneous rate, assuming $M \sim 0.4$). Using data on the same size class from 1980 to 1997 and an assumed rate of $M = 0.50$ y^{-1} spread throughout the year, the estimated average direct fishing mortality for the Mercury Bay bed was $F_{EST} = 1.26$ y^{-1}, and for the Little Barrier Island bed was $F_{EST} = 1.08$ y^{-1}. Estimated fishing mortality between 1998 and 2002 was considerably lower than these averages (0.01–0.45 y^{-1}). There is no known stock-recruit relationship for Coromandel scallops.

4.2 Biomass estimates

Virgin biomass, B_0, and the biomass that will support the maximum sustainable yield, B_{MSY}, have not been estimated and are probably not appropriate reference points for a stock with highly variable recruitment and growth such as scallops.

There have been annual surveys and assessments of Coromandel scallops since 1992 (except for 2000), in support of a CAY management strategy. Assessments are based on pre-season biomass surveys conducted by diving and/or dredging (Table 4).

Table 4: Estimated recruited biomass (at the time of surveys) of scallops of 95 mm or more shell length in the Coromandel fishery since 1980 using historical average dredge efficiency. – indicates no survey in a given year, * not all beds surveyed, estimate of total biomass probably significantly biased low. Bay of Plenty landings come from beds at Waihi, Motiti, and Papamoa

Year	Biomass (t greenweight)				
	Hauraki	Whitianga	Little Barrier	Bay of Plenty	Total
1980	–	1 197	–	–	–
1981	–	1 092	–	–	–
1982	–	725	–	–	–
1983	–	998	–	–	–
1984	800	1 092	–	–	*1 892
1985	2 000	966	–	–	*2 966
1986	1 500	1 313	–	–	*2 813
1987	–	1 628	–	–	–
1988	–	–	–	–	–
1989	–	–	–	–	–
1990	608	767	–	–	*1 375
1991	266	824	–	–	*1 090
1992	73	1 272	–	–	*1 345
1993	41	748	–	735	*1 524
1994	3	481	–	153	*637
1995	26	445	258	509	1 277
1996	28	619	346	241	1 244
1997	508	623	402	269	1 839
1998	506	641	99	132	1 414
1999	18	176	19	87	325
2000	–	–	–	–	–
2001	19	142	152	70	403
2002	90	255	85	70	513
2003	160	428	146	206	1 287
2004	471	2 546	119	340	3 479
2005	475	5 036	282	518	6 311
2006	685	4 397	321	237	5 640
2007	304	3 449	211	365	4 329

Until 1997, assessments for the Coromandel fishery were based on Provisional Yield (PY, estimated as the lower bound of a 95% confidence distribution for the estimated start-of-season biomass of scallops 100 mm or more shell length). Experiments and modelling showed this method to be sub-optimal, however. New estimates of the reference fishing mortality rates $F_{0.1}$, $F_{40\%}$ and F_{MAX} were therefore made, taking into account experimental estimates of incidental fishing mortality. For assessments since 1998, CAY was estimated using these reference fishing mortality rates, and CAY supplanted PY as a yield estimator. Recent experimentation and modelling of juvenile mortality in relation to habitat heterogeneity suggest that even these more conservative reference fishing mortality rates may be too high.

Diver surveys of scallops were conducted in June 2006 and June–July 2007 at selected scallop beds in Northland and Coromandel recreational fishing areas (Williams 2008, Williams *et al*. 2007). For the four small beds (total area of 4.64 km^2) surveyed in the Coromandel fishery, start-of-season biomass of scallops over 100 mm shell length was estimated to be 128 t greenweight (CV of 26%) or 16 t meatweight in 2006, and 82 t greenweight (CV of 13%) or 10 t meatweight (CV of 20%) in 2007.

4.3 Estimation of Maximum Constant Yield (MCY)

MCY has not been estimated for Coromandel scallops and would probably be close to zero.

4.4 Estimation of Current Annual Yield (CAY)

Recent management of Coromandel scallops has been based on a CAY approach. Since 1998, catch limits have been adjusted in line with estimated start-of-season recruited biomass and an estimate of CAY made using the version of the Baranov catch equation given by Cryer & Morrison (1997):

$$CAY = \frac{F_{ref}}{F_{ref} + \frac{5M}{12}} * [1 - e^{-(F_{ref} + \frac{5M}{12})}] * B_{jul}$$

where F_{REF} is a reference fishing mortality ($F_{0.1}$, F_{MAX} or $F_{40\%}$) and B_{JUL} is the start-of-season recruited biomass (scallops of 90 mm or more shell length). This approach is specific to the five month Coromandel scallop fishing season. Because of the uncertainty over biomass estimates, growth, and mortality in a given year, and appropriate reference rates of fishing mortality, CAY estimates are derived for two different scenarios.

Average outlook, excluding habitat effects
The recruited biomass of scallops 90 mm in shell length or greater at the start of the 2007 season in the Coromandel fishery was predicted to be 8428 t (greenweight) and 1061 t (meatweight) (Williams 2007). CAY was calculated using these biomass estimates and the reference fishing mortality rates $F_{0.1}$ and $F_{40\%}$ as follows:

For $F_{40\%}$ (0.514), CAY = 0.7116 × 0.5144 × 8428 (1061) = 3085 t (green) or 388 t (meat)

For $F_{0.1}$ (0.431), CAY = 0.6741 × 0.4724 × 8428 (1061) = 2684 t (green) or 338 t (meat)

These estimates of CAY would have a CV at least as large as that of the estimate of start-of-season recruited biomass (20–22%) are sensitive to assumptions about dredge efficiency, growth, and expected recovery of meatweight from greenweight, and relate to the surveyed beds only. The sensitivity of these yield estimates to excluding areas of low density has not been calculated, but excluding stations with scallop density less than 0.04 m^{-2} reduced the fishery-wide time of survey biomass estimate by up to about 22% (depending on which beds were fished). The level of risk to the putative Coromandel scallop stock of fishing at the estimated CAY level cannot be determined.

Average outlook, including putative habitat effects
Using experimental work on Coromandel scallops, Cryer & Parkinson (2005) modelled the "feedback" effects of habitat modification by the dredge method on juvenile mortality in scallops over an assumed "critical phase" lasting eight weeks. That approach led to estimates of $F_{0.1}$ = 0.274 and $F_{40\%}$ = 0.356 (Cryer & Parkinson 2005). CAY including putative habitat effects as well as incidental effects was calculated using each of these reference rates of fishing mortality:

For $F_{40\%}$ (0.356), CAY = 0.6308 × 0.4313 × 8428 (1061) = 2293 t (green) or 289 t (meat)

For $F_{0.1}$ (0.274), CAY = 0.5681 × 0.3827 × 8428 (1061) = 1832 t (green) or 231 t (meat)

These estimates of CAY would have a CV at least as large as that of the estimate of start-of-season recruited biomass (20–22%), are sensitive to assumptions about dredge efficiency, growth, and expected recovery of meatweight from greenweight, to the duration and spatial extent of any habitat-mediated increase in juvenile mortality, and relate to the surveyed beds only. The sensitivity of these yield estimates to excluding areas of low density has not been calculated, but excluding stations with scallop density less than 0.04 m^{-2} reduced the fishery-wide time of survey biomass estimate by up to about 22% (depending on which beds were fished). The level of risk to the putative Coromandel scallop stock of fishing at the estimated CAY level cannot be determined.

4.5 Other yield estimates and stock assessment results

The estimation of Provisional Yield (PY) is no longer accepted as appropriate, and assessments since 1998 have used a CAY approach.

Stochastic yield-per-recruit (YPR) and spawning-stock-biomass-per-recruit (SSBPR) modelling has been conducted for the Coromandel scallop fishery, including the incidental effects on growth and mortality of the dredge method in use throughout the fishery. Estimates of reference rates of fishing mortality from this study have been used to estimate CAY since 1998. More recent experimental and modelling studies indicate that even these reference rates of fishing mortality may be too high if habitat effects and juvenile scallop mortality are taken into account, causing a positive bias in CAY. CAY may also be over-estimated when either the efficiency of the dredge used during the survey is greater than that assumed in calculations (i.e., the multiplier used to account for dredge efficiency is optimistic), or the density of scallops is low and part of the biomass occurs at a density not viable for commercial fishing.

5. STATUS OF THE STOCKS

Estimates of current biomass for the Coromandel fishery are available from the 2007 dredge survey but the only reference biomass that might be calculated is average recruited biomass. Scallop biomass can be expected to vary from one year to the next, so the long-run average is difficult to estimate and not necessarily a good indicator. However, biomass estimates around the turn of the century (2000) were consistently at or near the lowest on record and it seems reasonable to conclude that the population was, for unknown reasons, at a very low ebb. In contrast, following reasonable increases in biomass, catch rate, and condition of scallops in 2003 and, especially, 2004, the biomass in 2005 (almost regardless of what was assumed about dredge efficiency) was the highest on record and probably higher than in the mid-1980's when not all of the beds were surveyed. This remarkable resurgence was strongest at the Mercury Islands location, but most beds showed some increase in density. The 2006 survey results suggested a maintenance of the high biomass observed in 2005. The 2007 survey results show there has been a decline in the overall biomass since 2006, although the biomass estimate is still high compared with historical records.

Uncertainty stemming from assumptions about dredge efficiency during the surveys, rates of growth and natural mortality between survey and season, and predicting the average recovery of meatweight from greenweight remain in these stock assessments. Future research should be aimed at reducing this uncertainty, and could include a modelling study of dredge efficiency using existing data, and more field studies of scallop growth and mortality. Managing the fisheries based on the number of recruited scallops at the start of the season as opposed to recruited biomass (the current approach) could remove the uncertainty associated with converting estimated numbers of scallops to estimated meatweight.

We do not understand the processes that have resulted in such large fluctuations in scallop abundance. To get sustainable yield from such a variable stock it is necessary to alter the catch every year. Recent management of Coromandel scallops has been based on a Current Annual Yield (CAY) approach using $F_{0.1}$ as an appropriate reference point, which is considered both appropriate and conservative. Annual pre-season research (dredge) surveys are required to estimate recruited biomass and for stock assessment to estimate CAY. Commercial catch limits are adjusted each year following a review of the survey results and stock assessment, and after consultation with fishery stakeholders. In recent years, the agreed catch limits have been substantially less than the estimated CAY.

Yield estimates, TACC, ACE and reported landings are summarised in Table 5.

Table 5: Yield estimates, TACC, ACE and reported landings, for the 2007–08 fishing year, for scallops SCA CS.

			2006	2007			2007-08
Fishstock	QMA	MCY	CAY ($F_{0.1}$)	CAY ($F_{0.1}$)	TACC	ACE	Landings
SCA CS	Coromandel	N/A	333–488	231–338	22	108	68

6. FOR FURTHER INFORMATION

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