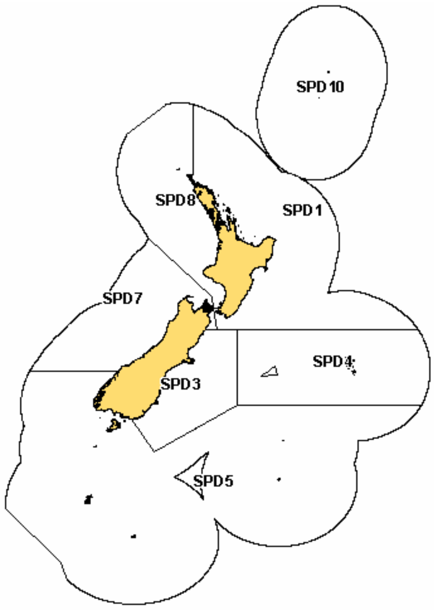
SPINY DOGFISH (SPD)

(*Squalus acanthias*)



1. FISHERY SUMMARY

(a) Commercial fisheries

Spiny dogfish are found throughout the southern half of New Zealand, extending to East Cape and Manakau Harbour on the east and west coasts of the North Island respectively. A related species the northern spiny dogfish (*Squalus mitsukurii*), is mainly restricted to North Island waters, overlapping with its conspecific in the central west coast area and around the Chatham Islands. Although they have different species codes for reporting purposes it is probable that some misidentification and misreporting occurs – particularly in FMAs 1, 8 and 9.

The best estimate of reported catch from the fishery is shown in the final column in Table 1. For the period 1980–81 to 1986–87 the best estimate of landings is the sum of the FSU data. For the period 1987–88 to 1996–97 this is the sum of the LFRR and the discards from the CELR and CLR. It has been assumed here that all the fish which have been caught and discarded will die, and that all the discarded fish have been recorded. Although neither assumption is likely to be true, and the biases they produce will at least partially cancel each other out, it is likely that the true level of discards is considerably higher. However, these figures are currently the best estimates of total removals from the fishery.

Before 1980–81 landings of rig, and both *Squalus* species were included together and catches of the latter were probably small. Since then the reported catch of spiny dogfish has fluctuated between about 3000 and 7000 t. The reported catch by the deepwater fleet has remained fairly constant during most of the period, averaging 2000 – 4000 t, with a slight decrease in recent years. Reported catch by the inshore fleet has shown a steady increase throughout the period and is now at a similar level to the catch from the deepwater fleet.

Most of the spiny dogfish caught by the deepwater fleet are taken as a bycatch in the jack mackerel, barracouta, hoki, red cod, and arrow squid fisheries, in depths from 100 to 500 m. Some are packed whole but most are trunked and exported to markets in Asia and Europe.

Table 1: Reported catches of spiny dogfish (t) by fishing year. FSU (Fisheries Statistics Unit), LFRR (Licensed Fish Receiver Return. Discards reported from CELR (Catch Effort Landing Return), and CLR (Catch Landing Return). Numbers in brackets are probably underestimates. (– no data).

	FSU				Best
	Inshore	Deepwater	LFRR	Discards	Estimate
80–81	–	(196)	–	–	196
81–82	–	1881	–	–	1881
82–83	(107)	2568	–	–	2675
83–84	309	2949	–	–	3258
84–85	303	3266	–	–	3569
85–86	311	2802	–	–	3113
86–87	870	2277	2608	–	3147
87–88	834	3877	4823	–	4823
88–89	(351)	(500)	3573	(16)	3589
89–90	(14)	(0)	2952	321	3273
90–91	–	–	5983	333	6316
91–92	–	–	3274	521	3795
92–93	–	–	4157	616	4773
93–94	–	–	6150	1063	7213
94–95	–	–	4793	628	5421
95–96	–	–	6230	1920	8150
96–97	–	–	4887	2572	7459

Spiny dogfish are also taken as bycatch by inshore trawlers, setnetters and longliners targeting flatfish, snapper, tarakihi and gurnard. Because of processing problems due to their spines, sandpaper-like skin, and short shelf life, and their low economic value many inshore fishers are not interested in processing and landing them. Furthermore, because of their sheer abundance they can at times severely hamper fishing operations for other commercial species and they are regarded by many fishers as a major nuisance. Trawlers working off Otago during the summer months often reduce towing times and headline heights, and at times leave the area altogether to avoid having to spend hours pulling hundreds of meshed dogfish out of trawl nets. Setnetters and longliners off the Otago coast, and in Tasman Bay and the south Taranaki Bight have also complained about spiny dogfish taking longline baits, attacking commercial fish caught in the nets or lines, and rolling up nets.

The catch by FMA from the FSU, CELR and CLR databases is shown in Table 2. Large catches have been made from FMAs 3, 5, 6, and 7 since 1982–83. Catches from FMA 4 have increased substantially since the mid-1990s. Landings from FMA 5 and 6 were most important in the early 1980s, with 1000 – 2000 t taken annually by factory trawlers. In more recent years FMA 3, and to a lesser extent, FMA 7 have become more important. The catch in both these areas is taken equally by factory trawlers and inshore fleets. The catch in FMA 1 is unlikely to be spiny dogfish which is considered to be virtually absent from the area, and so these catches should probably be attributed to *S. mitsukurii*.

Competitive quotas of 4075 t for FMA 3, and of 3600 t for FMAs 5 and 6, were introduced for the first time in the 1992–93 fishing year. These quotas were based on yields derived from trawl surveys using a method that is now considered obsolete, and harvest levels which are now considered unreliable. The reported catches exceeded the FMA 3 quota in 1997/98, 2000/01 and 2001/02 and the FMA 5/6 quota in 2002/02.

Spiny dogfish was introduced into the QMS in October 2004. Catches and TACCs are shown in Table 3.

Table 2: Reported landings of spiny dogfish by proposed Fishstock. Proportions by area have been taken from CELR and CLR and pro-rated to the best estimate from Table 1. Competitive quotas of 4075 t for FMA 3, and of 3600 t for FMAs 5 and 6, were introduced for the first time in the 1992–93 fishing year.

Year	FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9	FMA10	Other	Total
1982–83	4	0	151	131	2089	81	145	66	7			2675
1983–84	22	18	409	347	565	1700	119	63	16			3258
1984–85	21	12	557	481	451	1899	90	48	10			3569
1985–86	13	11	892	411	537	1017	120	92	20			3113
1986–87	64	18	1048	162	1002	29	501	296	27			3147
1987–88	50	9	1664	172	642	16	1402	841	27			4823
1988–89	341	16	1510	168	771	7	633	132	11			3589
1989–90	36	14	2243	136	241	2	521	80	0			3273
1990–91	129	14	2987	513	1708	14	883	67	0			6316
1991–92	54	23	1801	66	538	33	1031	249	0			3795
1992–93	50	9	2128	218	817	22	1163	366	0			4773
1993–94	51	34	3165	358	1158	21	2212	214	0			7213
1994–95	84	47	2883	363	606	37	1205	196	0			5421
1995–96	68	177	2558	969	1147	152	1205	186	15			7052
1996–97	30	159	2428	1287	764	120	1517	235	7	1	1	6555
1997–98	52	165	5042	917	428	223	2389	1172	34	0	11	10 433
1998–99	45	488	3148	1048	1996	154	1902	74	<1	0	<1	8424
1999–00	15	328	3309	994	1163	189	1505	25	7	0	5	7540
2000–01	38	336	4355	1075	1389	212	1310	54	16	0	28	8811
2001–02	12	222	4249	1788	3734	487	961	71	12	0	-	11 530
2002-03	10	245	3553	1010	2621	413	772	85	19	0	0	8727
2002-03	10	245	3557	1009	2624	413	773	85	19	0	0	8735
2003-04	12	91	2077	516	1032	302	423	20	5	0	0	4477

Table 3: Reported domestic landings (t) of Spiny Dogfish by Fishstock and TACC from 2005-06.

Fishstock	SPD 1		SPD 3		SPD 4		SPD 5		SPD 7	
FMA	1&2		3		4		5&6		7	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
2004-05	234	331	2707	4794	839	1626	2479	3700	842	1902
2005-06	186	331	3831	4794	1055	1626	2298	3700	832	1902

Fishstock	SPD 8			
FMA	8&9		Total	
	Landings	TACC	Landings	TACC
2004-05	121	307	7222	12 660
2005-06	108	307	8311	12 660

Prior to their introduction into the QMS spiny dogfish were legally discarded at sea (provided that total catch is reported). Although discard rates increased dramatically through the 1990s (Table 4), this is believed to reflect a change in reporting practise rather than an increase in the proportion of catch discarded.

Table 4: Discard rates (% of catch) by QMA and fishing year (after Manning et al., 2004).

Fishing year	QMA											
	1	2	3	4	5	6	7	8	9	10	Other	Total
1989–90	11	17	18	4	46	100	13	34	0	0	0	18
1990–91	7	0	6	2	29	11	21	24	0	0	0	11
1991–92	9	3	8	13	34	90	42	18	0	0	0	20
1992–93	13	47	5	51	39	43	20	80	0	0	0	21
1993–94	5	65	13	42	21	34	29	66	0	0	0	23
1994–95	2	52	8	31	20	74	29	64	98	0	5	19
1995–96	7	39	18	55	39	94	45	72	100	0	11	36
1996–97	15	61	26	40	70	68	59	89	93	0	16	44
1997–98	53	83	51	53	72	86	81	92	100	0	16	64
1998–99	20	92	57	60	29	78	82	63	0	0	16	58
1999–00	9	86	60	55	39	68	81	84	35	0	0	62
2000–01	37	70	60	77	57	77	72	56	29	0	87	64
Total	15	74	35	53	42	78	54	68	78	0	16	45

(b) Recreational fisheries

Spiny dogfish are caught by recreational fishers throughout their geographical range in New Zealand. They are mainly taken as bycatch when targeting other more valued species using rod and line and setnet. In many parts of New Zealand spiny dogfish are regarded by recreational anglers as a pest, often clogging nets and taking baits from hooks. Estimates of recreational landings obtained from two separate surveys in 1991–92 to 1993–94 and 1996 are given in Table 5. Overall, recreational landings probably comprise only a small proportion (<10 %) of the total spiny dogfish catch.

Table 5: Estimated number and weight of spiny dogfish 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, 2005). 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					
QMA 3	South		23		120
QMA 5	South		-		2
QMA 7	South		92		11
1992-93					
QMA 2	Central		42		133
QMA 7	Central		35		46
QMA 8	Central		45		143
1993-94					
QMA 1,9	North		-		<10
1996					
QMA 1	National	1000	–	–	–
QMA 2	National	5000	–	–	–
QMA 3	National	21 000	17	25–40	33
QMA 5	National	9000	–	–	–
QMA 7	National	24 000	21	30–45	37
QMA 9	National	15 000	–	–	–
1999-00					
QMA 1	National	9000	61	4.4-17.9	15
QMA 2	National	22 000	37	17.3-37.8	328
QMA 3	National	93 000	27	83.2-145.9	3309
QMA 5	National	7000	47	4.4-12.3	1163
QMA 7	National	25 000	35	20.4-41.9	1505
QMA 8	National	21 000	52	12.7-40.3	25
QMA 9	National	12 000	82	2.7-26.2	7

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 customary fisheries

Maori fishers traditionally caught large numbers of “dogfish” during the last century and this included rig, school shark, and spiny dogfish. Quantitative information on the current level of Maori customary take is not available.

(d) Illegal catch

It is unlikely that there is an illegal catch of spiny dogfish as the quota for this species has never been reached, and it has low commercial value.

(e) Other sources of mortality

It is likely that there is a large amount of spiny dogfish discarded by fishers which is never reported on the returns. The level of mortality and any temporal trends from non-reported discards have not been estimated. The introduction of cost recovery charges in 1994–95 may account for the decline in reported discards in that year.

2. BIOLOGY

Spiny dogfish are widely distributed around the South Island and extend as far north as Manakau Harbour and East Cape on the west and east coasts of the North Island respectively. They are most abundant on the east coast of the South Island and the Stewart/Snares Shelf. They are found on the continental shelf and upper slope down to a depth of at least 500 m, but are most common in depths of 50–150 m. Schools are strongly segregated by size and sex. The size of fish in the commercial fishery is not known but will depend to a large extent on the method of capture and area fished.

Spiny dogfish are born at a size of 18–30 cm total length (TL). They have been aged using fin spines, and early growth has been validated by following modes in length-frequency and eye lens weight frequency data. Males mature at 58 cm TL at age 6, and females mature at 73 cm TL at age 10. The maximum ages and lengths in a study of east coast South Island dogfish were 21 years and 90 cm TL for males, and 26 years and 111 cm TL for females.

M was estimated using the equation $\log_e 100$/maximum age, where maximum age is the age to which 1% of the population survive in an unexploited stock. Using a maximum age of 26 gave an estimate of M of 0.18. This has been revised up to 0.2 to reflect the imprecision with which this estimate is known. A similar estimate of M was obtained using a survivorship table approach (Hanchet, 1986). At an instantaneous mortality rate of 0.2 $year^{-1}$ an initial population of 1 000 females would replace themselves over their lifespan (given their length-at-age, length–at-maturity and fecundity-length relationships).

Female spiny dogfish give birth to young over an extended period between April and September, mainly on the shelf edge in depths of 200–300 m. Mating also occurs in deeper water (coincident with a movement of mature males offshore), after which females with young "candled" embryos move into shallower waters of 100 m or less. They remain there for 12 months until the embryos are 15 cm long after which they return to deeper water. Parturition occurs after a gestation period approaching 24 months, and is closely followed by mating and ovulation and the biennial cycle is repeated. Both the number and the size of young increase linearly with the length of the mother. The number of young per litter ranges from 1 to 19.

Young of the year move inshore into shallower waters shortly after birth. Over the next few years they move steadily into deeper water but remain in size segregated schools comprising up to 2 or 3 age classes. Once maturity is reached both males and females undergo inshore/offshore migrations associated with reproductive activity. A north/south migration along the east coast South Island during autumn/spring has also been postulated but the full extent of this migration is unknown.

Spiny dogfish are found both on the bottom and in mid-water and feed on a very wide range of species, including *Munida*, krill, fish, squid, and crabs.

Biological parameters relevant to the stock assessment are shown in Table 6.

Table 6: Estimates of biological parameters of spiny dogfish for QMA3 (Source Hanchet, 1986).

1. Natural mortality (M)

0.2

2. Weight = a (length)^b (Weight in g, length in cm fork length)

Males		Females	
a	**b**	**a**	**b**
0.00275	3.05	0.00139	3.25

3. von Bertalanffy growth parameters

Males			Females		
K	**t_0**	**L_∞**	**K**	**t_0**	**L_∞**
0.116	-2.88	89.5	0.069	-3.45	120.1

4. Maturity ogive

	Age (years)										
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**>12**
Males	0.00	0.02	0.21	0.68	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Females	0.00	0.00	0.00	0.00	0.04	0.04	0.23	0.52	0.75	1.00	1.00

3. STOCKS AND AREAS

No specific research on the stock structure of spiny dogfish has been carried out. Limited tagging has been conducted, so the only available data come from seasonal trawl surveys, and fisheries landings data.

The analysis of *W.J. Scott* and *James Cook* surveys carried out from 1978 to 1983 clearly showed seasonal migrations of spiny dogfish along the east coast of South Island (ECSI). Spiny dogfish were most abundant in the southern part of the coast from October to April, and more abundant to the north in May to September. It is also clear from summer trawl surveys of the area that there is a resident part of the population of spiny dogfish on the Stewart/Snares Shelf over the summer months. However, there have been no comparable series of seasonal surveys there and so it is presently unclear whether the ECSI fish migrate south as far as the Stewart/Snares Shelf. Until more data become available fish from the two areas should be treated as separate stocks.

Seasonal trawl surveys were also carried out on west coast South Island (WCSI) between June 1981 and April 1983 using the *W.J. Scott.* The catches showed a strong seasonal component being highest in summer and autumn and lowest in winter and spring. It is likely that some fish migrate north in winter, perhaps to the northern and southern Taranaki Bights, and Tasman Bay and Golden Bay. However, it is also clear from summer trawl surveys of the areas that there is a resident part of the population of spiny dogfish in the Taranaki Bights over the summer months. It may therefore be appropriate to treat fish from QMA 7 and 8 as a single stock.

There is little commercial catch in QMAs 1, 2, 4, and 9, and little data on movement in or between the areas. Until more data have been obtained it would seem appropriate to manage spiny dogfish with the following 5 Fishstocks:

SPD 1: QMA 1 & 2
SPD 3: QMA 3
SPD 4: QMA 4
SPD 5: QMA 5 & 6
SPD 7: QMA 7, 8 & 9.

4. STOCK ASSESSMENT

There are no estimates of current or virgin biomass. This is the first stock assessment for spiny dogfish.

(a) <u>Estimates of fishery parameters and abundance</u>

Biomass indices of spiny dogfish from recent trawl surveys using *Tangaroa* and *Kaharoa* are summarised in Table 7. Based on a combination of C.V.s, variability in biomass indices and the time span of each series, it is concluded that surveys only provide reliable indices of dogfish abundance off the west coast of the South Island and on the Chatham Rise. Relative biomass indices suggest that spiny dogfish became more abundant on the Chatham rise during the early to mid 1990s. Apart from a temporary increase during the mid-1990s, the abundance of dogfish off the west coast of South Island appears to have been fairly stable between 1991 and 2003. Although the relevant surveys were discontinued, spiny dogfish appear also to have increased substantially in abundance off the east coast of the South Island and on the Stewart-Snares shelf in the mid 1990s.

Table 7: Biomass indices (t) and coefficients of variation (C.V.) from trawl surveys assuming vulnerability, areal availability and vertical availability equal 1. Note: because trawl survey biomass estimates are indices, comparisons between different seasons (e.g. summer and winter ECSI) are not strictly valid.

QMA	Area	Vessel	Trip code	Date	Fishing year	Biomass (t)	C.V. (%)
2	East coast North Island	KAH	KAH9304	Feb–Mar 1993	1992-93	963	78
			KAH9402	Feb–Mar 1994	1992-94	988	47
			KAH9502	Feb–Mar 1995	1994-95	658	25
			KAH9602	Feb–Mar 1996	1995-96	1 026	51
3	East coast South Island (*Winter*)	KAH	KAH9105	May–Jun 1991	1990-91	12 873	22
			KAH9205	May–Jun 1992	1991-92	10 787	26
			KAH9306	May–Jun 1993	1992-93	13 949	17
			KAH9406	May–Jun 1994	1993-94	14 530	10
			KAH9606	May–Jun 1996	1995-96	35 169	15
	East coast South Island (*Summer*)	KAH	KAH9618	Dec–Jan 1996–97	1996-97	35 776	28
			KAH9704	Dec–Jan 1997–98	1997-98	29 765	25
			KAH9809	Dec–Jan 1998–99	1998-99	22 842	16
			KAH9917	Dec–Jan 1999–00	1999-00	49 832	37
			KAH0014	Dec–Jan 2000–01	2000-01	30 508	34
4	Chatham Rise	TAN	TAN9106	Dec–Feb 1991–92	1991–92	2 390	14
			TAN9212	Dec–Feb 1992–93	1992–93	2 220	11
			TAN9401	Jan–Feb 1994	1993–94	3 449	13
			TAN9501	Jan–Feb 1995	1994–95	2 841	21
			TAN9601	Dec–Jan 1995–96	1995–96	4 969	11
			TAN9701	Jan 1997	1996–97	9 570	14
			TAN9801	Jan 1998	1997–98	5 724	17
			TAN9901	Jan 1999	1998–99	8 551	13
			TAN0001	Dec–Jan 1999–00	1999–00	8 905	9
			TAN0101	Dec–Jan 2000–01	2000–01	9 586	9
			TAN0201	Dec–Jan 2001–02	2001–02	6 334	8
			TAN0301	Dec–Jan 2002–03	2002–03	6 191	17
			TAN0401	Jan 2004	2003-04	12289	18
			TAN0501	Jan 2005	2004-05	7 227	15
			TAN0601	Jan 2006	2005-06	5 650	14
			TAN0701	Jan 2007	2006-07	5 906	10
5	Stewart–Snares Shelf	TAN	TAN9301	Feb–Mar 1993	1992–93	36 023	13
			TAN9402	Feb–Mar 1994	1993–94	36 328	17
			TAN9502	Feb–Mar 1995	1994–95	91 364	29
			TAN9604	Feb–Mar 1996	1995–96	89 818	29
6	Sub-Antarctic (*Spring*)	TAN	TAN9105	Nov–Dec 1991	1991–92	8 502	55
			TAN9211	Nov–Dec 1992	1992–93	1 150	15
			TAN9310	Nov–Dec 1993	1993–94	1 585	21
			TAN0012	Nov–Dec 2000	2000–01	4 173	12
			TAN0118	Nov–Dec 2001	2001–02	8 528	31
			TAN0219	Nov–Dec 2002	2002–03	3 505	19
			TAN0317	Nov–Dec 2003	2003–04	2 317	17
			TAN0414	Nov–Dec 2004	2004-05	3 378	27
			TAN0515	Nov–Dec 2005	2005-06	4 344	19
			TAN0617	Nov-Dec 2006	2006-07	3 039	19
6	Sub-Antarctic (*Autumn*)	TAN	TAN9204	Apr–May 1992	1991–92	0 926	30
			TAN9304	May–Jun 1993	1992–93	0 440	38
			TAN9605	Mar–Apr 1996	1995–96	0 207	56
			TAN9805	Apr–May 1998	1997–98	1 532	36

Table 7 continued

QMA	Area	Vessel	Trip code	Date	Fishing Year	Biomass (t)	C.V. (%)

7	West coast South Island	KAH	KAH9204	Mar–Apr 1992	1991–92	3 919	15
			KAH9404	Mar–Apr 1994	1993–94	7 145	7
			KAH9504	Mar–Apr 1995	1994–95	8 370	10
			KAH9701	Mar–Apr 1997	1996–97	5 275	13
			KAH0004	Mar–Apr 2000	1999–00	4 777	12
			KAH0304	Mar–Apr 2003	2002–03	4 446	15
			KAH0503	Mar–Apr 2005	2004-05	6 175	12
9	West coast North Island	KAH	KAH9111	Oct 1991	1991–92	443*	34
			KAH9410	Oct 1994	1994–95	381*	30
			KAH9615	Oct 1996	1996–97	634*	68
			KAH9915	Nov 1999	1999–00	106*	15

Manning et al. (2004) recently evaluated the usefulness of commercial CPUE, commercial length composition, trawl survey relative biomass estimates and trawl-survey-catch length-composition for monitoring all major SPD stocks (Table 8).

Table 8: Catch and effort data sets and analyses evaluated as monitoring tools for major SPD stocks.

QMA	Data set and analysis
SPD 3 – East coast South Island	1. Standardized setnet CPUE for core vessels targeting SPD.
	2. Standardized setnet CPUE for core vessels targeting all species.
	3. Standardized bottom trawl CPUE for core vessels targeting all species.
	4. Relative abundance indices from East Coast South Island trawl surveys (discontinued after 2001)
SPD 4 – Chatham Rise	5. Standardized bottom trawl CPUE for core Korean vessels
	6. Standardized bottom trawl CPUE for core domestic vessels
	7. Standardized bottom longline CPUE for core domestic vessels
	8. Relative abundance indices from Chatham Rise trawl surveys.
SPD 5 – Stewart Snares Shelf	9. Standardized bottom trawl CPUE.
	10. Relative abundance indices from Stewart-Snares shelf surveys (discontinued after 1996)
SPD 7 – West Coast South Island	11. Standardized bottom trawl CPUE for core vessels
	12. Relative abundance indices from West coast South Island Trawl Surveys.

Based on the results of the analyses listed in Table 8, the following methods were recommended for monitoring SPD:

QMA	Recommended Monitoring Tools
SPD 3 – East coast South Island	Standardized setnet CPUE using model 2 (core vessels targeting all species)
SPD 4 – Chatham Rise	Chatham Rise Trawl Survey and length composition of commercial catch
SPD 5 – Stewart Snares Shelf	*Standardized bottom trawl CPUE and length composition of commercial catch.
SPD 7 – West Coast South Island	West coast South Island Trawl survey and length composition of commercial catch

* Information on historical changes in reporting rates is required before this index can be used.

(b) Biomass estimates

Lack of suitable information has precluded estimation of virgin and current biomass for spiny dogfish. Although most of the necessary biological parameters (Hanchet, 1986, 1988; Hanchet & Ingerson, 1997), relative indices of abundance and data required to estimate fishing selectivity for most important fisheries (with the exception FMA 4 bottom longline and QMA 3 setnet fisheries) are now available, robust stock assessments will also require estimates of historical, unreported discarding and discard mortality so that an accurate history of fishery related removals can be constructed.

(c) Estimation of Maximum Constant Yield (MCY)

MCY cannot be estimated.

(d) Estimation of Current Annual Yield (CAY)

CAY cannot be determined**.**

(e) Other factors

The ability to withstand harvesting depends on the strength of a number of compensatory mechanisms. For example, under exploitation individuals may grow faster, show increased fecundity, or suffer reduced natural mortality. In elasmobranchs the number of young born is related directly to the number of adult females, and, because of the relatively large size and hence good survival of the young at birth, it is presumed that there is a strong stock recruit relationship for these species.

Several methods of estimating MCY involve the multiplication of a harvest level by an estimate of B_0 or B_{av}. Francis & Francis (1992) used Monte Carlo simulation to estimate harvest levels for calculating MCY for a rig stock. No stock-recruitment data were available for elasmobranchs at the time and so they used values for the Beverton & Holt steepness parameter ranging from 0.35 to 0.50, and recruitment variability of 0.4. These values were all at the low range of values used for teleost species and which they considered appropriate for rig. The results of their simulation studies showed that the estimates of MCY obtained using the harvest levels given in the equations in Annala & Sullivan (1996) were overly optimistic for rig. Given that spiny dogfish have a slower growth rate and are less fecund than rig, it seems reasonable to assume that those harvest levels are also unsuitable for spiny dogfish.

5. STATUS OF THE STOCKS

No estimates of current or reference biomass are available.

Although reported commercial catches of spiny dogfish were observed to increase in all major FMAs during the 1990s, the extent to which these increases can be attributed to changes in reporting practice (i.e. more accurate reporting of discards in recent times) is uncertain. Trawl surveys, on the other hand, indicate that there was a general increase in the abundance of spiny dogfish, particularly around the South Island, in the mid 1990s. It is unknown whether current catch limits are sustainable or whether they are at levels that would allow the stock to move towards a size that will support the maximum sustainable yield.

Reported landings and TACCs for the 2005/06 fishing year are summarised in Table 9.

Table 9: Summary of TACCs (t) and reported landings (t) of spiny dogfish for the most recent fishing year.

Fishstock		FMA	2005-06 Actual TACC	2005-06 Reported landings
SPD 1	Auckland (East), Central (East)	1&2	331	**186**
SPD 3	South east (coast)	3	4794	**3831**
SPD 4	South east (Chatham)	4	1626	**1055**
SPD 5	Southland, Sub-antarctic	5&6	3700	**2298**
SPD 7	Challenger	7	1902	**832**
SPD 8	Central (west), Auckland (west)	8&9	307	**108**
Total			12 660	**8310**

6. FOR FURTHER INFORMATION

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