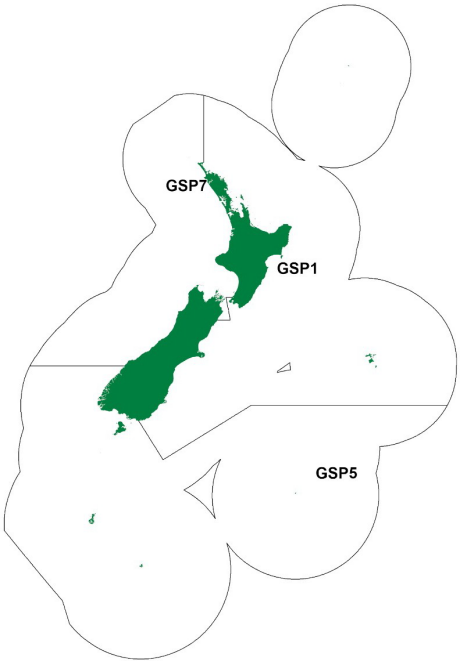
PALE GHOST SHARK (GSP)

(*Hydrolagus bemisi*)



1. FISHERY SUMMARY

1.1 Commercial fisheries

Two species (dark and pale ghost sharks) make up virtually all the commercial ghost shark landings. Pale ghost shark (*Hydrolagus bemisi*) was introduced into the QMS from the beginning of the 1999–00 fishing year as three Fishstocks: GSP 1 (FMAs 1 to 4, and 10), GSP 5 (FMAs 5 and 6) and GSP 7 (FMAs 7, 8 and 9). Catches of six other ghost shark (Chimaeridae) species known from New Zealand waters have been negligible.

Both ghost shark species are taken almost exclusively as a bycatch of other target trawl fisheries. In the 1990s, about 43% of ghost sharks were landed as a bycatch of the hoki fishery, with fisheries for silver warehou, arrow squid and barracouta combining to land a further 36%. The two ghost shark species were seldom differentiated on catch landing returns prior to the start of the 1998–99 fishing year. Estimated landings of both species by foreign licensed and joint venture vessels over the period 1 April 1978 to 30 September 1983 are presented in Table 1. Landings by domestic (inshore) vessels would have been negligible during this time period. The unknown quantities of ghost sharks that were discarded and not recorded are likely to have resulted in under-reported total catches over the full period for which data are available.

Table 1: Reported landings (t) of both ghost shark species by fishing year and EEZ area, taken by foreign licensed and joint venture vessels. An approximation of these areas with respect to current FMA boundaries is used to assign catches to QMAs. No data are available for the 1980–81 fishing year.

Year		EEZ Area												
	FMA	B 1&2	C(M)	C(1) 3	D 4	E(B)	E(P)	E(C)	E(A) 6	F(E)	F(W) 5	G 7	H 8	Total
1978–79*		1	37	99	26	3	16	11	88	90	8	68	17	465
1979–80*		1	55	54	426	10	4	28	138	183	7	1	5	912
1980-81*		–	–	–	–	–	–	–	–	–	–	–	–	–
1981–82*		0	84	28	117	0	2	6	29	71	9	4	0	350
1982–83*		0	108	35	84	0	2	17	98	99	29	1	1	474
1983–83#		0	84	41	73	0	0	17	5	16	17	0	0	253

* 1 April to 31 March. # 1 April to 30 Sept

In the early to mid 1980s, about half of the reported ghost shark landings were from FMA 3. Virtually all the additional catch was spread over FMAs 4–7. In 1988–89, landings from west coast South Island (FMA 7) began to increase, almost certainly associated with the development of the hoki fishery. In 1990–91, significant increases in landings were apparent on the Chatham Rise, off southeast South Island, and on the Campbell Plateau. The development of fisheries for non-spawning hoki was probably responsible for these increases.

Estimated landings of pale ghost shark by QMA are shown in Table 2. Landings from 1983–84 to 1994–95 were derived by splitting all reported ghost shark landings into depth and area bins, and allocating to species based on distribution data derived from trawl surveys (Section 2). Landings from 1995–96 to 1998–99 were estimated assuming that pale ghost shark made up 30% of the total ghost shark catch in FMAs 5 and 6, and 25% in all other FMAs.

Table 2: Estimated landings (t) of pale ghost shark by Fisheries Management Area for fishing years 1982–83 to 1998– 99 based on the reported landings of both species combined. The estimated landings up to 1994–95 are based on data in the 1997 Plenary Report. Landings from 1995–96 to 1998–99 were estimated assuming pale ghost shark made up 30% of the total ghost shark catch in FMAs 5 and 6, and 25% in all other FMAs.

	FMA										
	1	2	3	4	5	6	7	8	9	10	Total
1982–83	1	1	74	35	21	13	2	1	0	0	148
1983–84	0	1	63	24	11	15	7	1	0	0	122
1984–85	1	1	60	49	16	19	12	0	0	0	158
1985–86	1	1	96	23	10	14	7	1	0	0	153
1986–87	1	2	110	27	11	12	13	1	0	0	177
1987–88	1	1	138	21	13	2	15	1	0	0	192
1988–89	2	7	124	9	19	2	34	1	0	0	198
1989–90	1	3	86	8	41	5	33	5	0	0	182
1990–91	1	7	148	63	61	82	39	1	0	0	402
1991–92	1	2	218	95	64	54	35	2	1	0	472
1992–93	2	1	227	99	77	55	53	7	0	0	521
1993–94	1	2	173	42	36	32	99	4	0	0	389
1994–95	1	1	246	62	27	26	234	1	0	0	598
1995–96	4	12	226	84	30	29	183	3	1	0	572
1996–97	6	22	272	134	40	58	309	3	3	0	847
1997–98	6	6	256	87	30	58	57	1	4	0	505
1998–99	6	20	315	107	27	47	136	2	7	0	667

Table 3: Estimated landings (t) of pale ghost shark by Fishstock for 1999–2000 to present and actual TACCs set from 1999–2000 (QMR data).

Fishstock	GSP 1		GSP 5		GSP 7			
FMA (s)	1,2,3,4,10		5,6		7,8,9		Total	
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1999–00	577	509	216	118	35	176	828	803
2000–01	1 142	509	454	118	16	176	1 613	803
2001–02	1 033	509	545	118	71	176	1 649	803
2002–03	1 277	509	602	118	16	176	1 895	803
2003–04	1 009	509	529	118	15	176	1 553	803
2004–05	635	1 150	247	454	5	176	887	1 780
2005–06	565	1 150	134	454	9	176	708	1 780
2006–07	553	1 150	226	454	15	176	794	1 780
2007–08	473	1 150	329	454	16	176	818	1 780
2008–09	486	1 150	294	454	15	176	795	1 780
2009–10	534	1 150	206	454	11	176	751	1 780
2010–11	395	1 150	203	454	13	176	611	1 780
2011–12	447	1 150	201	454	10	176	659	1 780
2012–13	510	1 150	163	454	25	176	697	1 780
2013–14	409	1 150	286	454	33	176	727	1 780
2014–15	476	1 150	243	454	38	176	759	1 780
2015–16	493	1 150	171	454	26	176	690	1 780
2016–17	577	1 150	324	454	25	176	926	1 780
2017–18	525	1 150	469	454	35	176	1 029	1 780
2018–19	515	1 150	305	454	21	176	841	1 780
2019–20	468	1 150	193	454	19	176	681	1 780
2020–21	530	1 150	226	454	33	176	789	1 780
2021–22	569	1 150	148	454	33	176	750	1 780

From 1 Oct 1999 TACCs were set for pale ghost shark fishstocks as follows: GSP 1 509 t, GSP 5 118 t

and GSP 7 176 t. The TAC in each case was set equal to the TACC. Estimated and reported landings for this period are shown in Table 3, while Figure 1 shows the historical landings and TACC values for the main GSP stocks. The fisheries in GSP 1 and GSP 5 exceeded the TACC by large amounts, possibly as a result of better reporting of catches. From 1 October 2004 the TACCs for GSP 1 and GSP 5 were increased to 1150 t and 454 t respectively, the level of catch being reported from the fisheries. Catches have since declined to well below the TACC levels in GSP 1 and GSP 7. Landings of pale ghost sharks in GSP 5 exceeded the TACC for the first time since the 2004 introduction of the higher TACC in 2017-18.

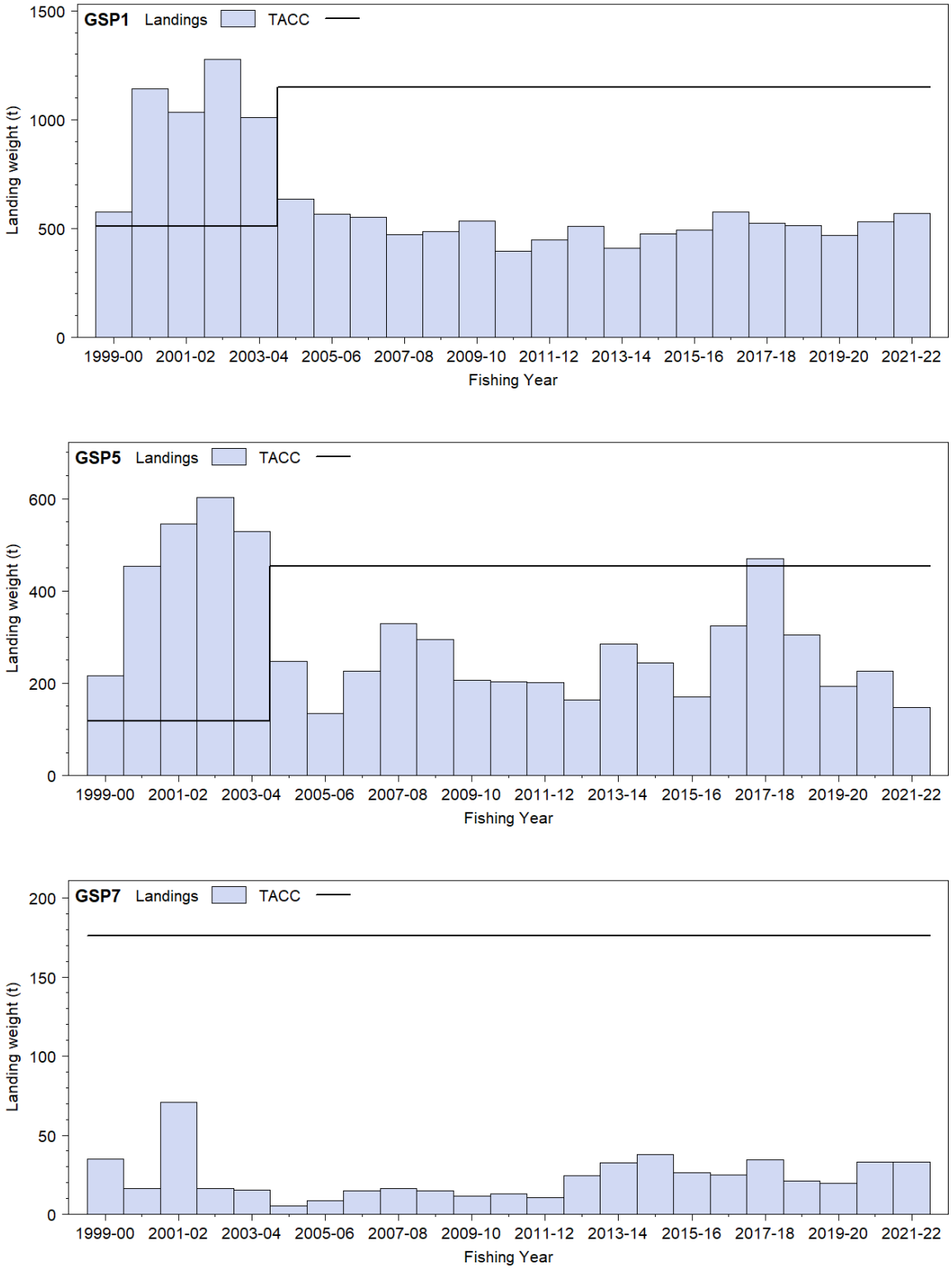


Figure 1: Reported commercial landings and TACC for the three main GSP stocks. From top: GSP 1 (Auckland East), GSP 5 (Southland) and GSP 7 (Challenger). Note that these figures do not show data prior to entry into the QMS.

In GSP 1, catches are mainly taken on the Chatham Rise while in GSP 5 catches are mainly taken in the Sub-Antarctic area; both as bycatch of the hoki trawl fisheries. Estimated catches appear to have been under-reported both before and after the introduction to the QMS. The original TACCs were based on estimated catches, but these are likely to have been much lower than the actual catches. Estimated catches on TCEPR forms since 1999–2000 have been only 25–30% of the QMR totals.

1.2 Recreational fisheries

Current catches of ghost sharks by recreational fishers are believed to be negligible in all areas.

1.3 Customary non-commercial fisheries

An estimate of current catch is not available but given the offshore location and depth distribution of lookdown dory customary non-commercial catch is thought to be negligible.

1.4 Illegal catch

Quantitative information on the level of illegal catch is not available. In 1998–99 (when dark ghost shark were in the QMS, but pale ghost shark were not), a quantity of dark ghost shark were incorrectly reported as pale ghost shark.

1.5 Other sources of mortality

Ghost sharks have been dumped and not reported in the past by commercial fishers in FMAs 1 and 2. Similar behaviour is believed to occur in all other FMAs.

2. BIOLOGY

Pale ghost shark occur throughout the EEZ and have been recorded in depths ranging from about 270 to 1200 m, and in bottom water temperatures of about 3–10° C. They are most abundant in depths of 400–1000 m on the Chatham Rise and Southland/Sub-Antarctic, but are uncommon north of 40° S and appear to inhabit a narrower depth range in that region (600–950 m). Their distribution appears largely unrelated to surface water temperatures.

Trawl surveys show that dark and pale ghost shark exhibit niche differentiation, with water depth being the most influential factor, although there is some overlap of habitat. On the Chatham Rise, the main overlap range appears quite compact (from about 340 to 540 m). In the Southland/Sub-Antarctic region, the overlap range is wider (about 350 to 770 m). Stomach contents indicate that both species are predominantly benthic feeders. Pale ghost sharks have been the most frequently recorded chimaera in research trawl catches, but aggregations appear to be rare with catches of more than 20 fish per km^2 not known from research trawls.

Length-frequency histograms indicate that females grow to a largersize than males. Hard parts of pale ghost shark have not yet been examined to check the existence of any banding pattern that may represent annual growth zones. Without population age structures or confident estimates of longevity it is not possible to estimate natural or total mortalities. A study has shown that eye lens measurements and spine band countsare potentially useful ageing techniques for dark ghost sharks (Francis & Ó Maolagáin 2001). However, these techniques have yet to be validated. Preliminary studies of the related *Hydrolagus colliei* found ages up to 21 years, and of *Chimaera monstrosa* found ages of up 30 years.

On the Chatham Rise, the estimated size at 50% sexual maturity for pale ghost sharks is 59–60 cm for males and 69–70 cm for females. Maturity is associated with a detectable change in growth form (fish become relatively light at length). As for most other elasmobranchs, their fecundity is likely to be low. Mating grounds, egg laying grounds, and nursery grounds of pale ghost sharks have not been identified. Pale ghost sharks of less than 30 cm CL (chimaera length) have been very rarely caught. Mature and gravid female pale ghost sharks have been caught in small numbers on Chatham Rise, Subantarctic, and west coast South Island *Tangaroa* surveys. Predators of ghost sharks are known to include ling, stargazer, and red cod.

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

Table 4: Estimates of biological parameters for pale ghost shark, from Horn (1997).

FMA	Estimate	
1. Weight = a (length)^b (Weight in g, length in cm chimaera length)		
Pale ghost shark	a	b
3 & 4	0.00512	3.037
5 & 6	0.00946	2.883

3. STOCKS AND AREAS

Horn (1997) proposed that ghost sharks be managed as three Fishstocks, i.e., east coast New Zealand (FMAs 1–4), Stewart-Snares shelf and Campbell Plateau (FMAs 5 and 6), and west coast New Zealand (FMAs 7, 8, and 9). Areas of narrow continental shelf separate these FMA groupings, so they could well provide barriers to stock mixing, particularly for the pale ghost shark. The deep water separating the Bounty Platform from the Campbell Plateau may also provide a barrier to mixing, and these areas may hold separate stocks.

4. STOCK ASSESSMENT

4.1 Estimates of fishery parameters and abundance

East coast (GSP 1: FMAs 1, 2, 3 & 4)

Pale ghost shark occur too deep to be monitored by east coast inshore trawl surveys. The Chatham Rise trawl survey indicated a steady biomass decline between 2001 and 2020, followed by a large increase in 2022 (Table 5: Figure 2). Pale ghost sharks were caught throughout Chatham Rise except on shallow banks and around the Chatham Islands. The biomass increased in 2022 throughout the survey area. The Chatham Rise survey has caught most pale ghost sharks between 50-80 cm CL. Between 2006 and 2016 a greater proportion of juveniles were caught with the length frequency composition becoming almost bimodal in several years (Figure 3). Pale ghost sharks were more frequently reported in commercial trawls in 2019–21 compared to 2009–11 on the east coast North Island and northeast Chatham Rise, suggesting there may be some movement within stocks and into and out of the survey spatial coverage.

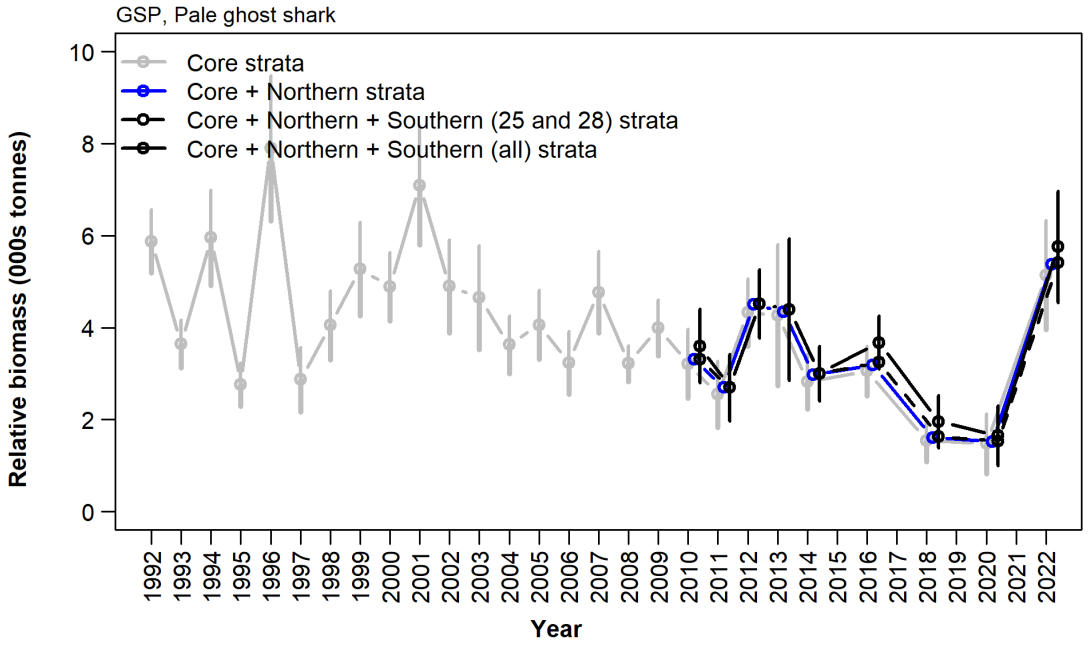


Figure 2: Pale ghost shark biomass indices from the Chatham Rise *Tangaroa* trawl survey.

Table 5: Biomass indices (t) and coefficients of variation (CV)

					Pale ghost shark	
QMA	**Area**	**Vessel**	**Trip code**	**Date**	**Biomass**	**% CV**
GSP1	Chatham Rise	*Tangaroa*	TAN9106	Jan–Feb 1992	6 060	5.7
			TAN9212	Jan–Feb 1993	3 570	7
			TAN9401	Jan-94	5 900	8.6
			TAN9501	Jan-95	2 750	8.4
			TAN9601	Jan-96	7 900	10
			TAN9701	Jan-97	2 870	12.2
			TAN9801	Jan-98	4 052	9.3
			TAN9901	Jan-99	5 272	9.7
			TAN0001	Jan-00	4 892	7.6
			TAN0101	Jan-01	7 094	9
			TAN0201	Jan-02	4 896	10
			TAN0301	Jan-03	4 653	12.1
			TAN0401	Jan-04	3 627	8.6
			TAN0501	Jan-05	4 061	9.2
			TAN0601	Jan-06	3 237	11
			TAN0701	Jan-07	4 766	9.0
			TAN0801	Jan-08	3 235	6.1
			TAN0901	Jan-09	3 995	7.6
			TAN1001	Jan-10	3 216	11.7
			TAN1101	Jan-11	2 550	14.2
			TAN1201	Jan-12	4 327	8.5
			TAN1301	Jan-13	4 270	18.0
			TAN1401	Jan-2014	2 824	10.5
			TAN1601	Jan-2016	3 055	8.8
			TAN1801	Jan-2018	1 544	15.0
			TAN2001	Jan-2020	1 476	22.0
			TAN2201	Jan-2022	5 144	11.5
GSP5	Southland Sub-Antarctic	*Tangaroa*	TAN9105	Nov–Dec 1991	11 210	6.1
			TAN9211	Nov–Dec 1992	4 750	7.2
			TAN9310	Nov–Dec 1993	11 670	9.4
			TAN0012	Nov–Dec 2000	17 823	12.4
			TAN0118	Nov–Dec 2001	11 219	8.8
			TAN0219	Nov–Dec 2002	9 297	9.3
			TAN0317	Nov–Dec 2003	10 360	8.7
			TAN0414	Nov–Dec 2004	8 549	10.3
			TAN0515	Nov–Dec 2005	9 416	10
			TAN0617	Nov–Dec 2006	12 619	10
			TAN0714	Nov–Dec 2007	13 107	11
			TAN0813	Nov–Dec 2008	10 098	13
			TAN0911	Nov–Dec 2009	13 553	9
			TAN1117	Nov–Dec 2011	11 677	9.6
			TAN1215	Nov–Dec 2012	16 181	12.6
			TAN1412	Nov–Dec 2014	11 725	10.1
			TAN1614	Nov–Dec 2016	4 160	11.0
			TAN1811	Nov–Dec 2018	6 331	20.7
			TAN2014	Nov–Dec 2020	12 464	13.9
GSP7	West Coast South Island	*Tangaroa*	TAN0007	Jun-Aug 2000	23.1	28.2
			TAN1210	Jul-Aug 2012	31.9	18.2
			TAN1308	Jul-Aug 2013	20.3	18.5
			TAN1609	Jul-Aug 2016	16.2	47.1
			TAN1807	Jul-Aug 2018	17.8	19.7
			TAN2107	Jul-Aug 2021	13.3	27.8

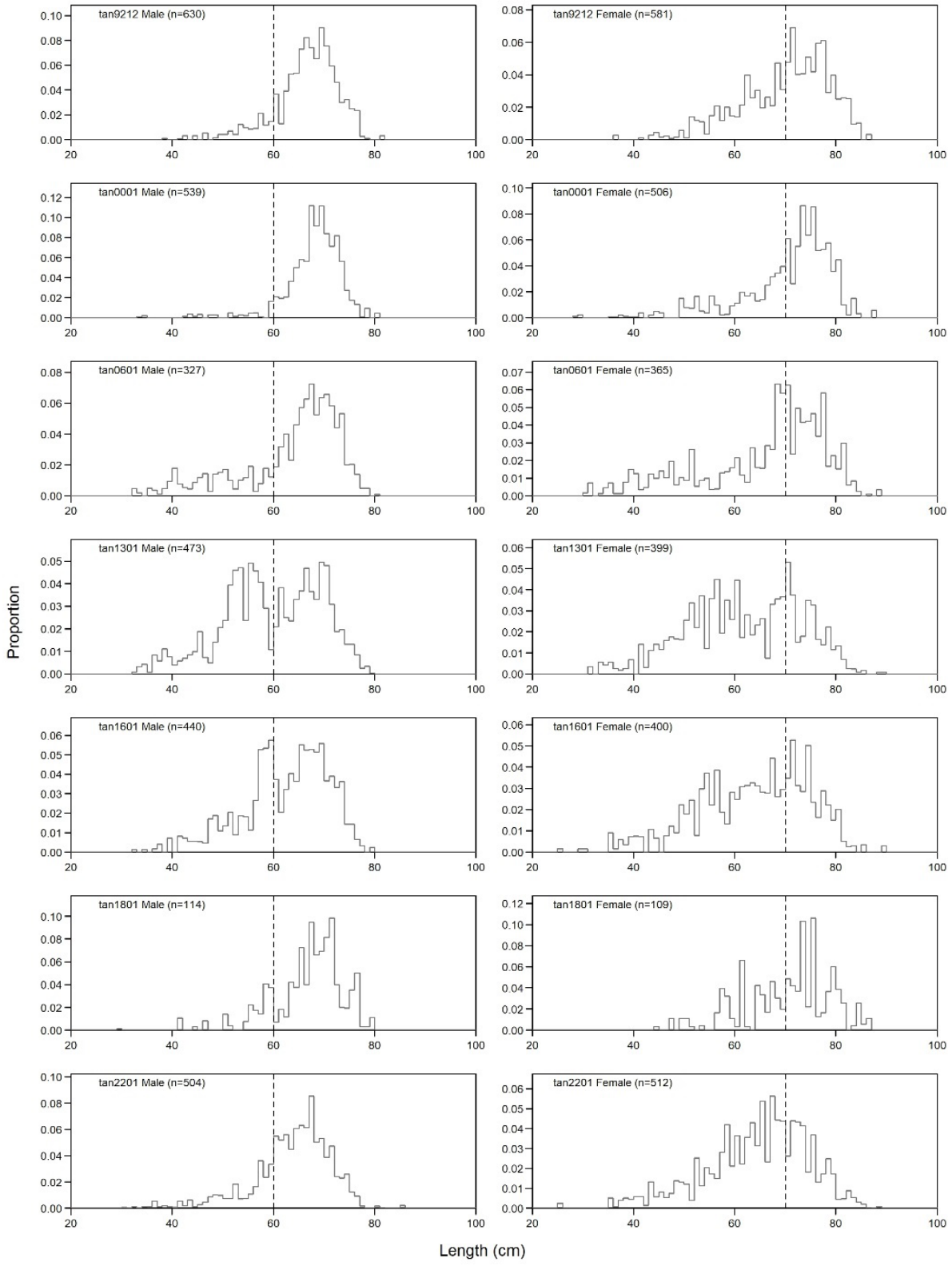


Figure 3: Selected pale ghost shark length frequency compositions for the Chatham Rise *Tangaroa* trawl survey core strata. n, number of fish measured. Vertical broken lines indicate the approximate size at first maturity.

Subantarctic (GSP 5: FMA 5 & 6)

The Subantarctic trawl survey indicated a no persistent trend in biomass (Table 5: Figure 4). Pale ghost sharks were caught throughout the Subantarctic. The Subantarctic survey has caught most pale ghost sharks between 50-80 cm CL, and the length frequency composition has remained largely the same throughout the time series (Figure 5).

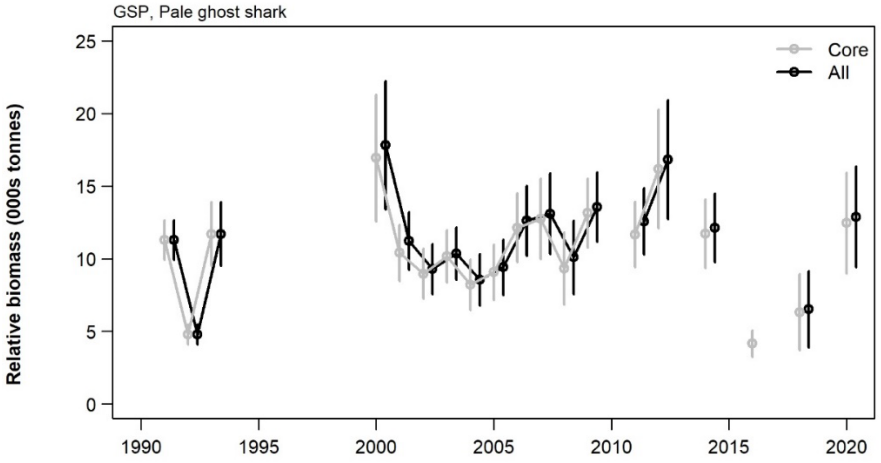


Figure 4: Pale ghost shark biomass indices from the Subantarctic November-December *Tangaroa* trawl survey.

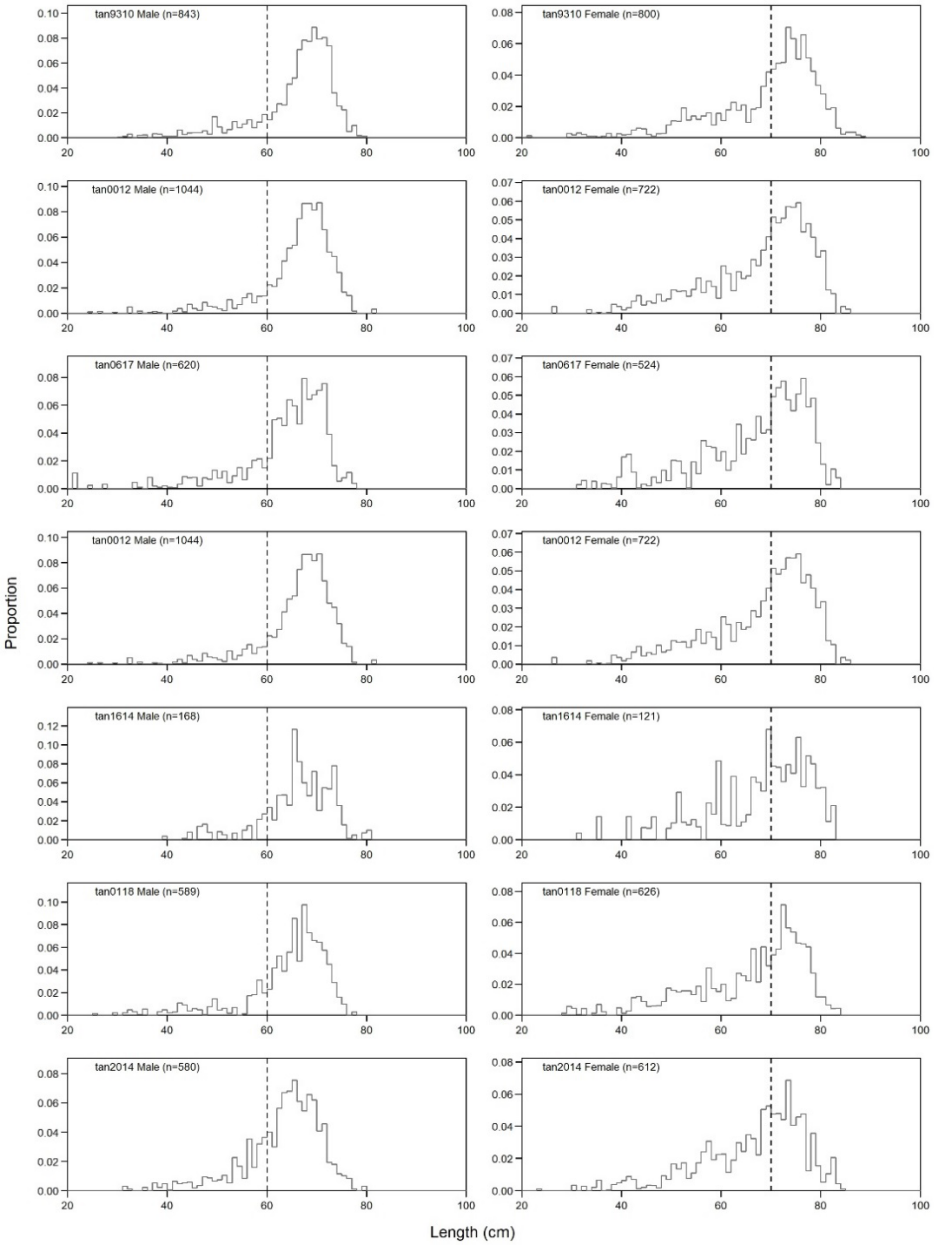


Figure 5: Selected pale ghost shark length frequency compositions for the Subantarctic November-December *Tangaroa* trawl survey core strata. n, number of fish measured. Vertical broken lines indicate the approximate size at first maturity.

West coast (GSP 7: FMAs 7, 8 & 9)

Pale ghost shark occur too deep to be monitored by east coast inshore trawl surveys. The west coast South Island trawl survey suggests a biomass decline between 2000 and 2013 and then no trend (Table 5: Figure 6). The west coast South Island survey has caught mostly adult male, and a mixture of juvenile and adult females with insufficient data to indicate any change in size frequency over time (Figure 7).

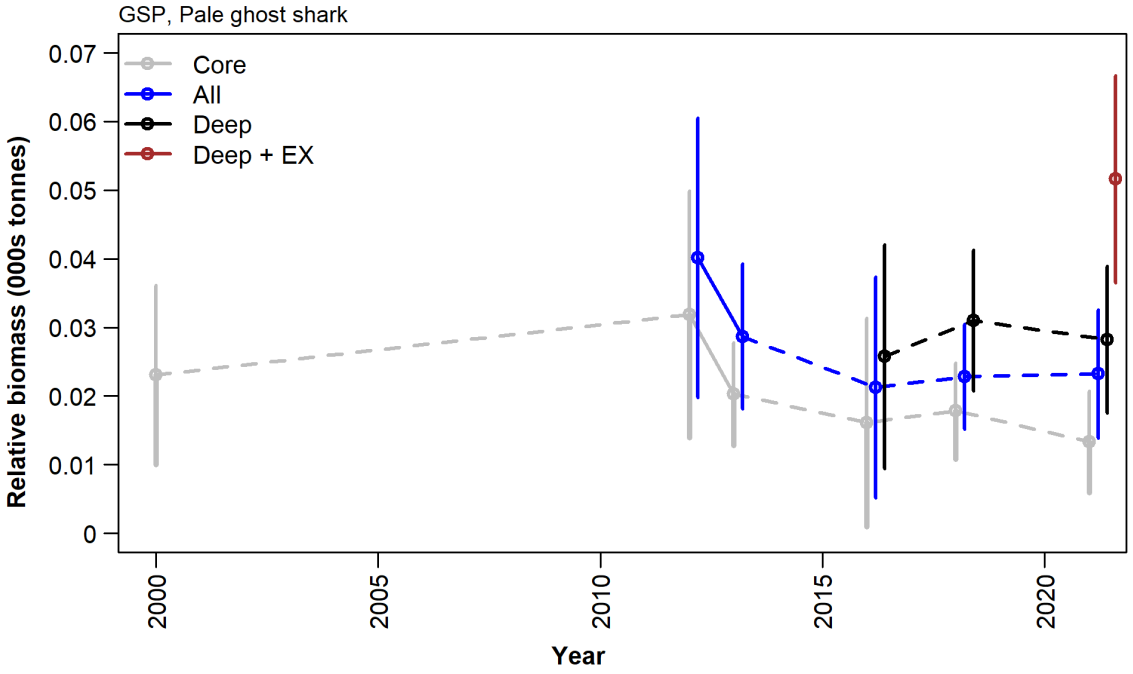


Figure 6: Pale ghost shark biomass indices from the west coast South Island *Tangaroa* trawl survey.

Establishing interim B_{MSY}-compatible reference points

The Working Group accepted the trawl surveys as valid biomass series for GSP 1 and GSP 5, but not for GSP 7. The Working Group in 2022 could not agree on year ranges for interim B_{MSY}-compatible proxies, and therefore surveys were used only to infer biomass trend.

4.2 Other factors

A data informed qualitative risk assessment was completed on all chondrichthyans (sharks, skates, rays and chimaeras) at the New Zealand scale in 2014 (Ford et al., 2015) and 2018 (Ford et al., 2018). Pale ghost shark was ranked equal eighth in terms of risk of the eleven QMS chondrichthyan species. Data were described as existing but poor for the purposes of the assessment and no consensus over this risk score was achieved by the expert panel. This risk assessment does not replace a stock assessment for this species but may influence research priorities across species.

5. FUTURE RESEARCH CONSIDERATIONS

- The fishery characterisation should be updated. The last characterisation covered the period to 2009–10. The characterisation should evaluate standardised CPUE as a further potential biomass index, and consider the influence of the squid and hoki fisheries in determining ghost shark catch and CPUE.
- Stock structure should be reviewed for all New Zealand simultaneously using all available data. This should include evaluating hypotheses for observed changes in the Chatham Rise length frequency distributions which were not clearly associated with changes in biomass, and consider conducting spatial-temporal analyses (noting some has historically been done post-survey).

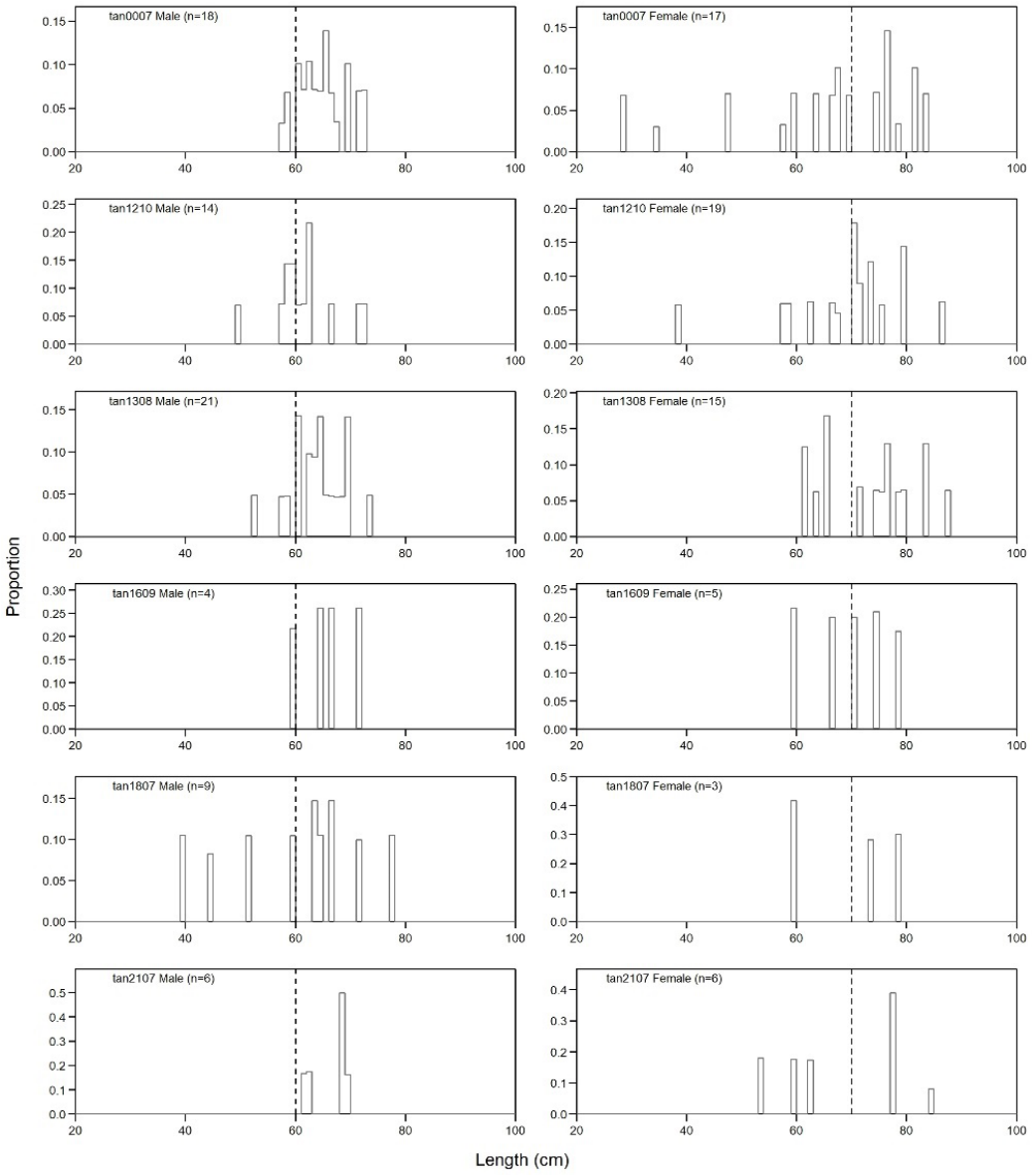


Figure 7: Pale ghost shark length frequency compositions for the west coast South Island *Tangaroa* trawl survey core strata. n, number of fish measured. Vertical broken lines indicate the approximate size at first maturity.

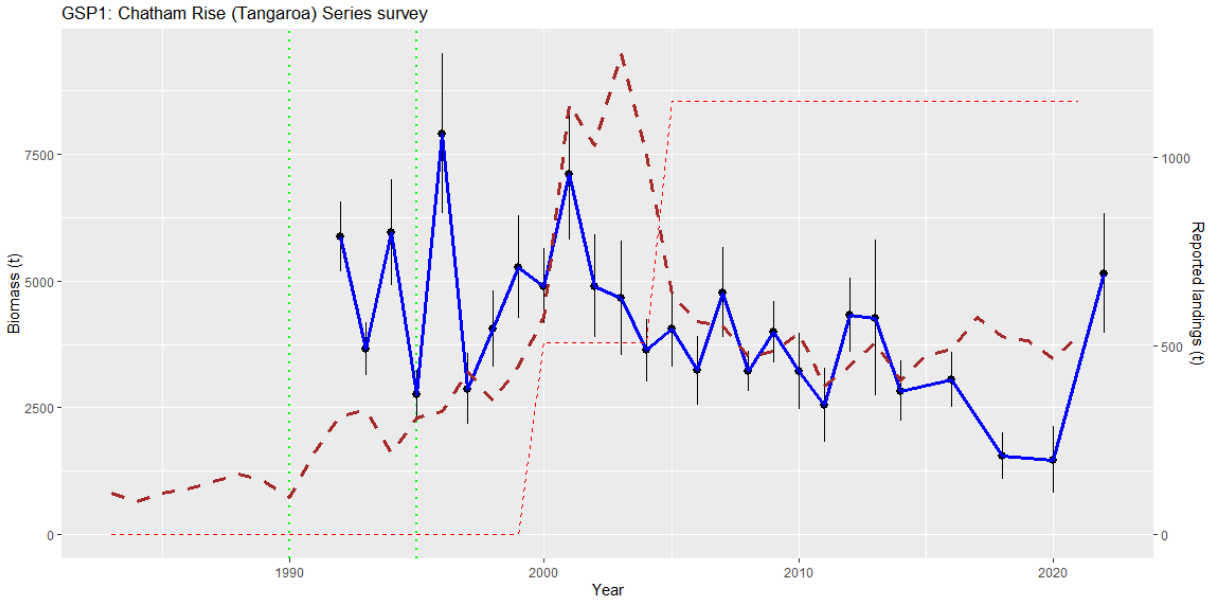
6. STATUS OF THE STOCKS

No estimates of current and reference biomass are available for pale ghost shark.

- **GSP 1**

Stock Status	
Year of Most Recent Assessment	2022
Assessment Runs Presented	Abundance index based on Chatham Rise *Tangaroa* research trawl survey
Reference Points	Interim Management Target: 40% B_0 Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: Not defined
Status in relation to Target	Unknown
Status in relation to Limits	Unknown
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status



GSP 1: Relative biomass from Chatham Rise *Tangaroa* trawl survey: blue line plus vertical lines showing ± 2 s.d. (left axis); dashed line, reported QMR/MHR landings (right axis); red dotted line, TACC for GSP 1 (right axis).

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Biomass estimate increased in 2022 after a period of steady decline.
Recent Trend in Fishing Mortality or Proxy	Unknown
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	Catches have been well below the TACC since 2004–05.

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unknown
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown

Assessment Methodology and Evaluation		
Assessment Type	Level 2 – Partial Quantitative Stock Assessment	
Assessment Method	Evaluation of survey abundance index and length frequencies	
Assessment Dates	Latest assessment: 2022	Next assessment: Unknown
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	Survey abundance index Survey length frequency	1 – High Quality 1 – High Quality
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	The core strata in the trawl survey do not cover the full depth distribution of pale ghost shark on Chatham Rise, nor stock areas to the north and south of Chatham Rise.	

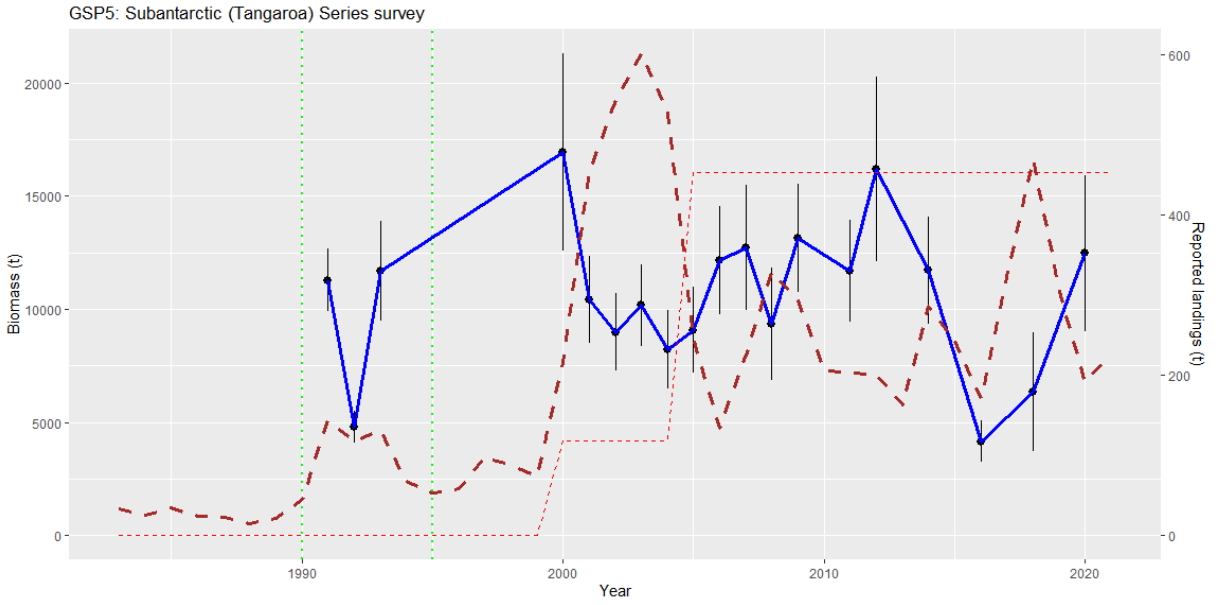
Qualifying Comments
The early catch history for this species is likely to underestimate actual catches.

Fishery Interactions
The pale ghost shark in GSP 1 is mainly taken as bycatch of the hoki fishery.

- **GSP 5**

Stock Status	
Year of Most Recent Assessment	2022
Assessment Runs Presented	Abundance index based on Subantarctic *Tangaroa* research trawl survey
Reference Points	Management Target: 40% B_0 Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: Not defined
Status in relation to Target	Unknown
Status in relation to Limits	Unknown
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status



GSP 5: Relative biomass from Subantarctic *Tangaroa* trawl survey: blue line plus vertical lines showing ± 2 s.d. (left axis); dashed line, reported QMR/MHR landings (right axis); red dotted line, TACC for GSP 5 (right axis).

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Biomass estimates have increased substantially after a series nadir in 2005–06.
Recent Trend in Fishing Mortality or Proxy	Unknown
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	Catches have been well below the TACC since 2004–05.

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unknown
Probability of Current Catch or TACC causing overfishing to continue or to commence	Unknown

Assessment Methodology		
Assessment Type	Level 2 – Partial Quantitative Stock Assessment	
Assessment Method	Evaluation of survey abundance index and length frequencies	
Assessment Dates	Latest assessment: 2022	Next assessment: Unknown
Overall assessment quality rank	1 – High Quality	
Main data inputs	Survey abundance index Survey length frequency	1 – High Quality 1 – High Quality
Data not used (rank)	-	
Changes to Model Structure and Assumptions	-	
Major Sources of Uncertainty	The core strata in the trawl survey do not cover the full depth distribution of pale ghost shark	

Qualifying Comments
The early catch history for this species is likely to underestimate actual catches.

Fishery Interactions
The pale ghost shark in GSP 5 is mainly taken as bycatch of the hoki fishery.

- **GSP 7**

Stock Status	
Year of Most Recent Assessment	2022
Assessment Runs Presented	There was no accepted monitoring method for GSP 7
Reference Points	Management Target: 40% B_0 Soft Limit: 20% B_0 Hard Limit: 10% B_0 Overfishing threshold: Not defined
Status in relation to Target	Unknown
Status in relation to Limits	Unknown
Status in relation to Overfishing	Unknown

Historical Stock Status Trajectory and Current Status

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Unknown
Recent Trend in Fishing Mortality or Proxy	Unknown
Other Abundance Indices	-
Trends in Other Relevant Indicators or Variables	Catches have been well below the TACC since 1999–2000.

Projections and Prognosis	
Stock Projections or Prognosis	Unknown
Probability of Current Catch or TACC causing Biomass to remain below or to decline below Limits	Soft Limit: Unknown Hard Limit: Unknown
Probability of Current Catch or TACC causing Overfishing to continue or to commence	Unknown

Assessment Methodology and Evaluation		
Assessment Type		
Assessment Method		
Assessment Dates	Latest assessment:	Next assessment: Unknown
Overall assessment quality rank		
Main data inputs (rank)		
Data not used (rank)		
Changes to Model Structure and Assumptions		
Major Sources of Uncertainty	The core strata in the west coast South Island trawl survey do not cover the full depth distribution of pale ghost shark, nor stock areas to the north.	

Qualifying Comments
The catch history for this species is likely to underestimate actual catches.

Fishery Interactions

7. FOR FURTHER INFORMATION

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