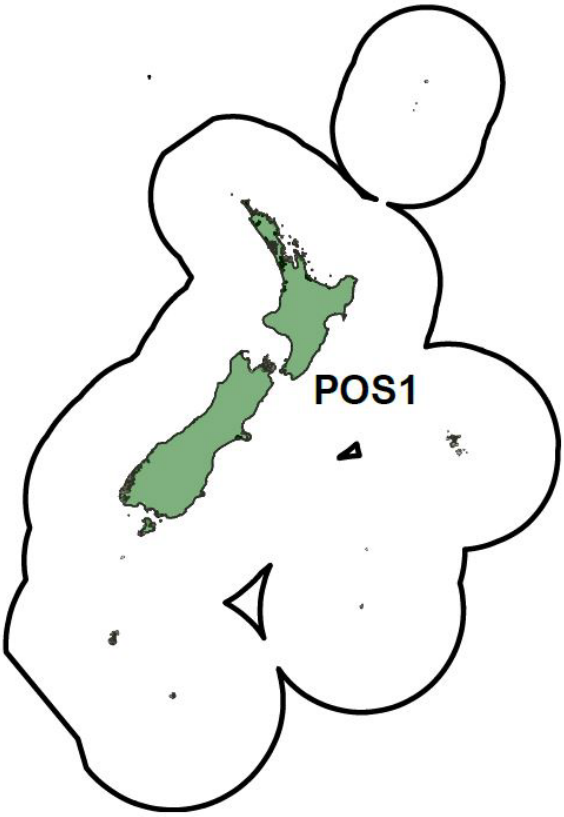
PORBEAGLE SHARK (POS)

(*Lamna nasus)*



1. FISHERY SUMMARY

Porbeagle sharks were introduced into the QMS on 1 October 2004 under a single QMA, POS 1, with a Total Allowable Catch (TAC) of 249 t, a Total Allowable Commercial Catch (TACC) of 215 t, and a recreational allowance of 10 t. The TAC was reviewed in 2012, and the reduced allocation and allowances applied from 1 October 2012 are given in Table 1. The decrease was in response to sustainability concerns surrounding porbeagle sharks, which are slow growing and have low fecundity, making them particularly vulnerable to overexploitation.

Table 1: Recreational and customary non-commercial allowances, TACCs and TACs (all in t) for porbeagle sharks.

Fish stock	Recreational allowance	Customary non-commercial allowance	Other mortality	TACC	TAC
POS 1	6	2	11	110	129

Porbeagle sharks were added to the Third Schedule of the 1996 Fisheries Act with a TAC set under s14 because porbeagle sharks are a highly migratory species and it is not possible to estimate MSY for the part of the stock that is found within New Zealand fisheries waters.

Porbeagle sharks were also added to the Sixth Schedule of the 1996 Fisheries Act with the provision that:

> "A commercial fisher may return any porbeagle shark to the waters from which it was taken if –
> (a) that porbeagle shark is likely to survive on return; and
> (b) the return takes place as soon as practicable after the porbeagle shark is taken."

The conditions of Schedule 6 releases were subsequently amended for porbeagle shark; on 1 October 2014 a ban on shark finning was introduced. After this time any porbeagle sharks for which the fins are retained are required to be either landed with the fins attached (artificial attachment such as tying or securing the fins to the trunk is permitted), or fishers can follow a fin-to-greenweight ratio to land porbeagle shark fins separately to the body.

From 1 October 2014, fishers have also been allowed to return porbeagle sharks to the sea both alive and dead, although the status must be reported accurately. Those returned to the sea dead are counted against a fisher's annual catch entitlement and the total allowable catch limit for that species.

Management of the porbeagle shark throughout the western and central Pacific Ocean (WCPO) is the responsibility of the Western and Central Pacific Fisheries Commission (WCPFC) and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). Under these regional conventions New Zealand is responsible for ensuring that the management measures applied within New Zealand fisheries waters are compatible with those of WCPFC and CCSBT. In 2023 the WCPFC Scientific Committee supported the removal of the southwest Pacific porbeagle shark assessment from the list of WCPFC stock assessments, given most catches for this species occur within the CCSBT convention area.

1.1 Commercial fisheries

About three-quarters of the commercial catch of porbeagle sharks is taken by tuna longliners and most of the rest by midwater and bottom trawlers. Landings of porbeagle sharks reported by fishers on Catch Effort Landing Return (CELR) (landed), Catch Landing Return (CLR), or Tuna Longline Catch Effort Return (TLCER) forms and by processors on Licensed Fish Receiver Return (LFRR) and Monthly Harvest Return (MHR) forms are shown in Table 2. Historical landings have recently been re-calculated to correct for changes in, and use of, inappropriate conversion factors, and to allow for mortality of released sharks (Francis 2017).

About 60% of porbeagle sharks caught by tuna longliners have been processed and the rest discarded. Before 1 October 2014 a high proportion of the catch was finned, but an increasing proportion of released sharks was reported as greenweight, and small amounts were processed for their flesh. Figure 1 shows historical catch for POS 1. Since the ban on shark finning in 2014, almost all porbeagle catches are now discarded or actively released. In the three-year period from 2019–02 to 2021–22, 99.5% of the annual mean total catch (i.e., including landings and disposals) of porbeagle of were disposed of (Moore and Finucci 2024).

Of the total porbeagle commercial captures between 2019–20 and 2021–22, surface longline accounted for 49.9%, mid-water trawl accounted for 33.7% and bottom trawl accounted for 10.8% of total porbeagle commercial captures. Of these captures, 51.8% of disposals of porbeagle sharks from surface longliners and 17.7% of disposals of porbeagle sharks from trawls were attributed to the disposal code X (alive and likely to survive) (Moore and Finucci 2024).

Between the 2019–20 and 2021–22 fishing years, most of the porbeagle catch and disposal from surface longline was taken by sets targeting southern bluefin tuna off the west coast of the South Island (Figure 2). Most of the catches and disposals of porbeagle sharks during this time for midwater trawls occurred around the Campbell Plateau in trawls targeting southern blue whiting (*Micromesistius australis*) (Figure 3), as well as off the west coast of the South Island. For bottom trawls, the majority of the catch of porbeagle sharks during the 2019 – 20 and 2021 – 22 fishing period occurred around the Auckland Islands (Figure 4), from tows targeting arrow squid (*Nototodarus sloanii*) and hoki (Moore & Finucci, 2024).

For all surface longline fisheries, porbeagle sharks made up less than 1% of the catch in 2024–25 (Figure 5). Longline fishing effort is distributed along the east coast of the North Island and the south-west coast of the South Island. The south-west coast South Island fishery predominantly targets southern bluefin tuna, whereas the east coast North Island fishery targets a range of species including bigeye, swordfish, and southern bluefin tuna.

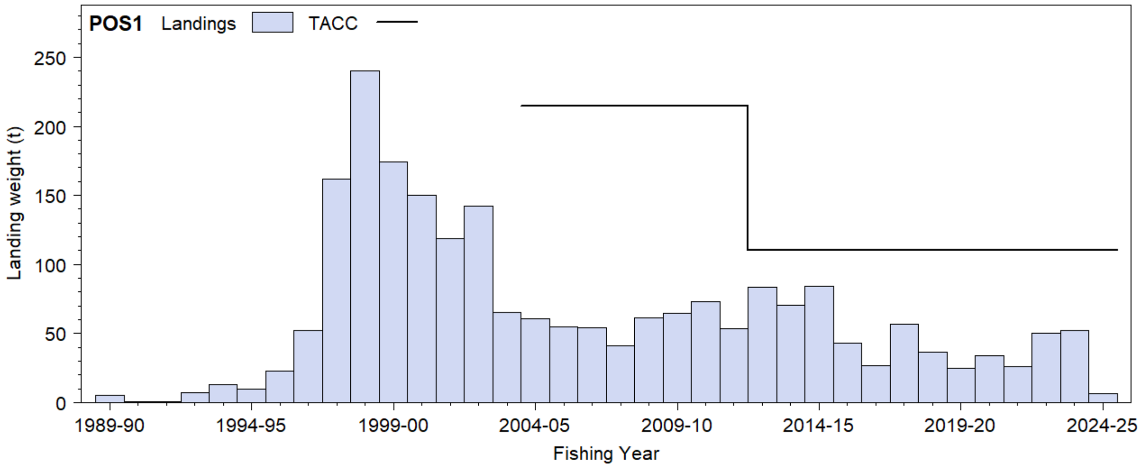


Figure 1: Catch of porbeagle sharks from 1989–90 to present within New Zealand waters (POS 1).

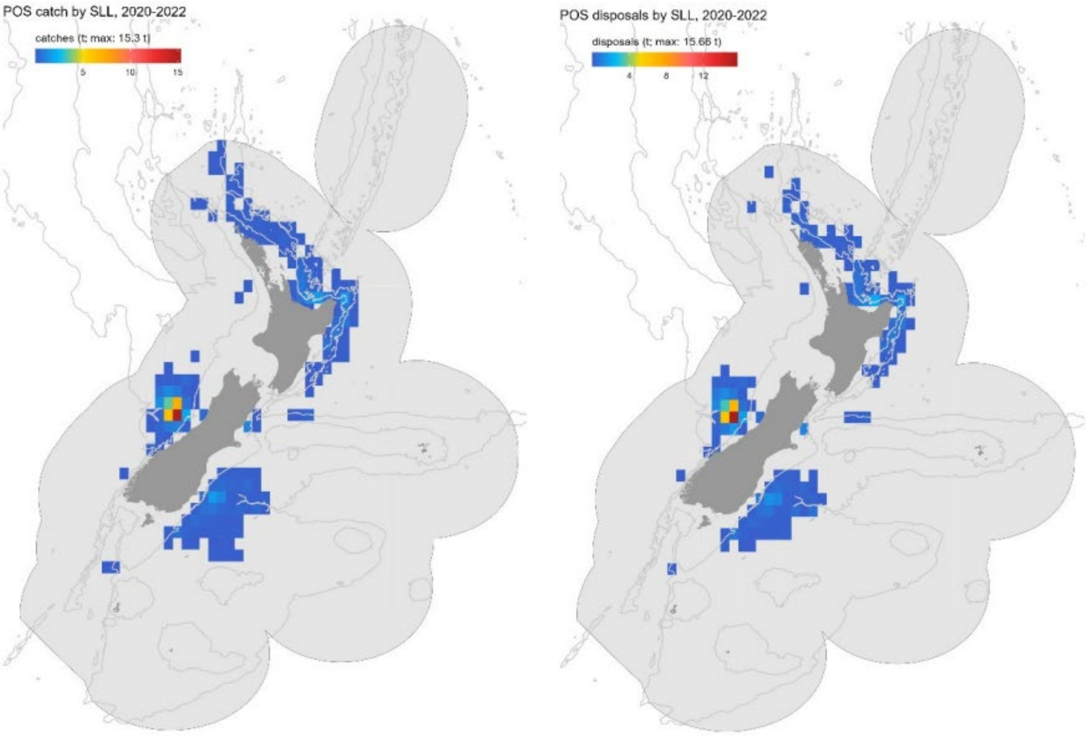


Figure 2: Total catches (including disposals; left) and disposals (right) of porbeagle (POS) by surface longline (SLL) in New Zealand's Exclusive Economic Zone, aggregated at the 0.5° resolution for 2019–20 to 2021–22 (Moore & Finucci, 2024).

Across all fleets in the surface longline fishery during most of the years 2006–07 to 2017–18, 50–70% of the porbeagle sharks were alive when brought to the side of the vessel (Table 3). The percentage of porbeagle shark catches retained has varied over time, becoming relatively low in 2014–15 (Table 4). Since the regulation change on 1 October 2014 both the charter and domestic fleets have discarded most of their porbeagle catch.

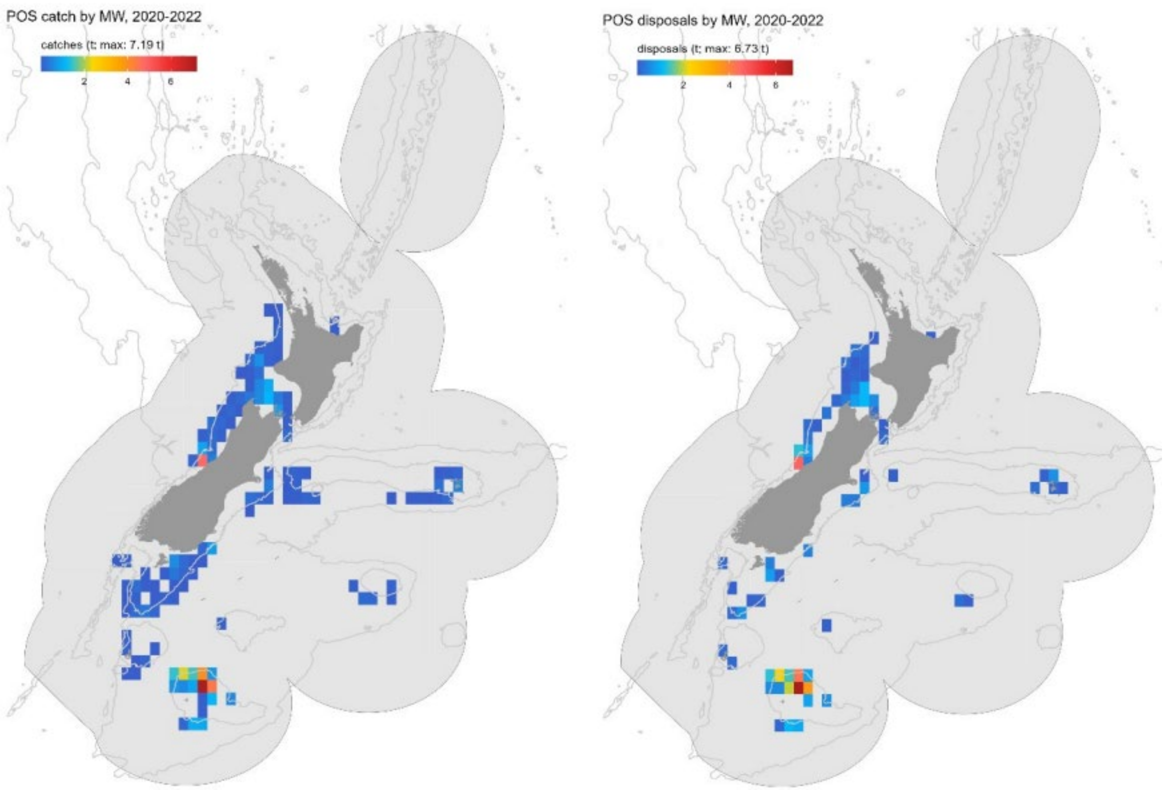


Figure 3: Total catches (including disposals; left) and disposals (right) of porbeagle (POS) by mid-water trawl (MW) in New Zealand's Exclusive Economic Zone, aggregated at the 0.5° resolution for 2019–20 to 2021–22 (Moore & Finucci, 2024).

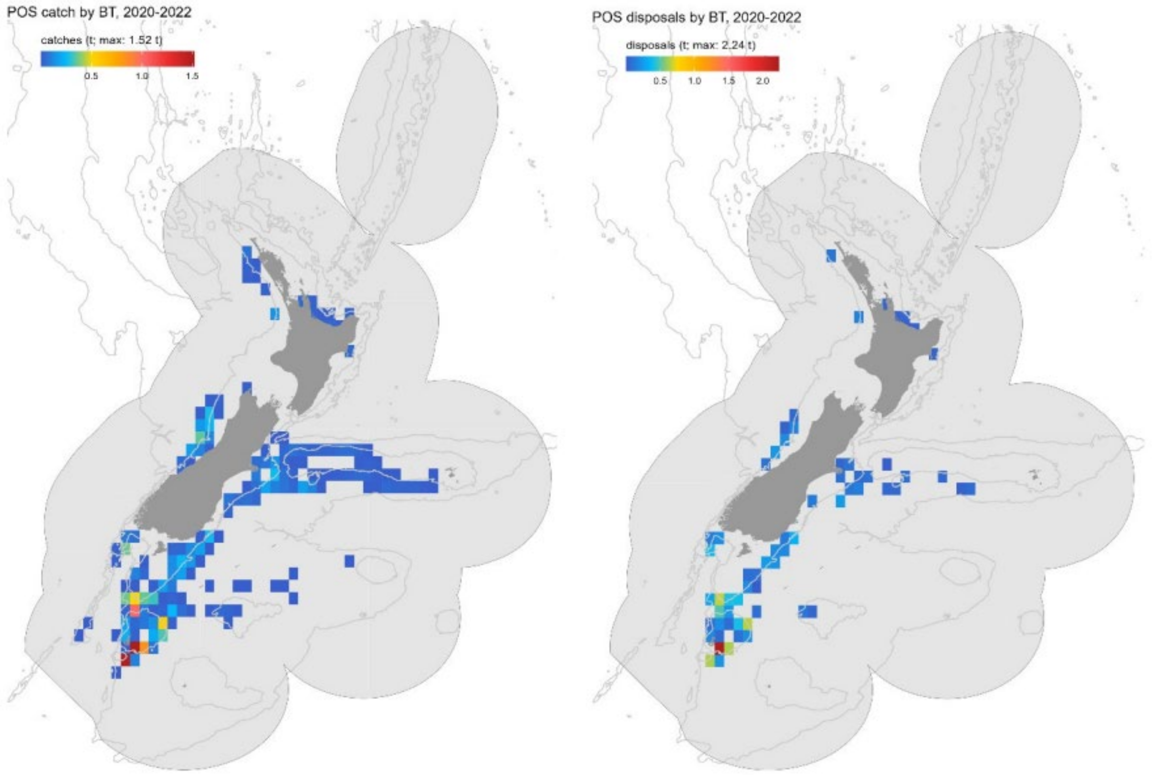


Figure 4: Total catches (including disposals; left) and disposals (right) of porbeagle (POS) by bottom trawl (BT) in New Zealand's Exclusive Economic Zone, aggregated at the 0.5° resolution for 2019–20 to 2021–22 (Moore & Finucci, 2024).

Table 2: New Zealand commercial landings (t) of porbeagle sharks reported by fishers (CELRs, CLRs, or TLCERs) and processors (LFRRs or MHRs) by fishing year (– no data available).

Year	Fishers	Processors	Year	Fishers	Processors
1989–90	–	5	2007–08*	43	41
1990–91	1	1	2008–09*	64	61
1991–92	1	1	2009–10*	–	65
1992–93	7	7	2010–11*	–	73
1993–94	10	13	2011–12*	–	54
1994–95	16	10	2012–13*	–	81
1995–96	26	23	2013–14*	–	70
1996–97	39	52	2014–15*	–	84
1997–98	205	162	2015–16*	–	43
1998–99	301	240	2016–17*	–	27
1999–00	215	174	2017–18*	–	57
2000–01	188	150	2018–19*	–	37
2001–02	161	119	2019–20*	–	25
2002–03*	152	142	2020–21*	–	34
2003–04*	84	65	2021–22*	–	26
2004–05*	62	60	2022–23*	–	50
2005–06*	54	55	2023–24*	–	52
2006–07*	53	54	2024–25*	–	7

* MHR rather than LFRR data.

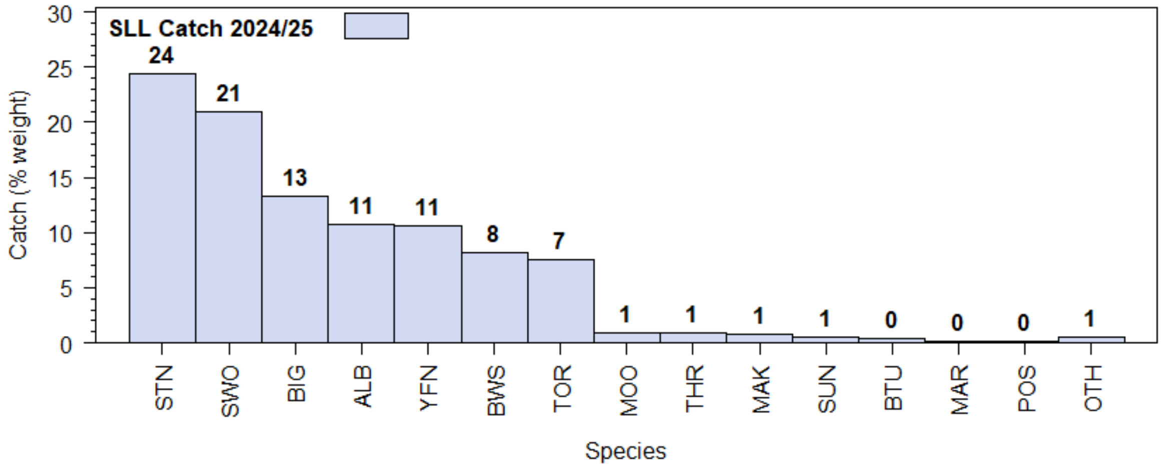


Figure 5: A summary of species composition of the surface longline estimated catch in the most recent year. The percentage by weight of each species is calculated for all trips classified under the activity.

1.2 Recreational fisheries

An estimate of the recreational harvest is not available. The recreational catch of porbeagle sharks is probably negligible, because they usually occur over the outer continental shelf or beyond. They are occasionally caught by gamefishers but most are tagged and released. In 2001, 40 porbeagle sharks were tagged by recreational fishers but numbers have dwindled from this peak to an annual average of just 1 individual per year (Holdsworth and Curtis, 2025).

1.3 Customary non-commercial fisheries

An estimate of the current customary catch is not available. The Māori customary catch of porbeagle sharks is probably negligible, because they usually occur over the outer continental shelf or beyond.

1.4 Unreported catch

There is no known unreported catch of porbeagle sharks.

1.5 Other sources of mortality

Many of the porbeagle sharks caught by tuna longliners are alive when the vessel retrieves the line, but it is not known how many of the released, discarded sharks survive.

Table 3: Percentage of porbeagle sharks (including discards) that were alive or dead when hauled to the longline vessel and observed during 2006–07 to 2020–21, by fishing year, fleet, and region. Small sample sizes (number observed < 20) were omitted (Griggs & Baird 2013, Griggs et al. 2018, 2021, 2024). Only the New Zealand domestic fleet operated after 2014–15.

Year	Fleet	Area	% alive	% dead	Number
2006–07	Charter	North	60.5	39.5	223
		South	87.3	12.7	370
	Domestic	North	44.8	55.2	134
	Total		**71.3**	**28.7**	**727**
2007–08	Charter	South	77.6	22.4	49
	Domestic	North	59.6	40.4	488
	Total		**61.3**	**38.7**	**537**
2008–09	Charter	North	91.0	9.0	78
		South	85.4	14.6	158
	Domestic	North	57.9	42.1	254
	Total		**71.5**	**28.5**	**494**
2009–10	Charter	South	82.4	17.6	68
	Domestic	North	40.4	59.6	322
		South	30.0	70.0	20
	Total		**46.8**	**53.2**	**410**
2010–11		South	75.6	24.4	82
	Domestic	North	62.0	38.0	686
	Total		**63.2**	**36.8**	**771**
2011–12	Charter	South	75.0	25.0	84
	Domestic	North	64.1	35.9	415
		South	37.1	62.9	124
	Total		**60.2**	**39.8**	**623**
2012–13	Charter	South	82.0	18.0	111
	Domestic	North	72.3	27.7	155
		South	33.3	66.7	27
	Total		**70.6**	**29.4**	**303**
2013–14	Charter	South	73.8	26.2	313
	Domestic	North	66.5	33.5	206
		South	28.3	71.7	198
	Total		**59.1**	**40.9**	**717**
2014–15	Charter	South	84.9	15.1	245
	Domestic	North	48.6	51.4	175
		South	32.0	68.0	50
	Total		**65.7**	**34.3**	**470**
2015–16	Domestic	North	54.2	45.8	671
		South	67.1	32.9	313
	Total		**58.3**	**41.7**	**984**
2016–17	Domestic	North	32.0	68.0	410
		South	55.4	44.6	269
	Total		**41.2**	**58.8**	**679**
2017–18	Domestic	North	48.7	51.3	156
		South	64.2	35.8	271
	Total		**58.5**	**41.5**	**427**
2018–19	Domestic	North	38.6	61.4	70
		South	40.1	59.9	222
	Total		**39.7**	**60.3**	**292**
2019–20	Domestic	North	52.3	47.7	65
		South	33.3	66.7	63
	Total		**43.0**	**57.0**	**128**
2020–21	Domestic	North	50.0	50.0	26
		South	28.0	72.0	268
	Total		**29.9**	**70.1**	**294**

Table 4: Percentage of porbeagle sharks that were retained, or discarded or lost, when observed on a longline vessel during 2006–07 to 2020–21, by fishing year and fleet. Small sample sizes (number observed < 20) omitted (Griggs & Baird 2013, Griggs et al. 2018, Griggs et al. 2021). Only the New Zealand domestic fleet operated after 2014–15.

Year	Fleet	% retained or finned	% discarded or lost	Number
2006–07	Charter	86.6	13.4	628
	Domestic	38.1	61.9	134
	Total	**78.1**	**21.9**	**762**
2007–08	Charter	89.8	10.2	49
	Domestic	35.7	64.3	488
	Total	**40.6**	**59.4**	**537**
2008–09	Charter	91.1	8.9	257
	Domestic	46.9	53.1	258
	Total	**68.9**	**31.1**	**515**
2009–10	Charter	79.2	20.8	72
	Domestic	46.0	54.0	348
	Total	**51.7**	**48.3**	**420**
2010–11	Charter	73.3	26.7	86
	Domestic	30.8	69.2	714
	Total	**35.4**	**64.6**	**800**
2011–12	Charter	64.3	35.7	84
	Domestic	32.8	67.2	609
	Total	**36.7**	**63.3**	**693**
2012–13	Charter	60.3	39.7	121
	Domestic	15.4	84.6	188
	Total	**33.0**	**67.0**	**309**
2013–14	Charter	24.8	75.2	318
	Domestic	31.1	68.9	454
	Total	**28.5**	**71.5**	**772**
2014–15	Charter	0.0	100.0	248
	Domestic	11.2	88.8	232
	Total	**5.4**	**94.6**	**480**
2015–16	Domestic	1.5	98.5	987
	Total	**1.5**	**98.5**	**987**
2016–17	Domestic	0.0	100.0	680
	Total	**0.0**	**100.0**	**680**
2017–18	Domestic	0.0	100.0	427
	Total	**0.0**	**100.0**	**427**
2018–19	Domestic	0.0	100.0	292
	Total	**0.0**	**100.0**	**292**
2019–20	Domestic	0.0	100.0	129
	Total	**0.0**	**100.0**	**129**
2020–21	Domestic	0.0	100.0	295
	Total	**0.0**	**100.0**	**295**

2. BIOLOGY

Porbeagles live mainly in the latitudinal bands 30–50° S and 30–70° N. They occur in the North Atlantic Ocean, and in a circumglobal band in the Southern Hemisphere. Porbeagles are absent from the North Pacific Ocean, where the closely related salmon shark, *Lamna ditropis*, fills their niche. In the South Pacific Ocean, porbeagles are caught north of 30° S in winter–spring only; in summer they are not found north of about 35° S. They appear to penetrate further south during summer and autumn and are found near many of the sub-Antarctic islands in the Indian and south-west Pacific oceans. Porbeagle sharks are not found in the tropics.

Porbeagles are live-bearers (aplacental viviparous), and the length at birth is 58–67 cm fork length (FL) in the south-west Pacific. Females mature at around 170–180 cm FL and males at about 140–150 cm FL. The gestation period is about 8–9 months. In the north-west Atlantic, all females sampled in winter were pregnant, suggesting that there is no extended resting period between pregnancies, and that the female reproductive cycle lasts for one year. Litter size is usually four embryos, with a mean litter size in the south-west Pacific of 3.75. If the reproductive cycle lasts one year, annual fecundity would be about 3.75 pups per female.

Studies of the age and growth of New Zealand porbeagles produced growth curves and estimates of the natural mortality rate (Table 5). However, attempts to validate ages using bomb radiocarbon analysis were unsuccessful, but they suggested that the ages of porbeagles older than about 20 years were progressively underestimated; for the oldest sharks the age underestimation may have been as much as 50% (Francis et al. 2007). Consequently, the growth parameters provided in Table 5 are probably only accurate for ages up to about 20 years. Males mature at 6–8 years, and females mature at 13–16 years. Longevity is unknown but may be about 65 years.

In New Zealand, porbeagle sharks recruit to tuna longline fisheries during their first year at about 70 cm FL, and the catch is dominated by juveniles, with about half of the males and two-thirds of the females being under 100 cm fork length. Most sharks caught by tuna longliners are 70–170 cm FL. The size and sex distribution of both sexes are similar up to about 150 cm, but larger individuals are predominantly male; few mature females are caught. Regional differences in length composition suggest segregation by size. The size and sex composition of sharks caught by trawlers is unknown.

Porbeagles are active pelagic predators of fish and cephalopods. Pelagic fish dominate the diet but squid are also commonly eaten, especially by the small sharks (Horn et al. 2013).

Table 5: Estimates of biological parameters.

	Fishstock	**Estimate**	**Source**
Natural mortality (m)	POS 1	0.05–0.10	Francis (unpublished data)
Weight	POS 1, both sexes.	$a = 2.143 \times 10^{-5}$; $b = 2.924$	Ayers et al. (2004)
von Bertalanffy model parameter estimates	POS 1, males	$k = 0.133$, $t_0 = -4.22$, $L_{\infty} = 185.8$	Francis (2015)
	POS 1, females	$k = 0.086$, $t_0 = -6.10$, $L_{\infty} = 210.9$	Francis (2015)

3. STOCKS AND AREAS

In the north-west Atlantic, most tagged porbeagle sharks moved short to moderate distances (up to 1500 km) along continental shelves, although one moved about 1800 km off the shelf into the mid-Atlantic Ocean. Sharks tagged off southern England were mainly recaptured between Denmark and France, with one shark moving 2370 km to northern Norway. Only one tagged shark has crossed the Atlantic: it travelled 4260 km from south-west Eire to 52° W off eastern Canada. Thus, porbeagles from the north-west and north-east Atlantic appear to form two distinct stocks. Based on the disjunct (antitropical) geographical distribution, differences in biological parameters, and genetic analyses, North Atlantic porbeagles are reproductively isolated from Southern Hemisphere porbeagles.

The stock structure of porbeagle sharks in the Southern Hemisphere is unknown. However, given the scale of movements of tagged sharks (Francis et al. 2015), it seems likely that sharks in the south-west Pacific comprise a single stock. There is no evidence to indicate whether this stock extends to the eastern South Pacific or Indian Ocean.

4. ENVIRONMENTAL AND ECOSYSTEM CONSIDERATIONS

This summary is from the perspective of the porbeagle shark but there is no directed fishery for the species so there is no information on the bycatch of other species in porbeagle fisheries.

4.1 Role in the ecosystem

4.1.1 Diet

Porbeagle sharks (*Lamna nasus*) are active pelagic predators of fish and cephalopods. Porbeagle sharks less than 75 cm feed mostly on squid but their diet changes to fish as they grow, with fish comprising more than 60% of the diet for porbeagle sharks 75 cm and over (Figure 6) (Griggs et al. 2007, Horn et al. 2013).

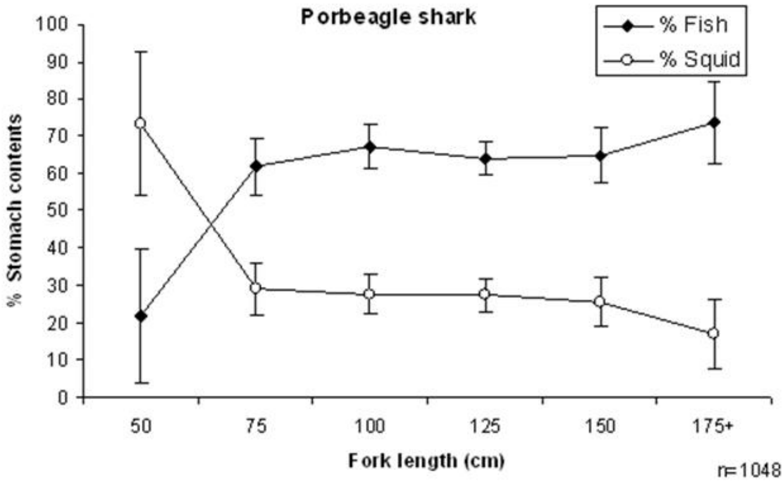


Figure 6: Changes in percentage of fish and squid in stomachs of porbeagle sharks as a function of fork length.

4.2 Non-target fish catch

Porbeagle shark is a non-target catch in the tuna and swordfish surface longline fishery in the New Zealand EEZ. Observer records indicate that a wide range of species are landed by the surface longline fleets in New Zealand fishery waters. Blue sharks are the most commonly caught species (by number), followed by lancetfish and porbeagle shark (Table 6).

Table 6: Total estimated catch (numbers of fish) of common bycatch species in the New Zealand surface longline fishery as estimated from observer data from 2017 to 2022. Observer data too limited to raise to the fleet for 2023. Also provided is the percentage of these species retained (2022 data only) and the percentage of fish that were alive when discarded, N/A (none discarded). Porbeagle sharks are highlighted in grey.

Species	2017	2018	2019	2020	2021	2022	% retained (2022)	discards % alive (2022)
Blue shark	49 924	63 618	89 377	37 093	39 524	65 277	0	91.9
Porbeagle shark	3 101	2 594	2 883	1 320	2 248	2 810	0	29.2
Lancetfish	13 274	13 163	18 747	11 457	4 211	2 212	0	2.1
Butterfly tuna	406	419	348	120	388	663	96.0	0
Moonfish	2 022	2 698	1 975	1 834	1 033	526	100.0	N/A
Oilfish	227	602	417	1 149	504	510	0	74.3
Pelagic stingray	1 798	2 949	526	1721	3 182	508	0	97.1
Ray’s bream	2 421	1 579	1 949	3 211	2 514	494	90.0	10.0
Mako shark	1 391	2 721	1 138	859	933	310	0	72.2
Striped marlin	290	247	157	279	426	175	0	66.7
Escolar	300	594	488	808	388	146	0	30.0
Skipjack tuna	57	184	8	134	110	117	100.0	N/A
Rudderfish	680	253	186	164	221	80	66.7	33.3
Dealfish	72	25	23	69	18	80	0	33.3
Sunfish	1 648	3 648	1 982	1 618	1 537	56	0	100.0
Big scale pomfret	17	34	0	52	17	53	0	50.0
School shark	59	187	116	29	64	27	100.0	N/A
Deepwater dogfish	32	6	90	29	42	27	0	100.0
Thresher shark	260	253	193	269	161	15	0	0

4.3 Benthic interactions

There are no known interactions with benthic habitats for this fishery.

5. STOCK ASSESSMENT

Relative to a wide range of shark species, the productivity of porbeagle sharks is very low. Females have a high age-at-maturity, high longevity (and therefore low natural mortality rate), and low annual fecundity. The low fecundity is cause for strong concern, because the ability of the stock to replace sharks removed by fishing is very limited.

5.1 Southern hemisphere

The stock status of porbeagle sharks from the entire Southern Hemisphere range of the species was assessed by WCPFC during the 13th Regular Session of the Scientific Committee (SC13) in 2017. A stock status risk assessment of the Southern Hemisphere porbeagle 'stock' (analysed as five separate sub-stocks) was undertaken for WCPFC and the Common Oceans (ABNJ) Tuna Project. SC13 reviewed the report, and it was subsequently revised (Hoyle et al. 2017).

The risk assessment of Southern Hemisphere porbeagle sharks assessed status by comparing estimates of fishing mortality against three maximum impact sustainable threshold reference points equivalent to r (the instantaneous fishing mortality that will in theory lead to population extinction; F_{crash}), $0.75r$ (the instantaneous fishing mortality rate that corresponds to the limit biomass; F_{lim}), and $0.5r$ (the instantaneous fishing mortality rate that corresponds to the maximum number of fish in the population that can be killed by fishing in the long term F_{msm}), where r refers to the estimated intrinsic rate of increase of the species. The spatial domain of the assessment was divided into five subpopulations or regions by longitude: 1) Western Atlantic Ocean; 2) Eastern Atlantic/Western Indian Ocean; 3) Eastern Indian Ocean; 4) Western Pacific Ocean; and 5) Eastern Pacific Ocean.

SC13 noted that although the stock status of the species is currently unknown the results of the assessment show that fishing mortality of the Southern Hemisphere stock is very low, and that it decreases eastward from the waters off South Africa to the waters off New Zealand. In the assessment area (eastern Atlantic to western Pacific Ocean) in the last decade (2005 to 2014), median F values ranged from 0.0008 to 0.0015 (mean 0.0010). This fishing mortality was less than 9% of the MIST based on r (F_{crash}) in all years assessed (1992–2014) and fell to half that level in more recent years, with at most a 3% probability of exceeding the maximum impact sustainable threshold (MIST) based on r (F_{crash}) in 2010–14. For the same scenarios, fishing mortality is less than 12% of the MIST based on $0.75r$ (F_{lim}) and less than 18% of the MIST based on $0.5r$ (F_{msm}) (Figure 7). These scenarios are based on 100% capture mortality and, assuming that some porbeagles survive their encounter with the fishery, would reduce the estimated risk levels even further.

SC13 advised that although the stock status of the species is currently unknown there is a very low risk that the Southern Hemisphere porbeagle shark is subject to overfishing anywhere within its range (Figure 8). It recommended that the WCPFC Commission (WCPFC14) requests the Common Oceans (ABNJ) Tuna Project to explore options for data improvements through liaison with other regional fishery bodies managing fisheries catching Southern Hemisphere porbeagle shark.

A follow-up assessment planned for 2022 was not done by WCPFC. Instead, the WCPFC shark research plan 2021-2025 mid-term review undertaken at the 19th Regular Session of the Scientific Committee (SC19) recommends that it would be more appropriate to assess the porbeagle stock within the CCSBT, where most of the catch occurs. It is suggested that WCPFC should support such an assessment through data provision (Brouwer and Hamer, 2023).

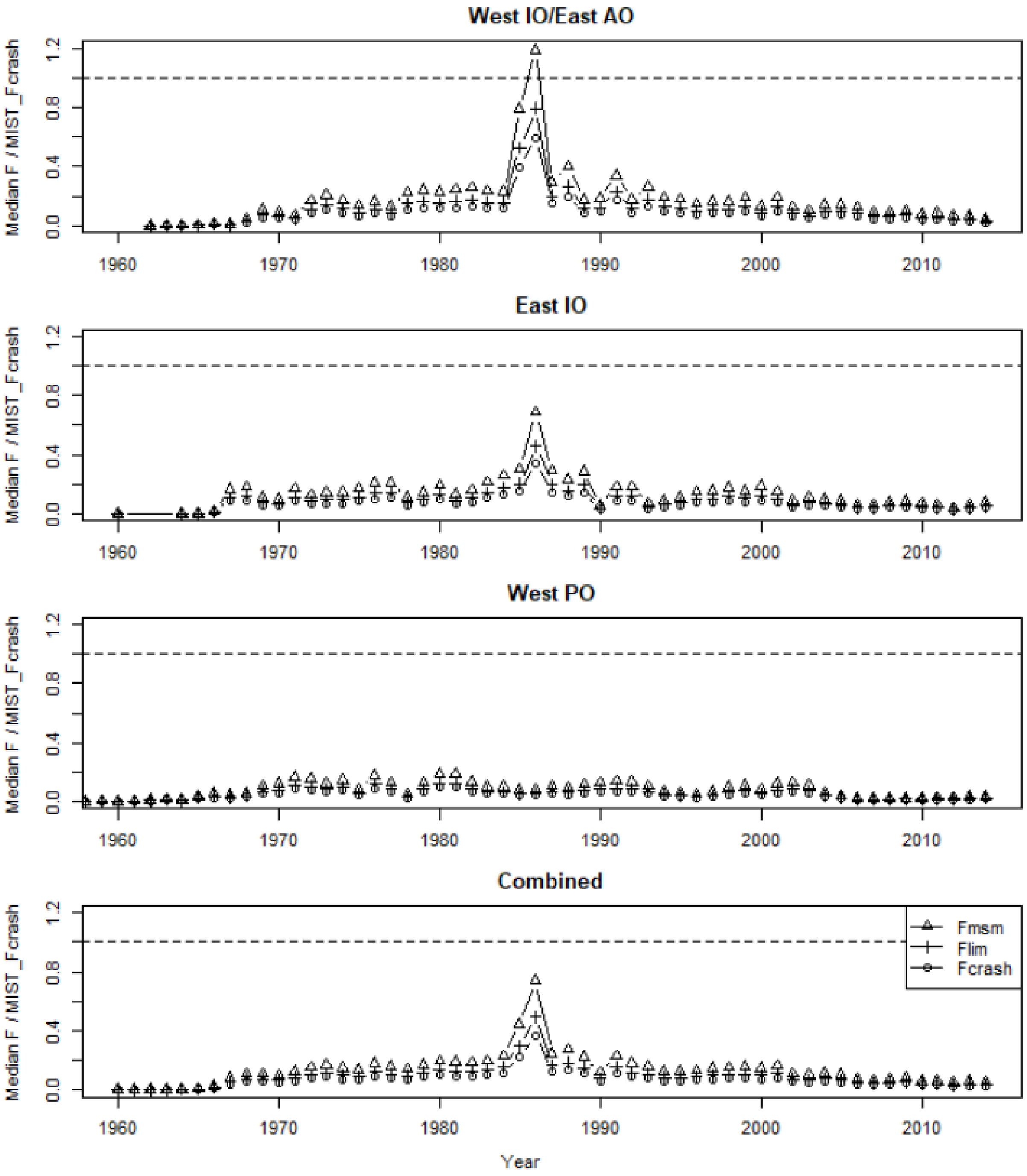


Figure 7. F-ratio plots showing the median values of F / MIST by year, for the three versions of the MIST (F_{msm}, F_{lim}, and F_{crash}), for the three regions (Western Indian Ocean (West IO)/Eastern Atlantic Ocean (east AO), Eastern Indian Ocean (east IO), Western Pacific Ocean (West PO) separately and combined (the assessment area). F-ratio is almost always below 1, indicated by the horizontal dotted line.

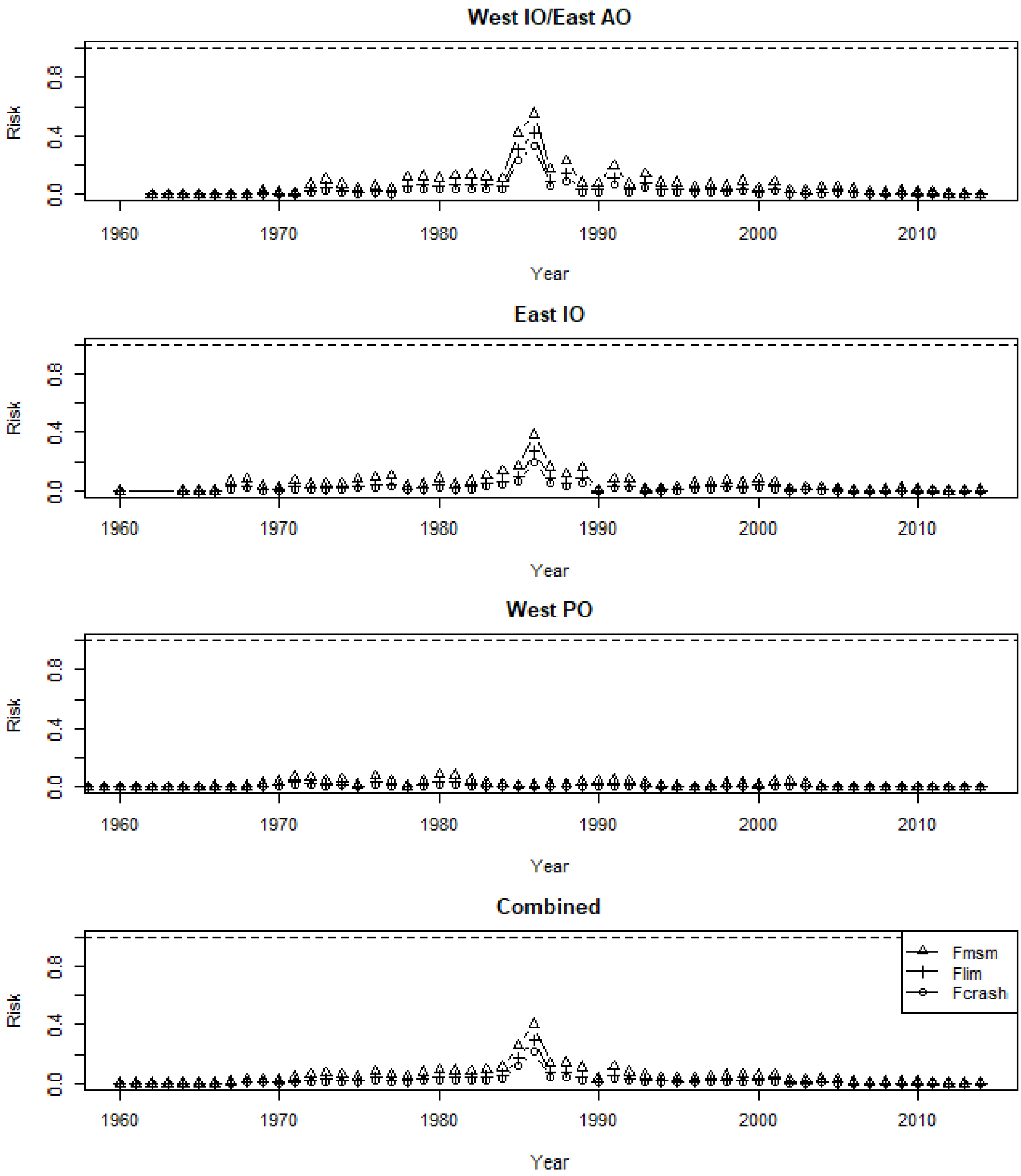


Figure 8. Risk plots showing the probability that F exceeds the MIST by year, for the three versions of the MIST (F_{msm}, F_{lim}, and F_{crash}), for the three regions (Western Indian Ocean (West IO)/Eastern Atlantic Ocean (east AO), Eastern Indian Ocean (east IO), Western Pacific Ocean (West PO) separately and combined (the assessment area).

5.2 New Zealand waters

There have been several attempts to assess the status of porbeagle sharks in New Zealand waters, all of which have however been inconclusive:

- 2014 – indicator analysis (Francis & Large 2017)
- 2019 – updated indicator analysis (Francis & Finucci 2019)
- 2017 – qualitative risk assessment (Ford et al. 2018)
- 2025 – spatial risk assessment (Edwards et al., 2025)

Indicator analyses

There have been no stock assessments of porbeagle sharks in New Zealand and no estimates of yield are possible given local sharks are part of the wider south-western Pacific Ocean stock. Indicator analyses instead considered a series of abundance indicators, including: high-CPUE (the proportion of half-degree cells having unstandardised catch per unit effort (CPUE) greater than a specified threshold); proportion-zeroes (the proportion of half-degree cells having zero reported catches in a fishing year); geometric mean index (the geometric mean of the species abundances in catches, for both the catch of all species including teleosts, and the catch of just the three sharks); standardised CPUE (for both commercial and observer data); proportion of males in the catch; and median lengths of males and females. The results suggest that abundance of porbeagle sharks may have declined in the late 1990s before increasing to higher levels in the late 2000s and early 2010s and declining again in 2017–2018 (Figure 9) (Francis & Large 2017; Francis & Finucci 2019).

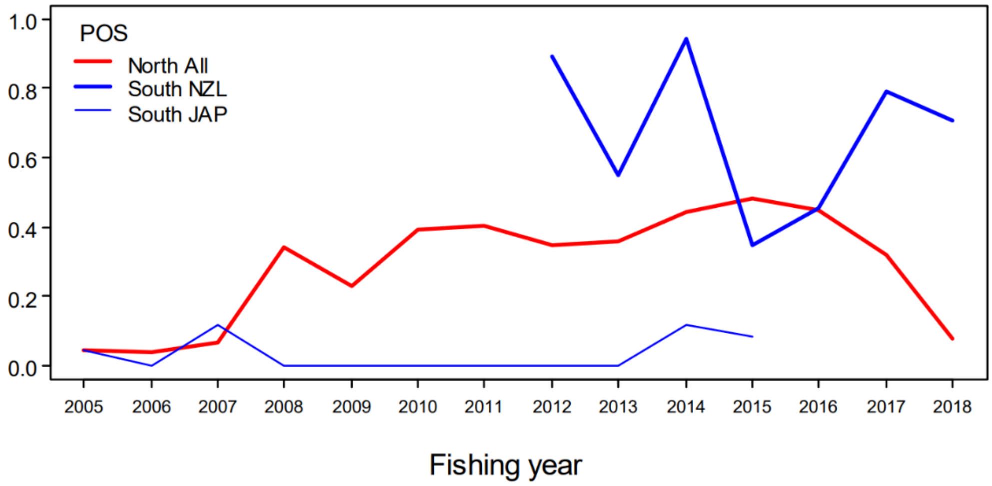


Figure 9. Porbeagle (POS) shark high-CPUE distribution indicators (proportions of 0.5 degree cells having CPUE greater than a given threshold) for North and South regions by fishing year (with South region divided into New Zealand domestic and Japanese chartered fleets) (Francis & Finucci 2019).

Taken at face value, the indicator analysis suggests there was a decline in the abundance of pelagic sharks in New Zealand's EEZ in 2017–18. However, the authors described a number of reasons why the indicators may not accurately index shark abundance: (1) Very similar patterns were seen for all three shark species analysed, but it seems unlikely that all three species would decline steeply at the same time; (2) the declines in North region standardised commercial CPUE appear to be too steep to represent real changes in population abundance; (3) observer-based standardised CPUE analyses did not show the same declines as the commercial CPUEs; (4) South region showed little change for all three sharks, so the steep declines seen in North region were not universal; (5) SLL effort has been declining in the EEZ and many pelagic sharks now survive capture by SLL vessels because they are released alive, hence fishing mortality of pelagic sharks has probably declined substantially since 2015. The abundance indicators have been compromised by changes in the fisheries they monitor, under-reporting by commercial fishers, and reduced collection of data by observers. They may also have been invalidated by avoidance of sharks by SLLs and changes in shark availability resulting from shark movement. These factors combine to make interpretation of the porbeagle stock status problematic.

Blue, porbeagle, and mako sharks are generally regarded as wide-ranging, mobile oceanic species. However, electronic tagging of porbeagle and mako sharks in New Zealand waters has shown that juveniles (which make up a high proportion of the catch of each species) are partly residential in the New Zealand EEZ. Thus, abundance indices for the New Zealand EEZ may not index the entire southwest Pacific populations of those species. To understand trends in the wider pelagic shark stocks of the South Pacific, and to quantify their status in relation to management reference points, quantitative regional stock assessments are required.

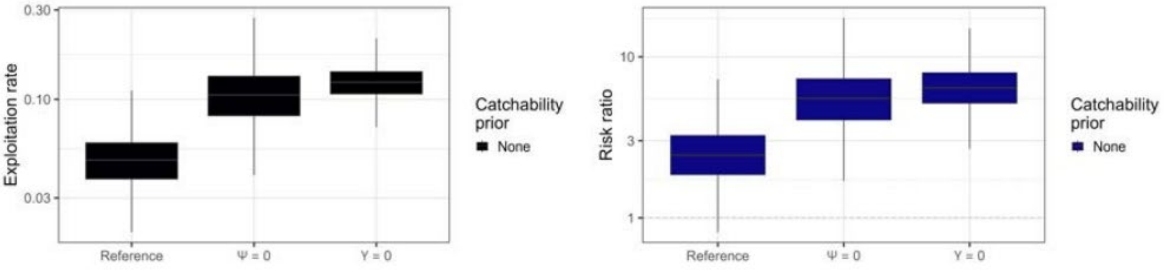
Risk assessments

A data-informed qualitative risk assessment was completed on all chondrichthyans (sharks, skates, rays, and chimaeras) at the New Zealand scale in 2017 (Ford et al. 2018). Porbeagle sharks had a risk score of 15 and were ranked second equal lowest risk of the eleven QMS chondrichthyan species. Data were described as ‘exist and sound’ for the purposes of the assessment and the risk score was achieved by consensus of the expert panel, but with low confidence. This low confidence was due to the fact that no data were available on adult stock size.

In 2025 a spatial risk assessment for selected shark species in New Zealand, including porbeagle sharks, was completed (Edwards et al., 2025). Catch and effort data were obtained for all methods that caught each of these species. From these data, the catchability per fishing gear type was co-estimated with the species spatial density distribution (in numbers) using Bayesian methods. The estimation model had a hierarchical structure, first predicting the density and spatial limit of the population as a function of environmental covariates, and then predicting the catch as the product of the density and catchability.

Exploitation rate was estimated from model parameters as the weighted sum of catchabilities across all fishing events, with weights provided by the spatial distribution of the population relative to each event. This was compared to an exploitation rate reference point (the impact sustainability threshold or IST), which is a function of the maximum intrinsic growth rate (rmax). Comparison of the exploitation rate with the IST yielded the risk ratio. Risk for a particular species was calculated as the posterior probability that the risk ratio was greater than one. Since the IST is a measure of the equilibrium exploitation rate at a desirable population status, the risk is the probability that this management objective will not be reached under current levels of fishing pressure.

The model was shown to provide a good fit to the catch data and produce well-defined posterior estimates of the risk for each species. However, risk estimates were highly sensitive to assumptions of post-capture survivorship (Ψ_l), and the proportion of the population outside of the spatial assessment domain (Υ) at any given time. Neither of these could be estimated, and sensitivity testing was therefore needed to explore the credibility of the results (Figure 10).



(a) Exploitation rate. **(b) Risk ratio.**

Figure 10. Posterior estimates of the recent (2021 to 2023 inclusive) total exploitation rate (as a proportion of the exploitable population, summed across all fishing methods) and the associated risk ratio, for porbeagle shark (POS). The reference case, and sensitivity to $\Psi_l = 0$ and $\Upsilon = 0$ are shown (Edwards et al., 2025).

Sensitivity runs showed that if the total population were inside the New Zealand Exclusive Economic Zone (EEZ), then the risk would be close to one for all species (i.e., eventual depletion of the population would be almost certain). The reference case assumed that most of the population was outside of the EEZ and not exposed to any fishing pressure. Under this scenario porbeagle shark was still estimated to have a risk close to one (the probability that the risk ratio was greater than one was >90%) with an exploitation rate of ≥5%.

6. STATUS OF THE STOCK

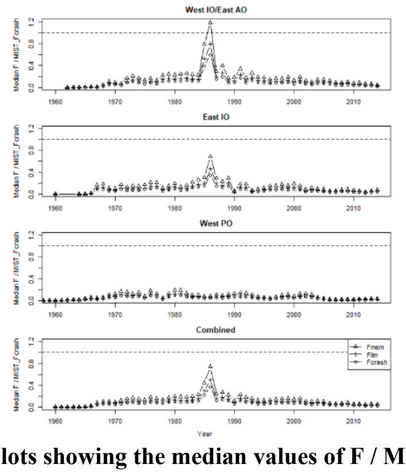
Stock structure assumptions

POS 1 is assumed to be part of the wider south-western Pacific Ocean stock. The results below are from a 2017 WCPFC risk assessment of the entire Southern Hemisphere porbeagle stock, as well as indicator analyses (up to 2017–18) and risk assessments of the New Zealand component of that stock only.

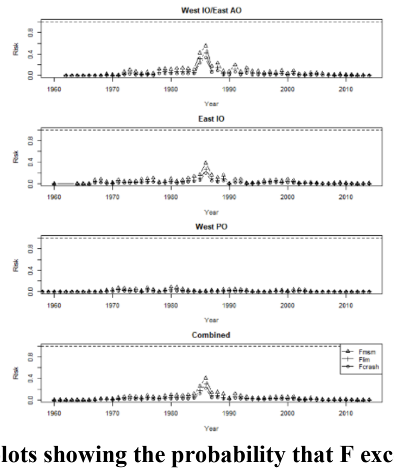
Stock Status		
Most Recent Assessment Plenary Publication Year	WCPFC 2017 southern hemisphere porbeagle shark risk assessment (Hoyle et al. 2017)	
Intrinsic productivity level		
Catch in most recent year of assessment	Year:	Catch:
Assessment Runs Presented	WCPFC – southern hemisphere stock Risk assessment modelling, comparing estimated F to maximum impact sustainable threshold (MIST): F_{msm}, F_{lim}, F_{crash}	
Reference Points	Target: Not established Soft Limit: Not established but HSS default of 20% SB_0 assumed. Hard Limit: Not established but HSS default of 10% SB_0 assumed. Overfishing threshold: F_{MSY}	
Status in relation to Target	Unknown	
Status in relation to Limits	Unknown	
Status in relation to Overfishing	Exceptionally Unlikely (< 1%)	

Historical Stock Status Trajectory and Current Status

WCPFC SC13 in 2017 concluded that although the stock status of Southern Hemisphere porbeagle shark is currently unknown there is a very low risk that it is subject to overfishing anywhere within its range.



F-ratio plots showing the median values of F / MIST by year, for the three versions of the MIST (F_{msm}, F_{lim}, and F_{crash}) for each of the three regions and for the three regions combined (the assessment area). Note that the F-ratio is almost always below 1, indicated by the horizontal dotted line.



Risk plots showing the probability that F exceeds the MIST by year, for the three versions of the MIST (F_{msm}, F_{lim}, and F_{crash}) for each of the three regions and for the three regions combined (the assessment area).

Fishery and Stock Trends	
Recent Trend in Biomass or Proxy	Unknown
Recent Trend in Fishing Intensity or Proxy	Very low
Other Abundance Indices	-
Trends in Other Relevant Indicator or Variables	Catches in New Zealand increased from the late 1980s to a peak in 1998–99 of 240 t, then declined to 41 t in 2007–08, and have not exceeded 50 t since 2018–19.

Projections and Prognosis	
Stock Projections or Prognosis	The stock is likely to increase if effort remains at current levels.
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	Exceptionally Unlikely (< 1%)

Assessment Methodology and Evaluation		
Assessment Type	Level 2 – Partial Quantitative Stock Assessment (2017 WCPFC Southern Hemisphere sustainability risk assessment)	
Assessment Method	Southern Hemisphere sustainability risk assessment	
Assessment Dates	Latest assessment Plenary publication year: 2017 (WCPFC)	Next assessment: Unknown
Overall assessment quality rank	1 – High Quality	
Main data inputs (rank)	- Distribution - Species composition - Size and sex ratio - Catch per unit effort	1 – All High Quality
Data not used (rank)	N/A	
Changes to Model Structure and Assumptions	N/A	
Major Sources of Uncertainty	- Historical catch recording before 2005 may not be accurate. - Lack of data on density distribution and life-stage specific vulnerability and overlap with fishing activities - Need for liaison with other regional fishery bodies managing fisheries catching Southern Hemisphere porbeagle shark, in particular CCSBT	

Qualifying Comments
Relative to a wide range of shark species, the productivity of porbeagle sharks is very low. Females have a high age-at-maturity, high longevity (and therefore low natural mortality rate), and low annual fecundity. The low fecundity and high longevity are cause for strong concern, as the ability of the stock to replace sharks removed by fishing is very limited.

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