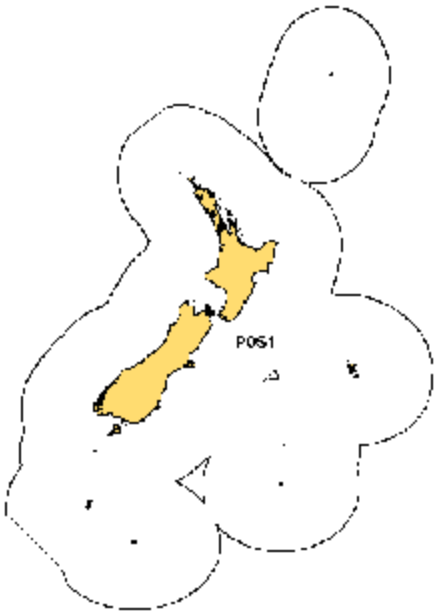
PORBEAGLE SHARK (POS)

(*Lamna nasus)*



1. FISHERY SUMMARY

Porbeagle shark were introduced into the QMS on 1 October 2004 under a single QMA, POS 1, with allowances, TACC, and TAC as follows:

Fishstock	Recreational Allowance (t)	Maori customary Allowance (t)	Other mortality (t)	TACC (t)	TAC (t)
POS 1	10	2	22	215	249

Porbeagle shark was added to the Third Schedule of the 1996 Fisheries Act with a TAC set under s14 because porbeagle shark is 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 shark was 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 from 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."

Management of the porbeagle shark throughout the western and central Pacific Ocean (WCPO) will be the responsibility of the Western and Central Pacific Fisheries Commission (WCPFC). Under this regional convention New Zealand will be responsible for ensuring that the management measures applied within New Zealand fisheries waters are compatible with those of the Commission. However, it is not expected that WCPFC will attempt to actively manage porbeagle shark in the first years of the Commission.

(a) Commercial fisheries

Most of the commercial catch of porbeagle sharks is taken by tuna longliners, but a significant proportion is also taken by midwater trawlers and smaller amounts by bottom longliners and bottom trawlers.

About 80% of porbeagle sharks caught by tuna longliners are processed, and the rest are discarded. Of the sharks that are processed, about 80% are finned only, and 20% are processed for their flesh and fins.

Landings of porbeagle sharks reported on CELR (landed), CLR, and LFRR forms are shown in Table 1. The total weights reported by fishers were 152–301 t during 1997–98 to 2002-03. Processors reported 119–240 t on LFRRs during the same period. There has been a 75% decline in the total weight of porbeagle shark reported since 1998–99, to a low of 60 t in 2004-05. This decline began during a period of rapidly increasing domestic fishing effort in the tuna longline fishery, but has accelerated since tuna longline effort dropped during the last two years. Estimates of the catch of porbeagle sharks aboard tuna longliners, based on scaled-up scientific observer records, were lower than reported by either fishers or processors in the most recent years for which comparable data are available (2000–01 and 2001–02). However, the observer-based estimates are imprecise, and possibly biased, because the observer coverage of the domestic fleet (which accounts for most of the fishing effort) has been low (less than 3% in the years 1997-98 to 2002-02) and has not adequately covered the spatial and temporal distribution of the fishery. Also, some of the difference is accounted for by catches reported from other fisheries, especially trawl fisheries. Some porbeagle catch is mistakenly reported by fishers as porae (species code POR), and is not included in Table 1; however the amount is likely to be small (annual reported landings of porae are about 60–70 t).

Table 1: New Zealand commercial landings and discards (t) of porbeagle sharks reported by fishers (CELRs and CLRs) and processors (LFRRs) by fishing year. Also shown for some years are the estimated quantities of porbeagles caught by tuna longliners, based on scaled-up scientific observer records. –, no data available.

	Reported by fishers			Processed	Estimated catch by tuna
		CELR and CLR	Total	LFRR	longliners
Year	Landed	Discarded	reported		
1989–90	–	–	–	5	–
1990–91	0	1	1	1	–
1991–92	0	0	1	1	–
1992–93	1	5	7	7	–
1993–94	3	7	10	13	–
1994–95	12	4	16	10	–
1995–96	18	7	26	23	–
1996–97	19	20	39	52	145
1997–98	127	78	205	162	146
1998–99	233	68	301	240	–
1999–00	147	68	215	174	–
2000–01	142	46	188	150	98
2001–02	101	60	161	119	76
2002-03*	110	42	152	142	
2003-04*	84		84	65	
2004-05*	62		62	60	

*MHR data.

Catches of porbeagle sharks reported by scientific observers aboard tuna longliners are concentrated off the west and southwest coast of South Island, and the northeast coast of North Island. However these apparent distributions are biased by the spatial distribution of observer coverage. Porbeagle sharks are probably taken by tuna longliners around most of mainland New Zealand. The target species for this fishery are mainly southern bluefin, bigeye, and albacore tuna. Most of the porbeagle landings reported on CELR and CLR forms were taken in FMA 7, with significant amounts also coming from FMAs 3, 5, and 6.

(b) 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.

(c) Maori customary fisheries

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

(d) Illegal catch

There is no known illegal catch of porbeagle sharks.

(e) Other sources of mortality

Many of the porbeagle sharks caught by tuna longliners (about 60%) are alive when the vessel retrieves the line, but it is not known how many of the unprocessed, discarded sharks survive.

2. BIOLOGY

Porbeagles live mainly in the latitudinal bands 30–50 ^{o}S and 30–70 ^{o}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*, replaces them. In the South Pacific Ocean, porbeagles are caught north of 30 ^{o}S only in winter–spring; in summer they are not found north of about 35 ^{o}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.

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 3.7 young per female. .

A study of the age and growth of New Zealand porbeagles produced growth curves and estimates of the natural mortality rate (Table 3). However attempts to validate ages using bomb radiocarbon analysis were unsuccessful, and suggested that the ages of porbeagles older than about 20 years were progressively under-estimated; for the oldest sharks the age under-estimation may have been as much as 50%. Consequently, the growth curves provided in Table 3 are probably only accurate for ages up to about 20 years. Males mature at 8–10 years, and females mature at 15–19 years. Longevity is unknown but is probably at least 40 years and possibly twice that amount.

In New Zealand, porbeagles recruit to commercial fisheries during their first year at about 70 cm FL, and much of the commercial catch is immature. Most sharks caught by tuna longliners are 70–170 cm FL. The size and sex distribution of both sexes is comparable 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 are unknown.

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

Estimates of biological parameters are given in Table 3.

Table 3: Estimates of biological parameters.

Fishstock	Estimate			Source
1. Natural mortality (M)				
POS 1	0.05–0.10			M. P. Francis unpublished data
2. Weight = a (length)^b (Weight in kg, length in cm fork length)				
		a	b	
POS 1, both sexes		2.143×10^{-5}	2.924	Ayers et al. (2004)
3. Von Bertalanffy model parameter estimates				
	k	t_0	L_∞	
POS 1 males	0.126	-4.22	179.7	Francis et al. (in review)
POS 1 females	0.097	-4.98	200.1	Francis et al. (in review)

3. STOCKS AND AREAS

In the North-west Atlantic, most tagged sharks moved short to moderate distances (up to 1,500 km) along continental shelves, though one moved about 1,800 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 2,370 km to northern Norway. Only one tagged shark has crossed the Atlantic: it travelled 4,260 km from South-west Eire to 52° W off eastern Canada. Thus porbeagles from the northwest and northeast Atlantic appear to form two distinct stocks. There have been no genetic studies to determine the number of porbeagle stocks, but based on the disjunct (antitropical) geographical distribution, North Atlantic porbeagles are probably 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, 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.

4. STOCK ASSESSMENT

With the establishment of WCPFC in 2004, future stock assessments of porbeagle shark in the western and central Pacific Ocean stock will be reviewed by the WCPFC. Unlike the major tuna stocks, in the short term, development of a regional assessment for porbeagle shark is likely to be done by collaboration among interested members.

There have been no stock assessments of porbeagle sharks in New Zealand. No estimates of yield are possible with the currently available data.

Unstandardised CPUE analysis of tuna longline catches recorded by observers show considerable variability over the period 1992–93 to 2001–02, but values for the most recent two years are the lowest recorded for all time series (Figure 1). These indices may not reflect stock abundance because they do not take into account variation in many influencing factors (e.g., vessel, gear, location and time of year), and indices for the domestic fleet are based on low observer coverage.

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, as the ability of the stock to replace sharks removed by fishing is very limited.

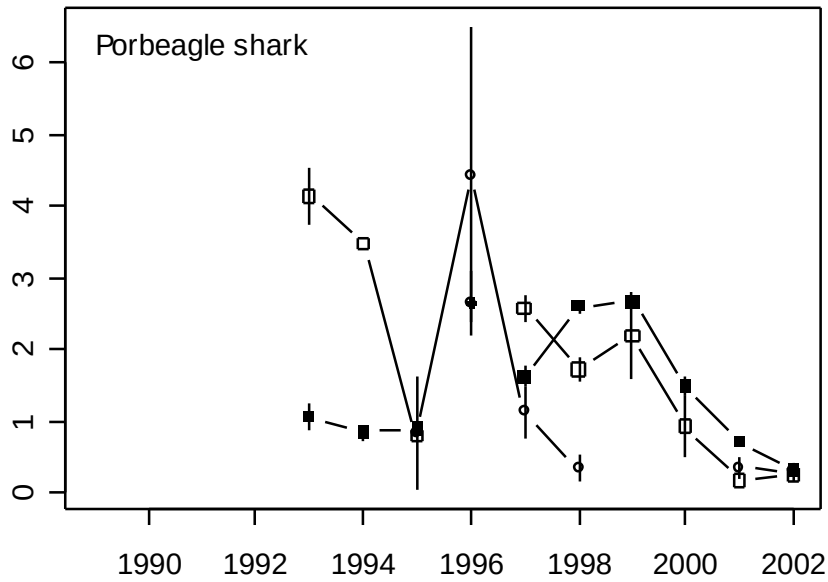


Figure 1. Unstandardised CPUE indices (number of sharks per 1000 hooks) for the tuna longline fishery based on observer reports. Years are fishing years (1993 = October 1992 to September 1993). Confidence intervals are from bootstrapped data. -■- foreign and charter fleet, southern New Zealand; -□- foreign and charter fleet, northern New Zealand; -●- domestic fleet, southern New Zealand; -○- domestic fleet, northern New Zealand. Source: Ayers et al. (2004).

5. STATUS OF THE STOCK

There is no assessment for this stock so it is not known if the stock is at or above a level capable of producing the maximum sustainable yield. Furthermore, it is not known whether current catches or the TAC are at levels that will allow the stock to move towards the biomass that would support the maximum sustainable yield. However declining catches over a period when effort has been increasing rapidly, and low CPUE in recent years, combined with the low productivity of the species and a history of fishery collapses in the North Atlantic, are all cause for concern.

6. FOR FURTHER INFORMATION

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