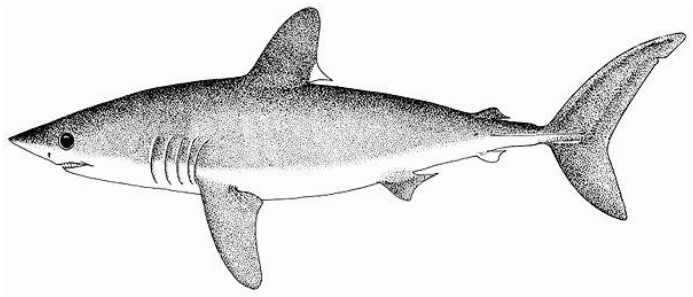
New Zealand non-detriment finding for porbeagle shark *Lamna nasus*



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1. Introduction

In March 2013, the 16th Conference of the Parties (CoP16) of the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES) listed seven commercially-important species of sharks and rays on Appendix II of the Convention: porbeagle shark *Lamna nasus*, oceanic whitetip shark *Carcharhinus longimanus*, scalloped hammerhead shark *Sphyrna lewini*, great hammerhead shark *Sphyrna mokarran*, smooth hammerhead shark *Sphyrna zygaena*, giant manta ray *Manta birostris* and reef manta ray *Manta alfredi*. Because these new listings were likely to require considerable work before the listings could be implemented, the date of entry onto CITES Appendix II was delayed by 18 months until 14 September 2014.

The CITES convention has three Appendices (I, II and III), based largely on the level of risk that international trade could have on the viability of wild populations of the species. Trade in plant or animal species listed in Appendix II has three requirements that must be fulfilled before permits are issued:

1. The CITES Management Authority of the exporting country (or equivalent recognised authority in the case of countries that are not Parties to the CITES Convention) must verify that the species was obtained legally;

2. In the case of live specimens, the CITES Management Authority must verify that specimens will be transported in a humane manner, and

3. The CITES Scientific Authority of the exporting country must advise that such export will not be detrimental to the survival of the species (known as a non-detriment finding (NDF)).

Also at the CITES CoP16, Parties adopted Resolution 14.6 (Rev. CoP16) which specifies procedures associated with trade in CITES-listed species obtained on the high seas (i.e. marine areas beyond national jurisdiction and outside the 200 nautical mile jurisdiction of any State). In the case of specimens of Appendix II species, the Scientific Authority (usually from the State where the specimen will be landed, but this can vary depending on particular chartering arrangements) must issue an NDF before the specimens are actually taken (i.e. collected at sea).

The listing of porbeagle shark on Appendix II of CITES therefore requires an NDF to be issued in three situations:

- before the export of porbeagle products that were obtained within the New Zealand Exclusive Economic Zone (EEZ),
- before the take of porbeagle on the high seas by a New Zealand vessel and landed at a New Zealand port, and
- before the take of porbeagle on the high seas by a New Zealand vessel and landed at a foreign port.

2. Porbeagle shark ecology

2.1 Distribution

The porbeagle shark is both coastal and oceanic. It has an amphitemperate or antitropical distribution, with centres between 30-70°N in the North Atlantic Ocean and Mediterranean Sea, and also in a circumglobal band of temperate water at 30-58°S in the Southern Hemisphere (Figure 1). In the southwestern 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, but they appear to penetrate further south during summer and autumn. In the New Zealand EEZ, porbeagle sharks are found right around the mainland throughout the year, but the main centre of their distribution moves northwards in winter and spring, with some reaching to about 30°S, and southwards in summer and autumn with some reaching about 55°S, off the sub-Antarctic islands (Figure 2). They are managed as a single fishery stock within the New Zealand EEZ.

Tagging data shows that porbeagle move between the New Zealand EEZ and neighbouring high seas to the east and west (M. Francis, NIWA, pers. comm.), and a recent population genetics study (Testerman 2014 in Simpfendorfer 2014) demonstrated clear differences between populations in northern and southern hemispheres, but no evidence of population structure in the southern hemisphere.

Figure 1: Global distribution of porbeagle; from FAO, Francis et al. (2007) and Semba et al. (2013).

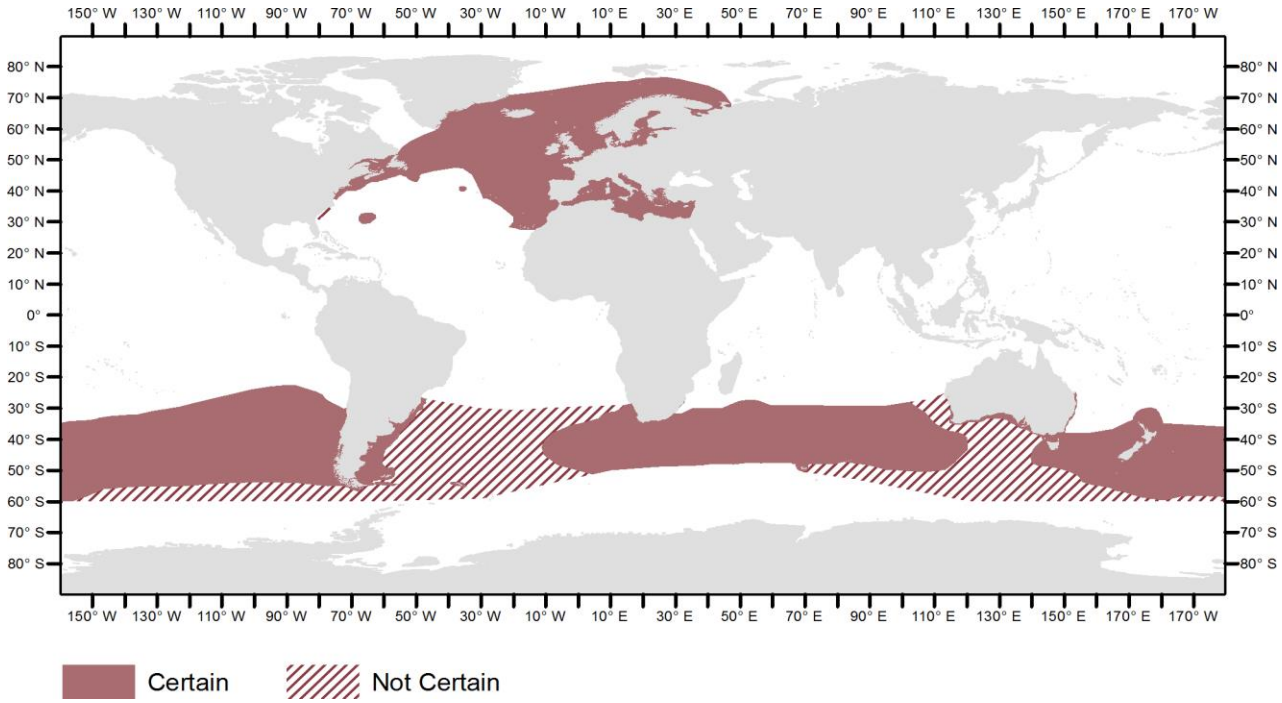
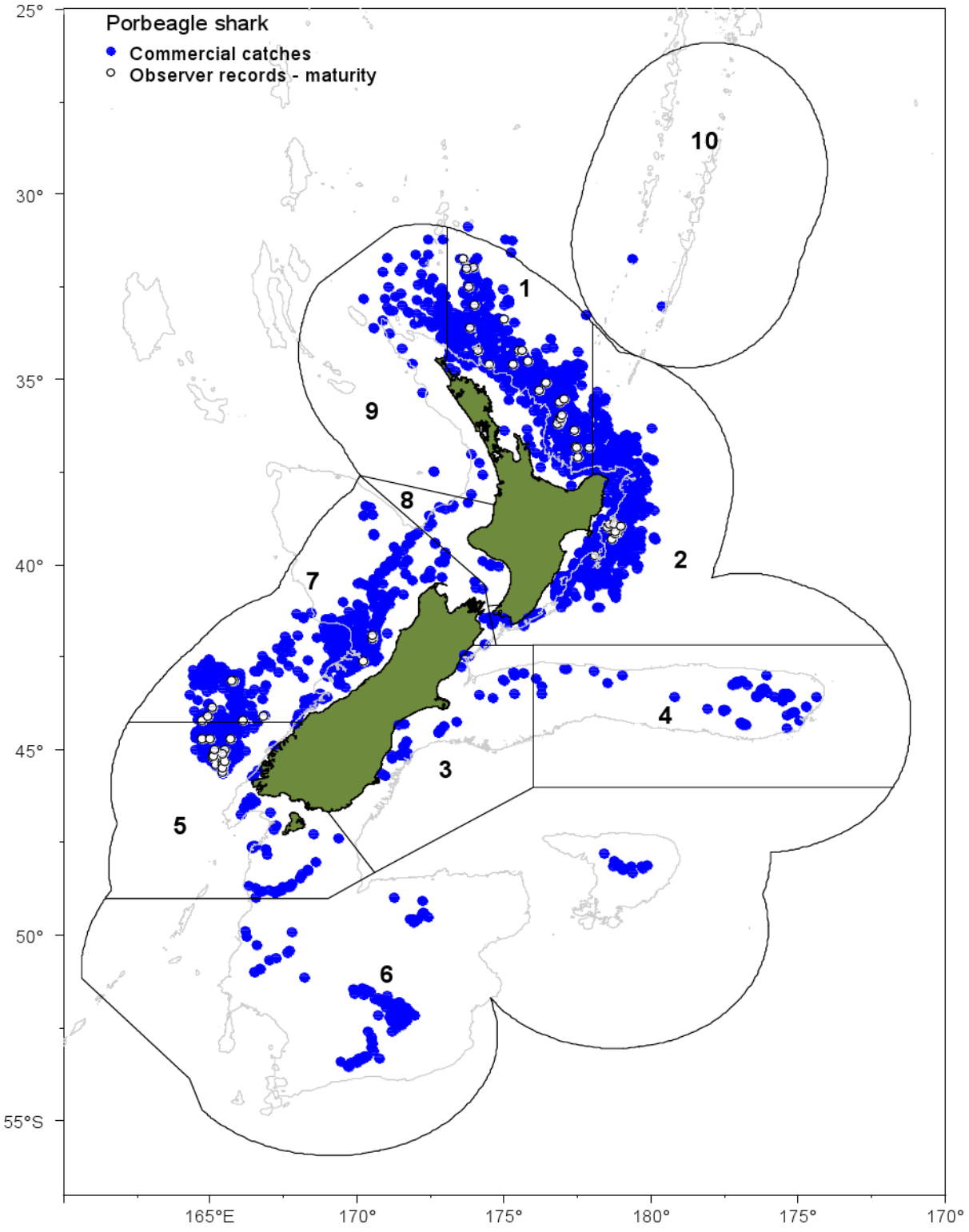


Figure 2: Distribution of New Zealand catches of porbeagle in 2010-2012; data from a study of reproductive maturity (Francis 2013).


Porbeagle shark
Commercial catches
Observer records - maturity
25°
30°
35°
40°
45°
50°
55°S
165°E
170°
175°
180°
175°
170°
1
2
3
4
5
6
7
8
9
10

2.2 Spatial distribution within New Zealand waters

Porbeagle shark are generally found in continental shelf and shelf break waters, and in the open ocean. One of the main drivers of their distribution is water temperature; the species has a relatively narrow thermal preference in the Southern Hemisphere of 1 - 23°C, with abundance dropping above about 19°C (Francis et al 2008), and the highest catch per unit effort being where sea surface temperatures are around 10°C (Semba et al 2013).

In the New Zealand EEZ, Francis (2013) found that most porbeagle are caught as bycatch on tuna surface longlines (SLL) set in the top 200 m of the water column. They are caught by SLL fisheries targeting mainly bigeye tuna (*Thunnus obesus*), but also some southern bluefin tuna (*Thunnus maccoyii*), to the east and north-east of the North Island (Fishery Management Area (FMA) 1 and 2), especially between Great Barrier Island and Hawke Bay, and targeting southern bluefin tuna west of the South Island (Fishery Management Areas 5 and 7). Moderate numbers are taken in mid-water trawls (MW) for hoki and southern blue whiting off the West Coast (FMA 7) and around the sub-Antarctic islands (FMA 6). Some are taken on bottom longlines (BLL) at depths of up to 700 m on the Chatham Rise (FMA 4) and along the southeast coast of the North Island (FMA 2), and a few are taken in bottom trawls around East Cape (FMA 2) and in the sub-Antarctic between The Snares and Auckland Islands (FMAs 5 and 6).

The northern SLL fishery (in FMAs 1 and 2) caught porbeagle during most of the year, peaking in May-August. Catches in the southern SLL and MW fisheries (in FMAs 5-7) were mainly in May-September (Francis 2013).

Spatial segregation by age and/or sex is common in sharks, and has been reported for pelagic sharks elsewhere in the Pacific (Francis et al. 2014). An analysis of porbeagle catches in the SLL fisheries (Francis 2013) showed that there were slightly more (56%) males in northern New Zealand waters and about equal numbers of both sexes in southwestern and southeastern fisheries (51% and 49% males respectively). Age-group frequencies vary significantly between fisheries. Many juveniles (<100 cm fork length (FL) and probably <5 years old) are caught in northern and southwestern fisheries but they are rare in southeastern fisheries, south of the Subtropical Front. Subadult males (5-10 years old) were present throughout, but subadult females (5-15 years old) were uncommon in northern waters. Adult males (>140-150 cm FL) were proportionately more common in northern waters, where adult females (>170-180 cm FL) were scarce. The low numbers of subadult and adult females led to the higher overall proportion of males caught in northern New Zealand waters.

2.3 Habitat and food

Porbeagles are an apex predator found throughout New Zealand waters, but there are regional variations in the spatial distribution of the sexes and age classes. Of 3654 porbeagle stomachs examined by fisheries observers on tuna longliners, 2426 (66%) were empty or contained only bait (Francis et al. 2007). Of the remaining 1228 sharks caught in the top 200 m of the water column, 1113 (91%) contained only fish or squid. The modest sample of the smallest individuals (50-74 cm) ate mainly squid, whereas larger porbeagle ate mainly fish (66% by volume) and less squid (26% by volume). Of 364 prey items identified to species, 56% were dealfish (*Trachipterus trachypterus*), 25% were Ray's bream (*Brama* sp., probably *B. australis*) and 6% were hoki (*Macruronus novaezelandiae*). All three species are common by-catch of tuna longlines and so some may have been scavenged from the longlines. Two lighthouse fish (*Photichthys argenteus*) were recorded along with octopus, salps and crustaceans. Elsewhere, porbeagle is known to feed on small sharks in addition to the usual diet of bony fish and squid.

2.4 Biological characteristics

The porbeagle shark is a medium-sized mackerel shark (family Lamnidae) growing to a maximum length of c.350 cm total length or 302 cm fork length in the Northern Hemisphere, but in waters around New Zealand and Australia porbeagle sharks longer than 200 cm fork length are very rare (Francis et al. 2001). New Zealand porbeagles mature at much shorter lengths than their conspecifics in the North Atlantic Ocean (Francis and Duffy 2005) but, based on growth rates, the estimated age at maturity in New Zealand of 8-11 years for males and 15-18 years for females is slightly older than those in the northwest Atlantic at c.8 and 13 years old respectively (Francis et al. 2007). The longevity of New Zealand porbeagles is not certain, but may be c. 65 years (Francis et al. 2007).

Porbeagle has the ability to elevate their muscle and visceral temperatures above ambient water temperature. They produce litters of 1-5 large live pups (Francis et al. 2008); in the southwest Pacific, including New Zealand, the normal litter size is 4 pups. The growing embryos are nourished by oophagy in which the female ovulate an enormous number of ova which are consumed by the embryos, and excess ova are consumed and stored in a "yolk stomach' for later use. In the southwest Pacific, porbeagles generally give birth in winter (June-July) after a gestation period of 8-9 months; this timing contrasts with the North Atlantic population which give birth in spring-summer.

This combination of low productivity, slow growth and long time to reach sexual maturity makes the species intrinsically highly vulnerable to over-exploitation and population depletion.

2.5 Global conservation status

In 2006, the global status of porbeagle was assessed by IUCN as being "Vulnerable' based on massive declines in the North Atlantic Ocean, tempered by assumed lower declines in the Southern Hemisphere (Stevens et al. 2006). The eastern and western North Atlantic populations collapsed following serious over-exploited by directed longline fisheries, initially in the northeast Atlantic, and then in the northwest Atlantic in the 1960s. Renewed target fishing in the 1990s led to a further population decline to c.11 to 17% of the original biomass within the three generation period of this species. Tuna and swordfish longline fleets in the southern hemisphere were known to take a significant partially-used bycatch of porbeagle but trend data were sparse in 2006 because New Zealand was the only country to report porbeagle catch to the FAO (Stevens et al. 2006). The regional status of porbeagle in the southwest Pacific Ocean was considered to be 'Near Threatened' (Lack & Meere 2009).

2.6 Population status in New Zealand

Recently, Francis et al. (2014) carried out an indicator-based analysis of the status of porbeagle and two other highly migratory shark species commonly taken as bycatch in tuna longline fisheries in the New Zealand EEZ. Four indicators were used for each species: distribution, percentage catch composition, standardised catch per unit effort (CPUE) and median size/sex ratio. Data came from the Ministry for Primary Industries (MPI) observer database for the 1993 to 2013 fishing years and the MPI commercial catch-effort database for the 2005 to 2013 fishing years, covering the period that porbeagle has been included in the Quota Management System (QMS) – see Section 4.1.

Observer data, which span a longer time period than commercial fisheries data, indicate that porbeagle may have declined rapidly in the early 2000s before stabilising at a relatively low level

(Francis et al. 2014). Given the huge decline in the number of hooks set on tuna longlines, from over 25 million per year in the 1979-80 fishing year, when effort data was first recorded, to c.10 million hooks per year in the early 2000s, and to less than 3.8 million hooks each year since 2004-05 (Griggs & Baird 2013), it seems quite plausible that the porbeagle stock levels were already severely depleted before the observed decline in the early 2000s.

None of the indicators for the period 2005-2013 suggest that porbeagle were declining in either of the main tuna fishing grounds, off north-eastern North Island nor off the West Coast of the South Island (Francis et al. 2014). In fact, some of the indicators, such as increasing CPUE in both fisheries and a decrease in the number of zero catches in the northern fishery, suggest positive trends for porbeagle since they entered the QMS; however, Francis et al. (2014) felt that the quality of observer data and of the model fits left some uncertainty about the true stock status and trends of porbeagle.

3. Pressures on porbeagle

3.1 Fishing pressures

Porbeagle are apex predators, however they are occasionally taken by orca and by great white sharks. The main threat to porbeagle worldwide is over-exploitation in targeted fisheries, which caused the collapse of North Atlantic stocks c. 50 years ago. They were targeted for their flesh, initially in the northeastern Atlantic, and then in the northwest Atlantic, but within 6 years in the 1960s the fishery had collapsed.

In the Southern Hemisphere, many porbeagle have been taken as a valuable bycatch in tuna fisheries, especially the pelagic driftnet fishery for albacore tuna (*Thunnus alalunga*) in 1982-1991 in the South Pacific, and on longline fisheries targeting southern bluefin tuna and bigeye tuna in the Indian and Pacific Oceans (Francis & Stevens 2000).

In New Zealand waters, porbeagle are the third most commonly caught shark on tuna long-lines after blue shark (*Prionace glauca*) and mako shark (*Isurus oxyrinchus*). Porbeagles were probably taken in unsustainably high numbers at the height of tuna longlining in the 1970s and 1980s, before the implementation of tighter fishing regulations for foreign vessels and before observer coverage started. In each of 1979-80 and 1980-81 fishing years, more than 25 million hooks were set, whereas each year since the 2004-05 season there have been less than 3.8 million hooks set (Griggs & Baird 2013).

New Zealand has never had a targeted fishery for porbeagle; however, along with blue sharks and short-finned mako sharks, two other highly migratory sharks, porbeagle is a common bycatch in tuna and swordfish surface longline fisheries around the mainland. The combined catch of these three species often exceeds the number of the target tunas and swordfish that are caught (Griggs & Baird 2013). Overall, 74-84% of all porbeagle caught in the New Zealand EEZ are caught on surface longlines. Of the porbeagle processed, about 80% are finned only, and 20% are processed for their flesh and fins (MPI 2013). Since October 2014, shark-finning in New Zealand waters has been banned.

A significant proportion of the catch of porbeagle is released alive or discarded dead. There has been a shift in the ratio of porbeagle retained, discarded dead, or released alive as a result of their inclusion in the QMS and on Schedule 6 of the Fisheries Act (which promotes live release of bycatch porbeagle) and/or because of fluctuating market prices for fins. In the period 2002-2007, 81% by weight were landed, 18% discarded and 1% released alive, whereas in 2008-2012, 75% were retained, 1% discarded and 24% released alive (Francis 2013). About 36% of the porbeagles caught on longlines are dead when brought to the side of the vessel, and these are generally retained.

Smaller porbeagle tend to be released or discarded because the percentage of the number of porbeagles discarded alive or dead differs considerably from the percentage weight, but has followed a similar trend recently. Based on numbers of animals, there were high discard rates in the early 1990s, declining to 7-22% in the late 1990s, and then rising to 35-64% in 2008-2012 (Francis 2013). Domestic vessels discard more (53-65%) porbeagle than do foreign charter vessels (8-21%). Of those released alive, only ten porbeagles were tagged (by observers aboard a tuna longline vessel) and all survived (M Francis, NIWA, pers. comm), but much more data are needed to understand normal survival rates from the different fisheries.

Moderate numbers (13-22% of the total) are caught as bycatch in mid-water trawl fisheries targeting hoki and southern blue whiting, and small numbers are caught on bottom long lines and bottom trawls targeting hoki and squid.

Reported landings of porbeagle in New Zealand have varied considerably, with some discrepancy between those reported by fishers and by licensed fish receivers, but the trends are similar (Table 1). Before 1997 there were incomplete records of the tonnage of landings, or else the vast majority of the catch was discarded.

Table 1: Annual porbeagle landings (tonnes) reported by fishers and by fish receivers/ processors, since the 1997-98 fishing year (MPI 2013a, MPI 2013b, and Francis et al. 2014).

Fishing Year	Reported catch (including discards) by longline fishers only (tonnes). Source: Francis et al 2014.	Total landings reported by all fishers (tonnes). Source:(MPI 2013a)	Commercial catch (landings, discards and releases) (tonnes). Source: MPI 2013b)	Total landings reported by licenced fish receivers or on Monthly Harvest Returns (tonnes). Source:(MPI 2013a)
1997-98		205		162
1998-99		301		240
1999-00		215		174
2000-01		188		150
2001-02		161		119
2002-03		152	133	142
2003-04		84	67	65
2004-05	39	62	50	60
2005-06	37	54	49	55
2006-07	35	53	54	54
2007-08	32	43	41	41
2008-09	53	64	68	61
2009-10	61	?	84	65
2010-11	69	?	59	73
2011-12	84	?	82	54
2012-13	63	?		80

There is very little information on the level of recreational or customary fisheries in New Zealand waters, but both are thought to be negligible because porbeagle are usually found over the outer continental shelf or beyond, and so beyond range of most non-commercial vessels. Fisheries

compliance and enforcement bodies in New Zealand have not recorded any incidents of illegal catch of porbeagle in recreational, customary or commercial fisheries.

Trade pressures

There are no quantitative time series data on international trade in porbeagle specimens or products because all global trade in *L. nasus* products have been reported at the species level only since 2010. Before then, they were included in the general Customs commodity code for 'shark species'.

On 25 September 2012, porbeagle were listed on CITES Appendix III, thus requiring all exports of porbeagle to be accompanied by CITES documentation verifying that they were legally obtained in New Zealand or landed in New Zealand from the high seas. Between 25 September 2012 and 13 September 2014, there has been minimal reported legal international trade of porbeagle products: 51 kg of dried fins, which equates to 5.5 tonnes greenweight using the MPI conversion ratio of 1 kg dried fin: 108 kg greenweight).

4. Existing management

4.1 National Plan of Action for Sharks and associated legislation

In 1998, to address global concerns about the conservation and management of sharks, the Food and Agriculture Organisation of the United Nations (FAO) developed an International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks). The overarching goal of the IPOA- Sharks is *"to ensure the conservation and management of sharks and their long-term sustainable use"*.

To fulfil its obligations under the international plan, New Zealand developed its own National Plan of Action (NPOA) for the Conservation and Management of Sharks in 2008 (MPI 2008) to ensure that domestic management strategies for sharks contribute to the achievement of international goals.

The NPOA was reviewed and revised in 2013 (MPI 2013b, MPI 2014). One of the most significant objectives in the 2013 plan (and revised through an announcement by the Minister for Primary Industries in August 2014) was the elimination of shark-finning from 1 October 2014. After that date, almost all shark species had to be landed with their fins naturally attached, though an exemption was made for porbeagle and six other QMS species for which fins must be landed in the appropriate ratio to the weight of shark trunks (currently set at 1:45 for wet fins or 1:108 for dried fins), and fins for each species must be separately stored and landed.

4.2 Quota Management System

Because of concerns over the sustainability of porbeagle bycatch in the tuna longline fishery, porbeagle were introduced to the Quota Management System (QMS with a single Quota Management Area, POS1, incorporating the entire EEZ) in October 2004, with individual transferable quota. This move brought with it the requirement that the weight of all processed and discarded or released porbeagle be recorded on fishing returns.

The total allowable catch (TAC) was initially set at 249 tonnes per year, including a total allowable commercial catch (TACC) of 215 tonnes, a recreational allowance (RA) of 10 tonnes, a customary non-commercial allowance (CNCA) of 2 tonnes and an allowance for other mortality of 22 tonnes.

This TAC was based on historical levels of landings rather than on any scientific analysis of the maximum sustainable yield, which would have been complicated by porbeagle being a highly migratory species with only part of the stock being found at any one time in New Zealand fisheries waters.

The TAC was reviewed in 2012. Because of ongoing sustainability concerns related to the slow growth and low fecundity of porbeagles, the allocation and allowances were reduced to a TAC of 129 tonnes, a TACC of 110 tonnes, RA of 6 tonnes, CNCA of 2 tonnes and an allowance of 11 tonnes for other mortality. The new quota was again based on historical catch rates being well under the existing 2004 quota, as well precaution based on concerns about the vulnerability of porbeagle to overfishing.

Since the TACCs were set, the total commercial landings of porbeagle have been consistently below the quota limits. The actual landings have been 19% (41 tonnes reported by licenced fish receivers against a quota of 215 tonnes) to 73% (80 tonnes reported versus a quota of 110 tonnes) of TACC. The appropriateness of the quota limits for maintaining a sustainable fishery has not really been tested, and the time series is still quite short.

4.3 Fisheries Act 1996

When porbeagle was added to the QMS, it was also added to the Schedule 6 of the Fisheries Act 1996 with the provision that:

" A commercial fisher may return any porbeagle shark to the waters from which it was taken if –

(a) The porbeagle shark is likely to survive on return; and

(b) the return takes place as soon as practicable after the porbeagle is taken."

This encourages commercial fishers to return live porbeagle to the sea and not count against their allocated quota, nor against the entire TAC.

4.4 Observer programme

Since the early 1990s, there has been an independent fishery observer programme in place within the New Zealand EEZ. There is good coverage of chartered Japanese longline vessels that take a reasonable percentage of the porbeagle catch, but a low coverage of domestic longline vessels and midwater trawl vessels (Griggs & Baird 2013).

4.5 Regional Fisheries Management

New Zealand has an obligation to provide estimates of the numbers of non-target fish species taken in the tuna longline fishery as part of its contribution to the Ecologically Related Species Working Group under the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), and to the Western and Central Pacific Fisheries Commission (WCPFC), which covers most of the New Zealand EEZ.

Management of porbeagle shark in the western and central Pacific Ocean is the responsibility of the WCPFC. In 2010, they added porbeagle and four other sharks (including the three CITES-listed hammerheads) to their existing list of eight sharks designated as 'key species' within their jurisdiction (Clarke *et al*. 2014). Designation as a key species requires WCPFC members to provide catch and effort data, and stock status, indicator-based or other population analyses are to be conducted by the Secretariat of the Pacific Community (SPC), the WCPFC's scientific services provider. Porbeagle have not yet been the subject of a stock status or indicator-based analysis by WCPFC, but Clarke et al. (2014) noted that there is a low number of reliable observer-recorded catches (only in New

Zealand waters, and by only New Zealand and Japanese flagged vessels), but a large number of dubious logsheet records (in many EEZs and by vessels from at least seven flagged states). The listing of porbeagle in CITES Appendices, together with a wealth of new materials to aid species identification, and their listing as a key species by WCPFC, should lead to improved quality of identification, and the recording of catches to the species level in the South Pacific.

New Zealand is also a member of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), but its area of interest, south of the Antarctic Convergence, is beyond the usual southern limit of porbeagle distribution. In 2006, CCAMLR prohibited the directed fishing of shark species in the Convention area except for scientific purposes. It also agreed that any bycatch of shark, especially juveniles and gravid females, taken accidentally in other fisheries, shall, as far as possible, be released alive. To date, there has been no stock assessment or indicator-based assessment carried out on the few porbeagle in the CCAMLR area.

4.6 Regional context

In the Oceania region, generally covered by WCPFC, porbeagle sharks are known to be caught as bycatch only in the Australian Commonwealth (offshore) fisheries targeting tuna and swordfish, and in and around the New Zealand EEZ. Foreign vessels targeting tuna were excluded from the Australian EEZ in the late 1980s, and the Australian domestic take of porbeagle has been consistently less than 2.5 tonnes per year (D. Rothenfluh, Department of the Environment, Australia, pers. comm..), and so is minimal compared with the New Zealand landings. Because Australian legislation requires all species listed on the Convention on the Conservation of Migratory Species of Wild Animals (CMS) to be protected, landings of porbeagle caught as bycatch are permitted, but export of porbeagle products are currently not permitted, leaving New Zealand as the only exporter in the region.

At present, there is doubt that porbeagle are currently being caught in fisheries in the Oceania region beyond New Zealand and Australia, despite their presence being widely recorded in logsheets of many Pacific nations (Clarke et al 2014). Semba et al. (2013) provide some distributional and CPUE data from longline and driftnet fisheries in the southern South Pacific Ocean that reinforces the contention that porbeagle catches in other parts of Oceania, beyond New Zealand and Australia, are minimal. Almost all porbeagle catches were south of 35°S, except for a few caught as far north as 28°16’S below French Polynesia in driftnet surveys done between 1982 and 1990, and some were caught up to 25°S in the Humboldt Current off South America during longline surveys for butterfly kingfish (*Gasterochisma melampus*) between 1987 and 1994. Logsheet data from the Oceania region purporting to be porbeagle catches are quite likely to be misidentified mako sharks (Clarke et al 2014).

5 Conclusion

Southern Hemisphere stocks of porbeagle have never been specifically targeted as a fishery, but rather they have been caught as a valuable secondary bycatch mainly in the tuna longline fishery. There are no reliable historical data available about the trends in the porbeagle population in the Southern Hemisphere or in the New Zealand EEZ. The data that are available suggests that their stocks do not seem to have collapsed in the same way as the targeted North Atlantic stocks.

There is some suggestion that many porbeagle were taken as bycatch at the peak of foreign tuna longline fisheries in the New Zealand EEZ in the 1970s and 1980s, and that stocks in the New Zealand EEZ continued to decline through to the early 2000s. Since porbeagle was included in the QMS in October 2004, indicators suggest that the population decline has been halted and the stocks are now starting to recover.

This tentative recovery can be attributed to a decrease in the total number of hooks set each year in the tuna longline fishery from over 25 million hooks in 1980 to less than 4 million since the introduction of porbeagle to the QMS in October 2004, as well as increased rates of releasing live porbeagle at sea. With the domestic requirement for porbeagle fins to be landed in a prescribed ratio relative to the whole weight (i.e. fishers have to land porbeagle trunks if they want to land porbeagle fins), there will be more incentive to release live porbeagle rather than fill freezer space with porbeagle carcasses.

Overall, it is likely that the amount of porbeagle landed under the quota set under the QMS is sustainable and the recent levels of take may have allowed some recovery of their stock. It should be noted that the landings have never been close to the actual TACC set under the QMS, and the recreational take or customary take (a total of 8 tonnes) has not been quantified or estimated, but both are believed to be well below the quota limits.

At this stage, the evidence suggests it is reasonable to **allow exports of porbeagle products that were legally obtained within the New Zealand EEZ under the Quota Management System** on the basis that the recent take is at least sustainable.

The high seas take of porbeagle which is landed in New Zealand is understood to be very small. Given that porbeagle move freely in and out of the New Zealand EEZ, the suggestion that recent take on tuna longlines within the New Zealand EEZ has been sustainable suggests that the recent small take on the nearby high seas has not been detrimental to the New Zealand stock. This suggests that **a modest quantity of porbeagle product can be legitimately introduced to New Zealand if it was taken from the high seas within 100 nautical miles of the New Zealand EEZ, and as long as the total green weight of porbeagle related to the product is less than 4 tonnes per annum**. This is arbitrarily set at half of the combined recreational take and customary take (8 tonne) allowed within the EEZ under the QMS on the basis that it appears that these two allowances are nowhere near filled each year.

6. Recommendations to improve the NDF process

1. Species-specific data continue to be collected on fishing effort; the number, weight, sex, age, total fork length of all porbeagle landed, and those discarded alive or dead.

2. The recreational and customary take under the QMS is estimated through survey of recreational and customary fishers.

3. Increase observer coverage of domestic longline vessels midwater trawl vessels and New Zealand-flagged high seas vessels, especially those operating in areas where porbeagle are often caught.

4. The type of indicator-based analysis performed by Francis et al (2014) should be repeated at 3-5 yearly intervals, and the models improved with more data and testing. Once sufficient data are available, a quantitative stock assessment should be made in conjunction with other countries in the region.

5. Given the increasing proportional importance of bycatch of porbeagle in midwater trawl and bottom longline fisheries, a similar analysis of those porbeagle catches should be conducted.

6. Review, research and implement best practice mitigation methods to minimise captures of porbeagle in each fishery.

7. Research, develop and implement specific methods for handling and releasing porbeagles, and investigate the fate of live discards by tagging a sample from different fisheries, including recreational and customary fisheries.

8. The volumes of porbeagle product introduced from the high seas to New Zealand be monitored closely, and expert advice be sought before the 4 tonne (greenweight or equivalent greenweight estimates using the current porbeagle conversion multipliers of 108 for dried fins and 45 for wet fins) limit above is allowed to be exceeded.

9. New Zealand collaborates with Oceania neighbours, and especially with WCPFC, to better understand the movements and population dynamics of porbeagle moving in and out of the New Zealand EEZ, and especially into other national fishing jurisdictions. At present there is doubt that porbeagle are actually caught in other Pacific fisheries apart from Australia. If necessary, WCPFC establish regional quota to cover the take of porbeagle on the high seas.

7. References

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