New Zealand's non-detriment finding for blue shark (*Prionace glauca*)

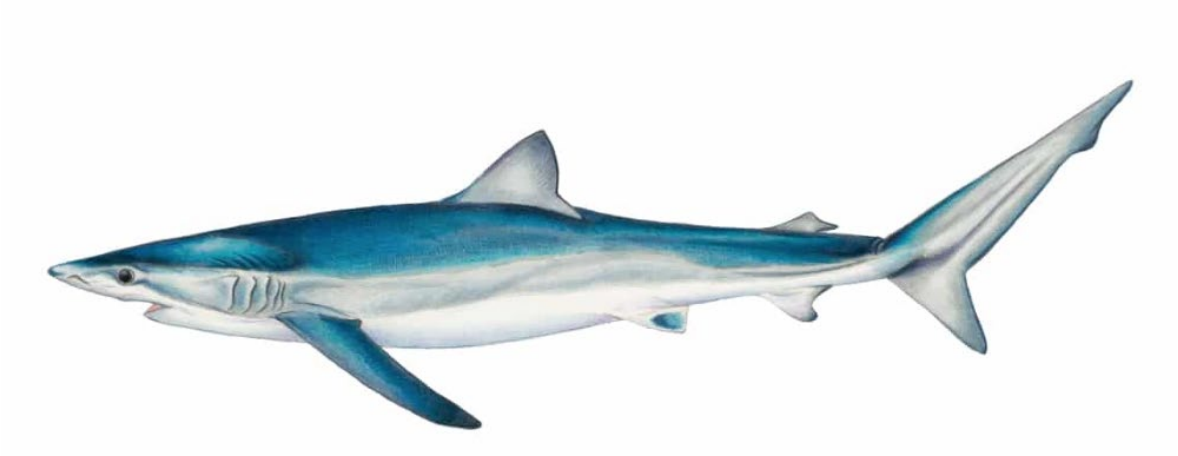

Illustration: Miguel Pinto Martins 2022 (https://www.aimmportugal.org/species/blue-shark/)

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Executive summary

The blue shark (*Prionace glauca*) is the most abundant pelagic shark found around the globe. It is highly migratory and lives in mainly temperate and subtropical oceanic waters, including in the New Zealand Exclusive Economic Zone (NZEEZ). In New Zealand waters, it is classified as 'Not Threatened' by the New Zealand Threat Classification System[1] even though for decades it has been the most bycaught pelagic shark species by both number and biomass. There is no targeted blue shark fishery in the NZEEZ. Almost all (98–99%) blue sharks caught are taken as bycatch in surface longline fisheries that target mainly bigeye tuna, southern bluefin tuna, and swordfish. Most blue sharks are caught off the northeastern North Island from Northland to Hawkes Bay, and off the West Coast of the South Island, especially in waters beyond the continental shelf that are deeper than 1000 m.

The combination of high productivity (4–135, but usually 26–56 live pups annually or biennially), fast growth rate, and relatively short time to reach sexual maturity makes the species intrinsically more resilient to over-exploitation and population depletion than other pelagic sharks. The blue shark is one of 11 shark species included in New Zealand's Quota Management System (QMS). It was introduced

[1] https://nztcs.org.nz/

into the QMS in October 2004 (i.e., the start of the 2005 fishing year) at the same time as shortfin mako shark (*Isurus oxyrinchus*) and porbeagle shark (*Lamna nasus*). The annual total allowable catch (TAC) of blue shark has been 2080 tonnes since coming under the QMS, with 1860 tonnes allocated for total allowable commercial catch (TACC), 20 tonnes for recreational fisheries, 10 tonnes for customary use, and 190 tonnes for other sources of fishery mortality. Since the New Zealand regulations to restrict shark finning was introduced in October 2014 (i.e., the 2015 fishing year), after which time any retained fins of blue sharks had to be landed either naturally or artificially attached to the trunk, the annual commercial take has been consistently less than 10% of the published TACC, with unknown, but likely low, levels of other fisheries mortality. Fisheries indicators, such as catch per unit effort and percentage catch composition, show that the New Zealand population of blue shark has been stable or increasing in recent decades, and is not overfished. We therefore **allow exports of blue shark products that were legally obtained within the NZEEZ under the QMS** on the basis that the levels of take have been at least sustainable in the last decade.

Both conventional tagging and satellite tagging of blue sharks caught in New Zealand waters have shown that many mature individuals migrate out of the NZEEZ in autumn to the high seas and/or into the EEZs of at least 10 other South Pacific nations, including as far away as Chile. They then return to the NZEEZ in spring to mate and give birth to live pups. All three satellite-tagged juveniles remained in the NZEEZ, mainly in shallower waters than used by mature blue sharks. New Zealand's blue shark stocks are therefore shared with many other nations in the Oceania region. Because stocks are shared internationally, both a local and a regional approach to blue shark fisheries management is required.

While there are high levels of uncertainty in some measures, a regional analysis of fisheries statistics concluded that blue shark stocks in the Southwest Pacific do not appear to be currently overfished. Together with the fishery statistics from within the NZEEZ, the evidence suggests that **up to 20 tonnes per year of blue shark that were caught on the high seas within 500 nautical miles of the NZEEZ can be sustainably introduced to New Zealand.** This quantity is arbitrarily set at about 1% of the TAC of 2080 tonnes allowed under the QMS, on the basis that since October 2014, when the fins of blue sharks have been required to be landed attached, the annual catch quota in the NZEEZ has not been approached.

1. Introduction

On 25 November 2023, following a 12-month implementation delay after the close of the 19th Conference of the Parties (CoP19) of the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES), the blue shark (*Prionace glauca*) was listed on Appendix II, along with all other species of requiem sharks (Family Carcharhinidae) not already listed on the CITES Appendices. Despite their distinctive physical appearance as live animals, the CoP specifically voted against a proposal to exclude blue shark as a 'look-alike species' in the family-level listing of Carcharhinidae.

New Zealand added the blue shark (Appendix II of CITES) to Schedule 2 of the Trade in Endangered Species Act (1989) by Order in Council in June 2023, with the date of enforcement delayed until 25 November 2023.

Export of all blue sharks or their products now requires a CITES export/re-export permit issued by the New Zealand Management Authority. Also, all landings in New Zealand of a blue shark caught on the high seas, whether for commercial or other purposes, will require a CITES 'Introduction from the sea certificate' obtained from the New Zealand Management Authority before the shark is brought into the

New Zealand Exclusive Economic Zone (NZEEZ). The same regulations apply to all other species of requiem sharks.

Of the requiem sharks, only blue shark is managed under New Zealand's QMS.

CITES 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 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 specimen 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 in the wild – known as a non-detriment finding (NDF).

At CITES CoP16, Parties adopted a revised 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 the 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 vessel registration arrangements) must issue an NDF before the specimens are transported into the State of introduction.

The listing of blue shark on Appendix II of CITES (as one of the 56 requiem shark species) therefore requires an NDF to be issued by New Zealand in three situations:

- before the export of blue shark products that were obtained within the NZEEZ,

- before the introduction of blue shark products obtained on the high seas by a vessel registered in New Zealand and landed at a New Zealand port, and

- before blue shark products taken on the high seas by a vessel registered in New Zealand is introduced to the EEZ of the foreign country where the product will be landed.

2. Blue shark ecology

2.1 Global distribution

The blue shark is a large pelagic predator found around the globe mainly in subtropical and temperate oceanic waters warmer than 15°C, but they can tolerate broad temperatures (as low as 7 ºC and up to 25ºC), making it the most widely distributed shark species in the world from 50°S to 60°N (Rigby et al. 2019, Figure 1). They are less common in tropical waters very close to the equator. Most are found off the edge of the continental shelf at depths of 0–350 m, but they can dive to depths of over 1300 m. Most juveniles are found in shallower waters, but even mature individuals can be found close inshore in places where the continental shelf is narrow, such as near Kaikoura.

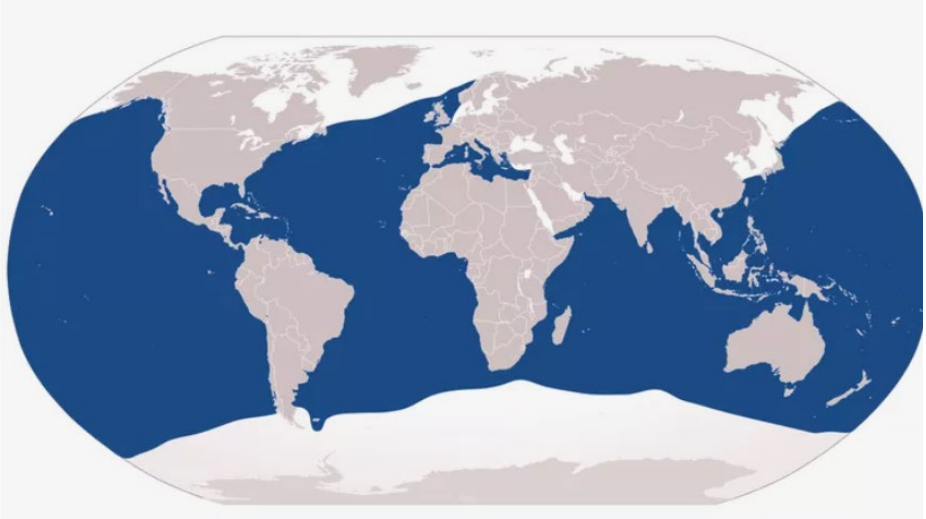

Figure 1: Global distribution of blue shark (from FAO).

A conventional tagging study shows that of 5116 blue sharks tagged by mainly recreational fishers in New Zealand waters between 1975 and 2022, most of the 90 recaptures were close to the tagging location (Sippel et al. 2016, Holdsworth 2023). Some individuals, however, moved extensively through the South Pacific Ocean, as far east as Chile, and one moved into the Indian Ocean to the southwest of Western Australia. A Chilean-tagged blue shark was recaptured by a New Zealand fisher in 2017, indicating two-way movements across the South Pacific (Fisheries New Zealand 2022). The majority of the 24 recoveries of blue sharks from outside the NZEEZ (Figure 2) were in subtropical waters to the north of New Zealand in an arc from Queensland (Australia), through New Caledonia, Fiji, Tonga, Cook Islands to French Polynesia (Sippel et al. 2016, Fisheries New Zealand 2022). None of the blue sharks tagged in New Zealand crossed the equator, nor did any of over 27,000 blue sharks tagged in the North Pacific Ocean (Sippel et al. 2016).

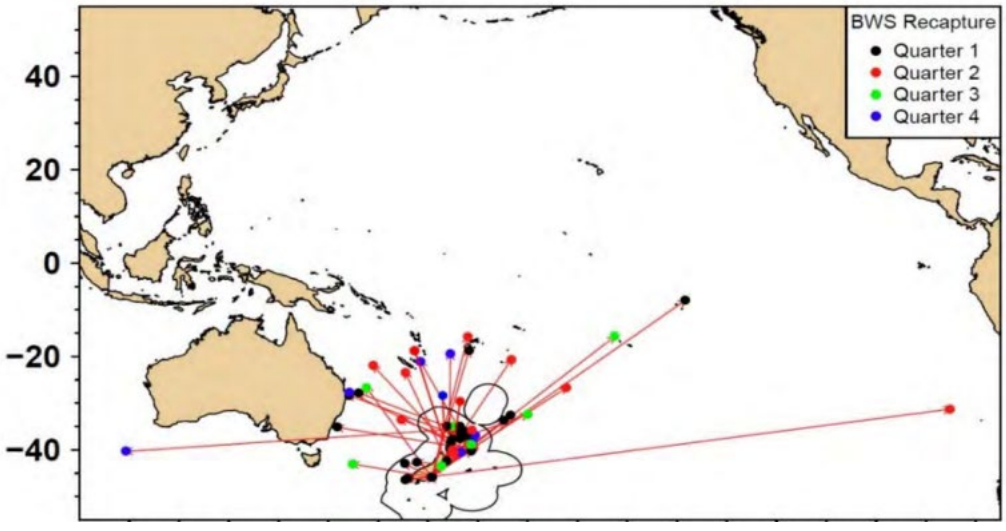

Figure 2: Long-distance recoveries of blue sharks tagged in New Zealand waters (from Holdsworth 2023).

Elliot et al. (2022) fitted satellite tags to 15 blue sharks caught off northeastern New Zealand in 2012–2015; nine of these tags were conventional SPOT (Smart Position and Temperature) tags that gave

two-dimensional location information, but six were SPLASH tags that gave three-dimensional data, including depth profiles. In autumn, all nine mature male blue sharks migrated over large distances to subtropical and tropical waters in the Southwest Pacific, including to the EEZs of Australia, Solomon Islands, Vanuatu, New Caledonia, Fiji, Tonga, Niue, Cook Islands, French Polynesia and Kiribati, and also to areas beyond national jurisdiction. One mature male almost reached the equator before turning and heading rapidly south. The maximum straight-line distance from New Zealand was 5200 km, and the maximum trip distance recorded was 14,559 km, though this figure would have been conservative given that the individuals will have made non-linear movements between successive satellite fixes. The mature males returned to the NZEEZ in spring. By contrast, the three mature females stayed in the NZEEZ or in adjacent international waters, and the three juveniles of both sexes remained within the NZEEZ (Elliot et al. 2022).

Genetic studies have historically shown that blue sharks have a panmictic population with little differentiation between stocks globally; however, recent research shows at least three separate stocks: the Mediterranean, the North Atlantic, and the Indo-West Pacific (Nikolic et al. 2023, Leone et al. 2024). Within the Indo-Pacific region, the North Pacific had very limited sampling in these studies, but elsewhere the generally small samples failed to detect any genetic differences between the Indian Ocean and Southwest Pacific samples. Tagging data showed no movement of blue sharks across the equator between the North Pacific and South Pacific Basins (Sippel et al. 2016), and so these populations are often treated as separate stock for management purposes (Taguchi et al. 2015).

2.2 Spatial distribution within New Zealand waters

Blue sharks are common throughout the NZEEZ, except in the Subantarctic. They are mainly found over deep waters beyond the continental shelf; however, they were most commonly caught at moderate hook depth range (70–130 m) up to 2004 but, since then, they have been taken mainly from shallower sets (< 80 m) (Horn et al. 2013). Some blue shark frequent coastal waters, particularly in places where the continental shelf is narrow, such as off Kaikoura.

About 99% of the annual commercial catch is taken as bycatch on bigeye tuna (*Thunnus obesus*), southern bluefin tuna (*Thunnus maccoyii*), and broadbill swordfish (*Xiphias gladius*) surface longlines (SLL) over the outer shelf and in oceanic waters. Small numbers of blue shark are caught on bottom longlines on the Chatham Rise and near the shelf edge around the mainland; by trawl (mainly midwater trawl) off the west coast of North Island; and by set net in inshore waters of both islands (Francis 2019). The highest bycatch by weight on SLL is off the northeastern North Island south to Gisborne and Hawkes Bay, and also off the coast of Westland and Fiordland (Francis et al. 2014, Francis & Finucci 2019). The greatest catch per unit effort has been from the outer Bay of Plenty, Gisborne and Hawkes Bay, and off central Westland (Francis et al. 2014, Francis & Finucci 2019).

Observer data from New Zealand tuna longline fisheries in the fishing years 1993–2013 showed no clear temporal trends, but spatial variation in length composition and sex ratios indicate that blue sharks segregate spatially by size and sex, thus suggesting that the NZEEZ contains breeding, birthing and nursery areas (Francis et al. 2014). New-born blue shark pups, ranging between 35–45 cm total length, have been observed off the northeastern North Island (Elliot 2020). It is likely that newborn pups move from shelf water to shallower coastal waters, away from oceanic zones, likely to avoid predation by other shark species (Elliott et al. 2022).

About 75% of the blue sharks caught off the western South Island were females, especially subadult females, but the sex ratio was more balanced off the northeastern North Island with males slightly predominating (54%). This was because of the presence of mature males as well as some mature

females and also juveniles of both sexes; this ratio varied from year to year and in some years subadult females predominated (Francis 2013, Francis et al. 2014).

The satellite tracking study by Elliot et al. (2022) showed that the three tagged juvenile blue sharks all remained within the NZEEZ, but they moved 200–630 km from their tagging site in track lengths that covered a minimum of 3000–5616 km at an average of over 25 km/day. Three mature females moved 410–830 km from their tagging site, in track lengths ranging from a minimum of 5658–11,259 km at an average of over 31 km/day. This took two of the mature females into the high seas, one north of New Zealand and one into the Tasman Sea, for up to 18% of their transmitter life. By contrast, the nine tagged mature males moved 1200–5200 km from their tagging site in track lengths that covered a minimum of 3573–14,559 km at an average of over 37 km/day. Most of their travel was directed, and this took them out of the NZEEZ for 28–89% of their tracking time.

2.3 Habitat and food

Blue sharks are an apex predator found throughout New Zealand waters. Juveniles generally live in shallower waters (<200 m) on the continental shelf, whereas most mature blue sharks live over deeper waters (>1000 m) around and beyond the shelf break.

SPLASH tags showed that by day and night, juveniles spent most of their time within 150 m of the surface. Mature blue sharks, instead, had a bimodal distribution during the day, with preferences within 150 m of the surface and at about 400 m depth, whereas at night, they resided predominantly within 100 m of the surface. During the day, mature males repeatedly dived below the thermocline to around 400 m (the maximum dive recorded was to 1364 m) for an average of 79 minutes before ascending to surface waters for an average of 41 minutes before descending again (Elliot et al. 2022). Dive depths at night were shallow but were significantly deeper close to full moon (mean 61 m) than close to new moon (mean 24 m); these differences were likely influenced by the vertical migration of prey in response to differences in moonlight (Elliott et al. 2022).

In New Zealand waters, Horn et al. (2013) found that juvenile blue sharks feed mainly on cephalopods (especially squid, but also octopus and occasionally nautilus and cuttlefish) but as they mature to midsize classes (130–210 cm length) they take a greater proportion of bony fish, especially Ray's bream and dealfish. Larger blue sharks (>210 cm length) took tuna and other large mesopelagic fish, though they still had a substantial cephalopod component to their diets. Blue sharks also feed on salps, crustacea, birds and carrion, and they are frequently attracted to baited hooks on tuna SLL.

2.4 Biological characteristics

The blue shark has the highest known population growth rate of the pelagic sharks (Simpfendorfer & Rigby 2023) but there are no specific data on the intrinsic rate of increase, *r*, in the South Pacific Ocean. Neubauer et al. (2022) estimated that r_{max} in the Southwest Pacific was 0.2–0.4, and hence a value of r = 0.15–0.35 was used in expert scientific advice informing the Australian NDF for blue sharks (Simpfendorfer & Rigby 2023).

Blue sharks grow to a maximum recorded total length of 384 cm, but in waters around New Zealand the largest blue sharks rarely exceed 300 cm in length and 200 kg in weight (Fisheries New Zealand 2022). The largest recorded blue shark in New Zealand had a total length of c. 360 cm (Francis & Ó Maolagáin 2016). In New Zealand waters, females mature at 180–185 cm fork length and males mature at 190–195 cm fork length (Francis & Duffy 2005). Based on growth rates, the estimated

median ages at maturity in New Zealand are 8 years for males and 7–9 years for females (Manning & Francis 2005). The maximum longevity of blue sharks is not certain, but Manning & Francis (2005) and Mukherji et al. (2021) estimated maximum ages in the South Pacific are 20–22 years for females and 23–25 years for males. Natural mortality estimates are 0.19 for male sharks and 0.21 for females (Manning & Francis 2005).

Gestation in female blue sharks lasts between 9–12 months, and 4–135 pups, usually 26–56, are born alive, probably during the spring (Fisheries New Zealand 2022). Reproductive periodicity is annual to biennial. Pup size at birth is 35–54 cm in total length (Elliot et al. 2022, Fisheries New Zealand 2022).

This combination of very high productivity, fast growth, and relatively short time to reach sexual maturity makes the species intrinsically more resilient to over-exploitation and population depletion than other pelagic sharks.

2.5 Conservation status

In 2009, and again in 2018, the global extinction risk status of blue shark was classified as “Near Threatened” in the IUCN Red List of Threatened Species (Stevens 2009, Rigby et al. 2019). The weighted global population trend estimated a median decline of 7.3%, with the highest probability of a <20% reduction over three generations (30–31.5 years). The population trends of different geographical stocks have been highly variable. The Mediterranean Sea stock has collapsed and is virtually locally extinct, and steep declines have been noted in the Atlantic Ocean, with a lesser decline in the Indian Ocean, but the South Pacific Ocean population has increased (Rigby et al. 2019).

In 2005 and 2016, expert panels assessed the conservation status of the blue shark in New Zealand waters as ‘Not Threatened’, with a qualifier ‘Secure Overseas’, according to the criteria of the New Zealand Threat Classification System (Hitchmough et al. 2007, Duffy et al. 2018).

2.6 Population status in New Zealand

Francis & Finucci (2019) carried out an indicator-based analysis of fisheries data for the fishing years 1994–2018 for blue shark and two other highly migratory shark species (shortfin mako and porbeagle) commonly taken as bycatch in tuna SLL fisheries in the NZEEZ. Because close to 99% of blue sharks caught in New Zealand waters are taken on SLL, these analyses are likely to be a reliable indicator of their overall stock status. The indicators used included geographical distribution of high catches and zero catches, species composition, catch per unit effort, median size and sex ratio.

The mean number of SLL hooks set in the NZEEZ declined from 25.8 million per year in 1980–1982 to 4 million in 2005 when blue shark was introduced into the QMS (Francis & Finucci 2019 – see Figure 3). This further declined to 2.1 million hooks per year in 2014–18 (Francis & Finucci 2019), and to 1.6 million hooks set in 2020–21 (Griggs et al. 2024). Up until 1990, the SLL fleet comprised foreign vessels (mainly from Japan, Korea and Taiwan), but a New Zealand domestic fleet then began operating. Since 1994, when the foreign fleet was reduced to a few vessels (usually four per year) chartered by New Zealand companies, domestic vessels have dominated the fishery. Foreign chartered SLL vessels last fished in the NZEEZ in 2015, and so the SLL fishery has been exclusively carried out by domestic vessels since 2016 (Francis & Finucci 2019).

Data used by Francis & Finucci (2019) were derived from the Ministry for Primary Industries' (MPI) observer database for the 1994 to 2018 fishing years, and the MPI commercial catch-effort database for the 2005 to 2018 fishing years, covering the period blue sharks were included in the QMS. Data were separated into three time-series: Japan South (chartered Japanese vessels with high (c.80%) observer coverage in Fisheries Management Areas (FMAs) 5 and 7 from 1994 to 2015; New Zealand South (domestic vessels in FMAs 5 and 7 with low (<10%) observer coverage) from 2012 to 2018; and New Zealand North (domestic vessels in FMAs 1, 2, 8, 9 and 10 with low (<10%) observer coverage) from 1994 to 2018 (Figure 4).

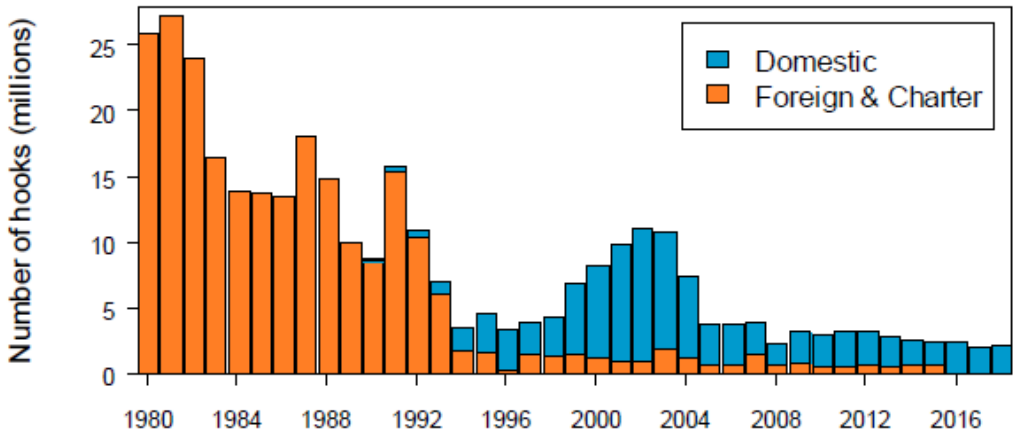

Figure 3: SLL fishing effort in the New Zealand EEZ 1980–2018 (from Francis & Finucci 2019).

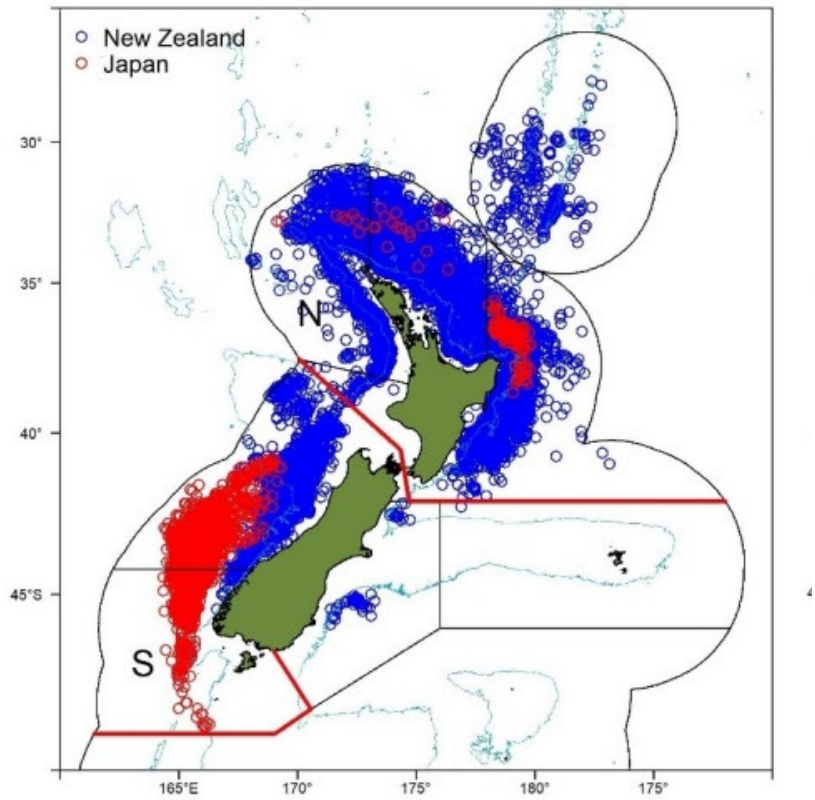

Figure 4: Distribution of commercial SLL sets 2005–2018 by fleet. North (N) and South (S) regions are demarcated by red lines. New Zealand-based fisheries are shown in blue and Japanese fisheries (only up to 2015) are shown in red (from Francis & Finucci 2019).

Observer catch per unit effort (CPUE) data, which span a longer time period than commercial fisheries Tuna Longline Catch Effort Returns (TLCER) data, suggest that blue sharks may have declined during the late 1990s and early 2000s, and then increased since the mid-2000s to considerably higher levels by 2015, followed by a decline in 2017–2018 in North region only (Francis & Finucci 2019). Given the much greater SLL fishing effort before 1993 and assumed high effort leading up to 1980 (when fisheries effort data were first collected), we expect that the catch of blue sharks was very much higher before the 1994–2018 fishing year period included in the analyses done by Francis & Finucci (2019).

Since the exit of the Japanese fleet from the NZEEZ in 2015, blue sharks have been caught in all 10 FMAs (Figure 5), but mainly in continental shelf and slope waters around the North Island (FMA 1, 2, 7, 8 and 9) and off the West Coast south to about Jackson Head at 44.5°S (FMA 7), but a few are caught as far south as 52°S near the sub-Antarctic Auckland and Campbell islands (Francis 2019). Under the QMS, blue sharks are managed as a single fish stock within the NZEEZ.

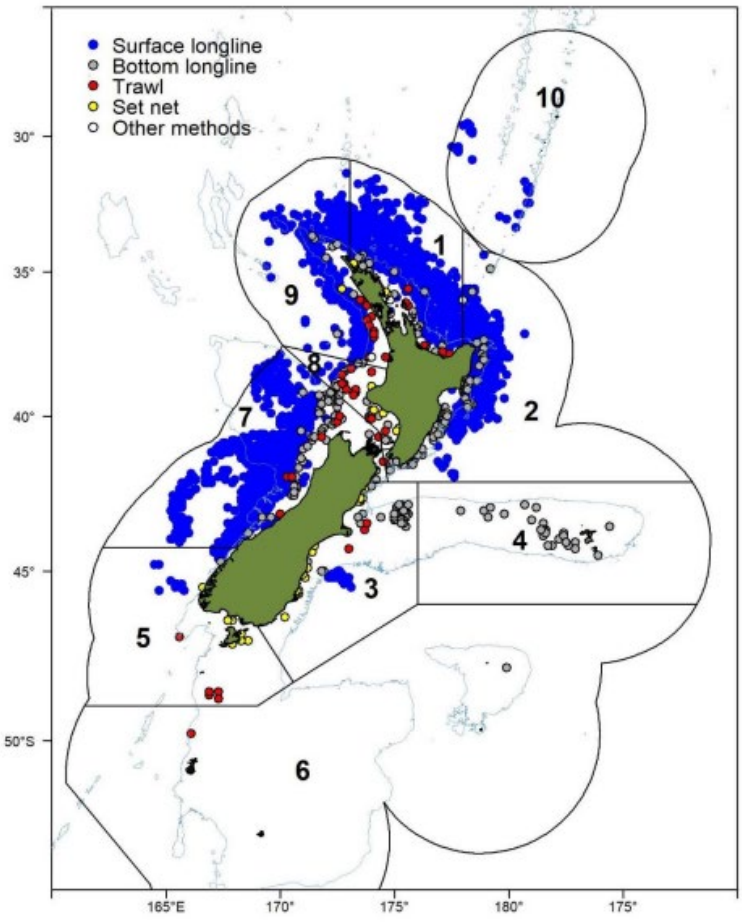

Figure 5: Distribution of the start locations of fishing sets or tows in the NZEEZ (black lines show the areas of Fisheries Management Areas (FMAs) within the EEZ) and reported catches of blue shark by fishing gear type in 2014–15 to 2017–18 (Francis 2019).

From their analysis of data to 2013, Francis et al. (2014) concluded that none of the indicators suggested that blue sharks were declining in either of the main tuna fishing grounds, off north-eastern North Island nor off the West Coast of the South Island. There was no evidence that blue sharks had

been adversely affected by fishing at levels experienced since they entered the QMS in 2005; in fact, all datasets indicated peak catch rates during the period 2011–2013.

In a more recent analysis, including an extra five years of data through to 2018, Francis & Finucci (2019) found that most abundance indicators showed declining trends in the latter years, particularly in the North region. The authors felt that the indicators may not accurately index blue shark abundance because similar steep declines were noted in the North region, but not in the South region, for all three main pelagic sharks (shortfin mako, porbeagle and blue shark), which suggests environmental rather than fisheries drivers. In addition, the retention and discards of dead blue sharks in the past five years have been very low, especially after the 2014 finning restrictions came into force. The extent to which the legislation restricting finning has altered reporting behaviour is unknown, but it is likely that discarding and reporting practices have changed; for example, Francis & Finucci (2019) explained that the steep drop in the median lengths of both male and female blue sharks in North region in 2017–2018 may have been due to fishers bringing small sharks aboard the boat to retrieve their hooks but cutting traces from large live sharks.

3. Pressures on blue sharks

3.1 Fishing pressures

Commercial fisheries

There are some small targeted commercial fisheries overseas, but the main global threat to blue sharks is bycatch from tuna and swordfish longline fisheries. Most global blue shark catch is from the Pacific Ocean, especially from the Southwest Pacific (including New Zealand), where many bycaught blue sharks have been retained as a valuable bycatch in SLL fisheries directed at tuna and billfish.

In New Zealand waters, blue sharks are the most commonly caught shark on tuna SLL and are often caught more frequently than the target species. They were therefore likely taken in very 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 the first two years of the 1980s more than 25 million hooks were set, whereas each year since the 2004 fishing season there have been fewer than 4 million hooks set (Francis & Finucci 2019). Small numbers of blue sharks are caught and discarded on bottom longlines on the Chatham Rise and near the shelf edge around the mainland; by trawl (mainly midwater trawl) off the west coast of North Island; and, in set nets in inshore waters of both islands (Francis 2019, Moore & Finucci 2024).

Catches of blue sharks in New Zealand waters have varied considerably over the years. They were likely very high in the 1980s and 1990s before the species was included in the QMS in October 2004 (i.e., the 2005 fishing year). After 2004, the annual commercial catch averaged 56% (37–88%) of the 1860 tonnes annual Total Allowable Commercial Catch (TACC). Since the regulations to restrict shark finning were introduced in October 2014, at the start of the 2015 fishing year, the annual commercial catch has averaged 54% (48–60%) of the quota (Table 1).

Table 1: Annual blue shark landings (tonnes) reported by fishers and by fish receivers/ processors, from the 1997–2022 fishing years (Francis 2019, Fisheries New Zealand (FNZ) 2018, and Fisheries Infosite).

Fishing Year (to 30 Sept)	QMS TACC	Reported Tuna Longline Catch Effort Returns (TLCER) including discards by **longline fishers** only. Source: Francis (2019)	Total landings reported by **longline fishers**. Source: Francis (2019)	Total landings reported by licenced fish receivers or on monthly harvest returns. Source: FNZ 2022, and Fisheries Infosite for 2023
1997–98				525
1998–99				1031
1999–00				1415
2000–01				1105
2001–02				914
2002–03				649
2003–04				734
2004–05	1860	694	526	752
2005–06	1860	795	556	656
2006–07	1860	1055	756	794
2007–08	1860	826	675	687
2008–09	1860	998	764	804
2009–10	1860	1021	678	696
2010–11	1860	1124	720	770
2011–12	1860	1635	1045	1011
2012–13	1860	1337	648	691
2013–14	1860	1096	78	117
2014–15	1860	1032	12	142
2015–16	1860	990	2	163
2016–17	1860	887	17	116
2017–18	1860	1118	5	120
2018–19	1860			101
2019–20	1860			112
2020–21	1860			94
2021–22	1860			55
2022–23	1860			117

Up until October 2014, most blue sharks were finned, and just the fins were retained while the trunks were disposed of at sea. For example, in the 10 years 2005–2014, 1856 tonnes (84.4%) of the 2200 tonnes of blue sharks caught had their fins removed or were landed whole; 84 tonnes were discarded; and, 259 tonnes were released alive (Moore & Finucci 2024). There was an abrupt change in the rate of retention of blue sharks around the time the finning restrictions came into effect, from most sharks being retained, to most dead or near dead being discarded or being released alive (Moore & Finucci 2024 – see Figure 6). In the eight fishing years (2015–2022) following the October 2014 finning regulations, which required blue shark fins to be landed attached to the trunk either naturally or tied to

the carcass, only 35 tonnes (0.7%) of blue sharks were landed, 705 tonnes (14.2%) were discarded dead or nearly dead, and 4205 tonnes (85.1%) were released alive (Moore & Finucci 2024).

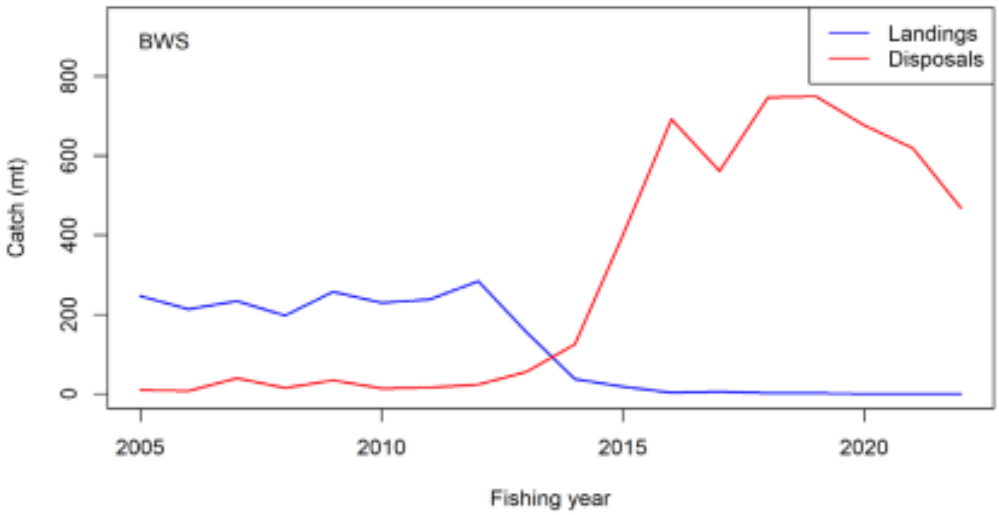

Figure 6: Annual commercial landings and disposals (discarded dead or near dead, or released alive) of blue shark in the NZEEZ from 2005 to 2022 fishing years (Moore & Finucci 2024).

Across all longline fleets fishing in the NZEEZ between 2006 and 2018, 91.1% of observed blue sharks were alive when hauled to the longline vessel (Ministry for Primary Industries 2022). Of these, 99.2% were released alive (Moore & Finucci 2024), often without being landed on board the vessel (Ministry for Primary Industries 2022). There have been no studies of post-release survival of blue shark in New Zealand waters, but Moore & Finucci (2024) summarised studies conducted elsewhere. Post-release survival from SLL fisheries in the Pacific was 62–90%, with most mortality occurring within days of tagging. Shark condition at release was the key factor determining post-release survival, while trailing fishing gear left on the shark was an important negative factor. Elliott (2020) estimated that the finning restrictions have reduced bycatch mortality of blue sharks in New Zealand waters by 83–89% per annum.

Recreational fishery

There is very limited information on the recreational catch of blue sharks in New Zealand waters, but landings are unlikely to approach the 20 tonnes per year limit set in the QMS. Under the Fisheries (Amateur Fishing) Regulations 2013, in 2025, there was a daily bag limit of one blue shark per active fisher off the eastern and southern South Island, except in the Te Whata Kai o Rakihouia i Te Tai o Marokura — Kaikōura Marine Area, where the bag limit is only one game shark (blue shark, hammerhead shark, mako shark, porbeagle shark, seven gill shark or thresher shark) per day; however, no bag limit is set elsewhere (Fisheries New Zealand 2025). Since 1987, there has been an upsurge in the popularity of tag-and-release of all game fish, resulting in a steady reduction in the numbers of sharks landed by big game fishers. Most shark species targeted by sport fishers are released alive, often after being tagged (Holdsworth & Saul 2017). In New Zealand blue sharks are generally only landed by sport fishers during competitions, although some are landed for line class records outside of competitions.

Although blue sharks are recognised by the International Game Fish Association as a game fish, they are not highly regarded by New Zealand sports fishers, and most are tagged and released. Over seven seasons from 1997–2003, members of clubs affiliated to the New Zealand Sport Fishing

Council landed an average of 89 (30–177) blue sharks weighing over 50 kg per year, and an average of 269 (63–749) were tagged and released each year (New Zealand Big Game Fishing Council 2004). The number of blue sharks released each year without being tagged by sports fishers is unknown. Because most recreational fishers do not belong to clubs (Clinton Duffy, pers. comm) the total number of blue sharks caught and/or landed by the recreational sector is unknown.

Holdsworth (2023) summarised data on the number of blue sharks tagged and released by big game fishers between 1995 and 2022. The number of fish tagged varied immensely over the years but averaged 109 (0–24) per year. Of the 5116 blue sharks tagged since 1995, only 90 (1.8%) recaptures have been reported. Levels of non-reporting and tag shedding are unknown, but given the estimated lifespan of blue sharks is about 20 years and the maximum elapsed time between tagging and recapture is less than 4 years, it seems likely that many tags are shed.

Customary fishery

There is no information on the current level of take of blue sharks caught in customary fisheries in New Zealand waters, but it is thought to be negligible (Fisheries New Zealand 2018) and likely well below the 10 tonnes per year set by the QMS.

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

3.2 Trade pressures

Blue shark fins are traded internationally for ‘shark fin soup’, considered a delicacy in East Asia. Although blue shark fins are not particularly sought after, they have long dominated the fin trade in Asian markets. Clarke et al. (2006) found that they made up 17% by weight of fins auctioned in the Hong Kong market in 2000–2001. More recently, Fields et al. (2017) found that they constituted 49% of fin trimmings from the Hong Kong market in 2014–2015, and Cardeñosa et al. (2020) found that they made up 36% of the fin trimmings obtained from the Guangzhou market in 2015–2017. The overall fin market has declined since shark finning (removal of fins and discarding the body) has been heavily regulated or banned in many jurisdictions, and since many airlines have refused to carry shark fins.

Blue shark meat can quickly ammoniate unless immediately bled or frozen. Nevertheless, in 2023, the first year after the listing of blue shark on the CITES Appendices, more than 5000 tonnes of mainly pre-Convention bodies and meat have been traded internationally, mainly of specimens caught on the high seas by Spanish and Portuguese vessels and imported into Spain, Brazil and Morocco

The requirement for international trade of CITES-listed shark species to be sustainable, combined with various conservation measures adopted by many Regional Fisheries Management Organisations, including retention bans for some species, has seen a global shift to a greater number of lower value fins (such as from blue shark) being traded. However, since the requirement for New Zealand fishers to land blue shark fins attached to the body was introduced in October 2014, the number of blue sharks landed has plummeted because of the space required to store the entire, low value, body rather than just the excised fins. International trade in blue shark fins or meat into and out of New Zealand appears to be negligible judging by the lack of CITES permit requests received between November 2023 and November 2024.

4. Existing management

4.1 National Plan of Action for Sharks and related risk assessments

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 for the Conservation and Management of Sharks (NPOA-Sharks) in 2008 (Ministry of Fisheries 2008). This has been revised twice, in 2013 (Ministry for Primary Industries 2014) and again in 2022 (Fisheries New Zealand and Department of Conservation 2022), though the latter is still in draft[2], waiting to be revised following consideration of public submissions.

The current (2013) NPOA-Sharks adopted a risk-based approach to prioritise management actions so that resources could be directed to those shark populations most in need of active management, whether that is through absolute protection, catch limits, measures to reduce incidental catches, or other methods such as spatial or temporal closures (Ministry for Primary Industries 2014). A qualitative assessment of the risk to shark and ray species in New Zealand waters was undertaken by an expert panel in 2014 (Ford et al. 2015). This was updated in 2017 for the 50 species at highest risk, including all 11 taxa included in the Quota Management System and three of the seven protected species (Ford et al. 2018). The risk assessment involved scoring the risk to each species from commercial fishing on a national (EEZ) scale taking into consideration its biological productivity.

In 2014, the blue shark had a risk score of 12 derived as the product of an intensity score of 4 out of 6 and a consequence score of 3 out of 6. This placed it at the lowest assessed risk of any of the 11 QMS shark species, and lower than all three protected species and 20 non-QMS shark and /ray species assessed but higher than 33 of the 66 non-QMS sharks and rays (Ford et al. 2015). Its intensity score was relatively high because it is vulnerable to fishing across 31–45% of its range and across most of the year. Three factors that reduced the consequence score were that they have a large global population, have moderate to high productivity, and CPUE figures available at that time suggested an increasing population (Ford et al. 2015).

The 2017 assessment came up with the same score and ranking for blue shark among the 11 QMS species, and 3 protected species, but this time 19 non-QMS chondrichthyan species were ranked at higher risk (Ford et al. 2018). For both assessments, data was described as 'exist and sound' and there was good consensus about the final score amongst the expert panel.

One of the most significant objectives in the 2013 NPOA-Sharks (and revised through an announcement by the Minister for Primary Industries in August 2014) was the introduction of regulations to restrict shark-finning after 1 October 2014 (2015 fishing year). Almost all shark species are required to be landed with their fins naturally attached. The exemptions are blue sharks, which must have the fins naturally or artificially attached to the trunk, and six other QMS shark species whose fins must be landed in the appropriate ratio to the weight of shark trunks. With this domestic requirement for blue sharks to be landed with fins attached, there is an incentive to release live blue sharks rather than fill freezer space with their low value carcasses, even though their fins still have a moderate commercial value.

[2] As of April 2025.

4.2 Quota Management System

In October 2004 (i.e., at the start of the 2005 fishing year), concerns over the sustainability of the bycatch of three highly migratory sharks (blue sharks, porbeagle and shortfin mako) in the tuna longline fishery, led to blue sharks being introduced to the Quota Management System (QMS with a single Quota Management Area, BWS 1, incorporating the entire EEZ). This move brought with it the requirement that the weight of all processed and discarded blue sharks had to be recorded on fishing returns.

The total allowable catch (TAC) was intended to allow for a continuation of historical bycatch rather than any targeted fishing. It was initially set at 2080 tonnes per year, including a total allowable commercial catch (TACC) of 1860 tonnes, a recreational allowance (RA) of 20 tonnes, a customary non-commercial allowance (CNCA) of 10 tonnes and an allowance for other sources of fishing-related mortality of 190 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 blue shark being a highly migratory species with only part of the stock being found in New Zealand fisheries waters for about half of the year (late spring to autumn). The TAC and TACC have been reviewed periodically but maintained at the same levels set in 2004.

Since the TACC was set, the total commercial landings of blue sharks (Table 1) have been consistently less than about 60% of the TACC, except in 2012 (1635 tonnes = 88% of TACC) and 2013 (1337 tonnes = 71% of TACC). The actual landings have been well below these levels because many blue sharks are released alive or their bodies discarded at sea, especially after finning regulations were introduced in October 2014 (i.e., 2015 fishing year). The appropriateness of the quota limits for maintaining a sustainable fishery has not really been tested, especially for the recreational and customary catch limits which are not reported on.

4.3 Fisheries Act 1996

In 2014, as part of the regulatory package to restrict shark finning in New Zealand waters, Schedule 6 of the Fisheries Act 1996 was amended to allow commercial fishers to return blue shark to the waters from which it was taken if it was returned as soon as practicable and likely to survive. In such cases, the shark would not be counted against the Annual Catch Entitlement (ACE). The regulations also allowed dead or unlikely to survive specimens to be discarded at sea, but their estimated weight counted against the ACE.

On 1 November 2022, Schedule 6 was repealed and replaced with a mechanism under section 72A of the Fisheries Act whereby the Minister of Fisheries may permit the return of a species to the sea if satisfied that it is likely to survive, or permit the return of the species (dead or alive) if retaining the species would damage other stocks or species taken.

The rules allowing three species of pelagic sharks, including blue sharks, to be returned to the sea if dead, near dead (unlikely to survive) or alive, must be reviewed periodically against the new provisions in section 72A to determine whether the rules should continue, be amended or be revoked. Reviews and decisions must next be implemented by 30 September 2028. There have been no changes to the ACE balancing requirements for blue shark (near dead/dead discards required to be balanced with ACE but live-releases are not required to be balanced).

4.4 Observer programme

Since the early 1990s, there has been an independent fishery observer programme in place within the NZEEZ. There was good coverage (c.80%) of hooks observed on chartered Japanese longline vessels that took a high percentage of the blue shark catch before the fishery ceased in 2015. There was a low but increasing coverage of domestic longline vessels up to a peak of 16.5% of hooks observed in the 2017 fishing year (Figure 7) but, since then, it dropped to about 10% of hooks observed in the three fishing years 2018–2020 (Francis & Finucci, 2019, Griggs et al. 2024), and then dropped to 5.6% in the 2021 fishing year (Fisheries New Zealand 2023).

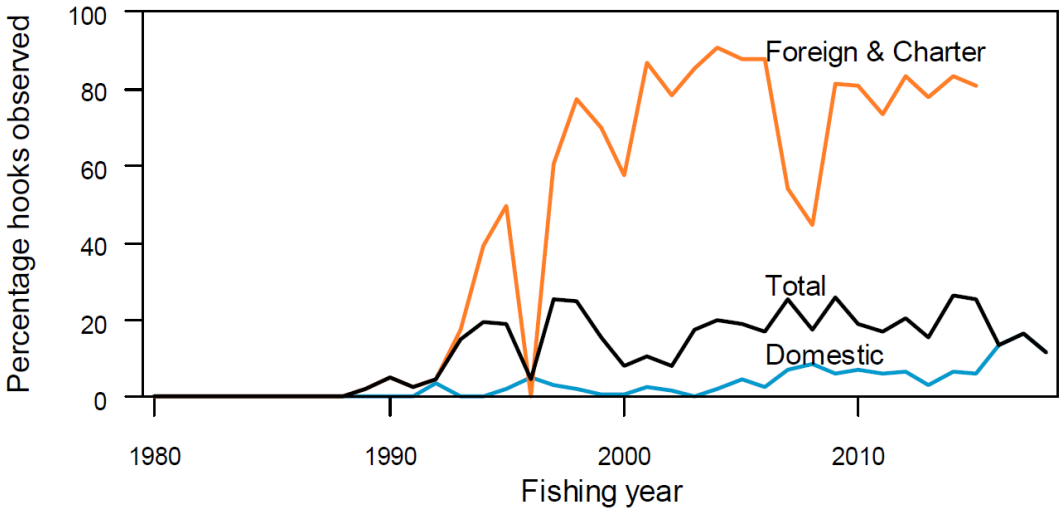

Figure 7: Percentage of hooks observed on foreign/charter and New Zealand domestic vessels (from Francis & Finucci 2019).

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 blue shark in the western and central Pacific Ocean is the responsibility of the WCPFC. In 2008, blue shark was one of the first seven shark species 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. 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. The blue shark in the Southwest Pacific Ocean (WCPFC regions 5 and 6) were the subject of an indicator-based analysis by Clarke et al. (2013). They showed that standardised catch rates declined from 1996–2003 but then increased strongly to peak in 2008 before dropping back to early 2000s levels in 2009 and picking up again in 2010. Blue sharks showed varying trends in median size depending on region and sex. Median lengths in the longline fishery declined for both sexes in Region 5, and males in Region 6, but median lengths of males in Region 6 remained close to constant.

Rice et al. (2015) analysed WCPFC data from the period 1995–2014. They found that in the South Pacific Regions 5 & 6, blue shark made up 60–90% of the total shark bycatch on tuna longlines. Both

the Proportion presence and High-CPUE time series show distinct downwards trends from the late 1990s to 2014 and both the standardised and nominal CPUEs declined in the initial 1995–2003 period and again after 2010, with relatively stable CPUEs between 2004 and 2009. Blue sharks of both sexes showed declining sizes in the Southwest Pacific, with nearly all the observed male blue sharks caught in Region 5 (Coral Sea and Tasman Sea) being immature in recent years.

Neubauer et al. (2021) carried out a three-fleet model stock assessment in the Southwest Pacific, using fleets covering: high-latitude fisheries catching juveniles and adults around New Zealand and South-Eastern Australia; the EU-Spanish mid-latitude fishery operating to the north and east of New Zealand; and, a high latitude and high seas fishery capturing adult sharks. The model was run for a 26-year period from 1995 to 2020. There was a decline from relatively high stock levels in 1995, reflecting increasing effort, followed by a steady increase in biomass as effort plateaued and discard rates increased, especially in lower latitude fisheries. The stock has likely recovered from low levels in the mid to late 2000s to levels close to the estimates of biomass under average recruitment. Fishing mortality has declined over the last decade and is currently relatively low, largely as a result of most sharks being released upon capture in the majority of longline fleets. They concluded that the Southwest Pacific stock on average does not appear to be overfished, and overfishing is not occurring.

Neubauer et al. (2022) published an improved stock assessment and structural uncertainty grid for Southwest Pacific blue shark by employing improved models and assumptions. This led to lower uncertainty compared with the 2021 model but, nevertheless, the overall model conclusions and recommendations from the 2021 blue shark assessment remain valid despite ongoing uncertainties, i.e., on average the blue shark stock in the Southwest Pacific does not appear to be overfished and overfishing is not occurring.

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 southern limit of blue shark distribution.

4.6 Regional context

A Pacific Regional Plan of Action for Sharks (RPOA Sharks) was developed jointly by the Pacific Islands Forum Fisheries Agency (FFA), the Secretariat of the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP) in response to both the International Plan of Action for the Conservation and Management of Sharks and to the Conservation and Management Measures (CMM) for sharks adopted by the Western and Central Pacific Fisheries Commission (WCPFC). This plan (Lack and Meere, 2009) was driven by the increasing recognition of the relatively low biological productivity of sharks and the deteriorating status of shark stocks worldwide. The regional approach recognises that stocks of several shark species, including blue shark, are shared across many countries in the Pacific, and so there is a need to collect species-specific data on catch rates to inform regional stock assessments and future fisheries management.

In the Oceania region, generally covered by WCPFC, blue sharks are known to occur in the EEZ of all nations, and throughout the high seas of the whole region.

The few juvenile and mature female blue sharks that have been satellite-tagged resided mainly in New Zealand waters year-round, though some mature females ranged to the high seas adjacent to the NZEEZ. On the other hand, most mature males were highly mobile for part of their year and migrate to the EEZs of at least 10 other Oceania nations (Elliott et al. 2022). Because stocks, especially those of mature males, are shared, both a local and a regional approach to blue shark fisheries management is required. It is encouraging that, although levels of uncertainty are high, the

most recent analyses of local (Francis & Finucci 2019) and Southwest Pacific stocks (Neubauer et al. 2021, 2022) point to a recovery of stocks of blue sharks, and that neither is being overfished.

5. Conclusion

New Zealand and Southwest Pacific stocks of blue sharks have never been specifically targeted as a fishery, except for a very small recreational sports fishery. For a long time, blue sharks were considered to be a valuable bycatch mainly in the tuna and swordfish longline fishery, but since New Zealand introduced regulations to restrict shark finning in October 2014, over 99% of blue sharks are now being released alive, or discarded dead or near dead.

It is likely that many blue sharks were taken as bycatch at the peak of foreign tuna longline fisheries in the NZEEZ in the 1970s and 1980s, when over 25 million longline hooks were set each year. Since the decline in the longline fishing effort to less than 2 million hooks set in the 2021 fishing year, and the inclusion of blue shark in the QMS, the stocks have been more or less stable or starting to recover. Retention rates have declined because the New Zealand finning regulations require New Zealand flagged vessels and those operating in New Zealand waters to land blue sharks with their fins attached, either naturally or artificially.

Overall, the evidence shows that blue sharks are being sustainably managed under the QMS. In New Zealand waters, the level of tuna longline fishing effort has declined substantially over the past 40 years and therefore it is likely that fewer blue sharks are being taken as bycatch, and those that are observed being caught are generally released alive rather than landed or discarded dead. Fisheries indicators, such as the proportion of zero captures and catch per unit effort, show that the New Zealand population has been more-or-less stable or increasing in recent decades. It should be noted that the landings have never been close to the actual TACC set under the QMS, and although the recreational and customary take have not been quantified, both are likely to be well below quota limits.

The evidence suggests it is reasonable to **allow exports of blue shark products that were legally obtained within the NZEEZ under the Quota Management System** on the basis that the recent level of take appears to be sustainable and unlikely to lead to stock decline.

The high seas take of blue sharks that is landed in New Zealand is understood to be very small, but some New Zealand flagged vessels may land their high seas catch in other jurisdictions. Given that mature blue sharks, especially mature males, migrate freely in and out of the NZEEZ, and because the Southwest Pacific fishery as a whole does not appear to be overfished (Neubauer et al. 2022), it therefore appears that current harvest levels have not been detrimental to the New Zealand portion of the stock nor to the regional stock as a whole. This suggests that **up to 20 tonnes of blue shark can be sustainably introduced to New Zealand if it was taken from the high seas within an arbitrary distance of 500 nautical miles from the New Zealand EEZ**. This quantity is also arbitrarily set at about 1% of the TAC set under the QMS, on the basis that the current level of 2080 tonnes per year from within the NZEEZ has been nowhere near reached, except for one year out of the past 18 years. The amount of 20 tonnes per year is similar to the total landings of blue sharks caught on the high seas in the 21-year period 2002–2022; the maximum landings in a year were about 4.2 tonnes (Fisheries New Zealand 2022).

6. Recommendations to improve the NDF process

These recommendations are made to the fishing industry, fisheries managers, and scientists supporting fisheries management in New Zealand and the Southwest Pacific.

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

2. The recreational take of blue sharks under the QMS is estimated by requiring organisers of fishing competitions to report catches, and through well-designed surveys, including log book, boat ramp and directed beach surveys.

3. The customary take of blue sharks under the QMS is estimated through well-designed surveys in conjunction with local fisheries guardians (tangata kaitiaki or tangata tiaki).

4. Increase observer coverage of domestic longline vessels and New Zealand-flagged high seas vessels, especially those operating in areas where tuna and swordfish longliner fleets are operating. There are often discrepancies between observer records and fisher records, but it is unclear if this is due to misreporting by fishers, or due to observer coverage not being truly representative of the fishery.

5. The type of indicator-based analysis performed by Francis & Finucci (2019) should be repeated at 3–5 yearly intervals, and the models improved with more data and testing.

6. Further efforts should be made to satellite tag blue sharks, especially mature females and juveniles, for which there is data available from only three individuals of each category.

7. New Zealand should collaborate with Oceania neighbours, and especially with WCPFC, to periodically conduct a formal quantitative stock assessment of blue sharks in the Southwest Pacific (WCPFC fishing areas 5 & 6) and, if necessary, establish quota for high seas fisheries in the Southwest Pacific. Now that blue sharks are listed on Appendix II of CITES, all catches on the high seas will require a positive non-detriment finding before they can be landed, so there is scope for regional players to collaborate to determine sustainable levels of harvest in the high seas of the Southwest Pacific.

8. Review, research and implement best practice mitigation methods to minimise captures of blue sharks on shallow tuna longlines.

9. Research, develop and implement specific methods for handling and releasing blue sharks to maximise their long-term survival, and to quantify the fate of those released alive while still in the water (cut free) versus those that have been brought on board and then released. Influences impacting survival (e.g., trailing gear) should also be evaluated to improve survival.

10. Improve methods of attaching conventional tags to blue sharks because maximum elapsed time recorded to date of < 4 years is well below the expected longevity of the species despite over 5000 blue sharks being tagged in New Zealand waters over the past 40 years. Further conventional and satellite tagging, and analysis of movements by age and sex, is encouraged.

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