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Tini a Tangaroa

Pelagic shark fishery characterisation

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EXECUTIVE SUMMARY

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Three species of highly migratory sharks (blue shark [*Prionace glauca*], shortfin mako shark [*Isurus oxyrinchus*] and porbeagle shark [*Lamna nasus*]) are common bycatch in tuna longline fisheries around New Zealand. New Zealand tuna fisheries are managed under the umbrella of two Regional Fisheries Management Organisations: the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and the Western and Central Pacific Fisheries Commission (WCPFC). As a member of CCSBT and WCPFC, New Zealand has numerous obligations, including the provision of data and reports describing the fisheries and research activities. Within New Zealand fisheries waters, New Zealand implements the objectives of the WCPFC's conservation and management measures via catch limits for the main pelagic shark species. New Zealand also carries out national assessments of pelagic shark stock status, and assists with similar regional assessments.

This study characterises the New Zealand fisheries for blue, porbeagle and mako sharks for the fishing years 2005 to 2018, updating a previous characterisation done in 2013. The three species are caught mainly by surface longline (SLL) in oceanic waters beyond the edge of the continental shelf. The mean percentages of estimated catches taken by SLL in the New Zealand Exclusive Economic Zone over the whole time period were 99% for blue shark, 94% for mako shark and 78% for porbeagle shark. The three sharks were mainly caught around North Island and off the west coast of South Island (Fisheries Management Areas (FMAs) 1, 2, 7 and 9) during autumn–winter. Significant amounts of porbeagle shark were also caught by trawl, particularly around Campbell Island in FMA 6 during August–September.

Before 2014, most pelagic sharks were finned. However, there have been major changes to the processing and fate of sharks since 2014, with the majority now being returned to the sea whole, either as dead discards or live releases. These changes are primarily the result of the introduction of a ban on shark finning (i.e. landing of the fins only) in October 2014 (i.e. at the start of the 2015 fishing year). However, changes were already apparent during the 2014 fishing year, probably because some airlines began restricting the export of shark fins from New Zealand by air freight. Despite the near complete cessation of pelagic shark landings from SLL since 2014, significant quantities of blue, porbeagle and mako sharks are still being reported on Monthly Harvest Returns, presumably reflecting dead discards which were permitted from October 2014 onwards under Schedule 6 of the Fisheries Act, and which must be balanced against Annual Catch Entitlements (whereas live releases do not).

1. INTRODUCTION

Three species of highly migratory sharks (blue shark [*Prionace glauca*], shortfin mako shark [*Isurus oxyrinchus*] and porbeagle shark [*Lamna nasus*]) are common bycatch in tuna longline fisheries around New Zealand (Francis et al. 2001; Griggs et al. 2018). These three shark species comprised 46% by number of the fish observed aboard tuna longline vessels during the 2010–11 to 2014–15 fishing years, and they were numerically more important in the catches than the target tunas and swordfish (27%) (Griggs et al. 2018). Until the 2012–13 fishing year, these three sharks were generally processed for their fins and sometimes their meat, but since then, most have been released alive or discarded under Schedule 6 of the Fisheries Act 1996 (Griggs et al. 2018).

New Zealand tuna fisheries are managed under the umbrella of two Regional Fisheries Management Organisations: the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) is responsible for managing southern bluefin tuna (*Thunnus maccoyii*, STN) and has an interest in ecologically related species taken in STN fisheries; and the Western and Central Pacific Fisheries Commission (WCPFC) is responsible for managing stocks of highly migratory species in the western and central Pacific Ocean. As a member of CCSBT and WCPFC, New Zealand has numerous obligations, including the provision of specific data and the submission of annual reports describing the fisheries and research activities. Within New Zealand fisheries waters, New Zealand implements the objectives of the WCPFC's conservation and management measures via catch limits for the main pelagic shark species.

Assessments for stocks of the three pelagic sharks are done on a regional basis, with New Zealand being responsible for monitoring its fisheries and providing these data to the respective commissions. In addition to the requirement for assessments, quantitative data on elasmobranch catches are also useful for monitoring the New Zealand component of these stocks, particularly as New Zealand fishes the extremes of the range for most of the HMS concerned. The National Plan Of Action-Sharks (Ministry for Primary Industries 2013) additionally requires that we fill some of the data gaps in information on New Zealand shark fisheries.

The objectives of this study were:

1. To characterise the bycatch fisheries for the major [pelagic] shark species in NZ waters
2. To update indicator analyses for blue, mako, and porbeagle sharks

This report addresses Objective 1, and it updates to 2017–18 a previous characterisation of pelagic shark fisheries for the fishing years 2007–08 to 2009–10 produced by Francis (2013). Objective 2 is addressed elsewhere (Francis & Finucci 2019).

2. METHODS

The analyses included in this report are based on fishing years, which run from 1 October to 30 September. Hereafter, fishing years are labelled after the second of the two years covered (e.g. the 2017–18 fishing year is referred to as 2018).

A fishery characterisation was carried out for 2005 to 2018. Data extracts were obtained from the Fisheries New Zealand catch-effort database *warehou* on 25 March 2019. Some of the files were incomplete, and revised files were obtained on 14 May 2019. Records containing the species codes BWS (blue shark), POS (porbeagle shark) and MAK (mako shark) were extracted from all estimated catch and landings form types. Fields extracted included date, fishing method, catch location (latitude, longitude, Fisheries Management Area (FMA)), destination, processed state and weight. For each shark species, a single Quota Management Area (QMA) encompasses the entire New Zealand Exclusive Economic Zone (BWS 1, POS 1, MAK 1), so Fishstock provides no useful information on catch location for these species.

Estimated catches reported here include discards under Schedule 6 of the Fisheries Act, so the analyses relate to total catch rather than retained or landed catch. To avoid double-counting of landings, records with temporary destination codes (B, P, Q, R, and T) were removed, as were records with secondary landed states. Records with similar destination and state codes were aggregated as follows:

- destination codes indicating that a dead shark was used in some way (codes U, W, O, E) were recoded as L (landed)
- destination codes indicating that a dead shark was lost or discarded (codes A, D, J) were recoded as Z (dead discard)
- state codes HGF, HGT, and HGU were recoded to DRE (dressed)

Basic grooming was carried out to remove obvious reporting errors. Sixty-two surface longline (SLL) sets (0.09% of the total) were removed from the estimated catches because of highly implausible daily catch weights (18 BWS catches of 11–48 t, three POS catches of 9–24 t, one MAK catch of 7 t, and 40 sets with inconsistent catch weights and numbers (whole weight greater than 2 t and number of sharks less than 10)). One landed catch of 51 t of mako shark into Timaru was deleted.

Fisheries New Zealand fishing return forms typically include estimated catches for only the top five or eight species caught (depending on the form type). Furthermore, estimated catches are meant to be whole (green) weight but some fishers incorrectly report processed weight. Characterisation studies frequently scale the estimated catches up to those of the reported landings in order to overcome these problems with reporting estimated catches. However, in this study no scaling was carried out because (a) the three shark species were usually in the top five species caught by weight on tuna longlines (which take most of the catch of these species), and (b) estimated catches were always greater than the landings because significant numbers of sharks are released under Schedule 6 of the Fisheries Act.

Fishery data were stratified into North and South regions reflecting the geographic distribution of fishing effort (Francis 2013; Griggs & Baird 2013; Francis et al. 2014; Griggs et al. 2018). The North region was defined as all sets made in FMAs 1, 2, 8 and 9, and the South region as all sets in FMAs 5 and 7. Data from all remaining FMAs were grouped into an ‘Other’ region.

3. RESULTS

3.1 Blue shark

Between 2005 and 2018, blue shark estimated catches ranged between about 700 and 1650 t per year (mean 1053 t) (Table 1). Monthly Harvest Return (MHR) landings of blue shark were about 650–1000 t per year between 2005 and 2013, but then declined rapidly to under 170 t per year from 2014 to 2018. The Total Allowable Commercial Catch (TACC) has been 1860 t since blue sharks were introduced into the Quota Management System (QMS) in October 2004, so estimated catches have never exceeded the TACC.

Nearly all the blue shark catch (99% between 2005 and 2018) was taken by SLL (Table 2, Figures 1 and 2). Much of the catch came from FMAs 1 and 2, with smaller amounts coming from FMAs 5, 7 and 9 (Figure 2). North region catches were considerably larger than South region catches. Catches were strongly seasonal, with most being taken in May–August in FMAs 1 and 2 and May–June in FMAs 5 and 7 (Figure 3).

Before 2014, most of the blue shark catch was landed ashore in the finned state (Figure 4). From 2014 onwards, there was a dramatic transition to whole sharks being discarded or released alive (Table 2). A very small proportion of blue sharks were processed for their flesh (landed in the dressed state) up to 2014.

The locations of fishing events that caught blue sharks during the four years 2015–2018 are shown in Figure 5. The predominance of SLL fishing is obvious, with most catches occurring in the open ocean

beyond the continental shelf. Small amounts of blue shark were caught by bottom longline 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.

3.2 Mako shark

Between 2005 and 2018, mako shark estimated catches ranged between about 80 and 180 t per year (mean 130 t) (Table 1). MHR landings of mako shark were about 40–110 t per year with the amount declining in recent years. The TACC was 406 t when mako sharks were introduced into the QMS in October 2004, dropping to 200 t in October 2012, so estimated catches have never exceeded the TACC.

Most of the mako shark catch (89–96% annually, mean 94%, between 2005 and 2018) was taken by SLL (Table 2, Figures 1 and 6). Much of the catch came from FMAs 1 and 2, with smaller amounts coming from FMAs 7 and 9 (Figure 6). North region catches were much larger than South region catches. Catches were seasonal, with most being taken in March–August in FMAs 1 and 2 and March–July in FMAs 7 and 9 (Figure 7).

Before 2015, most of the mako shark catch was landed ashore in the finned or dressed states (Figure 8). From 2015 onwards, there was a major transition to whole sharks being discarded or released alive (Table 2). A very small proportion of mako sharks were processed for their flesh (i.e. landed ashore in the dressed state) after 2014.

The locations of fishing events that caught mako sharks during the four years 2015–2018 are shown in Figure 9. SLL fishing dominated, particularly around North Island but with many records also from the west coast of South Island. Most catches occurred in the open ocean beyond the continental shelf. Small amounts of mako shark were caught by bottom longline and trawl around the mainland, particularly around North Island.

3.3 Porbeagle shark

Between 2005 and 2018, porbeagle shark estimated catches ranged between about 35 and 95 t per year (mean 64 t) (Table 1). MHR landings of porbeagle shark were about 30–85 t per year with no clear decline in recent years. The TACC was 215 t when porbeagle sharks were introduced to the QMS in October 2004, dropping to 110 t in October 2012, so estimated catches have never exceeded the TACC.

Most of the porbeagle shark catch (58–93% annually, mean 78%, between 2005 and 2018) was taken by SLL, although the proportion varied considerably among years (Table 2, Figures 1 and 10). Much of the catch came from FMAs 1, 2 and 7, with smaller amounts from FMAs 5 and 6 (Figure 10). North region catches were slightly larger than South region catches, and a significant amount of catch came from the Other region, particularly in 2014, 2015 and 2018. Catches were strongly seasonal, with most being taken in May–September in FMAs 1, 2, 6 and 7 (Figure 11).

Before 2014, most of the porbeagle shark catch was landed ashore in the finned state, with the dressed state also being important during 2010–2015 (Figure 12). From 2014 onwards, there was a major transition to whole sharks being discarded or released alive (Table 2).

The locations of fishing events that caught porbeagle sharks during the four years 2015–2018 are shown in Figure 13. SLL fishing dominated, particularly around northeastern North Island and the west coast of South Island. Most catches occurred in the open ocean beyond the continental shelf. Considerable amounts of porbeagle shark were also caught by trawl (mostly midwater) near Campbell Island and along the west coast of both North and South Islands. Small quantities were also caught by bottom longline along the east coast of North Island.

4. DISCUSSION

This study focussed on blue, porbeagle and mako sharks, the main highly migratory elasmobranchs caught by New Zealand commercial fisheries. A fishery characterisation was carried out for the fishing years 2005 to 2018, updating a previous characterisation done by Francis (2013). The three species continue to be caught mainly by SLL in oceanic waters beyond the edge of the continental shelf; mean percentages of estimated catches taken by SLL over the whole time period were 99% for blue shark, 94% for mako shark and 78% for porbeagle shark. Significant amounts of porbeagle shark were caught by trawl, particularly around Campbell Island in FMA 6 during August–September.

Before 2014, most pelagic sharks were finned. However, there have been major changes to the processing and fate of sharks since 2014, with the majority now being returned to the sea whole, either as dead discards or live releases. These changes are primarily the result of the introduction of a ban on shark finning (i.e. landing of the fins only) in October 2014 (i.e. at the start of the 2015 fishing year). However, changes were already apparent during the 2014 fishing year, probably because some airlines began restricting the export of shark fins from New Zealand by air freight. Furthermore, porbeagle shark was added to CITES Appendix II in September 2014, meaning that porbeagle products could only be exported from New Zealand following the issuing of a Non-Detriment Finding (NDF) by the Department of Conservation, and to date no such NDFs have been issued (H. Robertson, DOC, pers. comm.).

Despite the near complete cessation of pelagic shark landings from SLL since 2014, as indicated by TLCER data, significant quantities of blue, porbeagle and mako sharks are still being reported on MHRs, albeit at lower levels than previously (Figure 1). These MHR reports presumably reflect dead discards which were permitted from October 2014 onwards under Schedule 6 of the Fisheries Act, because dead sharks have to be balanced against Annual Catch Entitlements (whereas live releases do not).

5. ACKNOWLEDGMENTS

Thanks to Lynda Griggs and Fisheries New Zealand for providing data extracts. The draft report was reviewed by Lynda Griggs. This work was completed under Objective 1 of Ministry for Primary Industries project SHA2017-01.

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7. TABLES

Table 1: Estimated catches and Monthly Harvest Return (MHR) landings (t) of blue, porbeagle and mako sharks, all methods combined.

Fishing year	Blue shark		Mako shark		Porbeagle shark	
	Est. catch	MHR	Est. catch	MHR	Est. catch	MHR
2005	701	752	101	110	36	60
2006	800	656	114	82	47	55
2007	1062	790	118	75	44	54
2008	836	687	91	74	42	41
2009	1011	804	111	78	66	61
2010	1032	696	127	67	76	65
2011	1142	770	157	91	82	73
2012	1656	1006	181	102	86	53
2013	1344	700	153	81	72	83
2014	1105	117	143	44	93	70
2015	1039	142	176	50	69	84
2016	995	163	169	71	60	43
2017	890	116	82	38	57	27
2018	1135	143	93	37	65	57

Table 2: Estimated catches (t) of blue, porbeagle and mako sharks on tuna longlines as reported on Tuna Longline Catch Effort Returns (TLCER). The quantities discarded/released and retained are also shown.

Species	Fishing year	TLCER total	TLCER discarded	TLCER retained
Blue shark	2005	694	168	526
	2006	795	239	556
	2007	1055	299	756
	2008	826	151	675
	2009	998	235	764
	2010	1021	343	678
	2011	1124	404	720
	2012	1635	590	1045
	2013	1337	689	648
	2014	1096	1018	78
	2015	1032	1020	12
	2016	990	988	2
	2017	887	875	12
	2018	1118	1113	5
Mako shark	2005	94	31	63
	2006	108	47	61
	2007	112	48	64
	2008	84	30	53
	2009	104	43	60
	2010	117	68	48
	2011	150	78	72
	2012	170	83	88
	2013	145	94	51
	2014	136	114	22
	2015	166	158	8
	2016	163	153	9
	2017	73	66	7
	2018	83	80	3
Porbeagle shark	2005	25	6	19
	2006	34	11	23
	2007	37	5	31
	2008	31	10	21
	2009	51	10	42
	2010	64	21	42
	2011	69	33	36
	2012	80	34	47
	2013	65	31	34
	2014	77	54	23
	2015	57	56	1
	2016	58	58	0
	2017	55	54	1
	2018	40	40	0

8. FIGURES

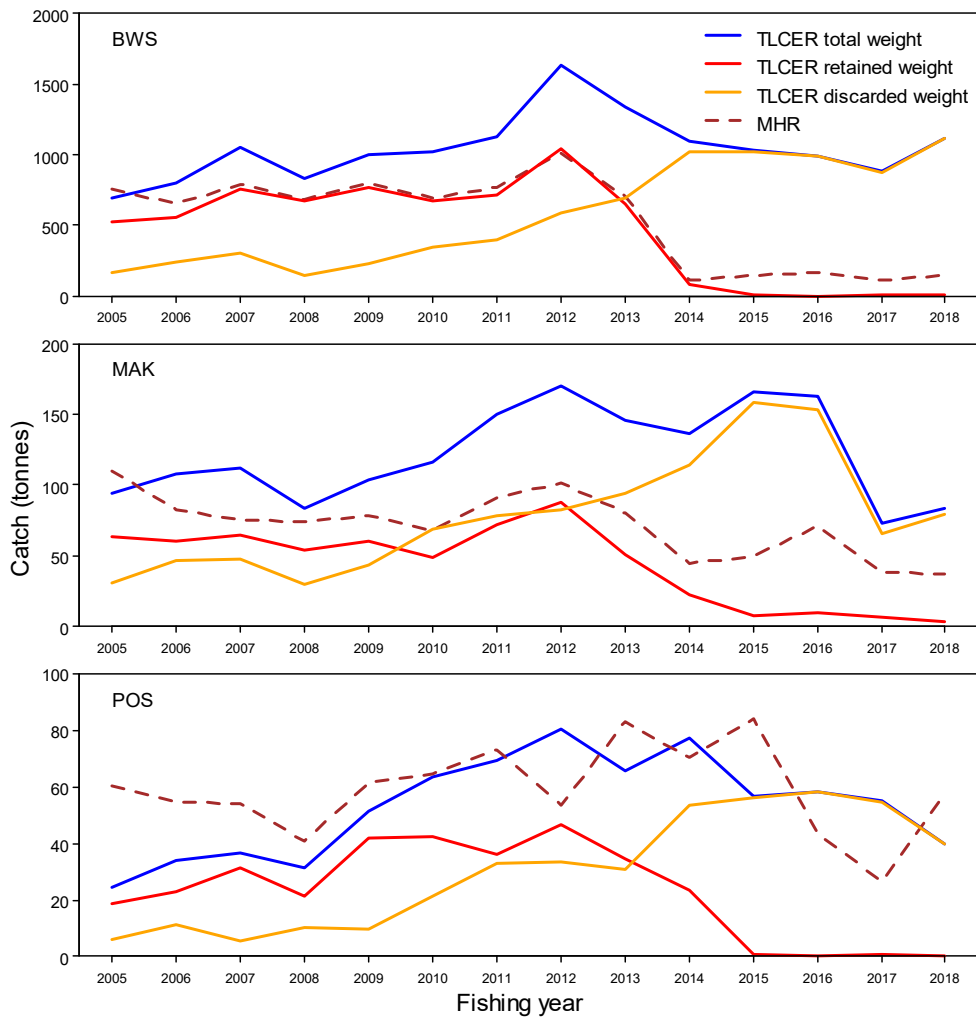


Figure 1: Total estimated catches of blue shark (BWS), mako shark (MAK) and porbeagle shark (POS) by tuna longlines for the fishing years 2004–05 to 2017–18 (TLCER data); a breakdown of TLCER catches by retained and discarded/released categories is also provided. Monthly Harvest Return landings (MHR) by all methods are also shown.

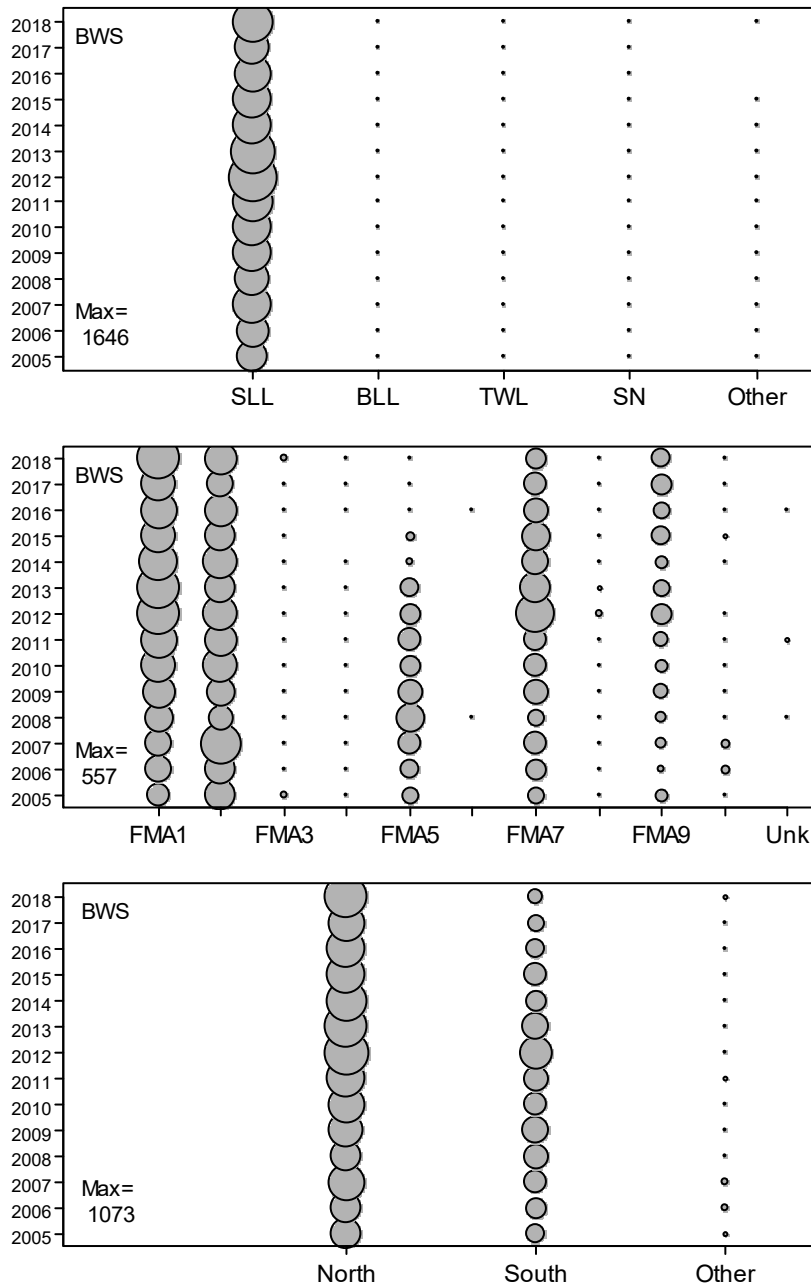


Figure 2: Proportional distribution of blue shark estimated catches by fishing method, FMA, and region for the fishing years 2004–05 to 2017–18. Fishing method codes: SLL, surface longline; BLL, bottom longline; TWL, trawl; SN, set net; Other, other methods. Unk, FMA unknown or outside the New Zealand EEZ. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

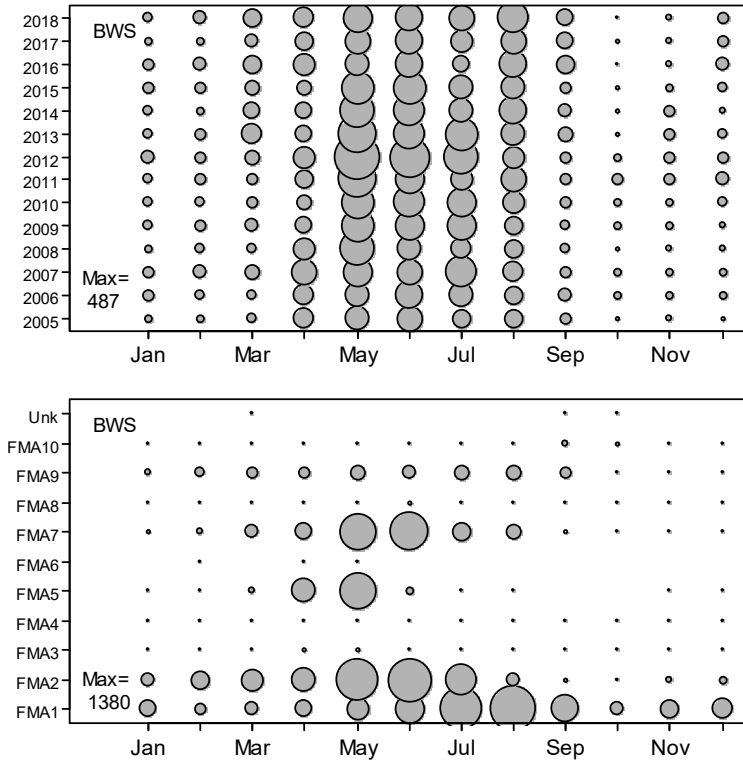


Figure 3: Proportional distribution of blue shark estimated catches by month, and FMA and month, for the fishing years 2004–05 to 2017–18. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

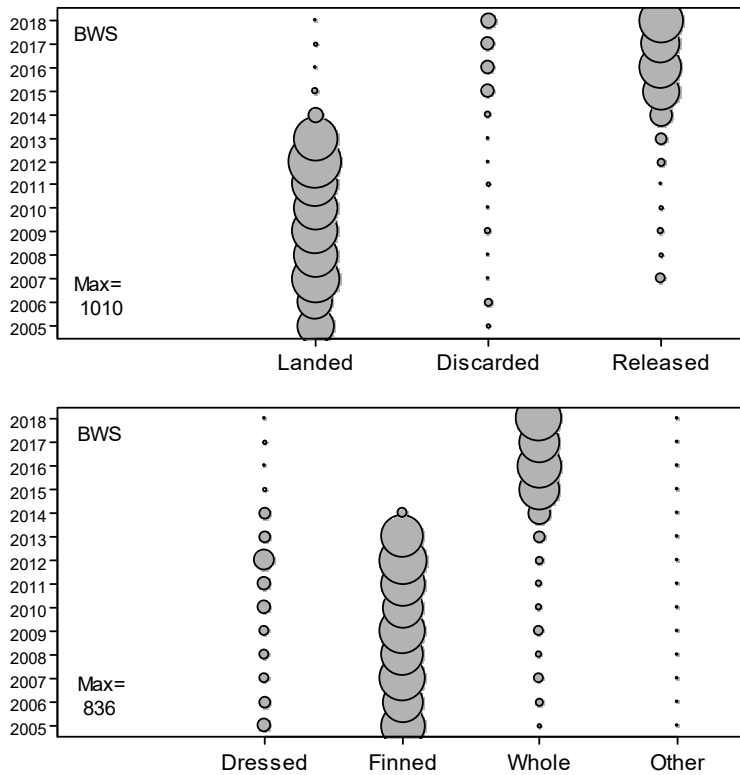


Figure 4: Proportional distribution of blue shark landings by destination and processed state for the fishing years 2004–05 to 2017–18. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

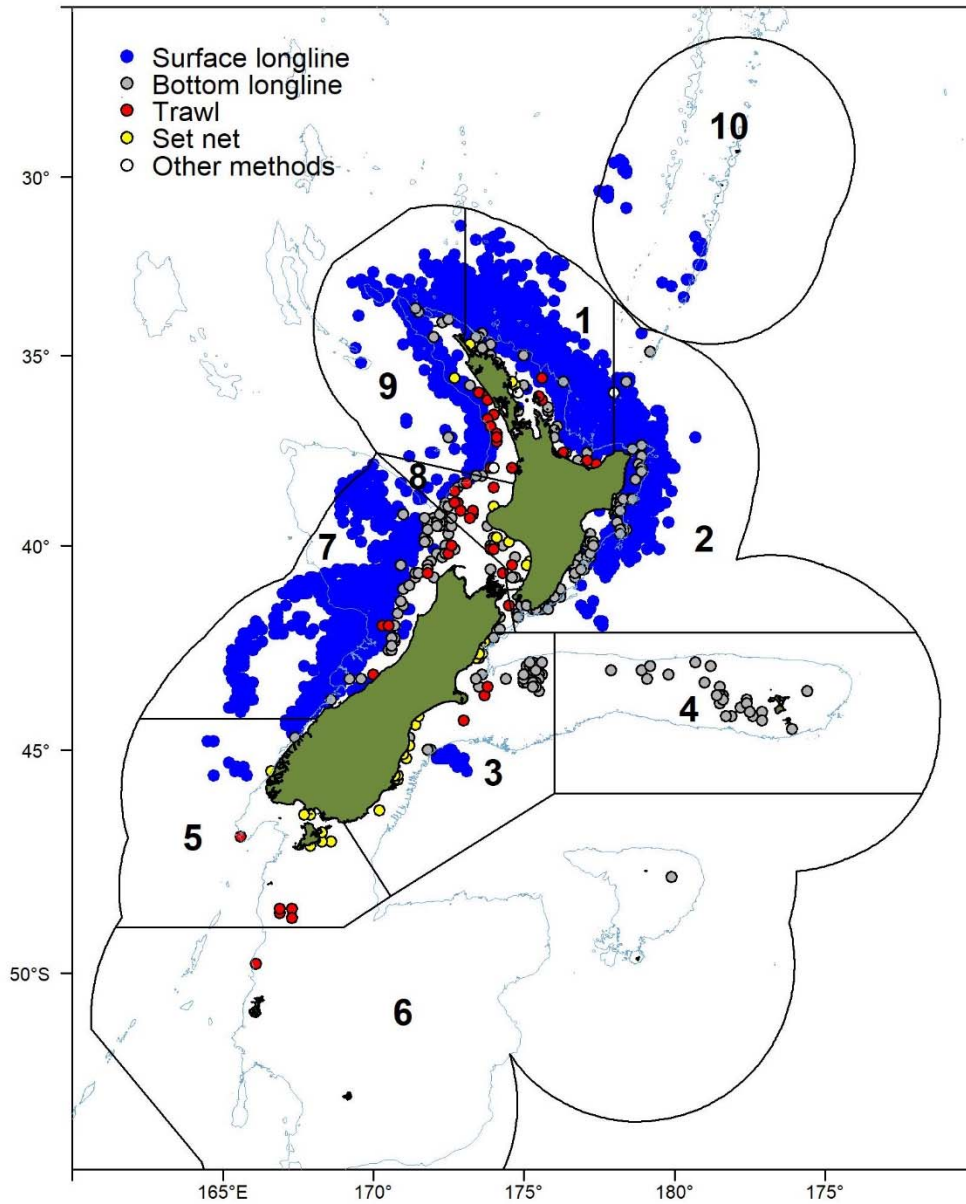


Figure 5: Start-of-set or start-of-tow positions for fishing events from 2014–15 to 2017–18 that reported estimated catches of blue shark. Black lines indicate boundaries of the EEZ and FMAs (numbered) and the grey line is the 1000 m depth contour.

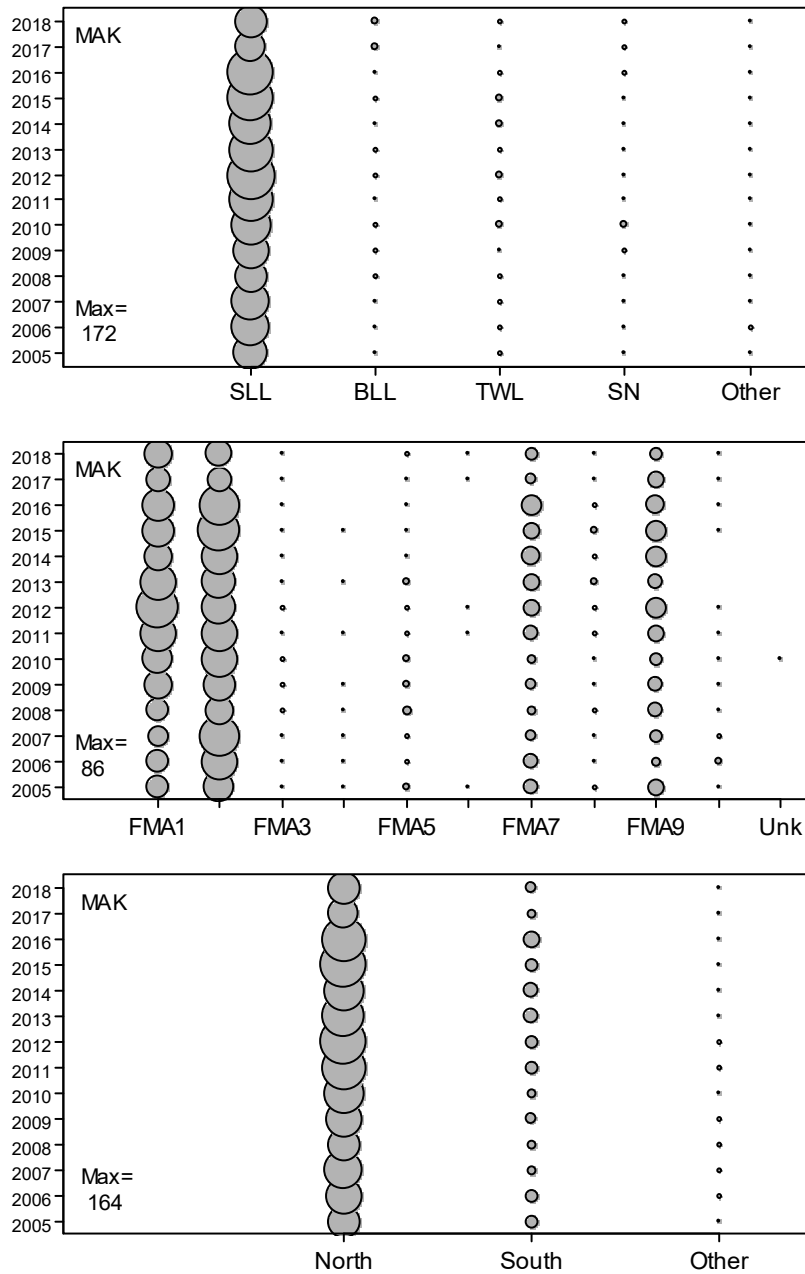


Figure 6: Proportional distribution of mako shark estimated catches by fishing method, FMA, and region for the fishing years 2004–05 to 2017–18. Fishing method codes: SLL, surface longline; BLL, bottom longline; TWL, trawl; SN, set net; Other, other methods. Unk, FMA unknown or outside the New Zealand EEZ. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

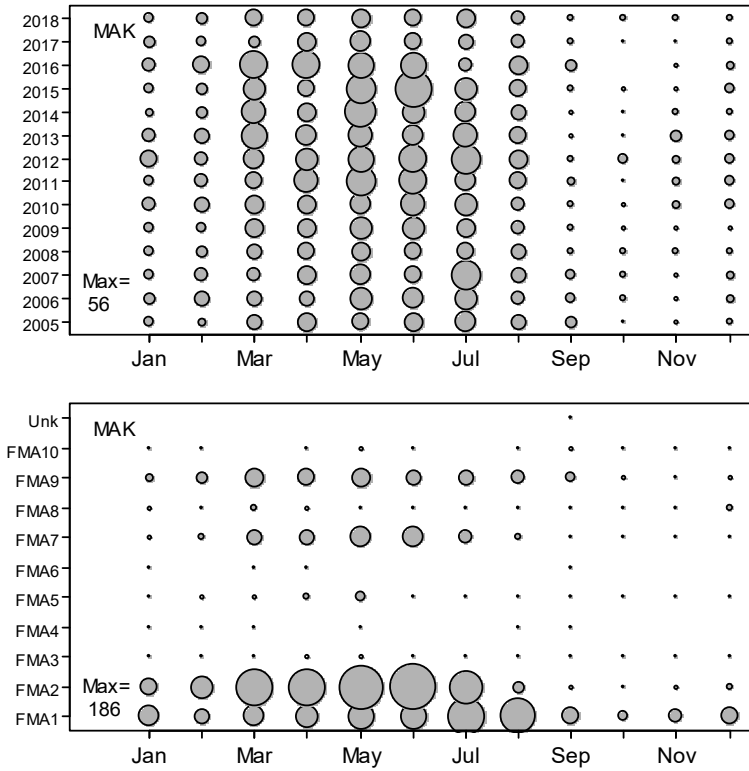


Figure 7: Proportional distribution of mako shark estimated catches by month, and FMA and month, for the fishing years 2004–05 to 2017–18. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

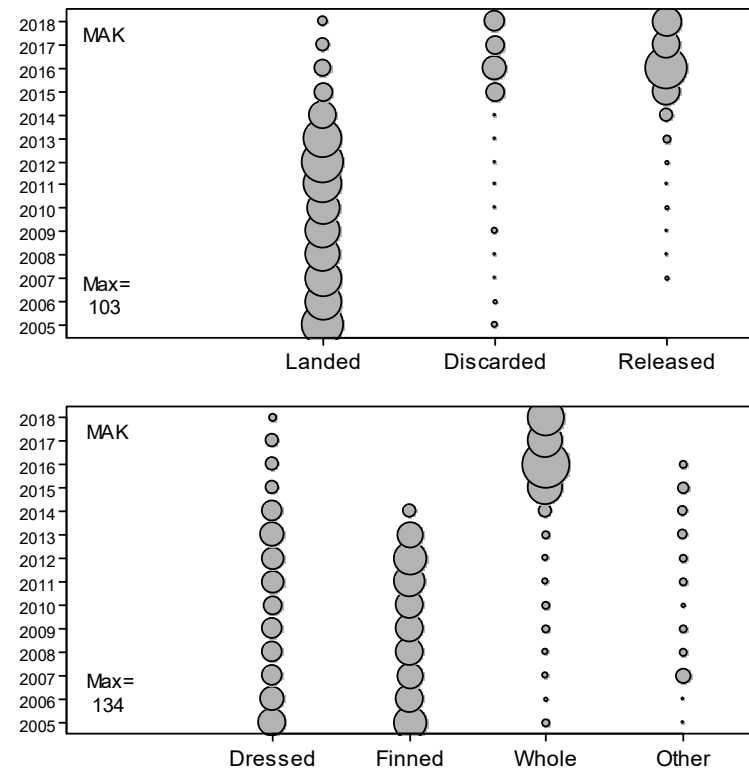


Figure 8: Proportional distribution of mako shark landings by destination and processed state for the fishing years 2004–05 to 2017–18. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

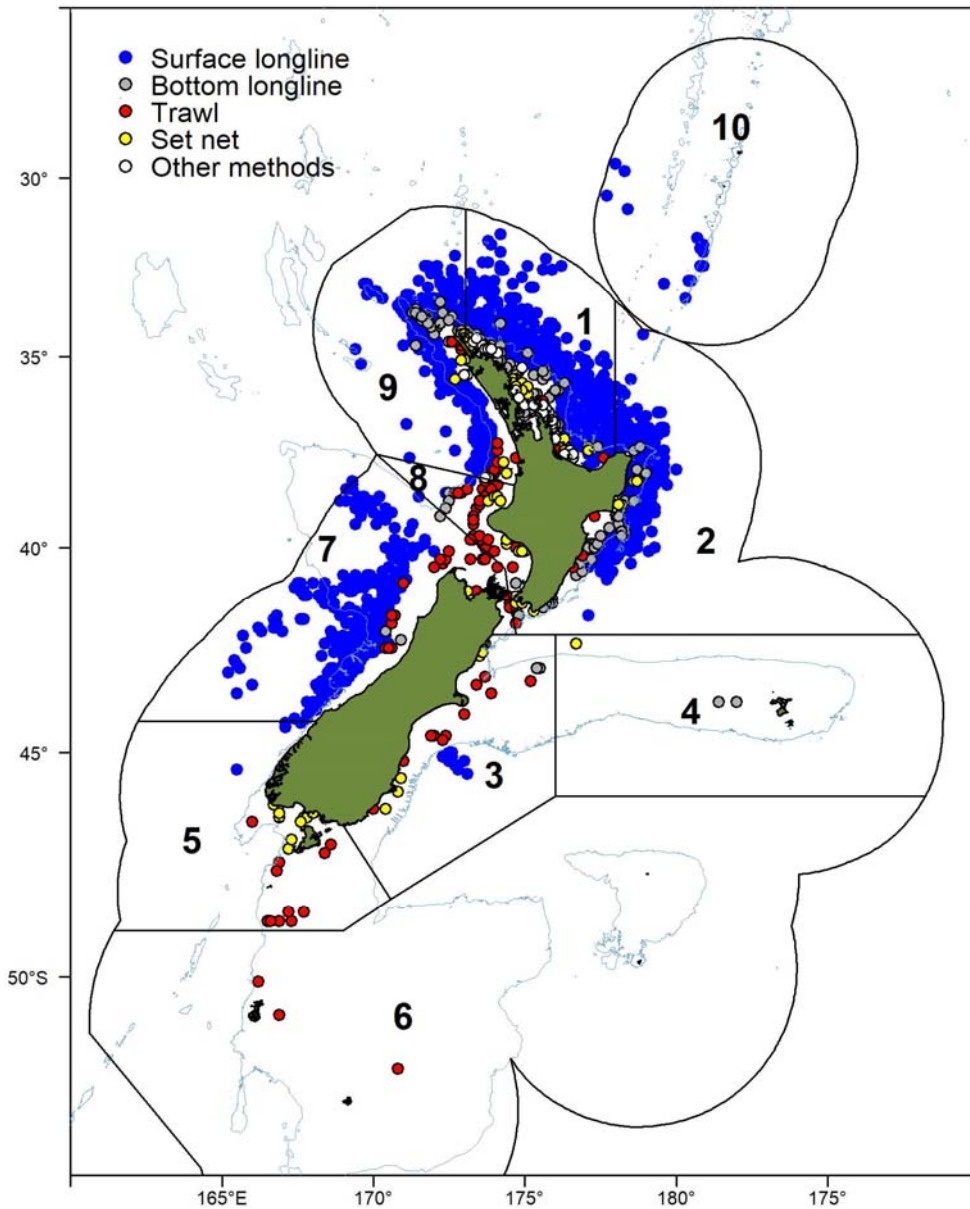


Figure 9: Start-of-set or start-of-tow positions for fishing events from 2014–15 to 2017–18 that reported estimated catches of mako shark. Black lines indicate boundaries of the EEZ and FMAs (numbered) and the grey line is the 1000 m depth contour.

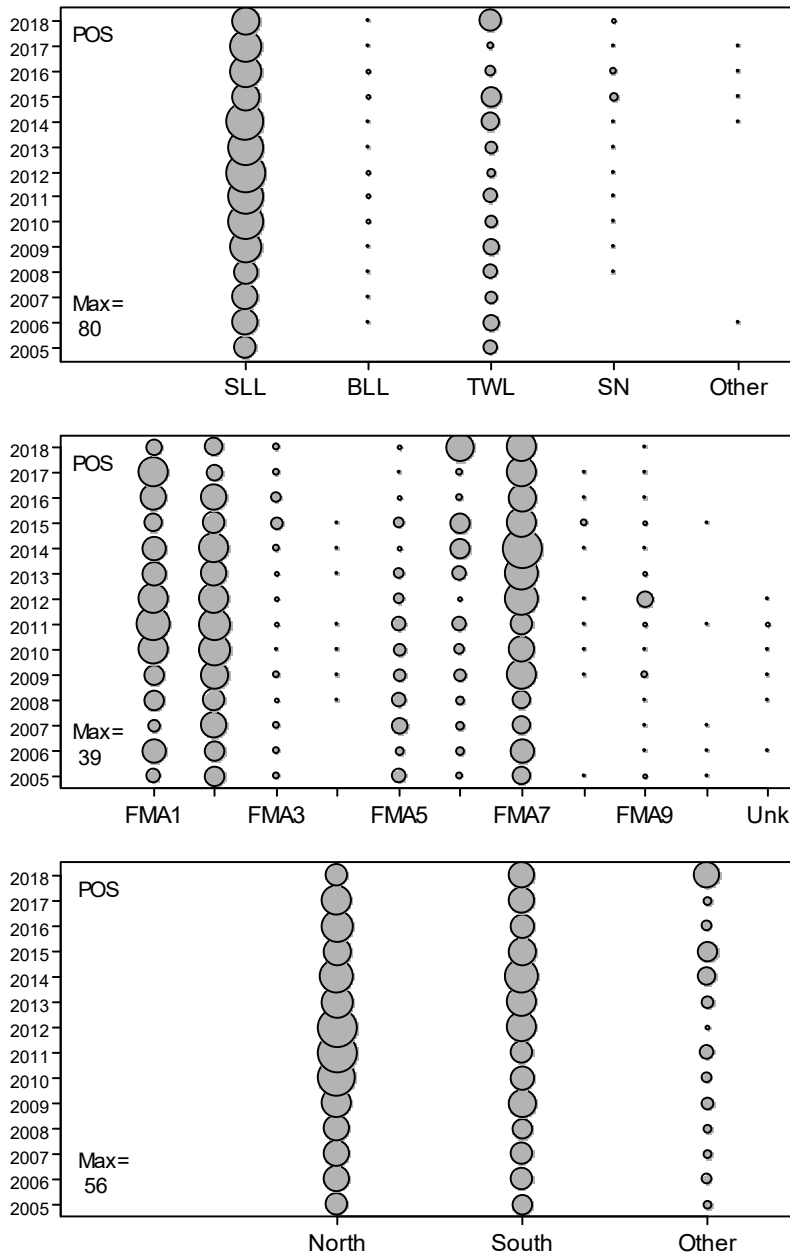


Figure 10: Proportional distribution of porbeagle shark estimated catches by fishing method, FMA, and region for the fishing years 2004–05 to 2017–18. Fishing method codes: SLL, surface longline; BLL, bottom longline; TWL, trawl; SN, set net; Other, other methods. Unk, FMA unknown or outside the New Zealand EEZ. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

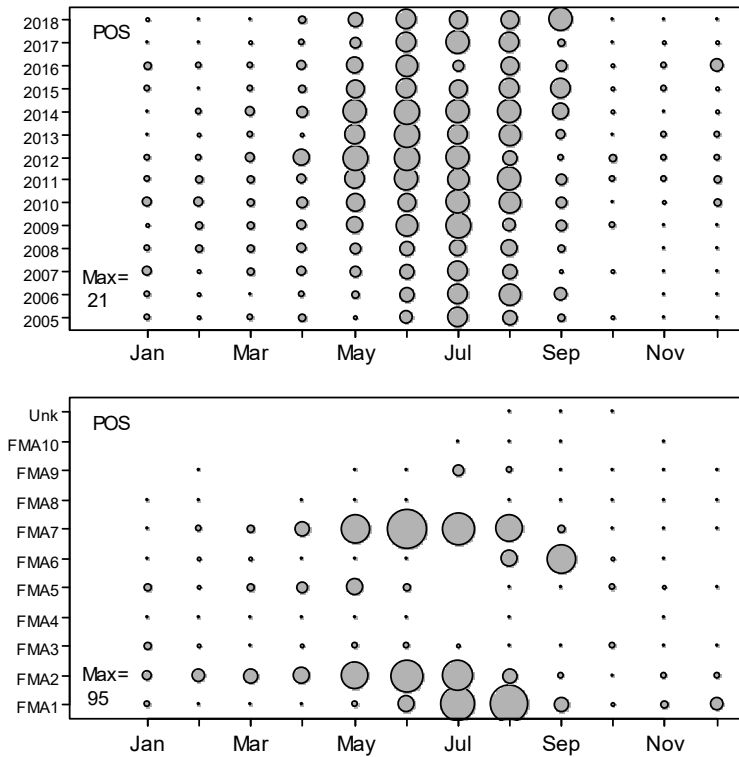


Figure 11: Proportional distribution of porbeagle shark estimated catches by month, and FMA and month, for the fishing years 2004–05 to 2017–18. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.



Figure 12: Proportional distribution of porbeagle shark landings by destination and processed state for the fishing years 2004–05 to 2017–18. The catch (in tonnes) represented by the largest bubble size is indicated in each panel.

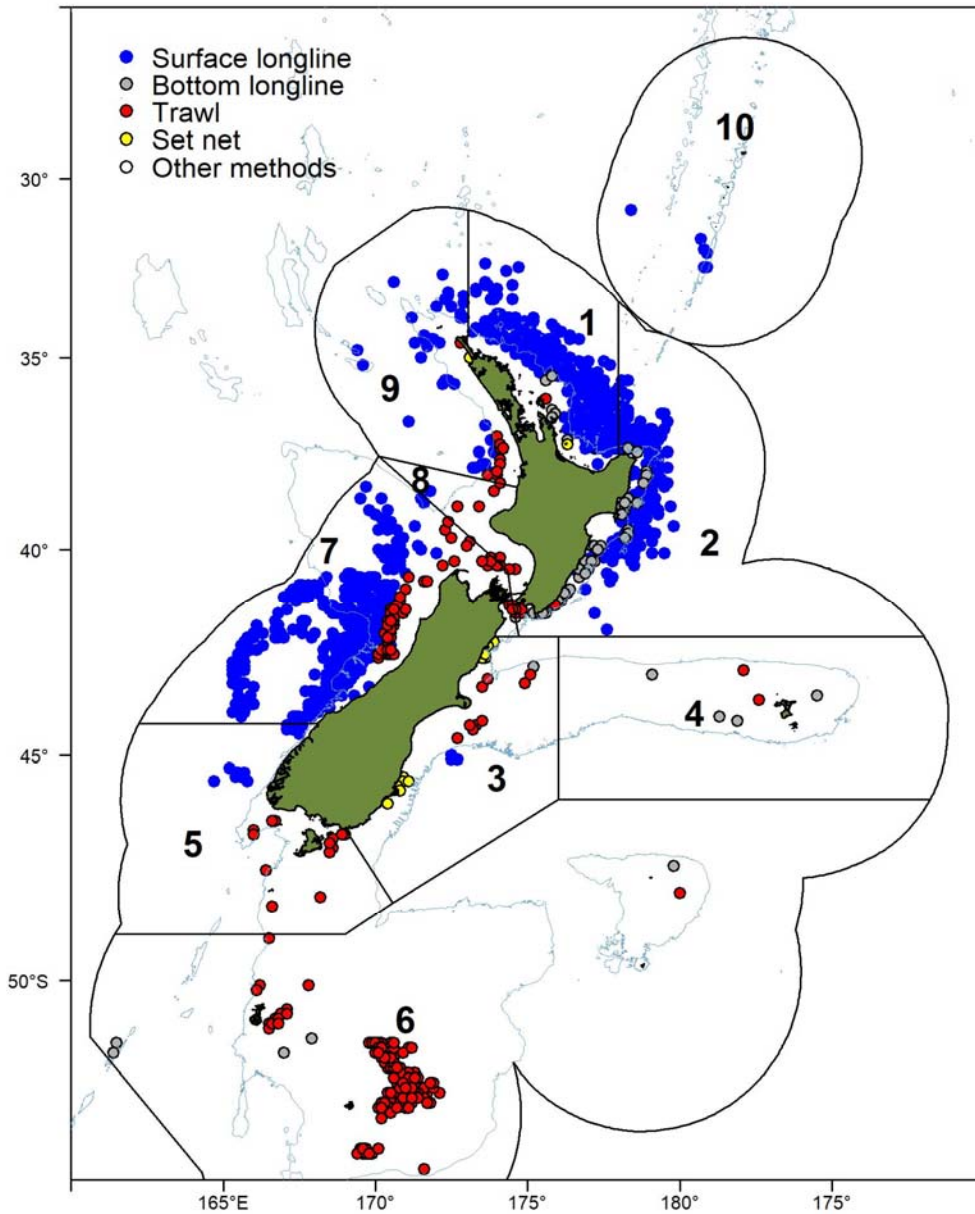


Figure 13: Start-of-set or start-of-tow positions for fishing events from 2014–15 to 2017–18 that reported estimated catches of porbeagle shark. Black lines indicate boundaries of the EEZ and FMAs (numbered) and the grey line is the 1000 m depth contour.