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New Zealand Annual Report

New Zealand

PO Box 3797, Wellington 6140, New Zealand
P: +64 4 499 9889 – F: +64 4 473 9579 – E: secretariat@sprfmo.int
www.sprfmo.int

Fisheries New Zealand
Tini a Tangaroa

New Zealand Annual Report on Fishing, Research Activities, and Observer Implementation in the SPRFMO Convention Area during 2020

SPRFMO SC9-Doc15

September 2021

New Zealand Government

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1 Description of Fisheries

1.1 PELAGIC FISHERIES

Jack mackerel
New Zealand conducted no fishing for *Trachurus* species in the SPRFMO Convention Area in 2020.

Chilean Jack mackerel (*Trachurus murphyi)* was first observed in New Zealand waters in 1987, although its distribution in New Zealand waters has changed significantly over time. *T. murphyi* in New Zealand is thought to be a small, periodically separated component of the larger South Pacific stock which undergoes occasional expansions or migrations. It is unknown whether there has been any spawning of *T. murphyi* in New Zealand waters.

Catches of *T. murphyi* within the New Zealand EEZ were highest in the 1990s, estimated at around 20,000 tonnes, but have since decreased significantly. Based on observer sampling of species proportions in fisheries around New Zealand, annual catch of *T. murphyi* in New Zealand waters is estimated be around 5,000 tonnes on average in each of the last three New Zealand fishing years for which data is available (15/16, 16/17, and 17/18) (Oct-Sept) (Horn et al. 2019b; Langley et al 2016).

Squid
New Zealand conducted no pelagic fishing for *Dosidicus* species in the SPRFMO Convention Area during 2020.

1.2 BOTTOM FISHERIES

The New Zealand high seas bottom trawl and line fisheries are described in detail in the bottom fishery impact assessment '*Cumulative Bottom Fishery Impact Assessment for Australian and New Zealand bottom fisheries in the SPRFMO Convention Area, 2020'* which can be found at http://www.sprfmo.int/science/benthic-impact-assessments/. Bottom fishing activities conducted during 2020 operated as described in that document. New Zealand vessels have been bottom fishing in the now-SPRFMO Convention Area since before 1990.

Specific high seas fishing permits for New Zealand vessels in the now-SPRFMO Convention Area were first authorised in 2007-08. The number of New Zealand vessels permitted to fish in the SPRFMO Convention Area since 2016 and the number of vessels which bottom fished in the Convention Area in the most recent 5 years are shown in Table 1.

Table 1: Summary of the number of New Zealand vessels permitted to bottom fish in the SPRFMO Area, and the number of vessels which actually fished in the Area by year with either bottom trawl or line for the last 5 years. The data are arranged by permit year, which is a split year from May to April.

Vessel Permit Year	Number of Vessels Permitted to Fish SPRFMO Area	No. of Vessels that Actively Bottom Fished in the SPRFMO Area	Bottom Trawling	Bottom Lining
2016–17	21	11	6	5
2017–18	16	8	5	3
2018–19	18	9	6	3
2019-20	15	10	4	6
2020-21	15	8	3	5

Figure 1 shows the total number of New Zealand vessels permitted to trawl in high seas areas (pre-2007) or specifically in the SPRFMO Area (post-2007) and those that were recorded as fishing in a given year.

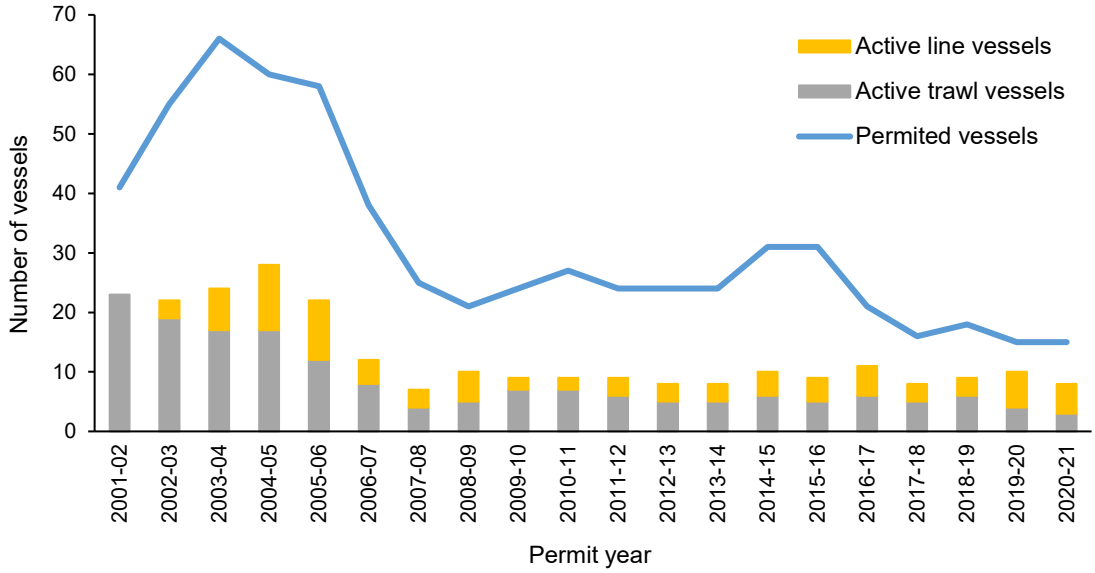

Figure 1: Summary of the number of New Zealand vessels permitted to bottom fish in the SPRFMO Area, and the number of vessels which were active in the Area by year by method. The data are arranged by permit year, which runs from May to April

The number of trawl vessels operating in the Area declined from a peak of 23 vessels in 2002 and has been stable since 2008 at between 3 and 7 vessels. The number of vessels bottom line fishing peaked at 11 vessels in 2005 and has been stable between 2 and 6 vessels since.

The distribution of vessel size of the permitted vessels for the most recent 5 years is shown in Table 2, with no clear trend in vessel size over time.

Table 2: Distribution of vessel size (length overall in metres) for New Zealand vessels permitted to bottom fish in the SPRFMO Area for the last 5 permit years (May - April).

					Length overall (m)					
Permit year	**≤ 11.9**	**12–17.9**	**18–23.9**	**24–29.9**	**30–35.9**	**36–44.9**	**45–59.9**	**60–74.9**	**≥ 75**	**Total**
2016-17	0	1	3	2	4	6	3	2	0	21
2017-18	0	1	3	0	3	5	3	1	0	16
2018-19	0	1	2	0	4	5	3	3	0	18
2019-20	0	1	4	0	2	4	3	1	0	15
2020-21	0	2	4	0	1	4	3	1	0	15

The main areas of bottom fishing utilised by New Zealand vessels outside of the New Zealand EEZ since 2006 are shown in Figure 2, overlaid with the Bottom Trawl, Midwater Trawl, and Bottom Line Areas from CMM 03-2020. These areas are broadly consistent with the FMAs used in the Bottom Fishing Impact Assessment.

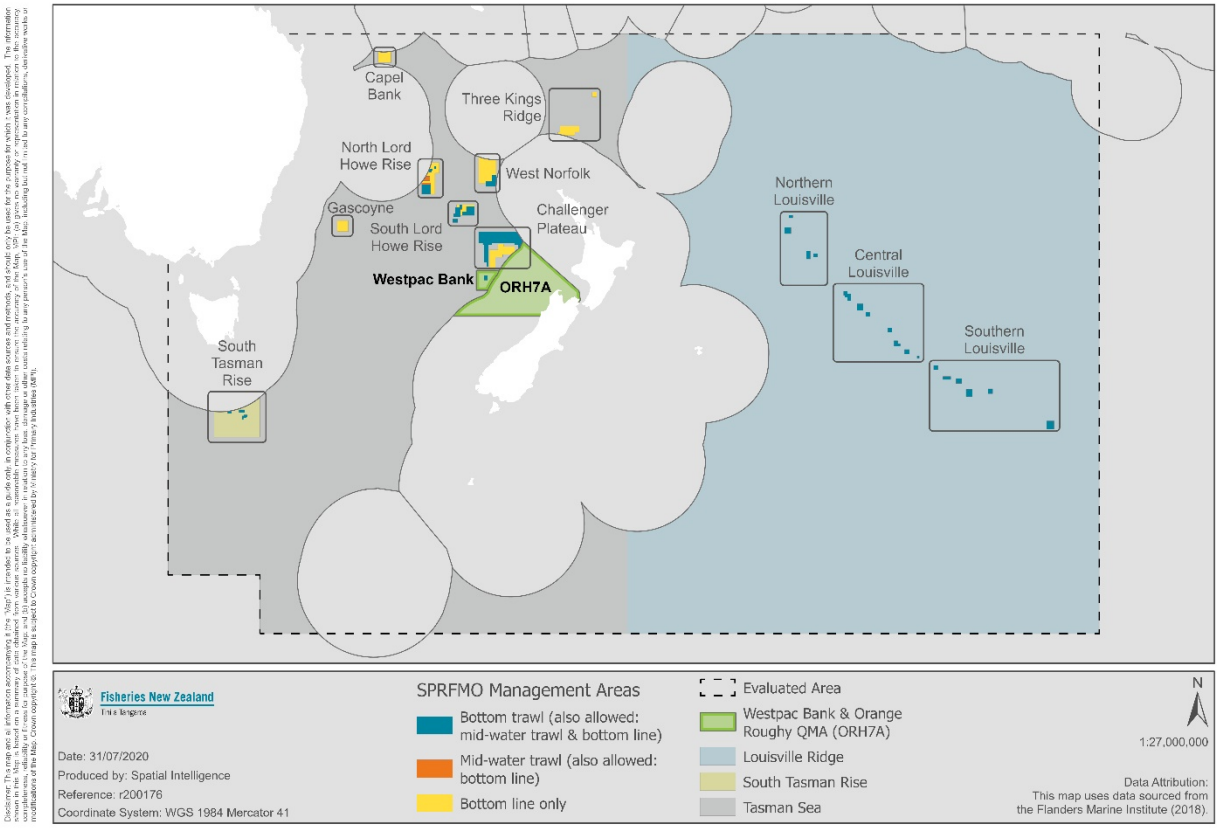

Figure 2: The general areas bottom fished by New Zealand trawlers in the SPRFMO Convention Area since 2006 (grey boxes) overlaid with Management Areas from CMM 03-2019

2 Catch, Effort and CPUE Summaries

2.1 TOTAL CATCH

New Zealand's total catch of orange roughy and other species for the most recent 5 years is tabulated in Table 3, including catch limits as appropriate.

Table 3: Total New Zealand catch and relevant catch limits (tonnes) for the previous 5 calendar years.

	2016	2017	2018	2019	2020	
Orange roughy catch	954	1 093	1 232	210	80	Tasman Sea
				111	88	Westpac Bank
				139	133	Louisville
Orange roughy limit	1 852	1 852	1 852	277	277	Tasman Sea
				190	245	Westpac Bank
				1 026	1 026	Louisville
Other species catch	545	690	635	269	233	
Other species limit*	762	762	762	762	762	
Exploratory catch	29.15	29.06	N/A	42.7	42.8	
Exploratory limit	30	30	N/A	140	140	

* Prior to 2019, New Zealand had a total catch limit of 2 614 tonnes which included an orange roughy catch limit of 1 852.

2.2 TRAWL FISHERIES

New Zealand's trawl fisheries in the SPRFMO Convention Area are primarily focused on bottom trawling for orange roughy (*Hoplostethus atlanticus*), with limited effort using midwater trawl gear to target alfonsino species (*Beryx splendens, B. decadactylus*) close to the seabed.

Bottom trawl

The annual bottom trawl fishing effort by New Zealand vessels in the SPRFMO Convention Area is summarised in Table 4. Effort has declined from a maximum of 23 vessels completing over 3 500 tows in 2002 to an average of 4 vessels and between 251 and 858 tows over the most recent three years. Effort was particularly low in 2019, likely as a result of the adoption of CMM03-2019 which significantly changed the management regime for bottom trawling in the Convention Area.

Orange roughy (ORY) is the main target species and has made up 67-99% of the total New Zealand bottom trawl catch since 2002 with tonnages ranging from 301 to 2 578 tonnes. Fishing effort and catch by area has varied over time, with the majority of catch taken since 2002 in the Challenger and Louisville areas. Further information on bottom trawl effort and orange roughy catch by area is shown in Figure 4 and Tables 5-8 below.

Other species that have been prominent in the catch include alfonsinos (ALF), cardinalfish (EPI), and oreo (BOE/SSO) species, however, catch of these species has fluctuated over time and catch of any one species has never exceeded 300 tonnes.

Table 4: Annual fishing effort (number of vessels and tows) and fisher-reported catch (tonnes) of the top five species by weight (identified by FAO species codes – Appendix 1) by New Zealand vessels bottom trawling in the SPRFMO Convention Area, for the last 5 calendar years. The number of tows reported here is the number of tows which recorded a fish catch and excludes tows where there was no catch.

Year	No. Vessels	No. Tows	Avg. Tows/ Vessel	ORY	ONV	BOE	EPI	ALF	SSO	RIB	RTX	SCK	Total (t)
2016	6	943	157	954	27	0	19	87	0	23	55	34	1 326
2017	5	1 423	285	1 093	30	22	1	290	7	36	52	20	1 641
2018	6	858	143	1 232	38	11	7	57	5	24	30	7	1 570
2019	4	251	63	460	3	8	0	33	3	8	0	0	584
2020	3	329	110	301	9	28	10	78	5	9	0	0	470

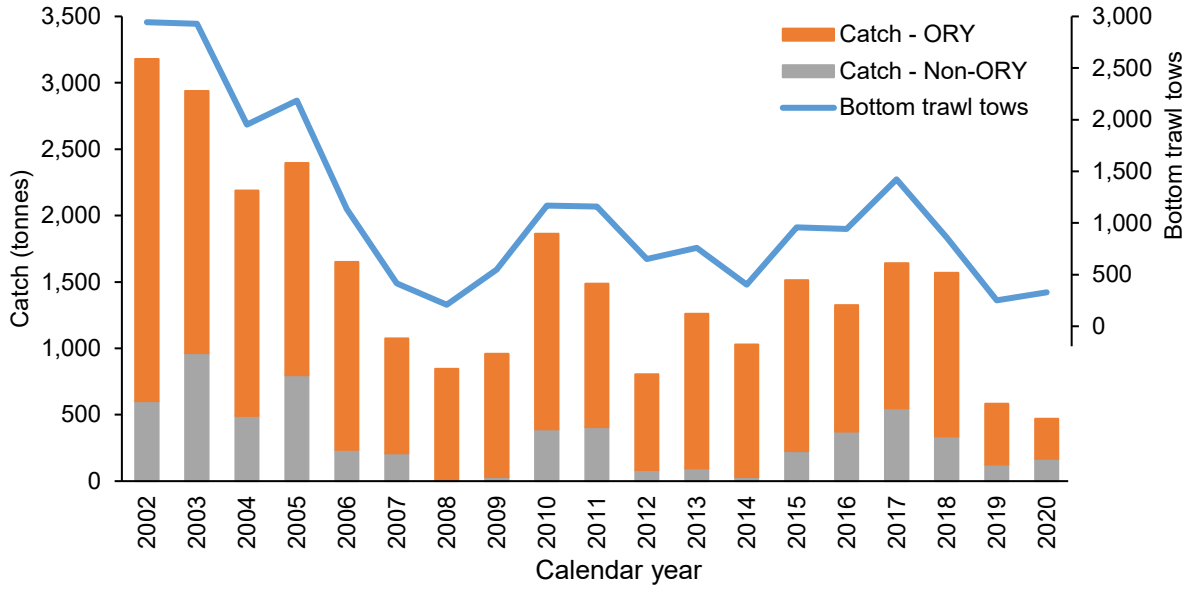

Figure 3: New Zealand bottom trawl effort (number of tows) and catch (in tonnes) from 2002 in the SPRFMO Convention Area.

Table 5: Bottom trawl effort (number of tows) in the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Area for the last 5 calendar years. Reported effort for the Westpac Bank only includes effort on the high seas.

Year	Challenger Plateau	Westpac Bank	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
2016	706	92	–	197	40	–	943
2017	421	44	25	583	352	-	1 423
2018	309	183	13	232	77	44	858
2019*						30	30

***effort from pre-catch limit implementation**

Table 6: Bottom trawl effort (number of tows) in the main areas fished by New Zealand vessels fishing in the SPRFMO Area for the last 5 calendar years consistent with management and catch limit areas in CMM03-2019.

Year	North West Challenger	West Norfolk Ridge	Lord Howe Rise	Tasman Sea Total	Westpac Bank	Louisville Ridge	All Areas
2019	74	1	87	162	23	36	221
2020	71	6	115	192	34	103	329

Table 7: Total estimated catch (tonnes) of orange roughy from the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Area for the last 5 calendar years. Landings from the Westpac Bank area (part of the Challenger Plateau) are also reported against New Zealand's ORH7A catch limit. –, less than 1 tonne

Year	Challenger Plateau	Westpac Bank	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
2016	486	234	0	208	27	-	954
2017	307	129	22	215	420	-	1 093
2018	399	569	5	180	81	-	1 232

Table 8: Total estimated catch (tonnes) of orange roughy from the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Area for the last 5 calendar years consistent with management and catch limit areas in CMM 03-2019.

Year	North West Challenger	West Norfolk Ridge	Lord Howe Rise	Tasman Sea Total	Westpac Bank	Louisville Ridge	All Areas
2019	171	0	38	210	111	139	460
2020	76	3	2	80	88	133	301

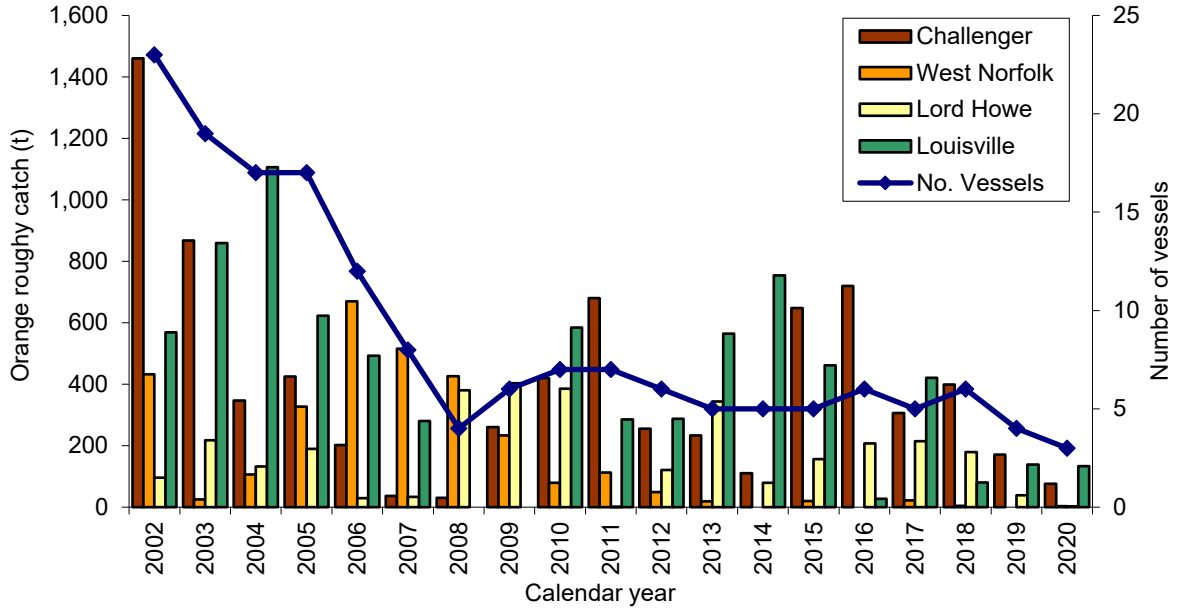

Figure 4: Trends in effort (the number of vessels bottom trawling) and total landings of orange roughy (tonnes) for each of the four main areas fished by New Zealand bottom trawl vessels in the SPRFMO Area by calendar year from 2002.

Midwater trawl

Midwater trawling for bentho-pelagic species is included in the SPRFMO definition of bottom fishing because the gear occasionally comes into contact with the bottom. Midwater trawling for bentho-pelagic species by New Zealand vessels has occurred sporadically since 1989 (Figure 5). Effort has been variable over time but reached a peak in 2018 with 145 tows (Table 9). Effort was particularly low in 2019 and 2020, with only 9 and 8 midwater trawl tows completed during these years respectively. This is likely due to the adoption of CMM03-2019 which changed the management regime for bottom fishing.

Catch from midwater trawling fluctuated around 150 tonnes per year from 2011 to 2013, was less than 100 tonnes from 2014 to 2017, increased to over 200 tonnes in 2018 but then declined again to 12 tonnes in 2019 and 7 tonnes in 2020. Catch from midwater trawling is predominantly alfonsino, which has comprised over 95% of catch in the most recent three years.

Table 9: Annual fishing effort (number of vessels and tows) and fisher-reported catch (tonnes) of the main species by weight (identified by FAO species codes – Appendix 1) by New Zealand vessels midwater trawling for bentho-pelagic species in the SPRFMO Convention Area for the last 5 calendar years.

Year	No. Vessels	No. Tows	Avg. Tows/Vessel	ALF	EDR	ONV	BWA	All Species
2016	3	42	14	82	3	0	0	86
2017	1	33	33	35	0	0	0	36
2018	3	145	48	211	3	0	3	219
2019	2	9	5	12	0	0	0	12
2020	1	8	8	6	0	0	0	7

* tows reported here is the number of tows which recorded a fish catch and excludes tows where there was no catch

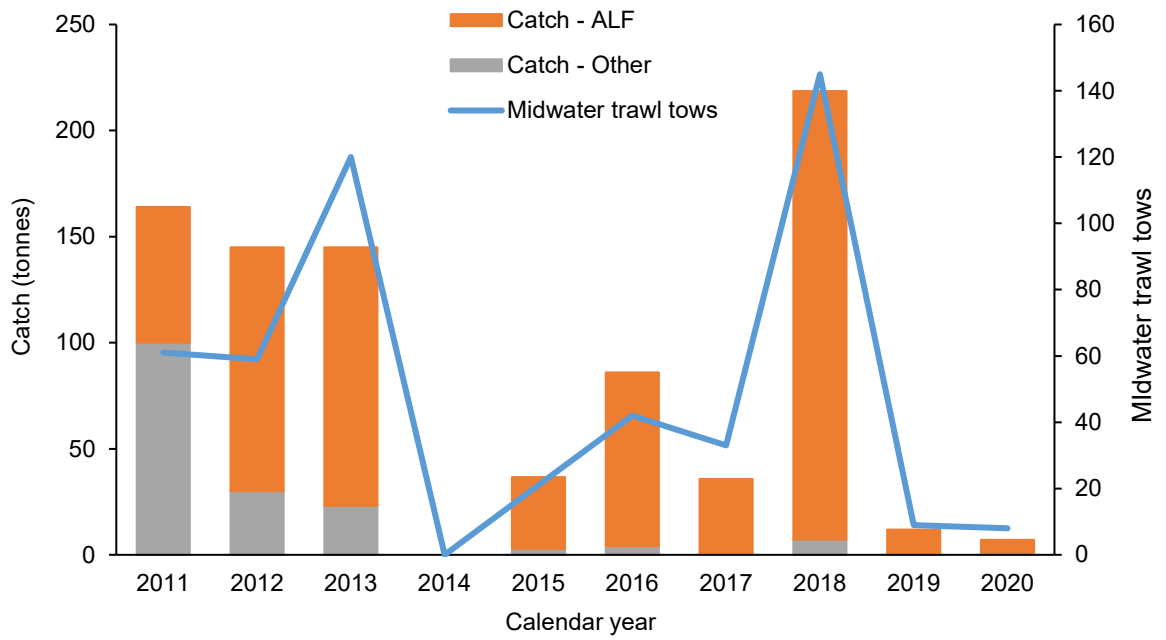

Figure 5: New Zealand midwater trawl effort (number of tows) and catch (in tonnes, split between ALF and other species) from 2011 in the SPRFMO Convention Area.

2.3 BOTTOM LINE FISHERIES

The annual fishing effort (number of vessels and hooks fished) and catch of the main bottom line target and bycatch species are summarised in Table 10. The number of active line vessels peaked at 11 in 2005, then declined and has fluctuated between 3 and 5 vessels since 2007. The numbers of hooks set has fluctuated over time, peaking at 780 000 hooks in 2014. The number of hooks increased in 2019 to 183 000, which is the highest since 2014, but decreased to 104 000 in 2020.

There have been three bottom line fishing methods used by New Zealand vessels in the SPRFMO Area, bottom longline, Dahn line, and hand line. Dahn and hand line are very similar, with both methods employing a vertical line with hooks that is either attached to a float (Dahn line) or remains attached to the fishing vessel (hand line). Given the similarities, Dahn line and hand line have historically been treated as a single fishery, and data reporting by commercial fishers and observers is the same for both methods.

Under CMM03-2020, 'bottom line' is defined to include longlines, hand lines, drop lines, trot lines, and dahn lines, so they will continue to be reported together.

Bluenose (BWA, *Hyperoglyphe antarctica*) catches peaked in 2006 at 271 tonnes but have declined and have fluctuated from 21-38 tonnes in the most recent 5 years. The other main species caught by bottom line, which occasionally makes up most of the catch, is wreckfish (HAU, *Polyprion oxygeneios* and *P. americanus*) which has been caught in quantities of 17–54 tonnes annually, over the last 5 years. Together, these three species have made up around 80% of the catch in the most recent five years.

Other species making minor contributions to bottom line catches include spiny dogfish (DGS), king tarakihi (MOW), kingfish (YTC), and sea perch (ROK).

Table 10: Effort and estimated catch for New Zealand vessels bottom longlining in the SPRFMO Area for the most recent 5 calendar years. Effort is presented as the number of vessels, trips, and number of hooks set, with catches in tonnes of the target and main bycatch species (codes detailed in Appendix 1). This table does not include information on exploratory fishing pursuant to CMMs 4.14 or 14a-2019.

Year	No. Vessels	No. Trips	No. Hooks (000s)	Hooks/ Vessel (000s)	BWA	HAU	DGS	MOW	RTX	Total catch (t)
2016	5*	10	111	28	20	54	5	3	<1	87
2017	3	14	115	38	46	47	3	3	2	106
2018	3	8	110	37	34	27	10	3	0	78
2019	5	16**	183	37	57	50	9	3	1	133
2020	5	11	105	21	17	26	1	3	0	57

* This includes one vessel that fished only using hand lines
** This includes a trip that began in Dec 2018 and ended in Jan 2019

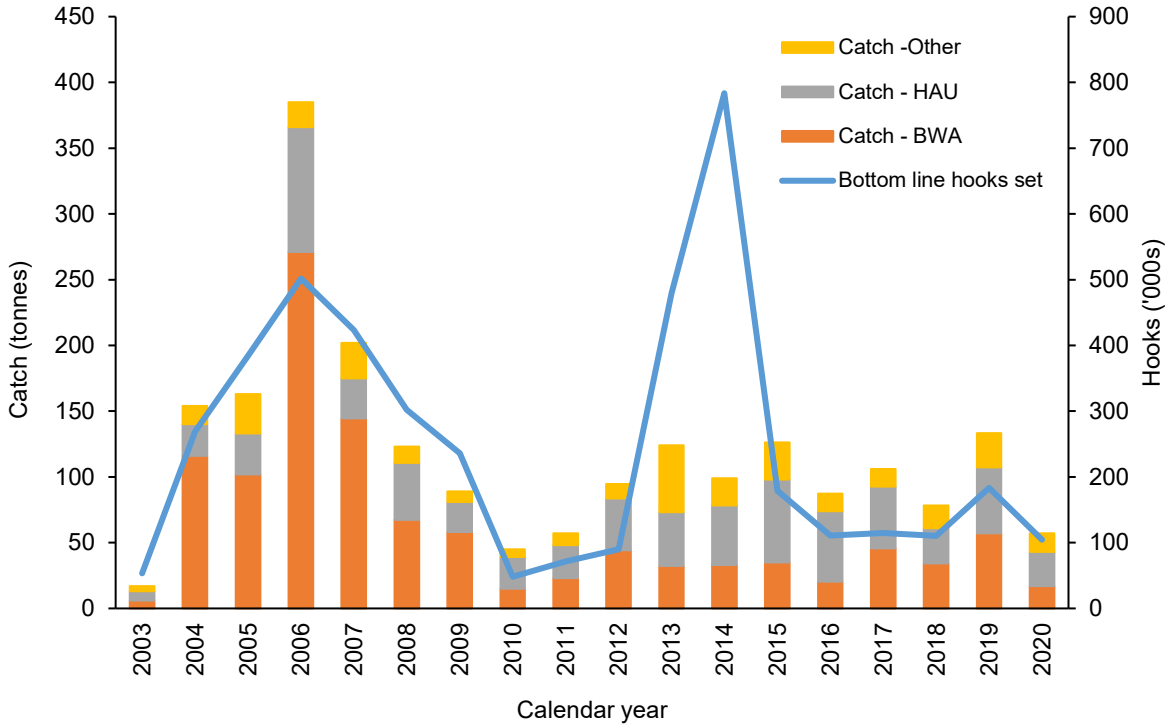

Figure 6: New Zealand bottom line effort (thousands of hooks) and catch (in tonnes, split between HAU, BWA and other species) from 2003 in the SPRFMO Convention Area.

Bluenose catch by main fishing areas since 2009 is shown in Table 11 and is compared with fishing effort in Figure 7. There are no clear trends in nominal CPUE (Figure 8).

Table 11: Total catch of bluenose, BWA, in tonnes, from the main areas fished by New Zealand bottom line vessels fishing in the SPRFMO Area by calendar year for the last 5 years.

Year	Challenger Plateau	West Norfolk Ridge	Three Kings Ridge	Louisville Ridge	Lord Howe	All Areas
2015	23	10	2	–	–	35
2016	6	15	-	-	-	20
2017	31	8	3	-	4	46
2018	27	7	-	-	-	34
2019	31	17	9	-	-	57
2020	7	8	-	1	-	17

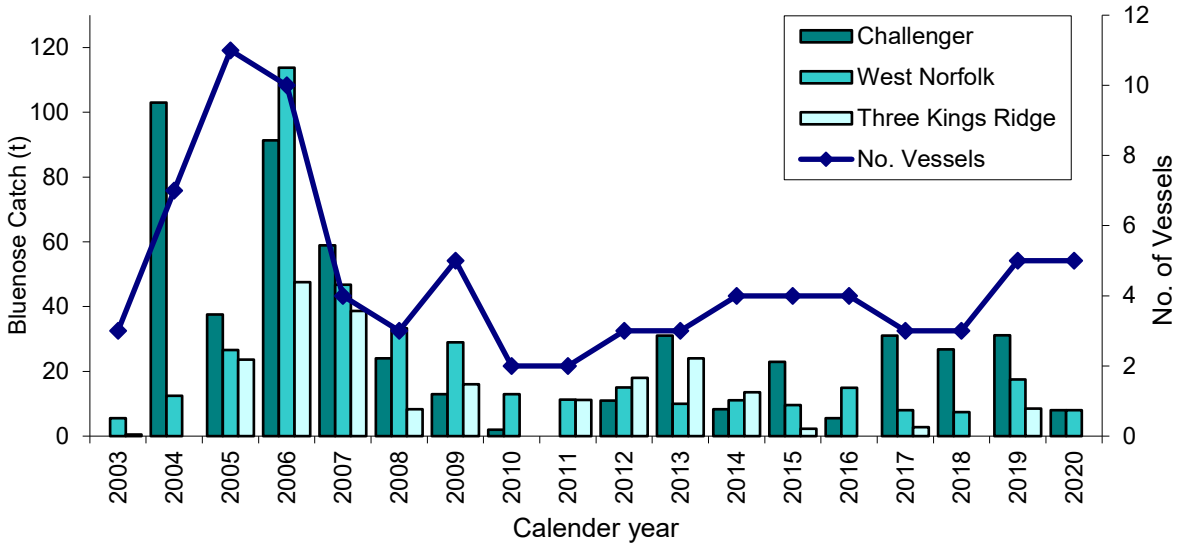

Figure 7: Trends in number of bottom line vessels and total bluenose catch from the three main areas fished by New Zealand bottom line vessels in the SPRFMO Area by calendar year 2003-2020.

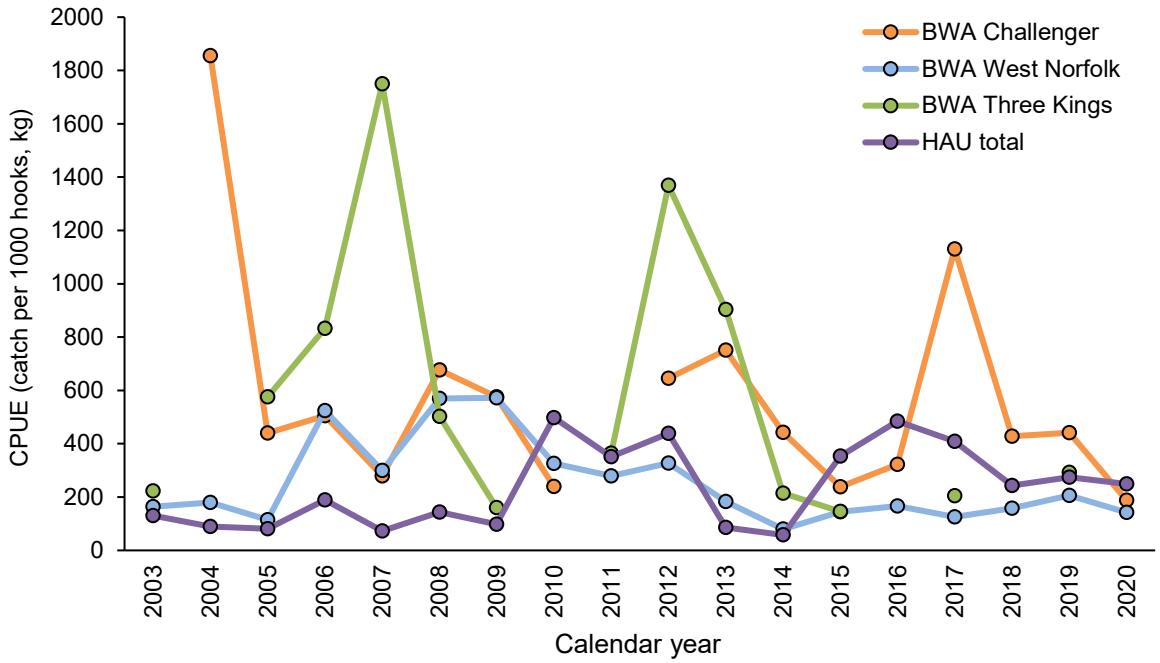

Figure 8: Trends in nominal CPUE (kg per 1000 hooks set) for bluenose (BWA) for the three main areas fished and wreckfish (HAU) by New Zealand bottom longline vessels fishing in the SPRFMO Area by calendar year 2003–2020.

Bottom longline comprises the majority of the fishing effort (105,000 hooks in 2020) and catch (57 tonnes in 2020). Effort using other bottom line methods is significantly less and more variable. Table 12 shows effort and catch from fishing using other bottom line methods for the most recent 5 years.

Table 12: Effort and estimated catches for New Zealand vessels using other bottom line methods in the SPRFMO Area by calendar year for the previous 5 years. Effort is presented as the number of vessels and number of hooks set, with catches in tonnes of the target and main bycatch species (codes detailed in Appendix 1).

Year	No. Vessels	No. Hooks	BWA	HAU	MOW	YTC	Total catch (t)
2016	1	128	1	<1	1	-	2
2017	1	49	<1	<1	<1	-	<1
2018	1	120	<1	<1	<1	-	<1
2019	1	20	<1	-	<1	-	<1
2020	1	30	<1	<1	<1	<1	<1

Table 13: Effort and catches for New Zealand vessels bottom longlining in exploratory fisheries in the SPRFMO Area by calendar year under CMM4.14 and CMM14a-2019. Effort is presented as the number of vessels, trips, and number of hooks set, with catches in tonnes of toothfish and main bycatch species (codes detailed in Appendix 1).

Year	No. Vessels	No. Trips	No. Hooks (000's)	TOA	TOP	GRV	MOR	ANT	Total catch (t)
2016	1	1	25.7	28.8	-	-	-	-	29.15
2017	1	1	41.1	28.8	-	-	-	0.13	29.06
2018	-	-	-	-	-	-			
2019	1	1	124.1	36.5	0.08	1.2	0.5	1.3	39.68
2020	1	1	98	41.0	0.06	0.9	0.02	0.4	42.82

3 Fisheries Data Collection and Research Activities

3.1 FISHERIES CATCH & EFFORT DATA COLLECTION SYSTEMS

Data collection on New Zealand high seas bottom fishing vessels are consistent with the information requirements detailed in CMM02-2020. Detailed tow-by-tow catch and effort data for all high seas fishing operations have been collected since 2007 using at-sea catch and effort logbooks and landings recording forms. Detailed observer Benthic Materials Forms are completed for all observed bottom fishing to record benthic bycatch to the most detailed taxonomic level as possible.

Leading up to May 2019 and the implementation of CMM 03-2019, a Vulnerable Marine Ecosystem (VME) Evidence Form was used by observers in the areas designated as move-on areas for trawlers (Appendix 2). From May 2019 to May 2020 and from May 2020 onward, revised forms have been used for all trawl effort reflecting the thresholds and requirements of CMM03-2019 and CMM02-2020 (Appendices 3 & 4).

From 1 October 2017, New Zealand trawl vessels >28m in length overall operating on the high seas started transitioning to reporting through a new electronic catch reporting system. The data fields are consistent with previous paper forms, however data is now submitted on a daily basis. In the 2018 calendar year, 75% of fishing events in the SPRFMO Convention Area were reported through the electronic catch reporting system. In the 2019 calendar year, 100% of trawl fishing events in the SPRFMO Convention Area were reported through electronic catch reporting and 70% of bottom lining events. Overall 82% of events in SPRFMO were reported electronically. In the 2020 calendar year 100% of trawl and bottom lining events in the SPRFMO Convention Area were reported through electronic catch reporting.

3.2 RESEARCH ACTIVITIES

As presented to recent meetings of the Scientific Committee and SPRFMO Commission meetings, New Zealand has worked with Australia to progress a number of workstreams to inform the development of the bottom fishing conservation and management measure. Progress updates on these workstreams have been presented to deepwater workshops, the fourth through ninth Scientific Committees, and the sixth, seventh and eighth meetings of the Commission. A brief summary of each aspect of this work is provided below, noting that most of this work has been reported in individual papers to the Scientific Committee.

The section below summarises relevant research New Zealand has completed, including research to support the development and review of the bottom fishing CMM.

3.2.1 Identification of fishing footprint and/or impact analysis

New Zealand provided a spatially-explicit bottom impact evaluation for bottom fisheries in the SPRFMO Area based on the method used in CCAMLR (Sharp, 2009). This method can be used to estimate the likely cumulative impact of one or more bottom fishing methods on benthic organisms with different levels of fragility and allow comparisons between fisheries employing different bottom fishing methods. The results of the application of the method provided an index of the "naturalness" of the benthic community in given locations affected by fishing, which was then used as an input layer for spatial decision-support software. This analysis was provided to SC-05 (SC5-DW06), and an updated analysis including bottom line methods was provided to SC-06 (SC6-DW10). Further impact assessment work has been done in collaboration with Australia and the results were presented to SC8 in the form of a revised Cumulative Bottom Fishery Impact Assessment (SC8-DW07 rev1), with key revisions made available in an accompanying paper (SC8-DW17).

The Cumulative Bottom Fishery Impact Assessment concluded that captures of marine mammals, seabirds, reptiles and other species of concern are rare in SPRFMO bottom fisheries and the risk to affected populations appears to be low. Work to assess these impacts cumulatively with other fisheries in the Southern Hemisphere is underway but will take time to complete.

For Orange roughy, stock assessments indicated all stocks were likely above limit biomass reference points and several were above target biomass reference points used elsewhere for the management of this species. For other target species caught in SPRFMO demersal fisheries, workplans are being developed for stock structure delineation studies, which may inform future assessment and management. For non-target and bycatch (discarded) species, ecological risk assessments were undertaken to categorise these species into the SPRFMO stock assessment framework and prioritisation of species estimated to be at high and extreme relative risk from fishing was undertaken.

Impact and risk to benthic habitats and VMEs was also a key focus of the assessment. New habitat suitability models were made for ten VME indicator taxa and, using these, estimates of the proportion of the estimated distribution of suitable habitat and abundance for each taxon outside the Bottom Trawl Management Areas (BTMAs) were calculated at a range of spatial scales using a variety of model structures and assumptions to assess sensitivity in the estimates. Estimates of the proportion of suitable VME indicator taxa habitat protected was uncertain but qualitatively favourable at most scales assessed. However, there are a number of areas at smaller scales (Fishery Management Areas) where the level of suitable habitat protected for some VME taxa was less favourable including Northwest Challenger, Central Louisville and Southern Louisville.

Any updates to the Cumulative Bottom Fishery Impact Assessment will be provided to SC9.

3.2.2 Encounter review process

A process for the SC to implement when it reviews encounters with potential VMEs in bottom fisheries at its annual meeting each year was put to SC8 (SC8-DW12), although the proposal was not accepted. An update on the review process, taking into consideration the discussion on SC8-DW12 at SC8, will be provided to SC9 and proposes a process for Members to review encounters with potential VMEs in bottom fisheries. This paper will also outline a process for the SC to implement when it reviews Member submissions on encounters at its annual meeting.

3.2.3 Updated candidate encounter thresholds for VME indicator taxa in the SPRFMO Area

New Zealand is developing a paper for presentation to SC9 to update candidate encounter thresholds for the 13 VME indicator taxa included in Annex 5 of CMM03-2021, with the intention of developing an authoritative set of candidate encounter thresholds for all VME indicator taxa. The paper includes a range of candidate encounter thresholds recalculated using the most up-to-date trawl bycatch data (for the period 2008-2020) from within the Evaluated Area of the SPRFMO Convention Area. It is intended these thresholds would be used to inform any future refinement of VME encounter thresholds to adjust the level of precaution included in CMM03 (if required).

3.2.4 Determination of optimal move-on distance in SPRFMO bottom fisheries

A paper presenting the results of analyses on the theoretical protection afforded, and the impact to fisheries, of the current move-on distance and potential alternative move-on distances (2, 5 and 10 nm), based on the size and distribution of predicted VME habitat patches is being developed for presentation at SC9. Results are for consideration of the SC and with the purpose of developing a recommendation to the SPRFMO Commission on the appropriateness of the current move-on distance for encounters with VMEs.

3.2.5 Incorporating combinations of FAO criteria into a multi-taxonomic level list of VME indicator taxa

At SC8 New Zealand presented SC8-DW11, a review of VME taxa known from the Evaluated Area of the SPRFMO Convention Area. 281 genera and 231 species were identified as meeting at least one of the FAO criteria for defining VMEs and were therefore considered candidate VME taxa. Following discussion of the paper at SC8, it was recommended that the question of how the FAO criteria should best be combined to identify VME taxa to the work plan. In response to this work plan item, a paper updating lists of VME indicator taxa that meet 4 different combinations of FAO criteria for defining VMEs is being developed for presentation to SC9.

3.2.6 Assessment on how ID guides for VME taxa could be developed

A paper proposing 10 steps for the development of a user-friendly ID guide for benthic bycatch commonly caught by bottom fishing gear within the SPRFMO Convention Area that can be used by observers and fishers to identify benthic bycatch landed during bottom fishing activities is being developed by New Zealand for presentation at SC9. The paper also proposes the development of training videos to familiarise users with the ID guide, and enable information provided to observers to be standardized, accurate and clear, paying particular attention to the identification, weighing, subsampling and collection of benthic bycatch samples. It is intended that this work will enable fishers, observers and researchers to recognize benthic bycatch taxa more readily, and to improve the quality of catch records.

3.2.7 Development of spatial management scenarios for bottom trawling and VME taxa in the SPRFMO area

In response to the SC work plan, New Zealand and Australia have prepared a paper for presentation at SC9 developing spatial management scenarios for VME indicator taxa using different approaches. Scenarios encompass protection levels of 70%, 80%, 90%, 95% for the 10 modelled VME indicator taxa at spatial scales of Fisheries Management Areas described in SC8-DW07_rev1 using variety of model structures and assumptions to assess sensitivity in the spatial scenarios. The scenarios explicitly account for uncertainties in VME indicator taxa model predictions and the relative availability of VME indicator taxa in an area.

3.2.8 Framework for providing precautionary advice on captures of marine mammals, seabirds, reptiles and other species of concern

The SC, at their eighth meeting, noted that captures of marine mammals, seabirds, reptiles and other species of concern are rare in midwater and bottom trawl fisheries and appear to be rare in bottom

line fisheries and requested bottom fishing Members to collaborate to develop a framework for providing precautionary advice on such captures. In response New Zealand has been developing such a framework for the consideration at SC9. The framework outlines the type of advice that may be provided related to such captures, the data sources that could be used to formulate advice, minimum data criteria, and appropriate analytical methods.

3.2.9 Monitoring biomass of target species

The main target species of bottom fishing in the SPRFMO Area are orange roughy (*Hoplostethus atlanticus)*, bluenose (*Hyperoglyphe antarctica*), wreckfishes (*Polyprion* spp.) and alfonsino (*Beryx* spp.), with orange roughy making up roughly 65% of New Zealand's total catch in the SPRFMO Area. All of these fisheries are relatively data poor; however, there are some data available, including historic catches, various effort data, and some biological data. New Zealand has focused stock assessment efforts on orange roughy in the first instance, as it remains the primary target of New Zealand and Australia's bottom trawl fisheries and makes up the majority of New Zealand's catch in the SPRFMO Area.

New Zealand has commissioned a range of approaches to estimate stock status and sustainable catch levels for SPRFMO orange roughy stocks. This work culminated in the fifth meeting of the Scientific Committee reviewing a number of stock assessment approaches and providing advice to the Commission on the setting of catch limits for two orange roughy areas (Report of 5th Scientific Committee).

New Zealand used age data from around 1 500 orange roughy otoliths to update the stock assessment for the Louisville Ridge in 2019 (Horn et. al 2019a, SC7-DW05), and incorporated results from a 2018 acoustic survey into a 2019 update of the ORH 7A stock assessment which was provided to SC7 along with options to recommend a catch limit for the Westpac Bank area to the Commission (Cordue, 2019, SC7-DW06, SC7-DW07_rev1).

In 2019, New Zealand developed and provided SC7 with a paper recommending an approach to updating stock assessments for Tasman Sea stocks of orange roughy (SC7-DW08). The Scientific Committee subsequently agreed with the recommendation of the paper to develop a stock assessment for the northwest Challenger Plateau as a priority and, as time and resources permit, for the Lord Howe Rise (Report of 7th Scientific Committee).

A new orange roughy stock assessment for NW Challenger was presented to SC8 using new age distributions, together with an updated catch-history model for Lord Howe Rise. Although current stock status for each of the stocks is quite uncertain, it is likely that NWC is currently above 40% B_0, (46-81%) while LHR is likely to be above 30% B_0 (29-93%) (SC8-DW10). Additional ageing of new and existing orange roughy samples from LHR will be provided to SC9 jointly with Australia.

3.2.10 Population research into key at-risk seabird species

New Zealand is progressively extending the scope of an impact and risk assessment for the effects of fisheries on New Zealand-nesting seabird species (e.g., Richard et al. 2020, Abraham et al. 2017). Southern hemisphere in-zone and high seas fisheries will be progressively included, starting with the larger pelagic longline fisheries (e.g., Francis & Hoyle 2019, Abraham et al. 2019). As part of the work to provide input data for the risk assessment, a series of population studies have been undertaken for key at-risk seabird species. These use aerial and ground count methodologies to collect both population size and demographic data. Draft reports are available through the Department of Conservation - Conservation Services Programme website and results are summarised in the risk assessment report (Richard et al. 2020) and in the Fisheries New Zealand's Aquatic Environment & Biodiversity Annual Review 2019-20 (FNZ 2020).

3.2.11 Antipodean Albatross distribution

Fisheries impacts on Antipodean wandering albatross (*Diomedea antipodensis antipodensis*) are of particular concern for New Zealand. This species is endemic to the Antipodes Islands, New Zealand and, since 2004, this population has declined: males at 6% per annum and females at 12%. At the current rate of decline, the Antipodean wandering albatross will be functionally extinct in 20 years. Debski et al. (2018) compared an updated at-sea distribution of Antipodean albatrosses with fishing

effort data (sourced from Global Fishing Watch http://globalfishingwatch.org) which indicated a significant overlap with fishing activity in the South Pacific.

In June 2021 a tool that allows stakeholders to explore the potential impact of threats to Antipodean Albatross and the demographic outcomes of management strategies was published. Using the tool, simulations of the demographic impact of different scenarios may be carried out so that management strategies can be assessed and prioritised. A small subset of the population of Antipodean albatross has been studied since 1994, and these field data were used to perform the simulations. A Bayesian integrated population model was developed to estimate the main demographic parameters of the population. The model considered detectability of individuals, inter-annual variability, and movements in and out of the study area. A report of this project is available at:
https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/final-reports/bcbc2020-09-antipodean-albatross-simulations-final-report2.pdf

4 Observer Implementation Report

4.1 OBSERVER TRAINING

MPI requires all observer recruits to complete a three-week training course before they are accepted into the programme. The course outline is as follows; sessions preceded with a number are unit standards registered on the New Zealand Qualifications Framework:

- Observer Programme overview, Trip Planning.
- Catch effort logbooks (CELB)
- Catch effort logbook exercises
- Overview of the Observer manual
- 12306 – Identify common parts, fittings and equipment on a vessel
- 12310 – Prevent, extinguish and limit the spread of fire on a vessel
- 497 – Protect health & safety in the workplace
- 6213 – Use safe working practices in the seafood industry
- 12309 – Demonstrate knowledge of abandon ship procedures and demonstrate sea survival skills
- 15679 – Demonstrate a basic knowledge of commercial fishing methods
- Volumetric measurement
- Density factors
- Time Sampling
- Catch Assessment
- Mixed tows
- 19847 – Describe the reduction of marine mammal and turtle incidental capture during commercial fishing, including assessment
- 5332 – Maintain personal hygiene and use hygienic work practices working with seafood
- 19877 – Demonstrate knowledge of protection of the marine environment during seafood vessel operations
- Department of Conservation – Marine mammals and seabirds, mitigation devices
- Non-fish bycatch forms
- Benthic form
- Personal clothing and stores
- Communications / Key vessel personnel / Emergency Evacuation codes
- The psychology of deployment – Observer health and safety issues
- Code of conduct / complaint procedure
- QMS overview
- Scales
- Net bursts / discards / Schedule 6 releases

- Product states
- 19846 – Describe the reduction of seabird incidental capture during commercial fishing including assessment
- 23030 – Use basic knife skills as a fisheries observer
- 23027 - Demonstrate knowledge of information displays aboard seafood harvesting vessels
- The Compliance Business and Observer Compliance Contribution
- 20168 – Work on a commercial fishing vessel
- Briefing / Debriefing / General paperwork
- Performance Assessment System
- Conversion factors / practical exercise
- Fish ID book
- Fish ID practical
- Otoliths/Staging
- Biological sampling forms practical
- Biological Manual
- First Aid kits
- Tablets and at-sea data entry
- Observer Powers
- Compliance Investigation Services - Role, Use of Observer data, Profiling, Forensics.
- Employment Agreement
- MPI Science use of observer data
- Examination

Successful recruits are deployed with an observer trainer for one to two trips of an average duration of 30 days per trip before they can be deployed independently.

4.2 OBSERVER PROGRAMME DESIGN AND COVERAGE

New Zealand has had an observer programme in place since 1986, operating as a unit within the New Zealand Ministry for Primary Industries (MPI) or predecessor organisations. It delivers coverage days for a number of clients, who are provided with some or all or the information collected. These clients include: The Ministry for Primary Industries (Science, Field Operations, Fisheries Management groups), The Department of Conservation through the Conservation Services Levy, The National History Unit of the Museum of New Zealand, the New Zealand Fishing Industry, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Ministry of Business Innovation and Employment, Maritime New Zealand, and the Conversion Factors Working Group, which is a joint MPI and industry working group.

New Zealand observers collect a wide range of data to inform scientific analyses including both target stock assessments and quantification of bycatch, monitoring of compliance with requirements including seabird mitigation measures, and the collection of more general biological information.

The MPI observer programme makes provision in its annual plan to meet the observer coverage levels set out in SPRFMO CMM 03-2020(Bottom Fishing in the SPRFMO Convention Area):

i. for vessels using trawl gear in the Convention Area, ensure 100% observer coverage for vessels flying their flag for the duration of the trip.

ii. for each other bottom fishing gear type, ensure that there is at least 10% observer coverage each fishing year, specified in CMM 03-2020 to be measured by % of hooks observed. Note that how the 10% was achieved was previously not specified.

All New Zealand vessels intending to fish in the SPRFMO Area are required to provide a 5 working day notification to the Fisheries New Zealand observer programme to allow for the deployment of an

observer as required. Wherever possible, two observers are deployed on trawl trips (and at least one at all times) and generally the first bottom line trip of the year. Subsequent bottom line trips may be required to carry an observer based on the overall level of effort (to ensure that a 10% minimum is observed), if they are intending to use a different gear type (e.g. hand or dahn line), or to provide additional information as observer resources are available.

Table 14 provides details on the number of fishing days and number of observed fishing days by month for trawl and by days and hooks observed during the haul for bottom line methods. Note that for some months, the number of days fished may not match between vessels and observers due to differences in the criteria for reporting fishing events for commercial vessels and observers.

Table 14: Monthly fishing effort (and observer coverage) on New Zealand vessels fishing in the SPRFMO Area during 2020. Numbers in () are observed.

Month & year	Trawl: N vessels (N observed)	Trawl: N days	Bottom line: N vessels	Bottom line: N days	Bottom line: N hooks
Jan-20	1 (1)	8 (8)	1 (0)	1 (0)	2,000 (0)
Feb-20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mar-20	0 (0)	0 (0)	1 (1)	3 (3)	6,053 (5,548)
Apr-20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
May-20	1 (1)	3 (3)	0 (0)	0 (0)	0 (0)
Jun-20	2 (2)	17 (17)	0 (0)	0 (0)	0 (0)
Jul-20	3 (3)	16 (16)	0 (0)	0 (0)	0 (0)
Aug-20	2 (2)	13 (13)	0 (0)	0 (0)	0 (0)
Sep-20	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Oct-20	1 (1)	14 (14)	5 (2)	15 (7)	65,873 (14,331)
Nov-20	1 (1)	7 (7)	2 (0)	7 (0)	16,369 (0)
Dec-20	0 (0)	0 (0)	1 (0)	7 (0)	14,243 (0)
Total	**11 (11)**	**78 (78)**	**10 (3)**	**33 (10)**	**104,538 (19,879)**

Overall, the following levels of coverage were attained in 2020:

- Bottom contacting trawl: 100% (78 days)
- Bottom line: 19% (10 days of 33; ~20,000 hooks of ~105,000)

A total of three New Zealand vessels bottom fished with trawl gear in the SPRFMO Convention Area during 2020 and all trips carried at least one New Zealand observer, covering 78 vessel days and 348 tows. All fishing days were observed and all of the 348 tows were observed. Scientific observers measured fish from 17% of bottom trawl tows (Table 15). A total of 1,610 fish were measured, 80% of which were the principal catch species, orange roughy.

Midwater trawl gear for bentho-pelagic species was used on one trip comprising 1 vessel day and 8 tows, all of which were observed.

Five New Zealand bottom line vessels operated in the SPRFMO Area during 2020. Three bottom line trips were observed comprising 10 vessel days with 20,000 hooks observed. 530 fish were sampled from 25 sets.

Table 15: Summary of observer and sampling coverage of bottom and midwater trawl and bottom longlining in the SPRFMO Convention Area during 2020. Events (trawl tows or line sets) relate to observed trips and days only.

Method	No. comm trips	No. obs trips	Total events (tow/hooks)	Events observed	Tows measured	No. Fish Measured
Bottom trawl	11	11	348	348	59	1610
Midwater trawl	1	1	8	8	0	0
Bottom line	11	3	105,000	20,000	25	530

Note: Tows/sets reported here are all tows conducted, including those which had no catch, and so may exceed the tows which had a catch, as reported in the effort summary tables.

4.3 BIOLOGICAL SAMPLING AND LENGTH/AGE COMPOSITION OF CATCHES

The bottom fisheries continued to be monitored by scientific observers during 2020 and a summary of the length-frequency sampling is provided in Table 16. Biological sampling in 2020 was primarily of orange roughy, the principal demersal trawl target species.

The unscaled length-frequency distribution of orange roughy from bottom trawl and alfonsino from midwater trawl are shown in Figures 9 and 10, respectively.

Table 16: Summary of length-frequency sampling for those species or species groups with a sample size of 100 fish or more conducted by scientific observers aboard New Zealand vessels conducting bottom fishing in the SPRFMO Area in 2020.

		Common	Measure	Length (cm)			Number
Scientific Name	**Method**	**Name**	**Used**	**Min**	**Mean**	**Max**	**Measured**
H. atlanticus	Bottom trawl	Orange roughy	Standard	23	36.55	55	1 292
Beryx splendens	Bottom trawl	Alfonsino	Total	23	36.67	48	298
H. antarctica	Bottom longline	Bluenose	Fork	48	63.07	95	265
Polyprion spp.	Bottom longline	Wreckfish	Total	57	89.91	140	245
						Total	**2,100**

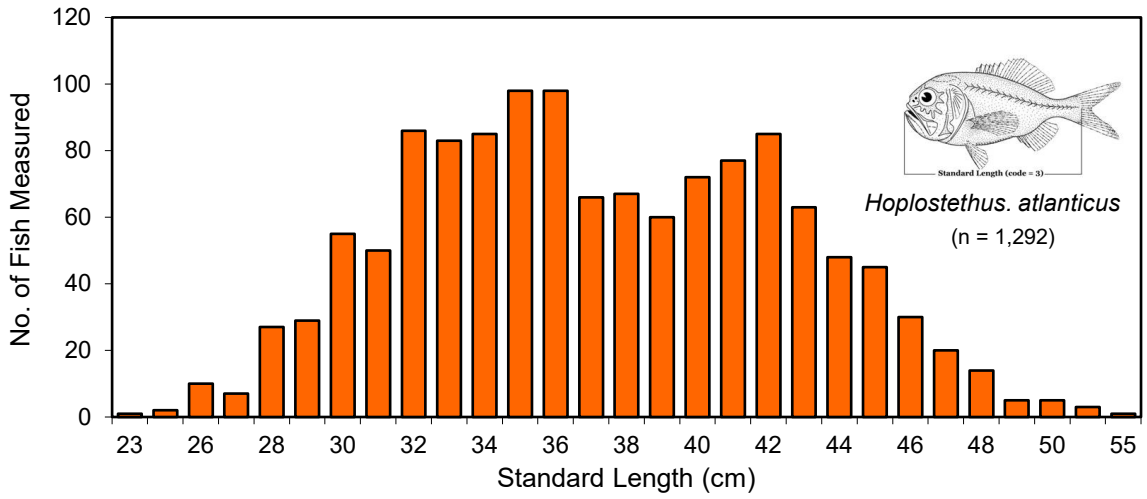

Figure 9: Length frequency distribution (unscaled) for orange roughy (*Hoplostethus atlanticus*) measured by scientific observers aboard New Zealand vessels fishing using bottom trawl in the SPRFMO Area during 2020.

Length frequency distributions for alfonsino (Figure 10) for midwater and bottom trawl suggest variable distributions, although sample sizes have been small in some years.

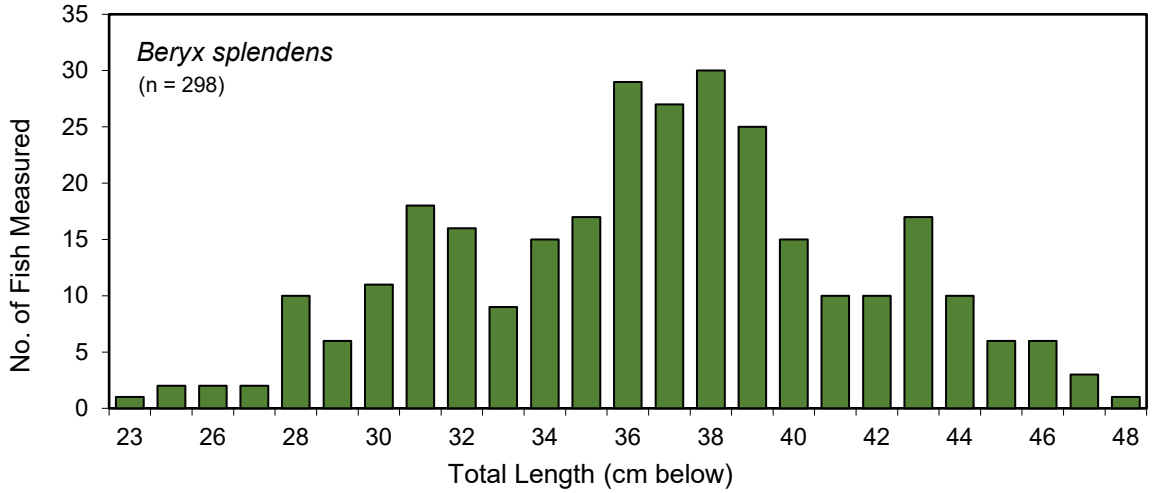

Figure 10: Length frequency distribution (unscaled) for alfonsino (*Beryx* spp.) measured by scientific observers aboard New Zealand vessels fishing using bottom trawl in the SPRFMO Convention Area in 2020

Comparison of length frequency distributions from 2016 to 2020 (Figure 11) suggests that the size of orange roughy caught in bottom trawls is relatively consistent over time. Differences are thought to be a result of changes in the location of fishing, in particular from 2019 when the spatial management regime of CMM02-2019 (and subsequently CM03-2020) was implemented.

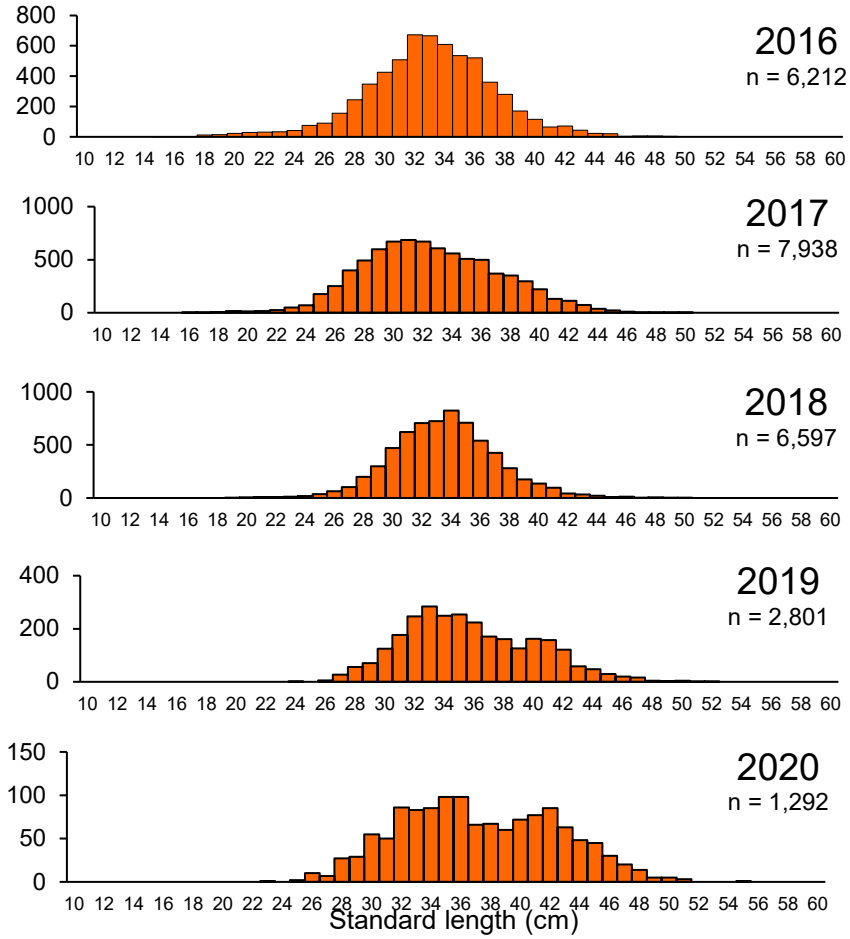

Figure 11: Length frequency distributions (unscaled – standard length) of orange roughy in the last five years to 2020 in the SPRFMO Convention Area.

The recorded sizes of bluenose and wreckfish vary considerably between years (Figures 12 and 14), likely as a result of small sample sizes and shifts in fishing locations.

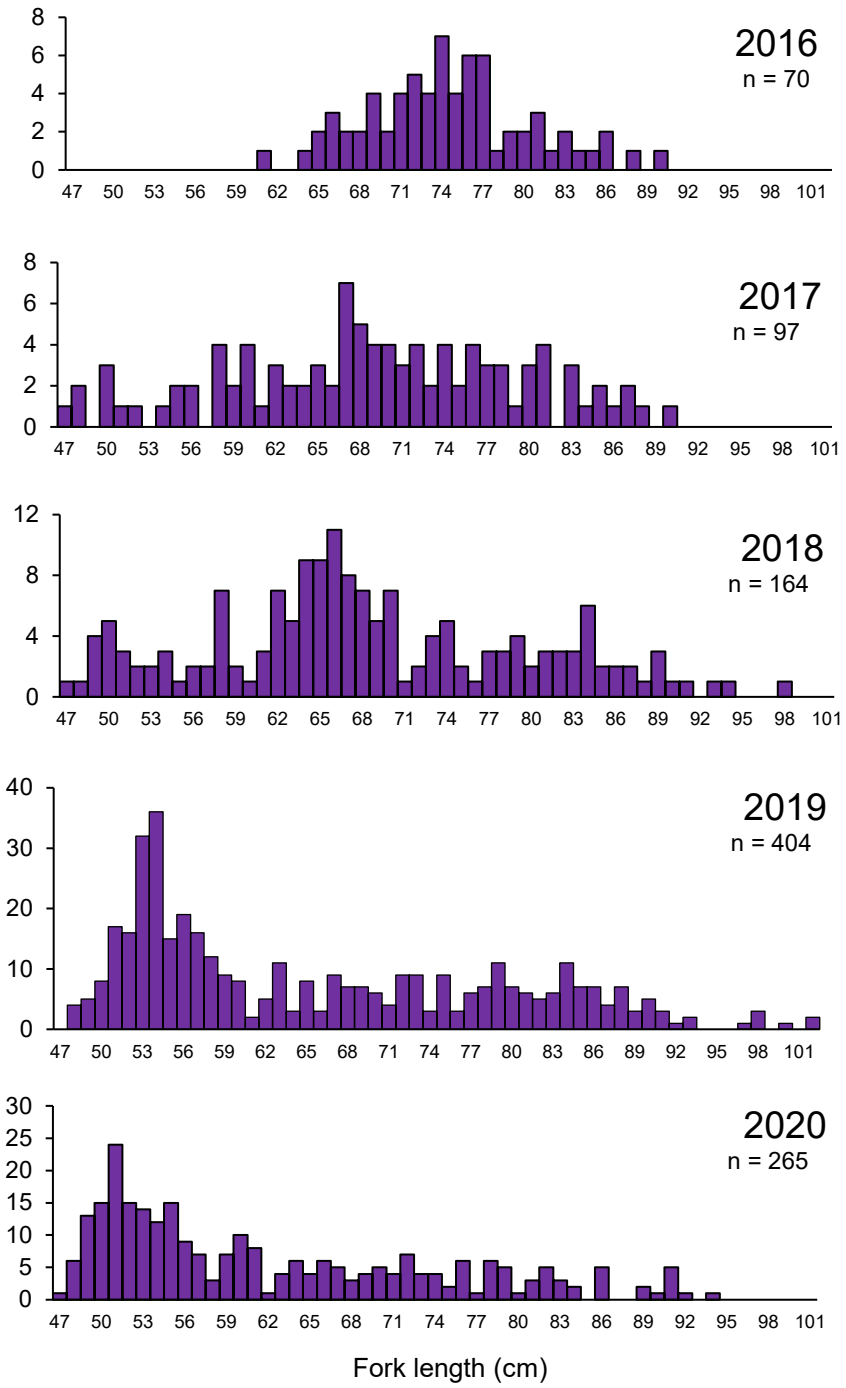

Figure 12: Length frequency distributions (unscaled) for bluenose measured by scientific observers aboard New Zealand vessels fishing in the five years up to and including 2020 in the SPRFMO Convention Area.

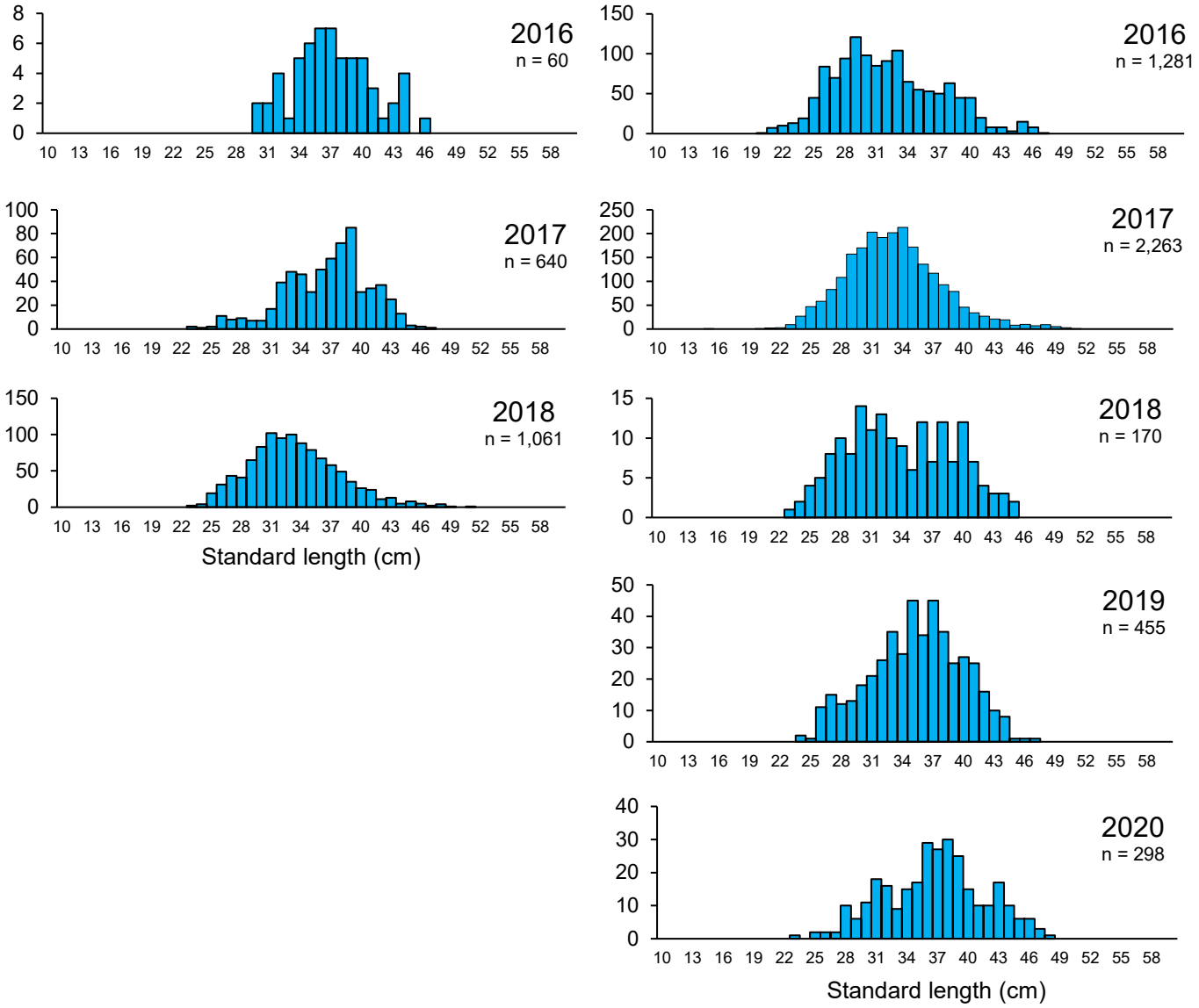

Figure 13: Length frequency distributions (unscaled) for alfonsino (*Beryx splendens* and *B. decadactylus* combined) for the five years to 2020 measured by scientific observers aboard New Zealand trawl vessels fishing in the SPRFMO Area where more than 50 fish have been measured. Left panel, from midwater trawls; right, from bottom trawls.

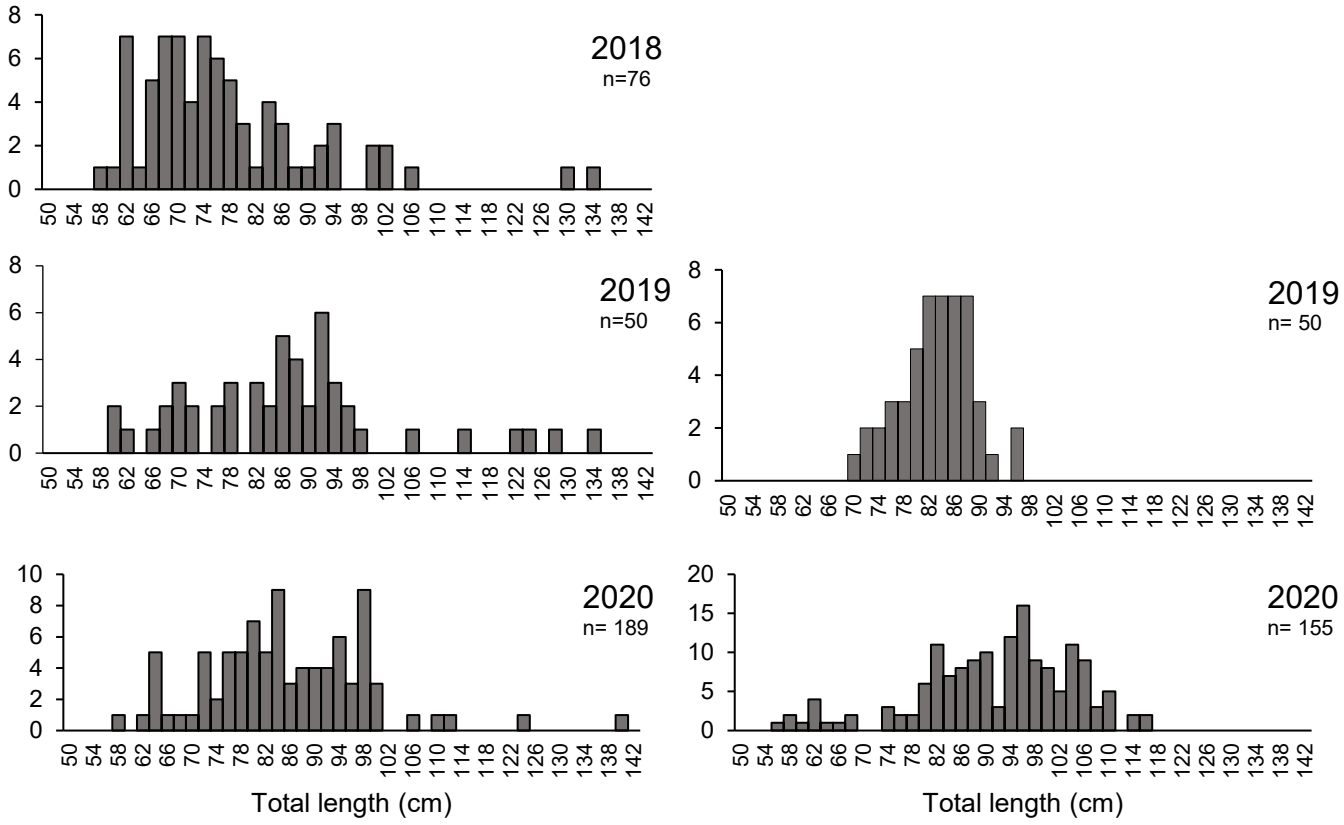

Figure 14: Length frequency distributions (unscaled, 2 cm bins) for wreckfish measured by scientific observers aboard New Zealand vessels bottom longlining for the five years leading up to and including 2020 in the SPRFMO Area where over 50 fish have been measured. Left panel, bass (*Polyprion americanus)*; right, hapuku (*Polyprion oxygeneios)*.

5 Ecosystem Approach considerations

5.1 ANTIPODEAN ALBATROSS

At its February 2020 meeting, the Convention on the Conservation of Migratory Species of Wild Animals (CMS) Conference of Parties unanimously agreed to list Antipodean Albatross on Appendix I of its Convention. The proposal was put forward jointly by New Zealand, Australia and Chile with the aim of catalysing international cooperation between States, including through RFMOs. This listing recognises the critical state of the species (assessed as Endangered by IUCN) and the need for urgent action to prevent ongoing decline. The listing creates an obligation on CMS Parties (130 countries) to impose strict protection measures for the species, including on their flagged vessels operating on the high seas. The Conference of Parties also approved the Concerted Action Plan which sets out actions for range States aimed at protecting this species, in particular in relation to fisheries bycatch in international waters. Further details are available on the CMS website (www.cms.int).

5.2 SEABIRD MITIGATION MEASURES

New Zealand vessels fishing in the SPRFMO Area are required to deploy seabird mitigation commensurate with CMM 09-2017.

For bottom line vessels, this includes the combined use of a line weighting system, streamer (tori) lines, setting at night (between nautical dark and nautical dawn), and controlling/avoiding the discharge of any biological material during shooting or hauling where possible.

For trawl vessels, this requires the deployment of streamer (tori) lines or a bird baffler where it is not operationally feasible to deploy streamer lines, and management of the discharge of biological material. Trawl vessels must, where possible, prohibit the discharge of biological material during shooting and hauling; convert offal into fish meal; retain all waste material related to fish processing; and restrict discharge to liquid discharge/sump water. Where this is not feasible, vessels should batch waste for two hours or longer.

In addition, all New Zealand trawl vessels >28 metres in length also have a vessel specific 'Vessel Management Plan' (VMP), which sets out the practices and processes that the vessel will follow to minimise the risk of seabird interactions. VMPs include a commitment to manage the discharge of biological material, to clean nets after every shot to remove 'stickers', and to minimise the time the net is on the water during hauling. VMPs also identify contingency plans in the case of gear or equipment malfunction which may otherwise result in increased risk of seabird interactions (e.g. meal plant breakdown or winch malfunction). Adherence to the VMPs is monitored by Fisheries New Zealand observers and reported on each year by MPI.

5.3 OBSERVED INTERACTIONS WITH SEABIRDS AND OTHER SPECIES OF CONCERN

New Zealand observers report captures of all seabirds, marine mammals, reptiles, sharks, and coral species protected under New Zealand's Wildlife Act 1953, and other species of concern, on the 'non-fish and protected species bycatch' form. In addition, all non-targeted marine invertebrates, marine plants, or benthic organisms are reported on the Observer Benthic Materials Form (Appendix 2). This information is recorded to a high standard and includes information on the species, the deployment of mitigation devices, adherence to other mitigation practices, and situational details about the capture where possible including where and how it was captured.

Observer coverage of the trawl fisheries in the SPRFMO Area has historically been high (70–100% of tows observed per year). New Zealand observers are present on about 10% of bottom line fishing trips by New Zealand vessels and typically observe 10–15% of all line sets each year.

Over the last five years, eight seabird captures have been observed on New Zealand vessels: four seabirds (all alive) in bottom line fisheries, and four seabirds (all alive) in trawl fisheries (Table 17). Species identification of some of the reports is being confirmed by expert analysis and may change.

In relation to other species of concern as specified in Annex 14 of CMM 02-2020, observers reported the capture of 50 kg of porbeagle shark (*Lamna nasus*) in 2015 from the Challenger area. No information on the number of individuals or the life status is available.

Table 17: All records from observer non-fish bycatch forms for seabirds, marine mammals, reptiles, and other species of concern captured by New Zealand vessels for the last 5 years including life status or catch weight as appropriate

Year	Area	Fishing method	Species	Dead/ alive	Catch weight	Notes
2016	Challenger	Trawl	White-faced storm petrel	Alive		
2017	Southern Ocean	Bottom longline	Prion (unidentified)	Alive		
2017	Lord Howe Rise	Trawl	Great-winged petrel	Alive		
2017	Louisville Ridge	Trawl	Storm petrel	Alive		
2018	West Norfolk Ridge	Bottom longline	Black petrel*	Alive		Likely to be a white-chinned petrel based on expert ID
2018	West Norfolk Ridge	Bottom longline	Black petrel	Alive		
2018	West Norfolk Ridge	Bottom longline	Black-browed albatross	Alive		
2018	Lord Howe Rise	Trawl	Great-winged petrel	Alive		

5.4 ECOSYSTEM CONSIDERATIONS

In order to better understand the impacts of fishing on the wider ecosystem, New Zealand's scientific observers record details on quantities of all species caught during fishing activities in the SPRFMO Area. Commercial fishers are also required to report the top eight species per fishing event.

Table 18 provides a summary of the top five non-target teleost species and top five chondrichthyan species reported by observers in bottom contacting trawl fisheries. Table 19 provides a summary of the same information as reported by commercial fishers in New Zealand bottom line fisheries in the SPRFMO Area.

Table 18: Top five non-target (non-orange roughy, alfonsino, or boarfish) teleost species and top five chondrichthyan species observed caught and quantities (tonnes) in New Zealand bottom-contacting trawl fisheries in the SPRFMO Area in the most recent 5 years

Species	2016	2017	2018	2019	2020
Teleosts					
Unicorn rattail *Trachyrincus* spp.	72.1	45.6	35.9	-	-
Rattails *Macrouridae* spp.	90.2	29.5	12.9	1.5	2.0
Ribaldo *Mora moro*	42.3	42.6	31.1	9.4	10.0
Spiky oreo *Neocyttus rhomboidalis*	28.8	33.4	38.7	2.7	9.6
Cardinalfish *Epigonus telescopus*	19.4	3.3	5.3	0.2	10.0
Chondrichthyans					
Shovelnose dogfish *Deania calcea*	100.9	58.8	26.0	2.9	2.4
Seal shark *Dalatias licha*	33.9	20.0	6.7	7.3	5.7
Widenosed chimaera *Rhinochimaera pacifica*	40.1	10.6	5.9	0.2	0.5
Long-nosed chimaera *Harriotta raleighana*	14.1	5.9	5.7	0.07	0.05
Baxter's lantern dogfish *Etmopterus baxteri*	3.5	13.7	3.0	0.8	0.001

Table 19: Top five non-target chondrichthyan species commercially reported (tonnes) in New Zealand bottom line fisheries in the SPRFMO Convention Area (non-target teleosts are covered in Table 7)

Species	2016	2017	2018	2019	2020
			Chondrichthyans		
Spiny dogfish *Squalus acanthias*	4.7	3.5	9.6	8.8	0.7
Northern spiny dogfish *Squalus griffini*	0.5	0.7	0.5	1.2	0.8
Thresher shark *Alopias* sp.	0	0	0.1	3.8	0
Seal shark *Dalatias licha*	0	0.01	0	0	0
Thresher shark *Alopias vulpinus*	0	0	0.1	3.9	0
Shovelnose dogfish *Deania calcea*	0.2	0	0.2	0.6	0.3

5.5 VME ENCOUNTERS AND STATE PROCESSES

From 2008 to 19 May 2019

The VME Evidence Process and move-on rule implemented within move-on blocks in the bottom trawl fishing footprint are described in Ministry of Fisheries (2008b) and Parker *et al*. (2009). The New Zealand move-on rule included two 'thresholds', the first was for weight thresholds for different taxa, the second was a 'biodiversity threshold' which was triggered by the number of certain taxa present in catch (See Appendix 2 for details on the thresholds). Where a trigger was breached, the relevant vessel was required to move-on 5 nautical miles from where the threshold was reached.

Scientific observers deployed on New Zealand bottom trawling trips in the SPRFMO Area complete VME Evidence Process forms for each tow conducted within a move-on area.

The move-on-rule was triggered in the demersal fishery seven times in the 397 trawl tows in move-on areas conducted between 2009 – early 2019 (Table 16). This average rate of less than 2% of tows triggering a move-on is less than the expected rate of about 8% predicted by Penney (2014), probably because the catch rates of VME taxa in the SPRFMO Area are lower than from inside the New Zealand EEZ. The move-on-rule was triggered mostly by exceeding one or more of the weight thresholds of individual VME taxa (six occasions) and less by capturing three or more different indicator taxa from the list of such taxa (two occasions). One event exceeded both thresholds. There were no move-on rule triggers in 2018 or early 2019.

Table 20: Data relating to the implementation of the move-on rule within the New Zealand bottom trawl fishery from 2009 to early 2019. The numbers of tows are those fished in the move-on rule areas only.

Bottom trawling in move-on-rule areas							
Year	No Tows	Observed tows.	Percentage observed	No of move-on events	Exceeded thresholds	Exceeded biodiversity count	Percentage of tows moved-on
2009	18	18	100%	1	1	0	5.6%
2010	56	50	89%	2	2	0	4.0%
2011	79	77	97%	2	2	0	2.6%
2012	22	22	100%	1	0	1	4.5%
2013	14	14	100%	0	–	–	0%
2014	2	2	100%	0	–	–	0%
2015	44	44	100%	0	–	–	0%
2016	69	69	100%	1	1	1	1.5%
2017*	92	92	100%	0	-	-	0%
2018*	24	24	100%	0	-	-	0%
2019**	0	0	-	-	--	-	-

Total	423	414	98%	7	6	2	1.7%

* Includes all effort that either started or finished in a move-on area (may not be consistent with previous years)
** pre-May 2019

In the midwater trawl fishery for bentho-pelagic species the move-on rule was triggered for the first (and only) time in 2018 (Table 17). New Zealand conducted no midwater trawling for bentho-pelagic species in move-on areas in 2014 or 2015 and only 3 tows in move-on areas in 2016. There was a significant increase in midwater trawling activity in move-on areas in 2018 and none in early 2019.

Table 21: Data relating to the implementation of the move-on rule within the New Zealand midwater trawl fishery for bentho-pelagic species 2009 to early 2019. The numbers of tows are those fished in the move-on-rule areas only.

Midwater trawling for bentho-pelagic species in move-on-rule areas							
Year	**No Tows**	**Observed tows.**	**Percentage observed**	**No of move-on events**	**Exceeded thresholds**	**Exceeded biodiversity count**	**Percentage of tows moved-on**
2009	0	0	–	–	–	–	–
2010	6	6	100%	0	–	–	0%
2011	16	16	100%	0	–	–	0%
2012	7	7	100%	0	–	–	0%
2013	5	5	100%	0	–	–	0%
2014	0	0	–	0	–	–	–
2015	0	0	–	0	–	–	–
2016	3	3	100%	0	–	–	–
2017	1	1	100%	0	–	–	–
2018	108	108	100%	1	1	–	1%
2019*	0	0	-	-	-	-	-
Total	143	143	100%	0			<1%

* pre-May 2019

From 19 May 2019 to the end of 2019
From May 2019, management of bottom fisheries was subject to CMM03-2019, which significantly changed the management regime, in particular with respect to fishing areas and avoidance of significant adverse impacts on Vulnerable Marine Ecosystems.

Fishing is now limited to method-specific Management Areas, and an encounter protocol applies whereby if a threshold is reached, the vessel must cease bottom fishing immediately within an encounter area of one (1) nautical mile either side of the trawl track extended by one (1) nautical mile at each end and report the encounter immediately to the Member or CNCP whose flag the vessel is flying and the Secretariat. Taking into account the Scientific Committee's determination of whether the encounter was unexpected based on the relevant VME habitat suitability models, and advice on management actions, at its next annual meeting, the Commission shall determine management actions for each encounter area.

The thresholds to trigger the 'encounter protocol' take two approaches, the first is the weight for individual VME indicator taxa, the second is a 'biodiversity' protocol which triggers when a weight threshold is exceeded for three or more different VME indicator taxa.

Thresholds in CMM03-2019 were as follows:

Annex 6A (2019): Weight Threshold for Triggering VME Encounter Protocol in Any One Tow for a Single VME Indicator Taxa

Taxonomic Level	**Common Name**	**Weight Threshold (kg)**
Phylum Porifera	Sponges	50
Phylum Cnidaria		
Class Anthozoa		

	Order Scleractinia	Stony corals	250
	Order Antipatharia	Black corals	5
	Order Alcyonacea	True soft corals	60
	Informal group Gorgonacea	Seafan octocorals	15
	Order Actiniaria	Anemones	40

Annex 6B: Weight Threshold for Triggering VME Encounter Protocol in Any One Tow for Three Or More Different VME Indicator taxa

Taxonomic Level	Common Name	Weight Threshold (kg)
Phylum Porifera	Sponges	5
Phylum Cnidaria		
Class Anthozoa		
Order Scleractinia	Stony corals	5
Order Antipatharia	Black corals	1
Order Alcyonacea	True soft corals	1
Informal group Gorgonacea	Seafan octocorals	1
Order Actiniaria	Anemones	5
Class Hydrozoa		
Order Anthoathecatae		
Family Stylasteridae	Hydrocorals	1
Phylum Echinodermata		
Class Asteroidea		
Order Brisingida	Armless stars	1
Class Crinoidea	Sea lillies	1

Since 19 May 2019, New Zealand vessels completed 550 trawl tows and zero tows recorded catches that exceeded the encounter thresholds. There were no encounters with potential VMEs in the 2019 calendar year.

From May 2020
At the 8th Commission meeting in 2020, the weight threshold for triggering the VME encounter protocol in any one tow was amended for Scleractinia from 250 kg to 80kg.

Annex 6A (2020): Weight Threshold for Triggering VME Encounter Protocol in Any One Tow for a Single VME Indicator Taxa

Taxonomic Level	Common Name	Weight Threshold (kg)
Phylum Porifera	Sponges	50
Phylum Cnidaria		
Class Anthozoa		
Order Scleractinia	Stony corals	80
Order Antipatharia	Black corals	5
Order Alcyonacea	True soft corals	60
Informal group Gorgonacea	Seafan octocorals	15
Order Actiniaria	Anemones	40

New Zealand reported a VME encounter occurring in the 2020 calendar year, within the North Lord Howe Rise Fishery Management Area. The encounter related to the capture of a quantity of Gorgonacea (FAO code GGW) estimated to be above the encounter threshold of 15 kgs. As per

CMM03-2020, the encounter area was closed to further fishing and a review of the encounter has been provided to SC9 (paper SC9-DW09).

Benthic bycatch data

Fisheries New Zealand observers also collect information on the bycatch of benthic fauna, whether or not a vessel is fishing in a move-on area. Information on the taxa and quantity of benthic bycatch reported by observers in New Zealand's bottom fishing activities is summarised for the last five years in Table 22.

Table 22: Weight in kg (and number of positive reports) of benthic bycatch reported by observers from New Zealand bottom trawl and line fisheries in the SPRFMO Convention Area between 2016 and 2020. Where taxonomic resolution allows, bycatch is presented at the Order level, otherwise at the Class or Phylum level. Row colours refer to VME indicator taxa included in CMM 03-2019 (purple), other VME indicator taxa added to CMM02-2021 (orange), and other benthic bycatch taxa (white).

Taxon	2016	2017	2018	2019	2020
BOTTOM TRAWL					
Arthropoda					
Hexanauplia (Barnacles)	1.7 (4)	0 (0)	0.6 (3)	1.9 (3)	0 (0)
Malacostraca (Crabs, prawns)	6.1 (5)	35.9 (18)	2.9 (4)	8 (3)	3 (2)
Pycnogonida (Sea spiders)	0 (0)	1.0 (1)	0 (0)	1.0 (1)	0 (0)
Brachiopoda (Lamp shells)	0 (0)	1.0 (1)	0 (0)	0 (0)	0 (0)
Bryozoa (Lace corals)	0 (0)	0 (0)	0.4 (2)	0 (0)	0 (0)
Chordata					
Ascidiacea (Sea squirts)	0 (0)	20 (4)	0 (0)	0 (0)	0 (0)
Thaliacea (Tunicates)	4.7 (8)	12.1 (13)	0 (0)	0 (0)	14 (4)
Cnidaria					
Anthozoa (Anemones, corals, sea pens)[1]	546.7 (164)	3369.5 (104)	1252.53 (139)	36.2 (23)	24 (24)
Actiniaria (Anemones)	906.3 (198)	902.5 (159)	989.1 (80)	107.8 (29)	83.5 (34)
Alcyonacea (Soft corals)	0 (0)	0 (0)	0 (0)	0 (0)	0.2 (2)
Antipatharia (Black corals)	48.7 (67)	37.9 (58)	46.9 (69)	13.7 (31)	2.5 (13)
Gorgonian Alcyonacea (Tree-like forms, sea fans, sea whips, bottlebrush)[2]	33.6 (51)	78.9 (73)	45.4 (64)	33.5 (29)	4.3 (7)*
Pennatulacea (Sea pens)	3.3 (15)	18.3 (28)	8.1 (11)	2.1 (10)	1.2 (8)
Scleractinia (Stony corals)[3]	32 (18)	640.1 (61)	47.5 (31)	8.4 (6)	62.8 (40)
Zoantharia (Hexacorals)	194.4 (131)	93.3 (93)	100.9 (57)	1 (1)	9.9 (7)
Hydrozoa (Hydroids)[4]	3 (2)	0.3 (2)	17.3 (11)	21 (21)	0 (0)
Stylasteridae (Hydrocorals)	0 (0)	3.7 (4)	2.3 (3)	0 (0)	0.3 (1)
Echinodermata					
Asteroidea (Starfish)	1.0 (2)	11.7 (8)	4.0 (3)	30.0 (12)	3.3 (5)
Brisingida ('Armless' stars)	2.1 (5)	0 (0)	2.3 (2)	0 (0)	0.1 (1)
Crinoidea (Sea lillies)	3.8 (7)	1.7 (13)	3.5 (6)	20 (20)	0 (0)
Echinoidea (Sea urchins)	1037.2 (38)	215.9 (45)	52.5 (6)	80 (3)	19.3 (13)
Holothuroidea (Sea cucumbers)	17.5 (14)	19.6 (7)	0 (0)	0 (0)	7.6 (03)
Ophiuroidea (Brittle stars)	253.0 (70)	11.3 (16)	2.0 (1)	3.0 (3)	1.6 (3)

Taxon	2016	2017	2018	2019	2020
Mollusca					
Bivalvia (Mussles, clams)	0.2 (2)	0.7 (3)	0.1 (1)	0 (0)	0 (0)
Gastropoda (Snails, whelks, tritons)	1.8 (5)	6.1 (7)	0 (0)	0 (0)	0.2 (1)
Phaeophyceae (Brown algae)	10.0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Porifera (Sponges)[5]	191.9 (125)	428.5 (97)	168.5 (73)	15.4 (16)	22.9 (27)
Sipuncula (Peanut worms)	0 (0)	3 (1)	0 (0)	0 (0)	0 (0)
Unidentified	15.7 (7)	5.7 (5)	4 (4)	0 (0)	0 (0)
BOTTOM LONGLINE					
Cnidaria					
Anthozoa (Anemones, corals, sea pens)[1]	0.2 (1)	0.1 (1)	0.4 (2)	0 (0)	0 (0)
Actiniaria (Anemones)	0 (0)	1.0 (1)	0.3 (1)	0 (0)	0 (0)
Antipatharia (Black corals)	0 (0)	0 (0)	0.2 (2)	0 (0)	0 (0)
Gorgonian Alcyonacea (Tree-like forms, sea fans, sea whips, bottlebrush)[2]	0.4 (3)	2.2 (4)	0.6 (3)	0 (0)	0 (0)
Scleractinia (Stony corals)[3]	0 (0)	0.1 (1)	0.3 (1)	0 (0)	0 (0)
Hydrozoa (Hydroids)[4]	0.8 (2)	2.1 (3)	0.3 (2)	0 (0)	0 (0)
Stylasteridae (Hydrocorals)	2.3 (1)	0.1 (1)	0 (0)	0 (0)	0 (0)
Echinodermata					
Crinoidea (Sea lillies)	0.3 (1)	1.0 (1)	0.6 (1)	0 (0)	0 (0)
Ophiuroidea (Brittle stars)	0.3 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Porifera (Sponges)[5]	0.1 (1)	4.0 (4)	0.2 (1)	0 (0)	0 (0)

* This does not include the encounter event or weight

[1] Includes taxa other than Actiniaria, Gorgonian, Alcyonacea, Scleractinia, Antipatharia, Pennatulacea, Zoanatharia
[2] Includes all Gorgonacea within the sub-orders Halaxonia, Calcaxonia and Scleraxonia
[3] Includes all taxa within the following genera: Solenosmilia; Goniocorella; Oculina; Enallopsammia; Madrepora; Lophelia
[4] Includes taxa other than Stylasteridae
[5] Includes all Porifera within the classes Demospongiae and Hexactinellidae

5.6 INFORMATION RELATING TO ABANDONED, LOST OR DISCARDED FISHING GEAR

A new conservation and management measure on fishing gear and marine plastic pollution in the SPRFMO Convention Area was adopted by the SPRFMO Commission in 2019 (CMM 17-2019), with it coming into force in May 2019.

Fisheries New Zealand observers currently report on abandoned, lost, or discarded fishing gear and any efforts made by a vessel to retrieve lost gear. They also record the catch of fishing materials, primarily small amounts of debris that can be identified as originating from fishing activities. Commercial fishers also report any fishing gear abandoned or lost during fishing activities on their vessel.

Tables 23-25 provide information on reported incidents of abandoned, lost, discarded or retrieved fishing gear from New Zealand vessels fishing in the SPRFMO Convention Area for 2020. 'Retrieved' currently includes catch of any type of debris identifiable as having come from fishing (e.g. floats, bins, etc…). There was one incident of trawl gear lost in the SPRFMO Area by New Zealand vessels in 2020.

Table 23: Gear loss recorded by observers from New Zealand trawl vessels in the SPRFMO Convention Area in 2020

Year	Trawl – abandoned/lost
2019	0
2020	1

Table 24: Gear loss recorded by observers from New Zealand bottom line vessels in the SPRFMO Convention Area in 2020

Year	Hooks	Backbone	Other
2019	N/A	N/A	N/A
2019 exploratory fishery	10,510	14,720 m	3 x grapnel 4 x gaff 1,500m sinking lines 1 x deck knife
2020	323	N/A	N/A
2020 exploratory fishery	1,600	1,450 m	2 x grapnel 3 x floats 1,450m downline 1 x GPS beacon

Table 25: Fishing gear (or part thereof) reported by observers as recovered by New Zealand vessels in the SPRFMO Convention Area in 2020

Year	Fishing gear recovered by trawl vessels	Fishing gear recovered by bottom line vessels
2019	3	0
2020	0	2

* Includes all records of fishing-related rubbish (e.g. “Rubbish-fishing plastics, rubbish-fishing textiles)

6 Implementation of Management Measures

6.1 DESCRIPTION OF HISTORICAL MANAGEMENT MEASURES

A detailed description of New Zealand’s implementation of the SPRFMO interim bottom fishing measures adopted in 2007 can be found in Ministry of Fisheries (2008b) and Penney *et al*. (2009). The management approach, subsequently codified in CMMs 2.03, 4.03, 03-2017, and 03-2018, is summarised below:

High seas bottom trawling measures in the SPRFMO Area were implemented by New Zealand in the form of high seas fishing permit conditions, imposed from 1 May 2008 to 19 May 2019. The key elements of these permit conditions include:

- Schedules designating open, move-on and closed bottom trawling areas within the historical (2002–2006) New Zealand high seas bottom trawl fishing footprint, and prohibiting bottom trawling within closed areas and everywhere else in the SPRFMO Area. These areas were last modified in 2015.
- The move-on rule VME Evidence Process for bottom trawling within move-on areas, with the requirement to report to the Ministry for Primary Industries and move-on 5 nautical miles from where the VME Evidence threshold is reached.
- A requirement to carry at least one observer on all bottom and midwater trawl trips. Observers are provided by the Ministry for Primary Industries and the costs are recovered from industry.
- Requirements for the deployment/implementation of seabird mitigation measures as per CMM 09-2017.
- Prohibition of fishing for *Trachurus* species or using set nets in the SPRFMO Area, including notice to the Ministry for Primary Industries in advance of transiting the SPRFMO Area with a set net on board.

The effect of these measures was to close bottom trawling in 41% of the total 217 463 km^2 New Zealand bottom trawl footprint surface area, with 30% made subject to a move-on rule, and 29% left open to

bottom trawling. The open area represents 0.13% of the entire SPRFMO Area. Maps showing all open areas and those open areas subject to the move-on rule are included in Appendix 3.

Fishing up to May 2019 was conducted pursuant to CMM 03-2018.

From May 2019, management measures changed substantially and were made consistent across all bottom fishing Members with the adoption of CMM 03-2019.

6.2 MANAGEMENT OF THE SOUTHWEST CHALLENGER PLATEAU STRADDLING STOCK ORANGE ROUGHY FISHERY

New Zealand manages the in-zone portion of the orange roughy stock which straddles the New Zealand EEZ and the Westpac Bank area in the SPRFMO Convention Area. The fishery in this area began in the 1980s with the first catch limit in the area set in 1986. New Zealand has completed a number of surveys and stock assessments of the area and, up until 2019, has set and managed New Zealand's catch limits for the full biological stock. The in-zone portion of the stock is comprised of New Zealand Quota Management Area ORH 7A.

The fishery was closed from 2000 to 2010 when it was re-opened with a TAC of 525 tonnes following a stock assessment completed by New Zealand that estimated there to be at least a 70% probability that the biomass had increased above the 'Soft Limit' of 20% B_0 (Ministry of Fisheries 2008a).

The stock was assessed again in 2014, supported by trawl and acoustic surveys (2010, 2013) with the stock estimated to be well above the lower end of the New Zealand agreed management target range of 30-50% B_0. The New Zealand Total Allowable Commercial Catch for ORH 7A was subsequently increased in 2014 to 1,600 tonnes.

The New Zealand bottom trawl management measures up to May 2019 included two open blocks on the Westpac Bank in the SPRFMO Convention Area where the stock straddles the New Zealand EEZ.

New Zealand vessels fishing on the Westpac Bank in the SPRFMO Area are required to report all catches against New Zealand's SPRFMO allocated catch limit and also balance those catches with New Zealand Annual Catch Entitlement to ensure catches are accounted for within the New Zealand Total Allowable Catch for the whole stock.

In 2018, New Zealand undertook a combined trawl/acoustic survey and subsequently updated the stock assessment of the Southwest Challenger Plateau orange roughy stock. The outputs from the stock assessment informed a review of the domestic catch limit (total allowable commercial catch) for the ORH 7A domestic management area. Advice on the catch limit was provided to the Minister of Fisheries who set a catch limit for ORH 7A of 2,058 tonnes that applied for the New Zealand fishing year 1 October 2019 – 30 September 2020.

The updated assessment of the Southwest Challenger Plateau was presented to the 7th Scientific Committee (2019) and the SC made recommendations to the 8th Commission meeting. As a result, the catch limit for the Westpac Bank was revised for CMM03a-2020 (SC7–DW06, SC7-DW07_rev1).

6.3 EXPLORATORY FISHERY FOR TOOTHFISH

New Zealand presented a proposal to the third meeting of the Scientific Committee in 2015 (MPI 2015, SC-03-DW-01) for a 2-year exploratory fishery for toothfish (Patagonian toothfish, *Dissostichus eleginoides*, and Antarctic toothfish, *Dissostichus mawsoni*) using the method of bottom longlining. This proposed fishery was outside New Zealand's existing bottom line fishing footprint (Figure 10) and in excess of average catches during the reference years 2002–2006. The Scientific Committee assessed New Zealand's proposal and confirmed that the proposal was acceptable under Article 22 (then CMM2.03, now CMM 03-2017) and the Bottom Fishery Impact Assessment Standard. The Compliance and Technical Committee and Commission considered the proposal in early 2016 and the Commission approved a 2-year exploratory fishery with a retained catch limit of 30 tonnes of *Dissostichus* spp. (both species combined) each year (see CMM 14-2016).

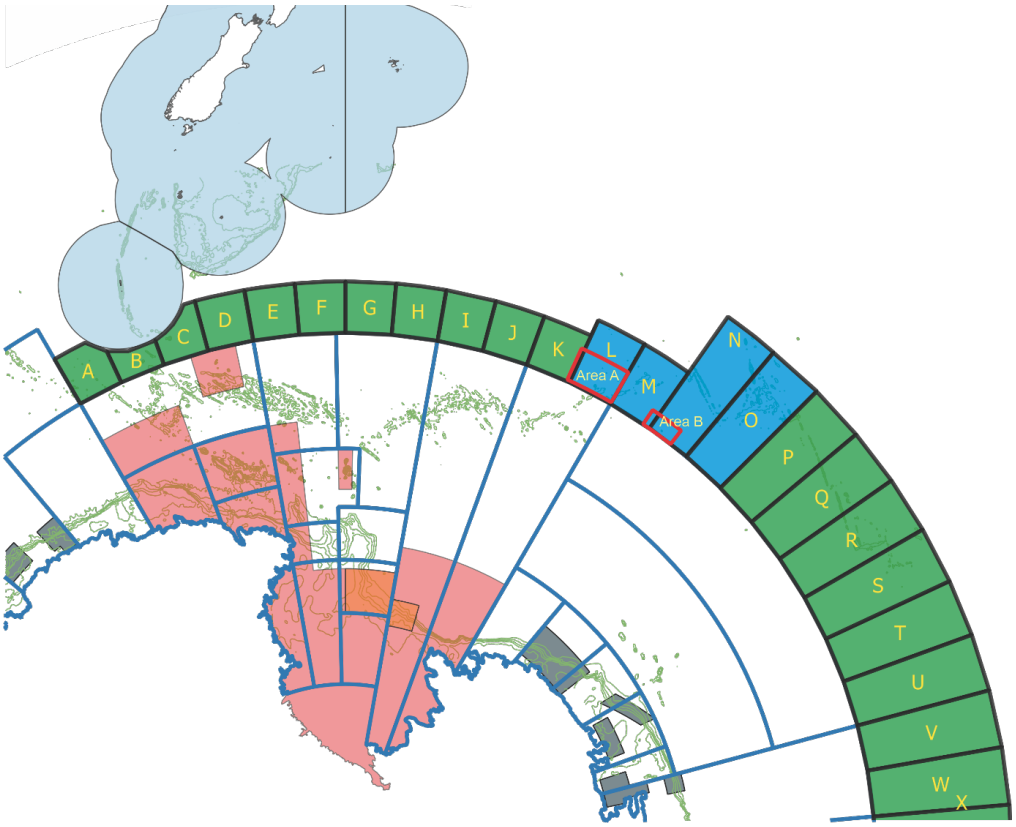

Figure 10: 2019 and 2020 research areas available for fishing coloured blue as defined by CMM-14a-2019. The red boxes (Area A and Area B) show previous research areas from 2016 and 2017.

Two exploratory fishing voyages were completed pursuant to CMM 14-2016, the first in August 2016 (see Fenaughty & Cryer 2016, SC-04-DW-02), the second in August/September 2017. Detailed results from both voyages were presented to SC-06 as part of the proposal for a continuation of the exploratory fishery (SC-06-DW-03-rev2). Generally, catch-rates in the exploratory fishery were very high compared with those typically recorded from most of the CCAMLR Convention Area. Most fish caught were large Antarctic toothfish and in relatively poor post-spawning condition, suggesting the area is close to a spawning ground. Only two Patagonian toothfish were caught and fish bycatch was less than 1% of the total catch by weight in both years. Invertebrate bycatch was less than 1 kg in total for both years.

The Commission approved the continuation of exploratory fishing starting in 2019, designed to cover key gaps in our knowledge of the distribution and life cycle of Antarctic toothfish in the South Pacific Ocean and Ross Sea to underpin understanding and management of those stocks (CMM 14a-2019) . This work complements the exploratory fishing work in the winter longline survey of Antarctic toothfish in the northern region of CCAMLR Subareas 88.1 and 88.2 proposed by New Zealand.

One exploratory fishing voyage was completed in September-October 2019 and a second in February-March 2020. These dates cover the periods after and before the expected spawning season. Total catch of *Dissostichus mawsoni* over the two voyages was 77.5 tonnes, with an additional 5 tonnes of other species taken as bycatch. Bycatch was primarily grenadiers (*Macrourus* spp) and blue antimora (*Antomora rostrate*).

Gonadosomatic Indices indicate that both sexes were progressing towards spawning in the February-March 2020 period. This contrasts with the information from the late 2019 voyage which showed mainly mature and spent fish. In addition, the condition of the fish indicated that the pre-spawning fish (from early 2020) have a marginally worse body condition than the post-spawning fish (late 2019).

A summary of results from the 2019-2021 exploratory fisheries for toothfish has been provided to SC9 (paper SC9-DW04). A proposal to continue the exploratory fishery for toothfish in 2022–2024 has also been provided to SC9 (paper SC9-DW01).

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Appendix 1. List of Species Codes, Scientific Names and Common Names Used

FAO Code	NZ Code	Scientific Name	Common Name
ALF	BYX	*Beryx splendens, B. decadactylus*	Alfonsino & Long-finned beryx
BOE	BOE	*Allocyttus niger*	Black oreo
BWA	BNS	*Hyperoglyphe antarctica*	Bluenose
DGS	SPD	*Squalus spp.*	Spiny dogfish, northern spiny dogfish
EDR	SBO	*Pseudopentaceros richardsoni*	Southern boarfish
EPI	CDL	*Epigonus telescopus*	Deepsea cardinalfish
HAU	HPB	*Polyprion oxygeneios, P. americanus*	Wreckfish (Hapuku & Bass)
MOW	KTA	*Nemadactylus sp.*	King tarakihi
ONV	SOR	*Neocyttus rhomboidalis*	Spiky oreo
ORY	ORH	*Hoplostethus atlanticus*	Orange roughy
RIB	RIB	*Mora moro*	Ribaldo
ROK	SPE	*Helicolenus spp.*	Sea perch
RTX	RAT	*Macrouridae (Family)*	Rattails
RXX	SKI	*Rexea spp.*	Gemfish, southern kingfish
SCK	BSH	*Dalatias licha*	Seal shark
SEM	WAR	*Seriollela brama*	Common warehou
SEP	SWA	*Seriollela punctata*	Silver warehou
SNK	BAR	*Thyrsites atun*	Barracouta
SSO	SSO	*Pseudocyttus maculatus*	Smooth oreo
TOA	TOT	*Dissostichus mawsoni*	Antarctic toothfish
TOP	PTO	*Dissostichus eleginoides*	Patagonian toothfish
YTC	KIN	*Seriola lalandi*	Kingfish

Appendix 2. Vulnerable Marine Ecosystem Evidence Forms & ID Guide

Form used to May 2019

Vulnerable Marine Ecosystem Evidence Process (Version 1.0 - Apr 08)

1. Trip, tow, and vessel information

Trip number	Tow number	Observer/s	Name of vessel master

2. Date, time, and position that hauling of the gear commenced

Date dd/mm/yy	Time 24-hr clock	Latitude Degrees Minutes	Longitude Degrees Minutes E/W
/ /	:	° . ' S	° . '

3. Instructions

Assess the total weights of all organisms whether dead or alive in each of the relevant taxonomic groups and record in Section 4.

If the Observed Weight of a taxonomic group is **greater than** (not equal to) the Threshold Weight, write the VME Indicator Score for that group in the "Score" Column.

If a taxonomic group is present, but the Observed Weight is **not** greater than the Threshold Weight, tick in the "Tick" column.

Sum the scores and count the ticks. Record these totals at the bottom of the columns. Add the Sum of scores to the Count of ticks and record it as the Total VME Indicator Score.

If the Total VME Indicator Score is 3 or greater, the area is considered to have Evidence of a Vulnerable Marine Ecosystem.

The taxonomic groups recorded on this form may not be a complete record of all benthic material present in the tow.

4. Relevant taxonomic groups, weights, and scores

Taxonomic Group	Code	Method of Weighting	Observed Weight (kg)	Threshold Weight (kg)	VME Indicator Score	Score if Threshold Weight exceeded	Tick if not scored but present
PORIFERA	ONG		.	50	3		✓
CNIDARIA							
Anthozoa (class)							
Actiniaria (order)	ATR		.	0	1		
Scleractinia (order)	SIA		.	30	3		✓
Antipatharia (order)	COB		.	1	3		✓
Alcyonacea (order)	SOC		.	1	3		✓
Gorgonacea (order)	GOC		.	1	3		✓
Pennatulacea (order)	PTU		.	0	1		
Hydrozoa (class)	HDR		.	6	3		✓
Unidentified Coral	COU		.	0	1		
ECHINODERMATA							
Crinoidea (class)	CRI		.	0	1		
Brisingida (order)	BRG		.	0	1		
						Sum these scores	Count these ticks
						+	

Total VME Indicator Score → Sum of scores + count of ticks =

5. Vessel notification

As soon as the form is completed for any tow provide a copy to the person in charge of the vessel.

Name (if not vessel master)	Received by person in charge (signature)	Date received (dd/mm/yy)	Time received (24-hr clock)
		/ /	:

Form used from May 2019 to May 2020

Vulnerable Marine Ecosystem Evidence Process

Fisheries New Zealand
Tini a Tangaroa

(v2 April 2019)

1. Trip, tow, and vessel information

Trip number	Tow number	Observer/s	Name of vessel master
		. .	

2. Date, time, and position fishing commenced (net reaches target depth) and end (net leaves target depth)

	Date (dd/mm/yy)	Time (NZST 24hr)	Depth (m)	Latitude	Longitude	E/W
Start	/ /	:		° . 'S	° . '	
End	/ /	:		° . 'S	° . '	

3. Relevant taxonomic groups, weights, and scores

Taxonomic Group	Species code	Method of Weighing	Weight (kg)	(Annex A) Threshold Limit (kg)	(Annex B) Weight Limit (kg)
PORIFERA Sponges	ONG		.	50	5
CNIDARIA					
Anthozoa (class) Anemone, coral and sea pens					
Scleractinia (order) Stony corals	SIA		.	250	5
Antipatharia (order) Black corals	COB		.	5	1
Alcyonacea (order) Soft corals	SOC		.	60	1
Gorgonacea (Informal group) Sea fans octocorals	GOC		.	15	1
Hydrozoa (class) Hydroid					
Pennatulacea (order) Sea pens	PTU		.		1
Actiniaria (order) Sea anemones	ATR		.	40	5
Anthoathecatae (order)					
Stylasteridae Hydro corals	COR		.		1
ECHINODERMATA					
Brisingida (order) Armless stars	BRG		.		1
Crinoidea (class) Sea lillies	CRI		.		1

If there are any ticks in Threshold limit checkbox column the event is considered an encounter and the encounter protocol must be applied. If there are three or more ticks in Weight limit checkbox column the event is considered an encounter and the encounter protocol must be applied.

4. Vessel notification ***Instructions overleaf.**

As soon as the form is completed for any tow provide a copy to the person in charge of the vessel.

Name (if not vessel master)	Received by person in charge (signature)	Date received (dd/mm/yy)	Time received (NZST 24hr)
		/ /	:

5. Instructions

Assess the total weights of all organisms whether dead or alive in each of the relevant taxonomic groups and record in Section 3.

If the weight of a taxonomic group is greater than (not equal to) the Threshold Limit, place a tick in the Threshold Limit box.

If the weight of a taxonomic group is greater than (not equal to) the Weight Limit, place a tick in the Weight Limit box.

If there are any ticks in Threshold Limit checkbox column then encounter protocol applies.

If there are three or more ticks in Weight Limit checkbox column then encounter protocol applies.

The taxonomic groups recorded on this form may not be a complete record of all benthic material present in the tow.

Weighing codes:

1 = Electronic platform scales

2 = Analogue platform scales

3 = Salter scales

4 = Electronic hanging scales

5 = Other weighing method or estimate of weight

Form used from May 2020

Vulnerable Marine Ecosystem Evidence Process

Fisheries New Zealand
Tini a Tangaroa

(v3 February 2020)

1. Trip, tow, and vessel information

Trip number	Tow number	Observer/s		Name of vessel master

2. Date, time, and position fishing commenced (net reaches target depth) and end (net leaves target depth)

	Date (dd/mm/yy)	Time (NZST 24hr)	Depth (m)	Latitude	Longitude	E/W
Start	/ /	:		° . 'S	° . '	
End	/ /	:		° . 'S	° . '	

3. Relevant taxonomic groups, weights, and scores

Taxonomic Group	Species code	Method of Weighing	Weight (kg)	(Annex A) Threshold Limit (kg)	(Annex B) Weight Limit (kg)
PORIFERA Sponges	ONG		.	50	5
CNIDARIA					
Anthozoa (class) Anemone, coral and sea pens					
Scleractinia (order) Stony corals	SIA		.	80	5
Antipatharia (order) Black corals	COB		.	5	1
Alcyonacea (order) Soft corals	SOC		.	60	1
Gorgonacea (Informal group) Sea fans octocorals	GOC		.	15	1
Hydrozoa (class) Hydroid					
Pennatulacea (order) Sea pens	PTU		.		1
Actiniaria (order) Sea anemones	ATR		.	40	5
Anthoathecatae (order)					
Stylasteridae Hydro corals	COR		.		1
ECHINODERMATA					
Brisingida (order) Armless stars	BRG		.		1
Crinoidea (class) Sea lillies	CRI		.		1

If there are any ticks in Threshold limit checkbox column the event is considered an encounter and the encounter protocol must be applied. If there are three or more ticks in Weight limit checkbox column the event is considered an encounter and the encounter protocol must be applied.

4. Vessel notification

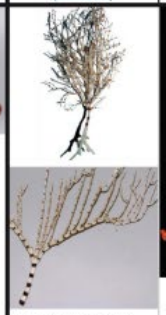
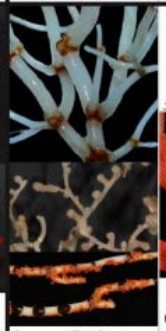
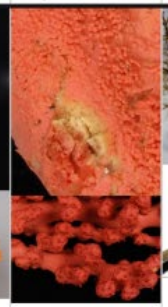
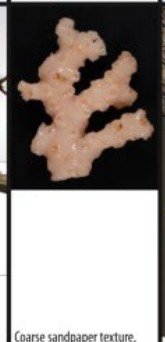
As soon as the form is completed for any tow provide a copy to the person in charge of the vessel.

Name (if not vessel master)	Received by person in charge (signature)	Date received (dd/mm/yy)	Time received (NZST 24hr)
		/ /	:

Note these are MFish codes

Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area

These groups are not included: Bryozoan, Snails, Sea Stars, Clams, Urchins, Worms, Crabs

Code	SIA p71-79	COB p 57-58	SOC pg 55-56	GOC p 59-65					HDR p 9; 66-68	
Level	Scleractinia (Order)	Antipatharia (Order)	Alcyonacea (Order)	Gorgonacea (Order)					Anthoathecate (Family)	Hydroida (Order)
Taxon	Stony corals	Black corals	Soft corals	Isididae (Bamboo)	Coralliidae (Red / Precious)	Primnoidae (Bottle brush, Sea fans)	Paragorgiidae (Bubblegum)	Chrysogorgiidae (Golden)	Stylasterids (Hydrocorals)	Hydroids
Form, Size	 **Branching:** Can form large matrices, often forms thickets **Cups:** usually small (<20cm), solitary or in small clusters	 Semi-rigid, woody, not very dense, dark brown or black skeleton, can be large (>2m). Branch tips can look like hydroids or small gorgonian	 Can be mushroom shaped. Floppy or soft, leather-like surface texture. Usually multiple large polyps, body not symmetrical, no foot or stalk	 Solid calcified trunk with brown joints (nodes), rings in x-section, branching 2D or 3D, fine tips, tree like branch tips	 Calcified skeleton, no spines. Thick, stubby stems with fine side branches	 Dark or metallic tree-like branches, flexible	 Large (up to 2m), red, thick stems, breaks when flexed	 Gold, black or green metallic lustre. Semi-rigid single, main axis with semi-soft tissue cortex. Small specimens can be feathery like hydroids or bushy like black coral	 Calcified, no rings in X-section, often pink or white. Often uniplanar, side branches lattice from obviously thicker main stems	 Entire organism small, <30cm, flexible and plant-like, often feathery, no soft tissue covering
Detail (Texture, colour, polyps)	 Calcified, very hard or brittle **Branching:** Often smooth stems **Cups:** Can be ridged Polyp calyces well formed with ridged edges, large, hard polyps	 Slimy flesh on branches. Surface with minute spines, may appear smooth. 3D, fine or bushy tips	 Similar polyps to seapens, but soft corals are not stalked	 Can scrape off surface tissue, skeleton surface smooth between nodes	 Can scrape surface tissue off. Smooth (not sandpapery) with knobbly ends. No pores on skeleton	 Usually no spines, some metallic lustre on skeleton, 3D Bushy branches, obvious polyps	 Chalky material, not hard. No spines, can scrape off surface. Bulbous ends with polyps	 Can be non-branching and whip-like. Usually no spines, metallic lustre. Fine or sparse 3D branching	 Coarse sandpaper texture, can't scrape off surface tissue. Has minute pores	 Indistinct polyps, feathery tips
Commonly mistaken for:	 Branching form can look like hard sponges but sponges are light with spicules	 Hydroid if small, or small pieces of dead Gorgonacea	 Small pieces of Corallidae. Can also resemble Demosponges, which have no polyps	 Other gorgonians if in small pieces, but won't break easily	 Soft corals, which always have soft stems	 Hydroids if small pieces, but have distinct polyps	 Small pieces of Corallidae	 Antipatharia, but tips are not slimy	 Small, hard Bryozoans or pieces of Coralliidae	 Small specimens of Gorgonacea or Antipatharia

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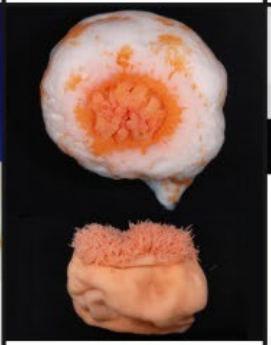
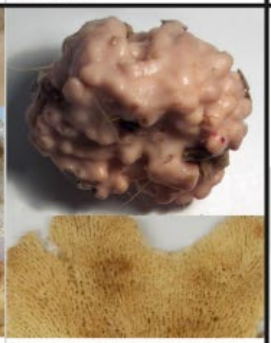
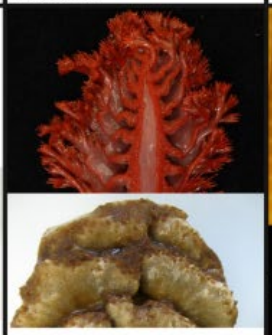
Developed by: D Tracey, S Parker, E Mackay, O Anderson, K Ramm, (2008)

Note these are MFish codes

Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area

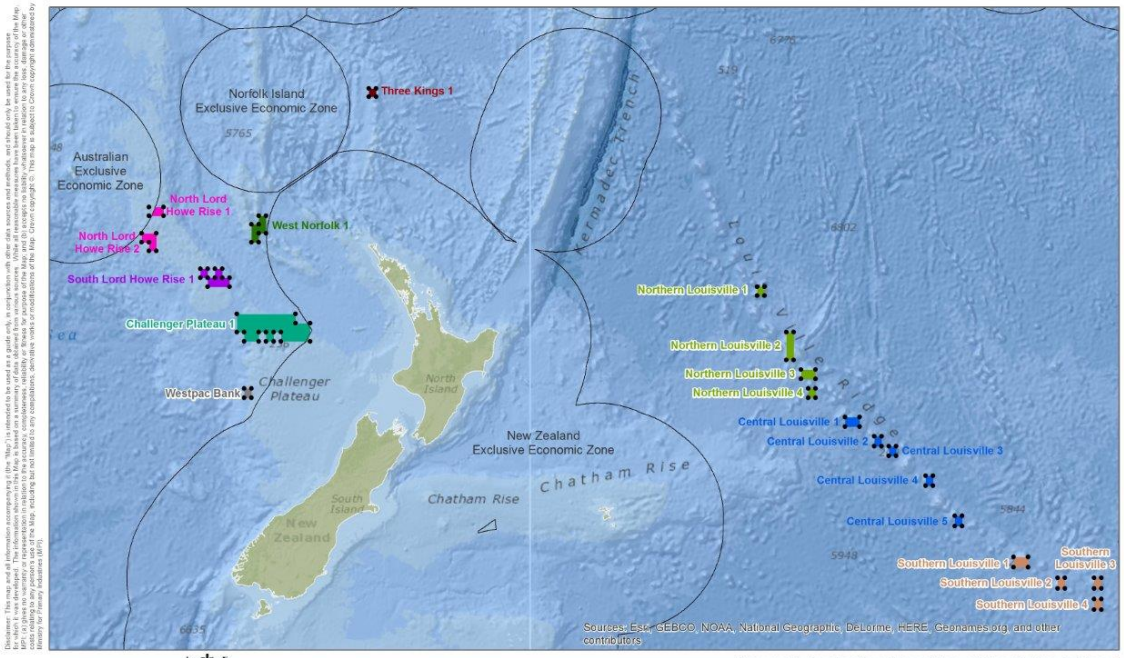
These groups are not included: Bryozoan, Snails, Sea Stars, Clams, Urchins, Worms, Crabs

Code	ONG p 30-45		ATR p 51-54	PTU p 69-70	CRI p 230-232	BRG p 207
Level	Porifera (Phylum)		Actiniaria (Order)	Pennatulacea (Order)	Crinoidea (Class)	Brisingida (Order)
Taxon	Hexactinellida (Glass sponges)	Demospongiae (Siliceous sponges)	Anemones	Sea pens	Crinoids	Armless stars
Form, Size						
	Often hollow central chamber can be vase like. Diverse shapes; fibrous or crystalline hard forms	Many shapes, some small & hydroid-like to round hard solid masses	Rubbery bottom with single polyp with lots of tentacles. Usually in retracted hardened cylinder form when captured	Feather-shaped with fleshy polyps. Non-branching to whip-like cartilaginous stalk. Fleshy foot or anchor present, body symmetrical. Can be tall, >1 m	Stalked. Small cuplike body. Arms usually branched. Crinoids are generally fragile, often only fragments. A long stalk, some bearing whorls of hooklike cirri	At least 6 arms, usually more than 10. Arms easily separated from central disc and often all that is taken
Detail (Texture, colour, polyps)						
	Pores often visible, glass spicules visible or fibre-glass like texture in hard forms	Fleshy, slimy or rubbery. Textures stony, woody, fibrous or airy	Knobbly, slimy, with tentacles. Tentacles sometimes look like worms when detached	Fleshy polyps. Flower or feather like polyp mass	Fragile, not flexible. Brittle and segmented	Long spines on ventro-lateral margin
Commonly mistaken for:						
	Bryozoans or scleractinians that are small and of a hard matrix	Alcyonaceans or ascidians, which are not spongy and have polyps or siphons	Alcyonaceans, which usually have several polyps or the Corallmorpharia a coral called jewel anemone	Alcyonaceans or some Gorgonians due to large polyps and size	Arm fragments can look like other animals such as brisingids	Other sea stars with multiple arms (e.g., brittle stars) and crinoid arms

Images used copyright of NIWA, MFish, CCAMLR, LINZ

Developed by: D Tracey, S Parker, E Mackay, D Anderson, K Ramm, (2008)

Appendix 3. Areas open to New Zealand flagged vessels for bottom fishing to May 2019



Ministry for Primary Industries
Manatū Ahu Matua

Figure 1: Indicative Location of the Bottom Trawl Open Area Coordinates as Described in Annex A

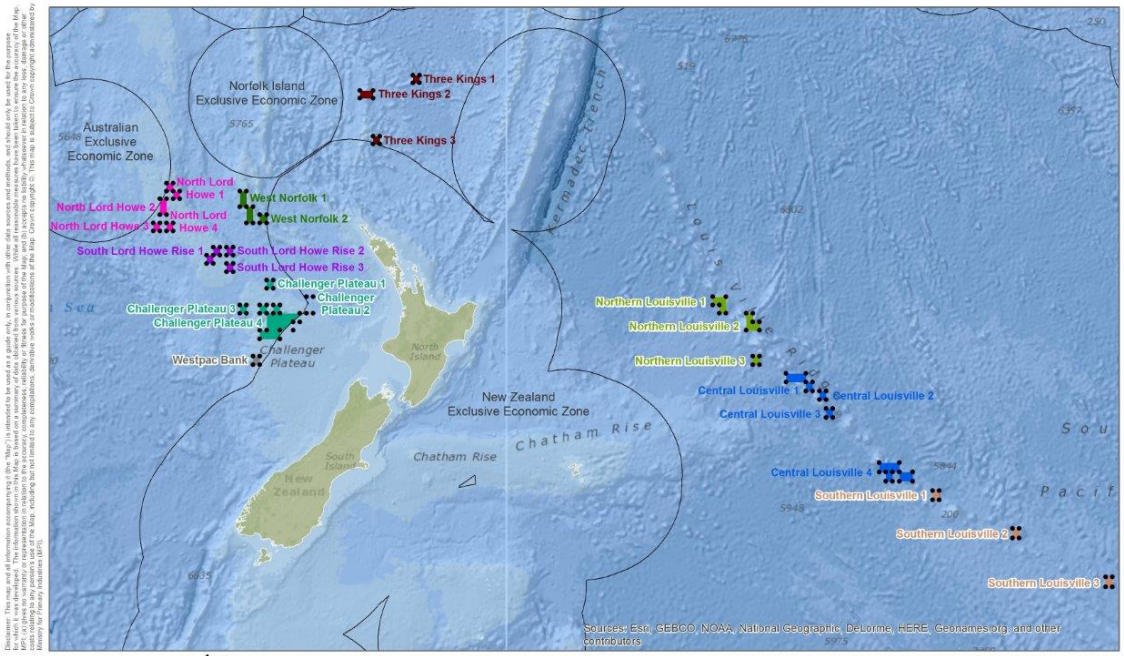
0 250 500 km
0 125 250 nm

1:15,000,000 @ A4
Data Coordinate System: WGS84
Map Coordinate System: WGS Mercator 41

• Coordinate locations

Date: 20/04/2016
Produced by: Spatial Analysis Solutions
Ref: r160094

Data Attribution:
This map uses data sourced from LINZ under CC-BY



Ministry for Primary Industries
Manatū Ahu Matua

Figure 2: Indicative Location of the Bottom Trawl Move On Coordinates as Described in Annex B

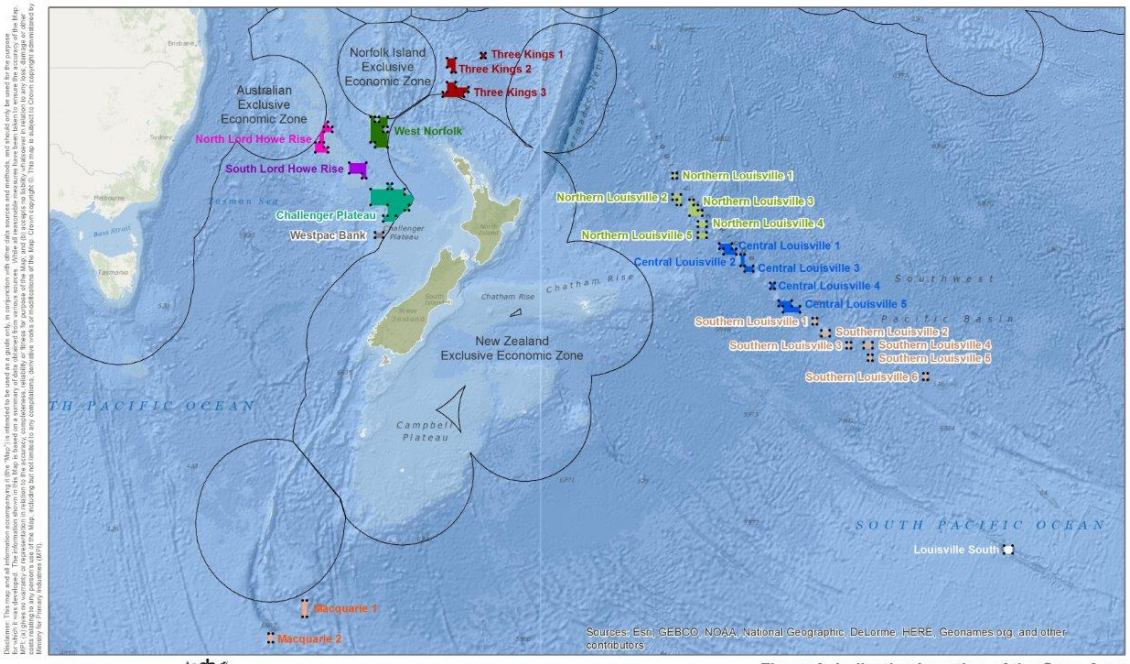
0 250 500 km
0 125 250 nm

1:16,500,000 @ A4
Data Coordinate System: WGS84
Map Coordinate System: WGS Mercator 41

• Coordinate locations

Date: 20/04/2016
Produced by: Spatial Analysis Solutions
Ref: r160094

Data Attribution:
This map uses data sourced from LINZ under CC-BY



Ministry for Primary Industries
Manatū Ahu Matua

0 400 800 km
0 200 400 nm

1:26,000,000 @ A4
Data Coordinate System: WGS84
Map Coordinate System: WGS Mercator 41

Data Attribution:
This map uses data sourced from LINZ under CC-BY

Figure 3: Indicative Location of the Open Area Coordinates for Bottom Longline as Described in Annex C

Date: 19/04/2016
Produced by: Spatial Analysis Solutions
Ref: r160094

Appendix 4. Areas open to bottom fishing from May 2019 (as per CMM 03-2019 & CMM 03-2020)