South Pacific Regional Fisheries Management Organisation

11th MEETING OF THE SCIENTIFIC COMMITTEE

11 to 16 September 2023, Panama City, Panama

SC11 – Doc16
Annual Report of New Zealand to SC11

New Zealand

Fisheries New Zealand

Tini a Tangaroa

New Zealand Annual Report on Fishing, Research Activities, and Observer Implementation in the SPRFMO Convention Area during 2022

SPRFMO SC11-Doc17

September 2023

New Zealand Government

Disclaimer

While every effort has been made to ensure the information in this publication is accurate, Fisheries New Zealand does not accept any responsibility or liability for error of fact, omission, interpretation or opinion that may be present, nor for the consequences of any decisions based on this information.

Requests for further copies should be directed to:

Publications Logistics Officer
Ministry for Primary Industries
PO Box 2526
WELLINGTON 6140

Email: brand@mpi.govt.nz
Telephone: 0800 00 83 33
Facsimile: 04-894 0300

This publication is also available on the Ministry for Primary Industries website at http://www.mpi.govt.nz/news-and-resources/publications/

Contents

Page

1	**Description of Fisheries**	**1**
1.1	Pelagic Fisheries	1
1.2	Bottom Fisheries	1
2	**Catch, Effort and CPUE Summaries**	**3**
2.1	Total Catch	3
2.2	Trawl Fisheries	4
2.3	Bottom Line Fisheries	7
3	**Fisheries Data Collection and Research Activities**	**10**
3.1	Fisheries Catch & Effort Data Collection Systems	10
3.2	Research Activities	11
4	**Observer Implementation Report**	**18**
4.1	Observer Training	18
4.2	Observer Programme Design and Coverage	19
4.3	Biological Sampling and Length/Age Composition of Catches	21
5	**Ecosystem Approach considerations**	**24**
5.1	Antipodean Albatross	24
5.2	Seabird Mitigation Measures	24
5.3	Observed Interactions with Seabirds and Other Species of Concern	24
5.4	Ecosystem Considerations	25
5.5	VME Encounters and State processes	26
5.6	Information Relating to Abandoned, Lost or Discarded Fishing Gear	31
6	**Implementation of Management Measures**	**32**
6.1	Description of historical Management Measures	32
6.2	Management of the Southwest Challenger Plateau Straddling Stock Orange Roughy Fishery	33
6.3	Exploratory fishery for toothfish	34
7	**References**	**37**
Appendix 1. List of Species Codes, Scientific Names and Common Names Used		**41**
Appendix 2. Vulnerable Marine Ecosystem Evidence Forms & ID Guide		**42**
Appendix 3. Areas open to New Zealand flagged vessels for bottom fishing to May 2019		**50**
Appendix 4. Areas open to bottom fishing from May 2019 (per CMM 03-2019-CMM 03-2023)		**52**

1 Description of Fisheries

1.1 PELAGIC FISHERIES

Jack mackerel
New Zealand conducted no fishing for *Trachurus* species in the SPRFMO Convention Area in 2022.

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 2022.

1.2 BOTTOM FISHERIES

New Zealand vessels have been bottom fishing in the now-SPRFMO Convention Area since before 1990. 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'* (http://www.sprfmo.int/science/benthic-impact-assessments/). Bottom fishing activities conducted during 2022 operated as described in that document. This document is in the process of being updated by New Zealand and Australia in 2023.

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

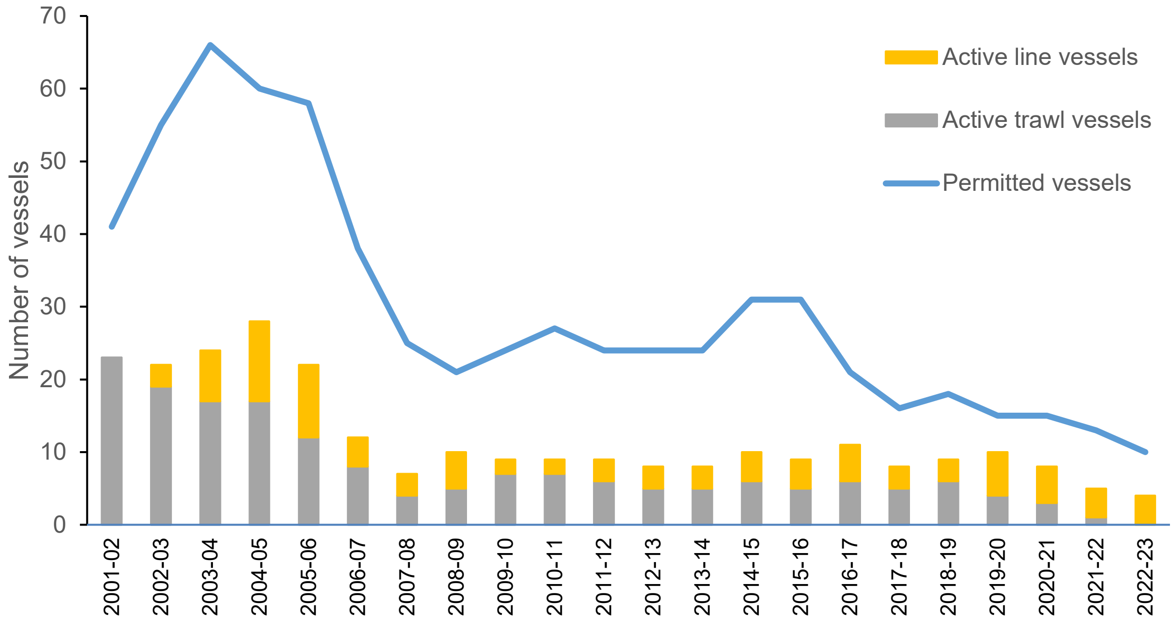


Figure 1: Summary of the number of New Zealand vessels permitted to bottom fish in the SPRFMO Area, and the number of vessels which were active in the Area by year by method. The data are arranged by permit year, which runs from May to April

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
2018–19	18	9	6	3
2019-20	15	10	4	6
2020-21	15	8	3	5
2021-22	13	5	1	4
2022-23	10	4	0	4

The number of trawl vessels operating in the Area declined from a peak of 23 vessels in 2001/02 and has fluctuated between 0 and 7 vessels since 2008 (Figure 1). The number of vessels bottom line fishing peaked at 11 vessels in 2004/05 and has been stable between 2 and 6 vessels since (Figure 1).

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).

Permit year	Length overall (m)									
	≤ 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
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
2021-22	0	1	3	0	1	3	3	2	0	13
2022-23	0	1	2	0	0	3	3	1	0	10

The main areas of bottom fishing utilised by New Zealand vessels outside of the New Zealand EEZ since 2006 are shown as the labelled grey boxes in Figure 2. Bottom Trawl, Midwater Trawl, and Bottom Line Areas from CMM 03-2023 are also displayed. The main areas of bottom fishing utilised by New Zealand vessels are broadly consistent with the FMAs used in the Bottom Fishing Impact Assessment.

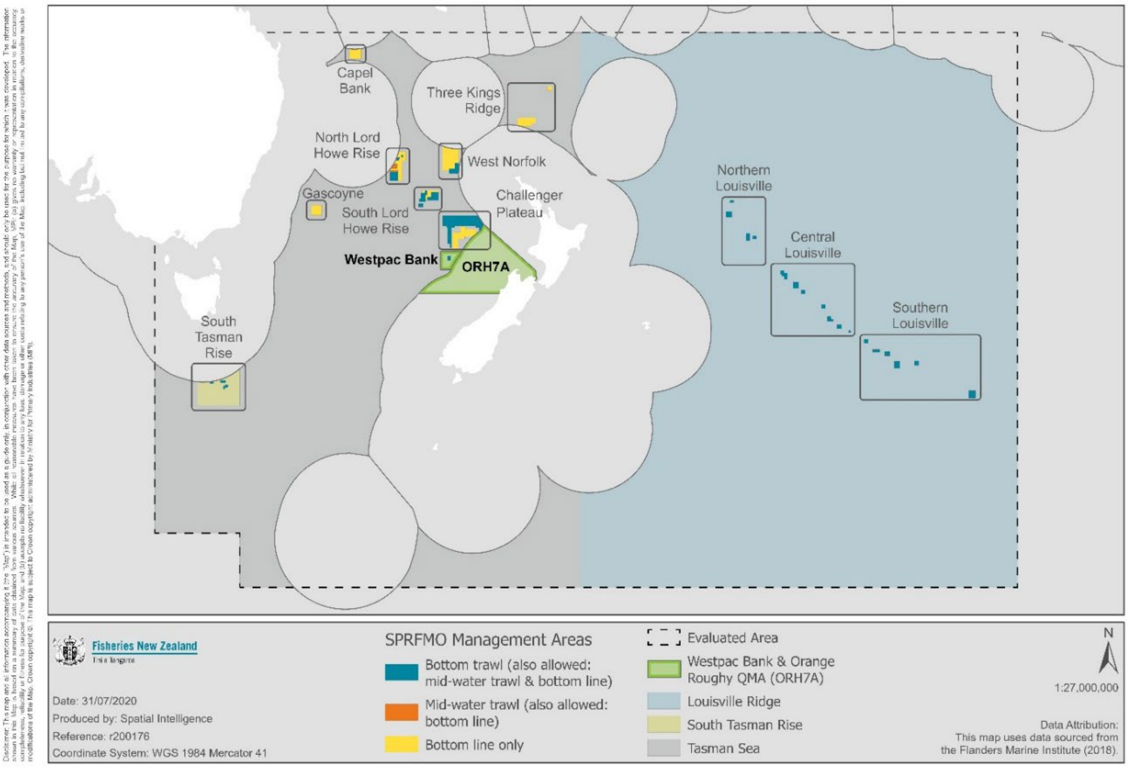


Figure 2: The general areas bottom fished by New Zealand trawlers in the SPRFMO Convention Area since 2006 (grey boxes) overlaid with Management Areas from CMM 03-2023

2 Catch, Effort and CPUE Summaries

2.1 TOTAL CATCH

New Zealand conducted no trawl fishing in the SPRFMO Convention Area during 2022.

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.

	2018	2019	2020	2021	2022	
Orange roughy catch	1 232	210	80	0	0	Tasman Sea
		111	88	20	0	Westpac Bank
		139	133	0	0	Louisville
Orange roughy limit	1 852	277	277	569	569	Tasman Sea
		190	245	245	245	Westpac Bank
		1 026	1 026	1026	1026	Louisville
Other species catch	635	269	170	44	53	
Other species limit*	762	762	762	762	762	
Exploratory catch	N/A	42.7	42.8	25.4	39.5	
Exploratory limit	N/A	140	140	240	240	

* 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

Historically New Zealand's trawl fisheries in the SPRFMO Convention Area have been 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 3 vessels and 199 tows 2019-2021.

New Zealand conducted no trawl fishing in the SPRFMO Convention Area during 2022.

Orange roughy (ORY) has been the main target species and has made up 67-99% of the total New Zealand bottom trawl catch since 2002 with tonnages ranging from 22 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.

Year	No. Vessels	No. Tows	Avg. Tows/ Vessel	ORY	ONV	BOE	EPI	ALF	SSO	RIB	RTX	SCK	Total (t)
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
2021	1	17	17	20	0	0	0	0	0	0	0	1	22
2022	0	0	0	0	0	0	0	0	0	0	0	0	0

* tows reported here is the number of tows which recorded a fish catch and excludes tows where there was no catch, for the total number of tows including tows with no catch see Table 15.

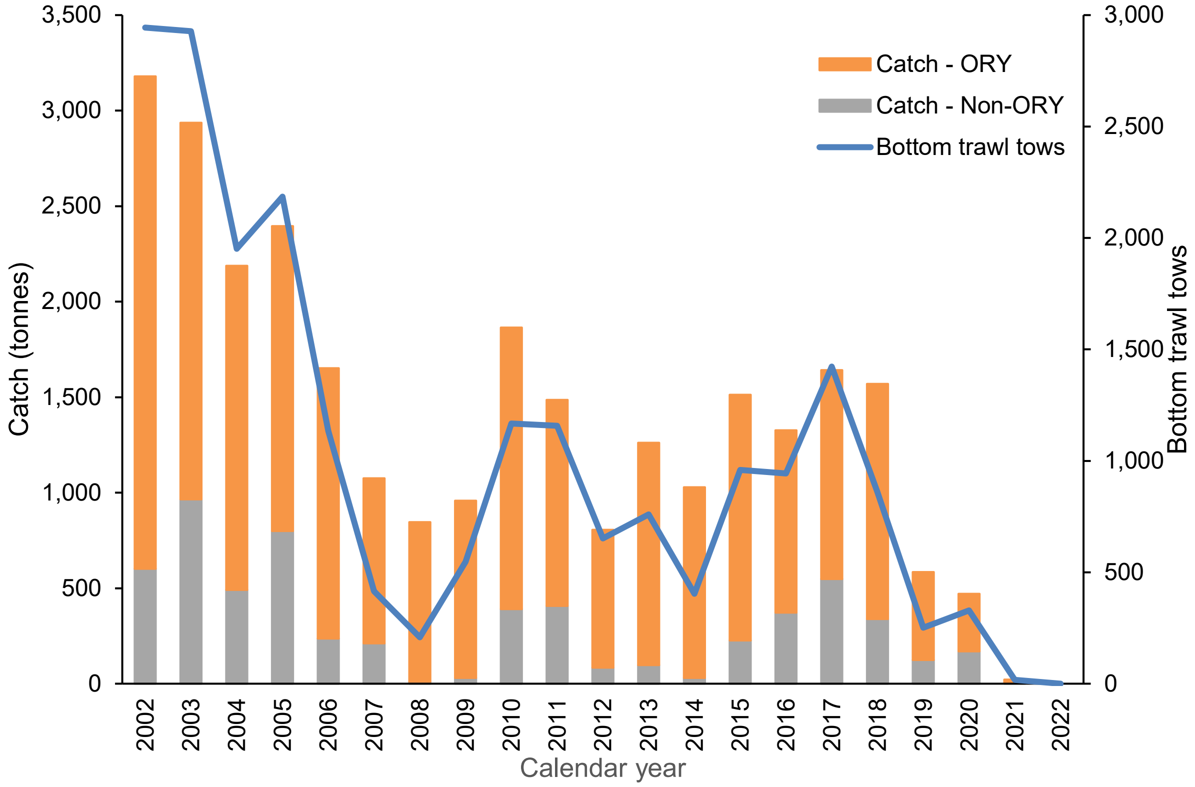


Figure 3: New Zealand bottom trawl effort (number of tows recording a catch) and catch (in tonnes) from 2002 in the SPRFMO Convention Area. For the total number of bottom trawl tows including tows with no catch see Table 15.

Table 5: Bottom trawl effort (number of tows recording a catch) in the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Area over the last 5 calendar years and that were prior to the introduction of CMM 03-2019. Reported effort for the Westpac Bank only includes effort on the high seas. For the total number of bottom trawl tows including tows with no catch see Table 15.

Year	Challenger Plateau	Westpac Bank	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
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 recording a catch) in the main areas fished by New Zealand vessels fishing in the SPRFMO Area over the last 5 calendar and that were post the introduction of CMM 03-2019. These values are consistent with management and catch limit areas. For the total number of bottom trawl tows including tows with no catch see Table 15.

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
2021	0	0	0	0	17	0	17
2022	0	0	0	0	0	0	0

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 over the last 5 calendar and that were post the introduction of CMM 03-2019. Landings from the Westpac Bank area (part of the Challenger Plateau) are also reported against New Zealand's ORH7A catch limit.

Year	Challenger Plateau	Westpac Bank	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
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 over the last 5 calendar and that were post the introduction of CMM 03-2019. These values are consistent with management and catch limit areas in.

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
2021	0	0	0	0	20	0	20
2022	0	0	0	0	0	0	0

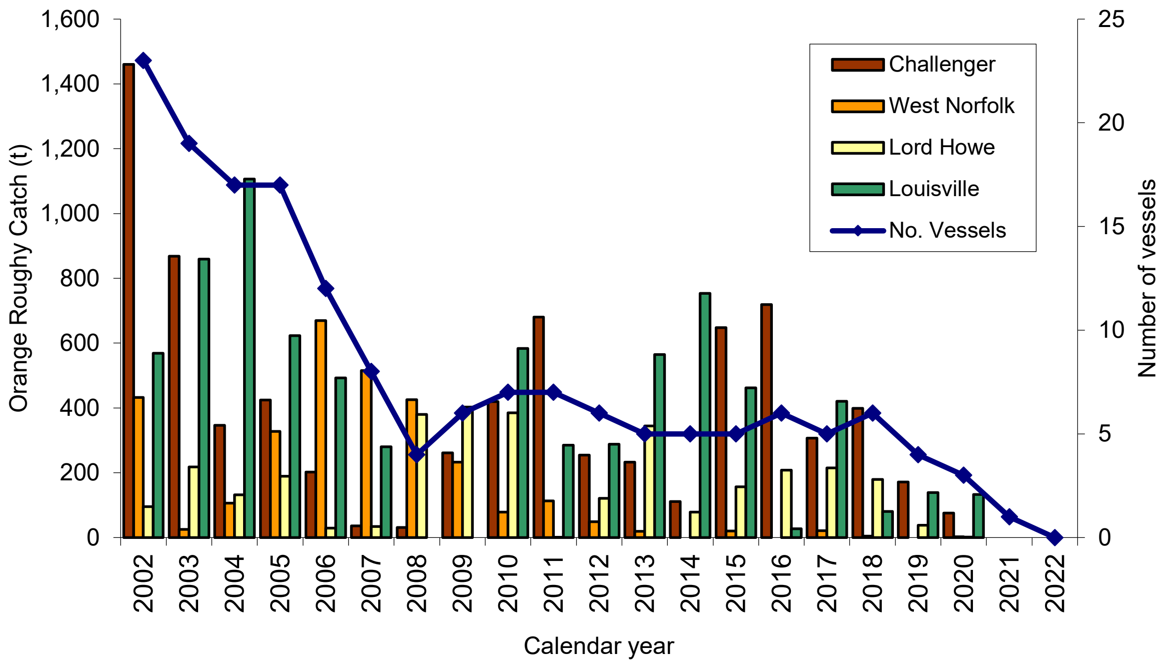


Figure 4: Trends in effort (the number of vessels bottom trawling) and total landings of orange roughy (tonnes) for each of the four main areas fished by New Zealand bottom trawl vessels in the SPRFMO Area by calendar year from 2002.

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). New Zealand conducted no midwater trawls in the SPRFMO Convention Area in 2022.

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 the midwater trawling occurred.

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
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
2021	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0

* tows reported here is the number of tows which recorded a fish catch and excludes tows where there was no catch, for the total number of tows including tows with no catch see Table 15.

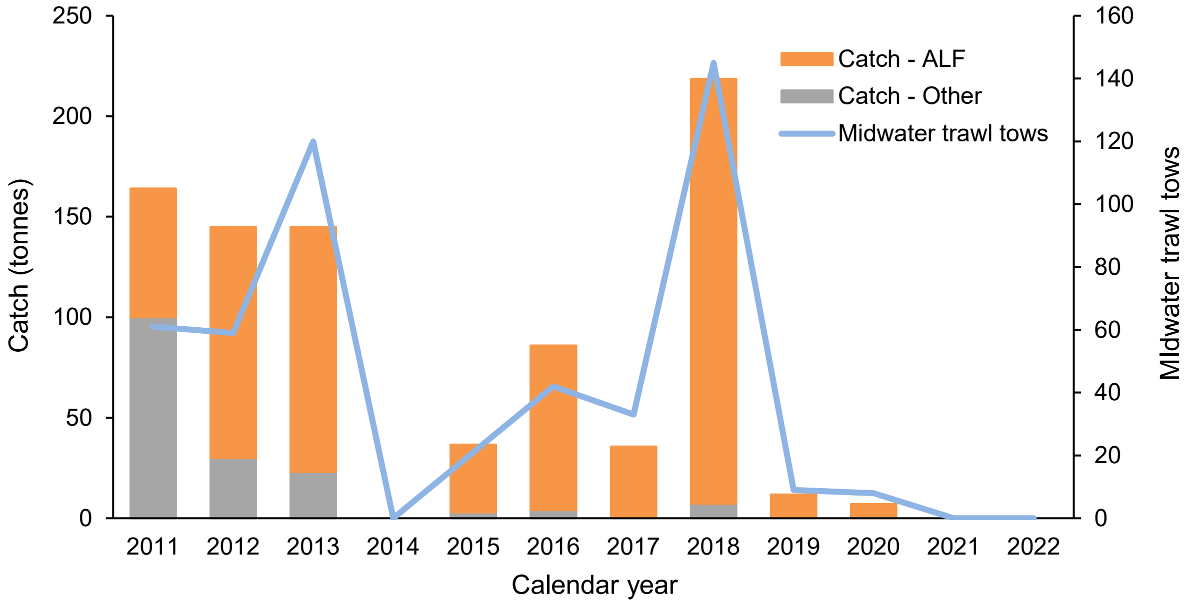


Figure 5: New Zealand midwater trawl effort (number of tows recording a catch) and catch (in tonnes, split between ALF and other species) from 2011 in the SPRFMO Convention Area. For the total number of midwater tows including tows with no catch see Table 15.

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 set in 2022 was approximately 252 000.

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 CMM 03-2023, '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 8-38 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, 14a-2019, 14a-2022 (but see Table 13).

Year	No. Vessels	No. Trips	No. Hooks (000s)	Hooks/ Vessel (000s)	BWA	HAU	DGS	MOW	RTX	Total catch (t)
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
2021	4	11	97	24	20	7	1	1	0	43
2022	3	6	252	84	8	33	8	2	0	53

* This includes a trip that began in Dec 2018 and ended in Jan 2019

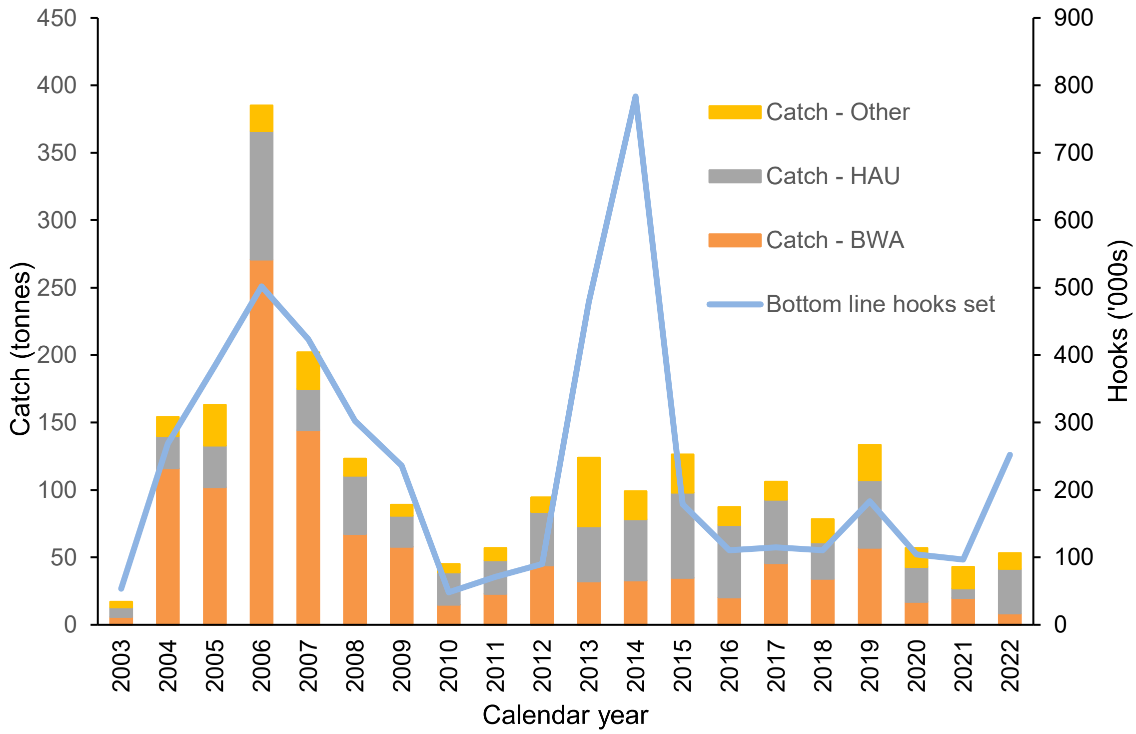


Figure 6: New Zealand bottom line effort (thousands of hooks) and catch (in tonnes, split between HAU, BWA and other species) from 2003 in the SPRFMO Convention Area.

Bluenose catch (BWA) by main fishing areas since 2018 is shown in Table 11, with the relationship between catch and fishing effort shown 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	Other	All Areas
2018	27	7	-	-	-	34
2019	31	17	9	-	-	57
2020	7	8	-	1	-	17
2021	12	4	2	-	2	20
2022	1	4	1	2	-	8

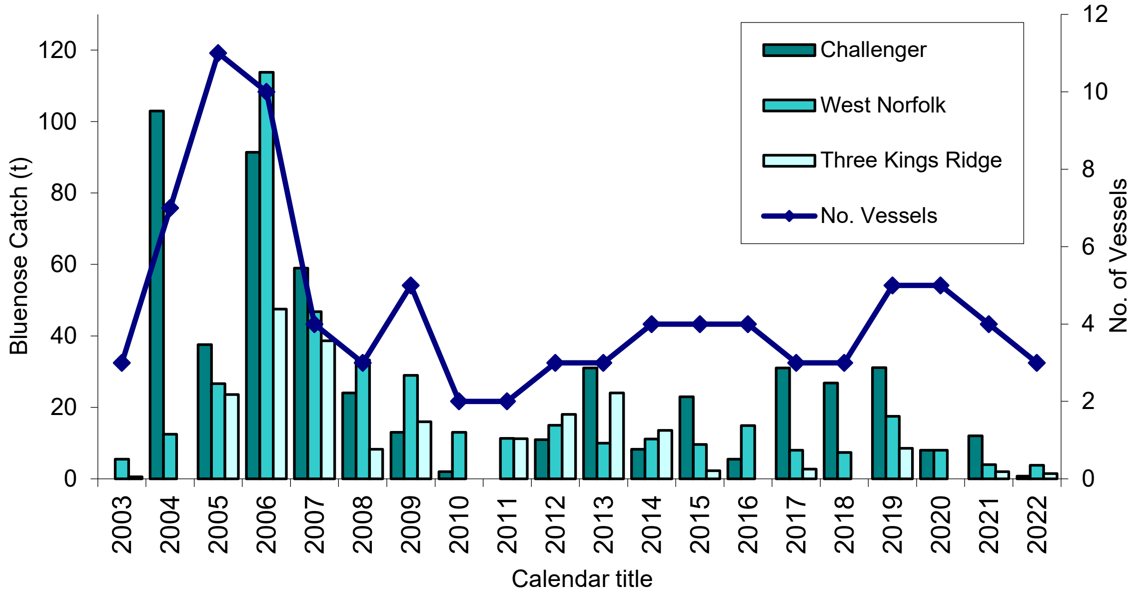


Figure 7: Trends in number of bottom line fishing vessels and total bluenose catch from the three main areas fished by New Zealand bottom line vessels in the SPRFMO Area by calendar year 2003-2022.

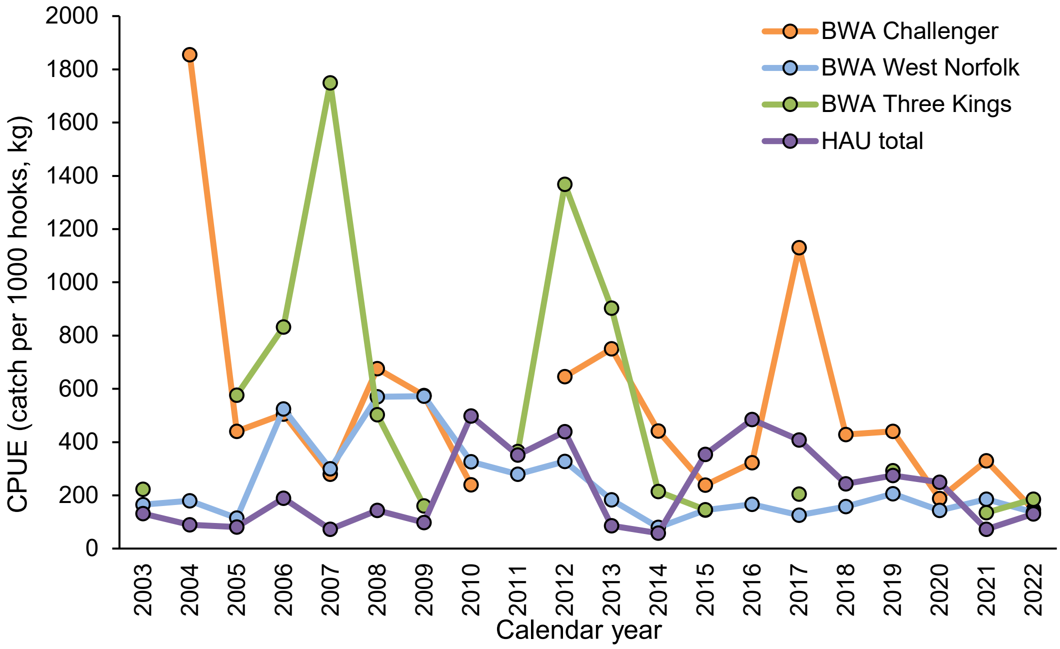


Figure 8: Trends in nominal CPUE (kg per 1000 hooks set) for bluenose (BWA) for the three main areas fished and wreckfish (HAU) by New Zealand bottom longline vessels fishing in the SPRFMO Area by calendar year 2003–2022.

Bottom longline comprised all of the fishing effort (252 287 hooks in 2022) and catch (53 tonnes in 2022) compared to other bottom line methods. Effort using other bottom line methods (i.e., hand lines, drop lines, trot lines, and dahn lines) is significantly less and more variable over time in the SPRFMO area. 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)
2018	1	120	<1	<1	<1	-	<1
2019	1	20	<1	-	<1	-	<1
2020	1	30	<1	<1	<1	<1	<1
2021	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0

Table 13: Effort and catches for New Zealand vessels bottom longlining in exploratory fisheries in the SPRFMO Area by calendar year for the previous 5 years under CMM 14a-2022. 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)
2018	-	-	-	-	-	-	-	-	-
2019	1	1	124.1	36.5	0.08	1.2	0.5	1.3	39.68
2020	1	1	98.0	41.0	0.06	0.9	0.02	0.4	42.82
2021	1	1	376.4	32.6	0	2.8	0	1.0	36.58
2022	1	1	89.1	38.7	0.02	0.38	0	0.22	39.53

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 CMM02-2022. 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. 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 to CMM02-2022 (Appendix 2).

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. Since 2020 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 SPRFMO Scientific Committee and SPRFMO Commission meetings, New Zealand has worked with Australia to progress a number of workstreams to inform the development and review of the bottom fishing conservation and management measure CMM 03-2023. Progress updates on these workstreams have been presented to deepwater workshops, the fourth through tenth Scientific Committees, and the sixth through eleventh meetings of the Commission. A brief summary of each aspect of recent work is provided below, noting that most of this work has been reported in individual papers to the Scientific Committee. In addition, newly progressed workstreams to be presented at the 11th Scientific Committee are also summarised.

3.2.1 Modification of Bottom Trawl Management Area Boundaries to Achieve a 70% Protection Target for VME Indicator Taxa

Australia and New Zealand have developed a paper for SC11 that presents modifications to the boundaries of the Bottom Trawl Management Areas (BTMA) established under para 14 and Annex 4 of CMM03-2023 to allow the Commission to apply a minimum of 70% protection of suitable habitat for each modelled VME indicator taxa, as required under para 19 of CMM03-2023 (SC11-DW05). BTMA boundaries are modified in 5 of 9 Fisheries Management Areas to ensure that spatial management in all FMAs provide for a minimum of 70% protection of suitable habitat for all modelled VME indicator taxa. The paper recommends that the Commission applies a minimum of 70% protection of suitable habitat for each modelled VME indicator taxa, as required under para 19 of CMM03-2023, by adopting the modifications to the BTMA boundaries as presented in SC11-DW05.

3.2.2 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). At SC9, New Zealand presented a paper that provided an addendum to the Cumulative Bottom Fishery Impact Assessment for Australian and New Zealand bottom fisheries in the SPRFMO Convention Area 2020 (SC9-DW02). The addendum in this paper detailed missing information on the current protection levels afforded in the Westpac Bank area.

New Zealand and Australia have submitted an update to the Cumulative Bottom Fishing Assessment for SC11 (SC11-DW01) in accordance with the relevant obligations prescribed in SPRFMO Conservation and Management Measures (CMMs) and the SPRFMO Bottom Fishing Impact Assessment Standard (BFIAS) (SPRFMO 2019), updating the 2020 BFIA (Delegations of Australia and New Zealand 2020).

The 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, previous stock assessments indicated stocks were likely above limit biomass reference points, noting that subsequent stock assessments work has been performed since (Section 3.2.12). 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 (see SC8-DW07 rev1 for more details).

Impact and risk to benthic habitats and VMEs was also a key focus of the assessment. Habitat suitability models are available for sixteen VME indicator taxa. Estimates of Relative Benthic Status for ten of these sixteen taxa have been updated to reflect proposed changes to the BTMAs to achieve a minimum level of 70% protection for suitable VME habitat, although the new RBS estimates do not reflect recent reductions in catch limits for the orange roughy fishery. Overall, the results for the BTMAs implemented under CMM03-2023 generally show that RBS exceeds 95% for most combinations of taxa, FMA and sensitivity, although there are some exceptions. Similarly, the results for the BTMAs proposed to be implemented in 2024 also generally show that RBS exceeds 95% for most combinations of taxa, FMA and sensitivity for future fishing effort, again with some exceptions.

Estimates of the proportion of the estimated distribution of suitable habitat and abundance for each taxon outside areas open to bottom trawling have been calculated, on the basis of management measures implemented in CMM03-2023, and alternatives proposed to be adopted by Commission in 2024, as described in SC11-DW05. These calculations have been done at the scale of BTMAs within FMAs and using a variety of model structures where available and assumptions to assess sensitivity in the estimates.

Under the spatial management measures implemented in CMM03-2023, over 70% of Habitat Suitability for most VME indicator taxa within an FMA is within areas closed to fishing, but this reference point is not met for some taxa, particularly within Northwest Challenger, Central Louisville and South Louisville.

Under the spatial management measures that are proposed in SC11-DW05, all VME indicator taxa with > 1% of their HSI within an FMA have at least 70% of Habitat Suitability within areas closed to fishing.

A range of additional analyses are also presented to explore uncertainty in the habitat suitability index (HSI) modelling, including potential model over-prediction, as well as analyses of the relationships between HSI and abundance of VME indicator taxa on the seafloor and the catchability of VME indicator taxa in trawl gears. These analyses should be considered when interpreting results provided in the VME impact assessment and making inferences about the performance of CMM03-2023 (bottom fishing).

New Zealand has developed a paper for SC11 evaluating the orange roughy population and wider ecosystem impacts of carrying forward of TACs over multiple years (SC11-DW06). This includes evaluating the impact of different year gaps in harvesting on: the orange roughy population; the footprint of the fishery and overlap of footprint with predicted distributions of VME indicator taxa.

3.2.3 Further development of VME indicator taxa distribution

New Zealand presented a paper at SC10 that updated the Scientific Committee on: (i) the development of habitat suitability models for previously unmodelled VME indicator taxa; and (ii) the development of abundance models for VME indicator taxa (SC10-DW05).

Habitat suitability models, and associated uncertainty estimates, for previously unmodelled VME indicator taxa were developed following the same methods presented in the New Zealand and Australia BFIA (SPRFMO SC8-Report 2020). Similarly, to previous modelled VME indicator taxa, model estimates for the newly modelled VME indicator taxa (Actinaria, Brisingida, Bryozoa, Hydrozoa, Zoantharia, Crinoidea (and sub-groups stalked Crinoidea and unstalked Crinoidea) were assessed as having high statistical skill in classifying suitable habitat. Pending acceptance of the new habitat suitability models by the SC, a total of 17 VME indicator taxa habitat suitability models would be available for the SPRFMO Evaluated Area, covering all VME indicator taxa listed in Annex 5 of CMM 03-2023.

Two methods for estimating spatial distribution of the abundance of VME indicator taxa were trialled: a data-driven modelling approach which is underpinned by (the limited) abundance data; and a principles-based approach, i.e., where distribution of abundance of taxa are based on known or estimated relationships informed by experts.

- The data-driven approach was trialled for two VME indicator taxa: *Goniocorella dumosa* (representing the order Scleractinia, stony corals) and Demospongiae (representing the phylum Porifera, sponges). Both abundance models produced credible predictions of spatial distributions of relative abundance with high correlations between modelled predictions and observed abundances (noting that these samples were also used to train the models).
- A preliminary trial of abundance modelling using a principles-based approach (having only received input from a subset of experts, 5 out of 22 experts) provided spatial estimates which visually appeared plausible, but which performed no better at predicting abundance than previously developed habitat suitability models. Further work is required to fully assess the appropriateness of this approach, including the integrations of responses from a greater number of experts (representing a variety of expertise and knowledge of the taxa) and possibly combining expert opinion using alternative elicitation methods than those tested.

Where sufficient abundance data exist to develop robust statistical models, a data-driven approach will be prioritised for estimating the distribution of VME indicator taxa abundances. However, given the paucity in abundance data, it is likely that for at least some VME indicator taxa, insufficient abundance data will be available to develop robust data-driven models. For these VME indicator taxa, the principles-based approach could be further explored and may remain the only means to estimate distribution of abundance for data poor taxa.

New Zealand has developed a paper for SC11 on abundance models for VME taxa. This includes a continuation of the 2022 abundance modelling work (SC10-DW05) (SC11-DW07). It presents abundance models for 15 VME indicator taxa within the evaluated area of the SPRFMO Convention Area using data-driven and principal based approaches (Table 1). Additionally, to assess the utility of existing habitat suitability models and abundance models developed by this work for informing management decisions we also explore: 1. the relationship between models and historic benthic bycatch; and 2. the use of abundance models to develop VME indices. It also includes development of a spatial model with the vector autoregressive spatio-temporal (VAST) modelling platform for a VME indicator taxon in the SPRFMO Evaluated Area, with predictive biomass maps, uncertainty for biomass estimates and predictions of the biomass useful for relating to trawl bycatch data.

3.2.4 Design of a process for reviewing historical bycatch in bottom fisheries

New Zealand presented a paper at SC10 that created a process to review all recent and historical benthic bycatch data to determine the ongoing effectiveness of the spatial management measures (SC10-DW03). This firstly required broad-scale spatial patterns of historic bycatch relative to the location of bottom trawl management areas (BTMAs) to be mapped so as to visualise broad spatial patterns of benthic bycatch. Following mapping of broad-scale patterns of historic bycatch, closer examination of fine-scale spatio-temporal patterns in historic bycatch for key areas of interest will be required to determine the potential presence of VMEs. The SC10 paper presented an approach to mapping the broad-scale spatial distribution of historic benthic bycatch of VME indicator taxa by New Zealand bottom trawl vessels operating within the Evaluated portion of the SPRFMO Convention Area between 2008 and 2022. The paper presented a series of Figures and Tables that identifies Fisheries Management Areas (FMAs) and BTMAs where there has historically been a high frequency of interactions with VME Indicator taxa (e.g., the South Lorde Howe – East; Northwest Challenger; and Central Louisville 15 Management Areas) or exceptionally large bycatch events (e.g., of Scleractinia in the West Norfolk; North Louisville Ridge 23; Central Louisville Ridge 13, 14 and 15). Conversely, the Figures and Tables also identify FMAs and BTMAs where bycatch of VME indicator taxa has been relatively infrequent (e.g., North Lord Howe – North; North Lord Howe – South; Westpac Bank; North Louisville Ridge 17 and 18; South Louisville Ridge 3, 5, 7, 8, 9 and 11). The paper proposed that for locations within BTMAs with a high number of encounter events, or with high bycatch, that fine-scale spatio-temporal investigations of historic bycatch are undertaken to determine the ongoing effectiveness of the spatial management measures.

New Zealand has developed a paper for SC11 that updates the results presented in SC10-DW03 with reference to the new BTMA boundaries Australia and New Zealand are proposing in SC11-DW05 for adoption in 2024 to allow the SPRFMO Commission to achieve a 70% spatial protection target for modelled VME indicator taxa. The paper also proposes an approach for fine-scale spatio-temporal analysis of areas within BTMAs with where there has historically been a high frequency of interactions with VMEs. .

3.2.5 Investigate catchability of benthic bycatch

New Zealand presented a paper at SC10 that investigates the catchability of benthic bycatch of VME indicator taxa using existing data to support design of a wider research programme (SC10-DW04). Bottom trawl gear, designed to catch fish, is relatively inefficient at catching benthic invertebrates, including vulnerable marine ecosystem (VME) indicator taxa. Depending on their size and structure, some organisms may be broken into small fragments and lost from the net before it is recovered to the surface for examination of the bycatch, while other organisms might be able to withstand or avoid the passage of the trawl net and therefore not be included in the bycatch. Estimating catchability of benthic bycatch is important for informing future review of the VME encounter protocol included in CMM 03-2023 by allowing the potential extent of the impact on the VME corresponding to a given encounter threshold level to be estimated. Two types of data were used to estimate catchability: co-located data (trawl surveys which included images and video from headline cameras) and paired data (where imagery data was collected adjacent to trawl tows). The results of the analyses (as for previous assessments, SC7-DW14 and SC7-DW21-rev1), indicate that in general the catchability of VME indicator taxa by bottom trawls is very low to low (<5%), but for some taxa it can be moderately (5-10%) or relatively high (>20%). In addition to variation by taxa, the previous and present paired data analysis for SPRFMO (the most comparable analyses), indicate that catchability can vary by geographic area and depth. However, there are several issues that relate to these catchability estimates (using both paired and co-located data) that provide cause for concern about their robustness (i.e., small sample sizes, spatial coverage of imagery and mismatch between trawl locations and imagery location), despite all the measures that were taken to make them as reliable as possible. The data evaluated in this analysis represent the best available estimates, but as per the previous analyses, are insufficient to yield quantitative estimates of catchability for VME indicator taxa with certainty. Recommendations to help design a programme to better determine catchability of VME indicator taxa were provided based on the findings from this study.

3.2.6 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.

At SC9 New Zealand presented a paper that proposed a process for Members to review encounters with potential VMEs in bottom fisheries (SC9-DW08). This paper also outlined a suggested process for the SPRFMO SC to implement when it reviews Member submissions on encounters at its annual meeting. The SC adopted the components of the process identified in this paper as an interim protocol for the review of encounters with potential VMEs under CMM 03-2021. The SC also agreed that this protocol be further developed intersessionally and as science advances or to reflect any changes to the CMM. New Zealand actively contributed to the bottom fishing intersessional working group and one of the questions being considered was, how can the encounter review process be strengthened to provide greater benefits in assessing significant adverse impacts on VMEs and identifying management options?

At SC9 New Zealand also presented a paper that provided a Member review of the VME encounter that occurred in 2020 on a New Zealand flagged vessel that was bottom trawling in the SPRFMO area (SC9-DW09-rev1). The purpose of the review was to provide a detailed description of the encounter and suggest management actions to prevent SAIs on VMEs to meet requirements of CMM03-2021. This information was used to inform a review of the encounter by the SC. The SC noted multiple aspects of the paper (see SC9-DW09_rev1) including that the Commission was still deliberating on appropriate levels of protection. The SC also recommended that:

i) If assessing SAI on VMEs at the scale of FMAs, reopening the Encounter Area would likely not result in SAI on VMEs; and

ii) If assessing SAI on VMEs at the scale of the Encounter Area, reopening the Encounter Area may result in SAIs on VME

Another topic that is being considered by the bottom fishing intersessional working group, that New Zealand is actively contributing to, is management actions for the 2020 encounter area.

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

New Zealand presented a paper to SC9 to update candidate encounter thresholds for the 13 VME indicator taxa included in Annex 5 of CMM-03-2020 , with the intention of developing an authoritative set of candidate encounter thresholds for all VME indicator taxa (SC9-DW10). 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. The SC recommended to the Commission that the updated candidate encounter thresholds for VME indicator taxa presented in SC9-DW10 are used to inform any future refinement of the VME indicator taxa thresholds included in Annex 6A and 6B of SPRFMO CMM-03-2021. Noting the need for the SC to provide more biologically meaningful guidance on appropriate VME thresholds the SC recommended to the Commission that it adds to the VME Encounters and Benthic Bycatch task in the SC Multi-Annual Work Plan a 2023+ subtask to develop a research programme within the SPRFMO Convention Area to allow the determination of taxon-specific estimates of catchability for VME indicator taxa. This work is currently in progress (section 3.2.4).

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

New Zealand presented a paper to SC9 on 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 (SC9-DW07). 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. The SC noted that: the analysis was focused on stony coral reef habitat on the Louisville Seamount Chain, as it was the only available information suitable for this task at this time; that other taxa and areas could only be addressed in the future, when abundance models are available to perform such analyses (in particular, such models for ‘slope’ environments); and that abundance models are already included in the SC multi annual work plan for 2022. The SC also agreed to recommend to the Commission that: utilising the best available scientific information, for the stony coral *Solenosmilia variabilis* on the Central Louisville Seamount Chain, increasing the move-on distance from 1 to 5 nm would increase encounter avoidance by an additional 7% and reduce availability of the previously fished area by an additional 53%. During COMM10 it was proposed that an intersessional process should review CMM-03-2021 and report back to the 2023 Commission meeting. The five interrelated components identified for the review are the scale of management to prevent and assess adverse impacts on VME; the protection scenarios; move on rule; specific 2020 VME encounter and reopening that area; and the encounter review process. New Zealand is actively contributed to this bottom fishing intersessional working group.

3.2.9 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. At SC9 New Zealand presented updated lists of VME indicator taxa known from the Evaluated Area of the SPRFMO Convention Area by identifying taxa that meet a combination of FAO criteria for defining VMEs rather than a single criterion (SC9-DW11). These lists were designed to be an important resource for SC work on defining VME indicator taxa. The SC reaffirmed that the lists of VME taxa should be reviewed periodically and updated as necessary when better information on the taxa become available, so that taxa can be assessed against more VME criteria. The SC also recommended discussion with the FAO and other RFMOs on the potential usefulness of different criteria combination approaches and how they could be standardised among RFMOs.

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

New Zealand presented a paper to SC9 to propose 10 steps for the development of a user-friendly identification (ID) guide and training videos that can be used by observers and fishers to identify benthic bycatch landed during bottom fishing activities (SC9-DW12). This work was intended to enable fishers, observers and researchers to recognize benthic bycatch taxa more readily, and to improve the quality of catch records from the SPRFMO Convention Area. The SC recommended that the development of ID guide for benthic bycatch, following the steps proposed in this paper, and associated training videos, are added to the SC Multi-annual Work Plan with a 2022+ timeframe.

New Zealand presented a paper at SC10 that provided an update on the SC multi-annual workplan subtask to develop an ID guide for benthic bycatch, following the steps proposed in SC9-DW12 (SC10-DW06). The paper reports on progress against 7 of the 10 steps identified in SC9-DW12, including the development of a purpose statement for the ID guides, what taxa and taxon-specific information to include in the guide, appropriate levels of taxonomic classification to inform management while minimizing misclassification, and procedures for handling, sampling, labelling and photographing bycatch, including when samples should be collected and returned for expert identification. The paper also introduces updates to the Classification Guide for potentially vulnerable invertebrate taxa in the SPRFMO Convention area to include all VME indicator taxa in Annex 5 of CMM 03-2023 and recommends that the updated guide is published on the 'Science' page of the SPRFMO website and used by observers and fishers to identify VME indicator taxa landed as bycatch during bottom fishing operations.

New Zealand has developed a paper for SC11 on to provide an update on development of an ID guide for benthic bycatch (SC11-DW09), following the steps proposed in SC9-DW12. The paper introduces assessments by taxonomists and para-taxonomists of the taxonomic resolution at which taxa reported in Annex 2 of SC10-DW06 should be included within the ID guide. Additionally, the paper identifies several additional taxa that should be included within the ID guide, based on their known occurrence within the SPRFMO evaluated area. The paper recommends that the SC agrees the list of taxa presented in Annex 1 is used to begin updating the ID guide.

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

New Zealand and Australia presented a paper to SC9 that developing spatial management scenarios for bottom trawling and VME indicator taxa using different approaches (SC9-DW06_rev1). 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 rev 1 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. The SC agreed that the approach taken to develop spatial management protection scenarios and report on their performance is appropriate and work will continue intersessionally to refine scenarios to meet all protection targets for presentation to Commission. The SC recommended that the Commission consider the results of the spatial protection scenarios including to inform its determination of the level of protection required to prevent SAI on VMEs in the SPRFMO Convention Area. Also, the SC noted that ecologically relevant spatial scales for assessing protection levels to prevent SAIs on VME indicator taxa still remain to be agreed, but that the existing information at the FMA is likely to be a more biologically appropriate compared with larger scales. Following SC9 New Zealand and Australia continued development of spatial management scenarios intersessionally and presented updated scenarios to COMM10. As previously stated, this is one of the topics considered by the bottom fishing intersessional working group that New Zealand actively contributed to.

3.2.12 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. The SC requested bottom fishing Members to co-develop a framework for providing precautionary advice on such captures.
New Zealand presented a paper to SC9 that developed this framework (SC9-DW13). 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. The SC recommended the Commission notes the four different types of advice that can be sought from SC on the capture of seabirds, marine mammals, reptiles and other species of concern, and associated

resourcing and other implications related to the data required to provide different types of scientific advice, as outlined in this framework.
New Zealand presented a paper at SC10 that updated SC8-DW14 by providing the direct and indirect interactions between bottom fishing and marine mammals, seabirds, reptiles and other species of concern between 2020-2021 (SC10-DW02).

3.2.13 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.). 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 had generally made up the majority of New Zealand's catch in the SPRFMO Area.

New Zealand has previously 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.

New Zealand presented a paper for SC10 that updated the orange roughy stock assessments for the Lord Howe Rise (1 stock), West Norfolk Ridge (1 stock) and Louisville Ridge (3 stocks) (SC10-DW01_rev1). However, application of the stock assessment methods used in SC7-DW05 and SC8-DW10 to one of the domestic New Zealand stocks has shown that the stock assessments have undesirable statistical properties (linked to over-parameterisation; where more parameters are being estimated than can be informed by the data) (Dunn et al., 2022). Subsequently, the orange roughy research task for 2022 was to (1) evaluate the existing stock assessment model approach (SC7-DW05 and SC8-DW10) for precision and accuracy and (2) if the modelling approach was acceptable, then updating the assessments, and if the modelling approach was not acceptable, to produce estimates of the minimum biomass for each stock (B_{min}). Evaluation of the assessment of the Central Louisville Ridge from SC7-DW05, including simulation studies, found that the approach was unreliable for estimating stock size and status given the available data. The historical age data were few and noisy and so offered little signal on stock size and status, and the model fitted to those data was over-parameterised. The stock assessment models were instead used to estimate B_{min}. Catch limits based upon a fixed proportion of B_{min} could be deemed precautionary (depending on the proportion used). That is, it is very likely that the true virgin biomass was higher than the estimated minimum and so using this estimate as a basis for setting sustainable catch limits would represent a conservative approach. B_{min} estimates can be used as a proxy for B_0 (virgin biomass) estimates and that sustainable yields should be calculated by applying a fixed scalar to the B_{min} associated with an MCY (maximum constant yield) policy of 1.45% (i.e., sustainable yield = $0.0145 \times B_{min}$). Until further informative data are available the uncertainty in sustainable yield estimates will remain high. The most informative data to collect would likely be acoustic biomass estimates. Catch limits for orange roughy stocks were reduced at COMM 11 based on this updated stock assessment (CMM 03a-2023 Deepwater Species)

As previously outlined above, New Zealand has developed a paper for SC11 to evaluate the orange roughy population and wider ecosystem impacts of carrying forward of TACs over multiple years (SC11-DW06).

3.2.14 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).

3.2.15 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 03-2023 (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 03-2023 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 2022. Numbers in () are observed.

Month & year	Trawl: N vessel trips (N observed)	Trawl: N days	Bottom line: N vessel trips	Bottom line: N days	Bottom line: N hooks
Jan-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Feb-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mar-22	0 (0)	0 (0)	2 (2)	21 (20)	135 928 (71 303)
Apr-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
May-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Jun-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Jul-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Aug-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sep-22	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Oct-22	0 (0)	0 (0)	1 (0)	8 (0)	59 000 (0)
Nov-22	0 (0)	0 (0)	2 (0)	6 (0)	50 565 (0)
Dec-22	0 (0)	0 (0)	2 (0)	11 (0)	95 922 (0)
Total	**0 (0)**	**0 (0)**	**7 (2)**	**46 (20)**	**341 415 (71 303)**

Overall, the following levels of coverage were attained in 2022:

- Bottom contacting trawl: N/A (0 of 0 days)
- Bottom line: 21% (20 days of 46; ~71,000 hooks of ~340,000)

There was no trawling by New Zealand vessels in the SPRFMO region in 2022.

Four New Zealand bottom line vessels operated in the SPRFMO Area during 2022. Two bottom line trip was observed comprising 20 vessel days with 71,300 hooks observed. 88 fish were sampled from 37 sets all of which were wreckfish.

Table 15: Summary of observer and sampling coverage of bottom and midwater trawl and bottom longlining in the SPRFMO Convention Area during 2022. 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	o	o	0	0	0	0
Midwater trawl	0	0	0	0	0	0
Bottom line	7	2	343,415	71,303	37	88

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 2022 and a summary of the length-frequency sampling is provided in Table 16. Biological sampling in 2022 was only of wreckfish.

Table 16: Summary of length-frequency sampling conducted by scientific observers aboard New Zealand vessels conducting bottom fishing in the SPRFMO Area in 2022.

Scientific Name	Method	Common Name	Measure Used	Length (cm) Min	Mean	Max	Number Measured
P. americanus	Bottom Long Line	Wreckfish - Bass	Standard	60	86.4	149	88
						Total	**88**

The unscaled length-frequency distribution of orange roughy from 2021 is shown in Figure 9.

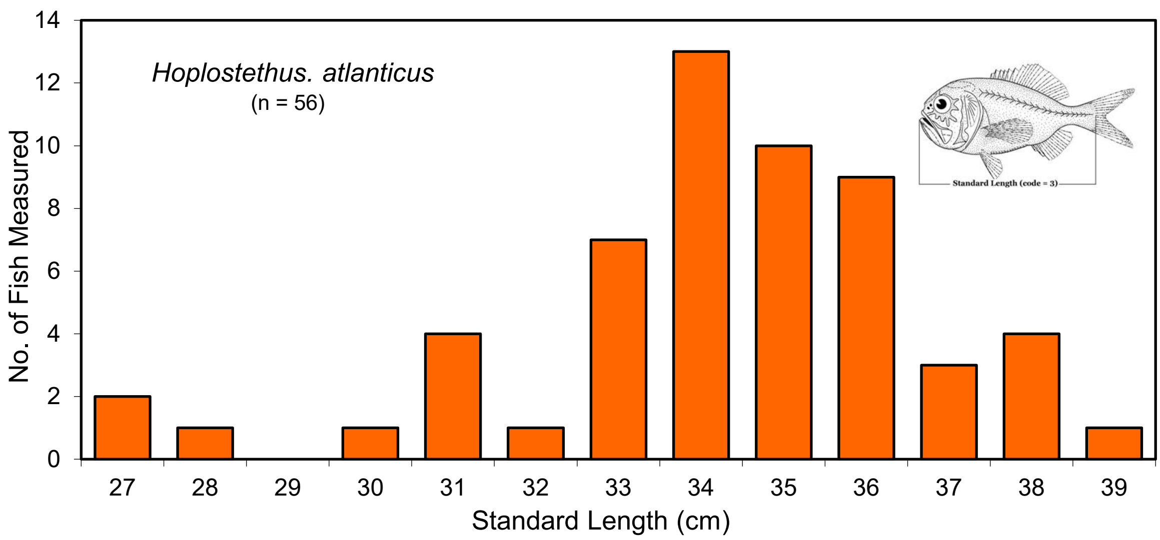


Figure 9: Length frequency distribution (unscaled) for orange roughy (*Hoplostethus atlanticus*) measured by scientific observers aboard New Zealand vessels fishing using bottom trawl in the SPRFMO Area during 2021 noting there was no trawl fishing for orange roughy in 2022.

Comparison of length frequency distributions from 2017 to 2021 (Figure 10) 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 CMM03-2020) was implemented.

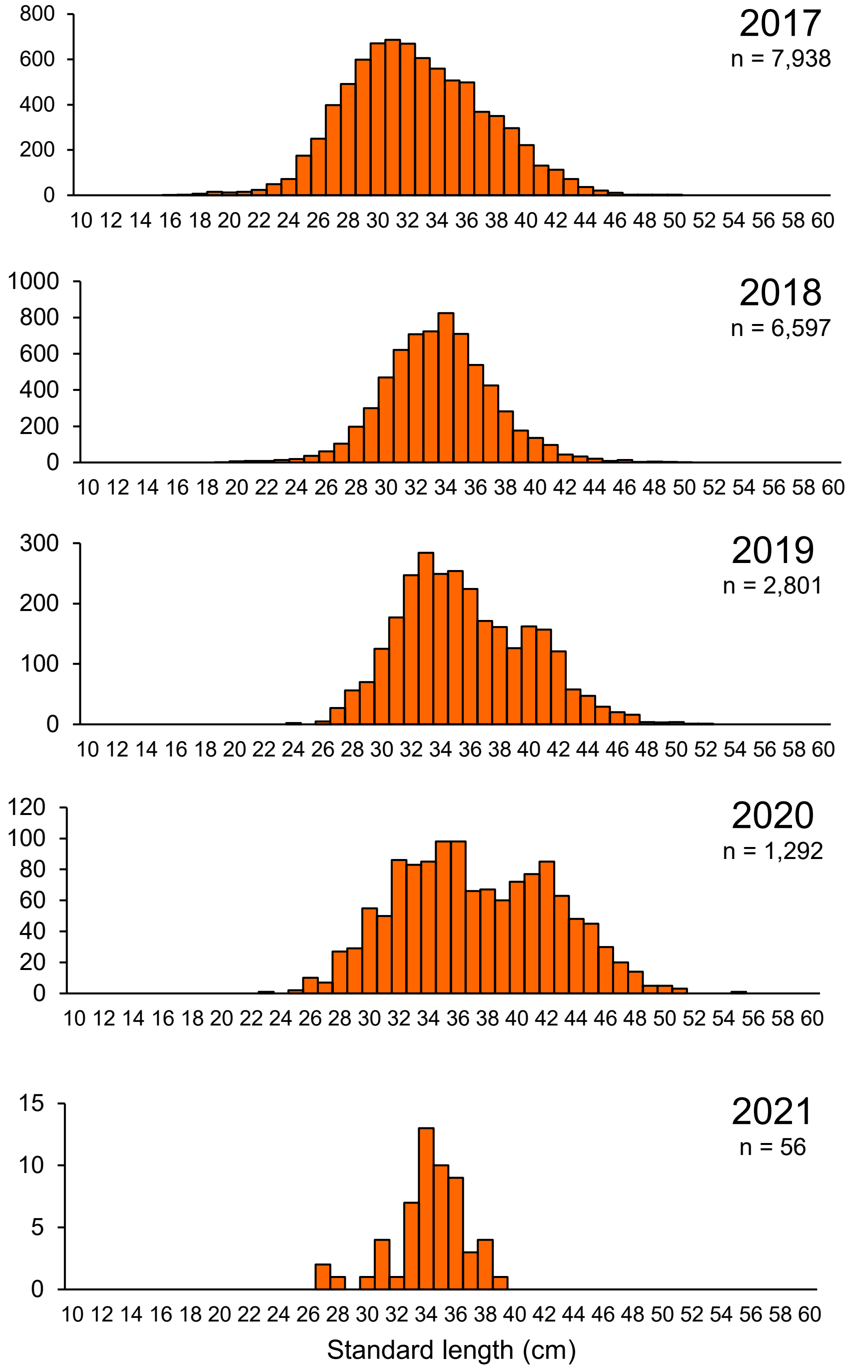


Figure 10: Length frequency distributions (unscaled – standard length) of orange roughy from 2017 to 2021 in the SPRFMO Convention Area noting there was no trawl fishing for orange roughy in 2022.

The recorded sizes of bluenose vary considerably between years (Figures 11), likely as a result of small sample sizes and shifts in fishing locations.

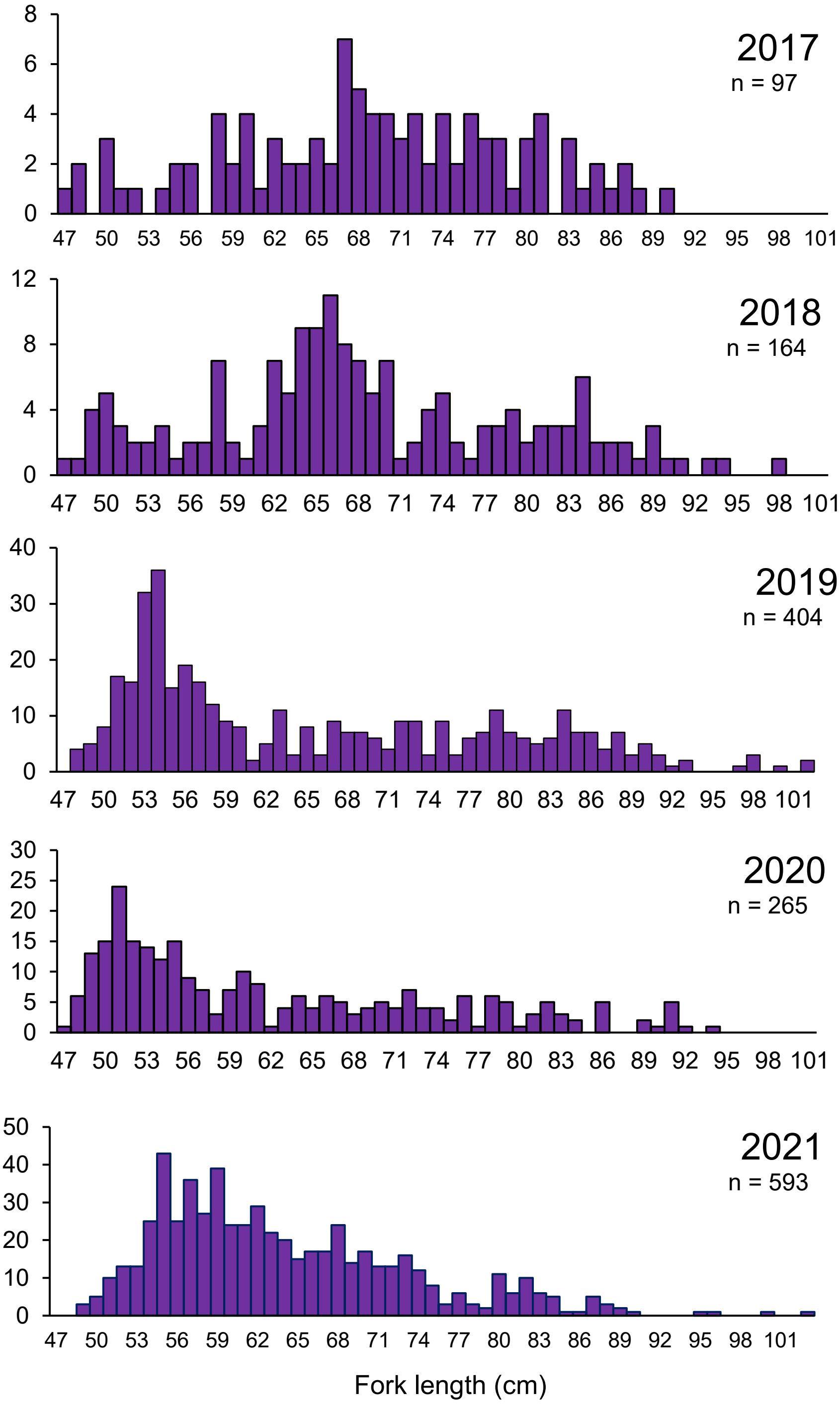


Figure 11: Length frequency distributions (unscaled) for bluenose measured by scientific observers aboard New Zealand vessels fishing from 2017 2021 in the SPRFMO Convention Area noting no bluenose were measured in 2022.

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, six seabird captures have been observed on New Zealand vessels: four seabirds (all alive) in bottom line fisheries, and two seabirds (one alive and one dead) in trawl fisheries (Table 17). Species identifications of some of the reports are being confirmed by expert analysis and may change.

In relation to other species of concern as specified in Annex 14 of CMM 02-2022, 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	Notes
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	
2021	Westpac Bank	Trawl	Fairy Prion*	Dead	*Originally identified as a white chinned petrel but ID changed based on expert identification
2022	Three Kings	Bottom longline	Black 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	2018	2019	2020	2021	2022
Unicorn rattail *Trachyrincus* spp.	35.9	0	0	0	-
Rattails *Macrouridae* spp.	12.9	1.5	2.0	0.2	-
Ribaldo *Mora moro*	31.1	9.4	10.0	0.01	-
Spiky oreo *Neocyttus rhomboidalis*	38.7	2.7	9.6	0.3	-
Cardinalfish *Epigonus telescopus*	5.3	0.2	10.0	0	-
Shovelnose dogfish *Deania calcea*	26.0	2.9	2.4	0.1	-
Seal shark *Dalatias licha*	6.7	7.3	5.7	0.2	-
Widenosed chimaera *Rhinochimaera pacifica*	5.9	0.2	0.5	-	-
Long-nosed chimaera *Harriotta raleighana*	5.7	0.07	0.05	0.02	-
Baxter's lantern dogfish *Etmopterus baxteri*	3.0	0.8	0.001	0.3	-

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 12)

	Chondrichthyans				
Species	**2018**	**2019**	**2020**	**2021**	**2022**
Spiny dogfish *Squalus acanthias*	9.6	6.8	0.7	0.03	0
Northern spiny dogfish *Squalus griffini*	0.5	0.9	0.8	1.1	7.9
Shovelnose dogfish *Deania calcea*	0.2	0.09	0.3	0.9	0.09
School shark *Galeorhinus galeus*	0.2	0.4	0.6	0.3	0.1
Mako shark *Isurus oxyrinchus*	0.5	0.6	0.08	0	0

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

There were no encounters with potential VMEs between May 2019 and the end of the 2019 calendar year.

May 2020 – May 2021
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

From May 2021
At the 9th Commission meeting in 2021, Annex 6A and Annex 6B were updated in CMM03-2021 as follows:

Annex 6A: 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	25
Phylum Cnidaria		
Class Anthozoa		
Order Scleractinia	Stony corals	60
Order Antipatharia	Black corals	5
Informal group Gorgonian Alcyonacea	Seafan octocorals	15
Order Actiniaria	Anemones	35
Order Zoantharia	Hexacorals	10

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 Pennatulacea	Sea pens	1
Order Actiniaria	Anemones	5
Order Zoantharia	Hexacorals	1
Class Hydrozoa		1
Order Anthoathecatae		
Family Stylasteridae	Hydrocorals	1
Phylum Bryozoa	Bryozoan	1
Phylum Echinodermata		
Class Asteroidea		
Order Brisingida	Armless stars	1
Class Crinoidea	Sea lillies	1

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 was provided to SC9 (SC9-DW06_rev1). No encounters have been triggered by New Zealand vessels in 2021 or 2022.

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 2018 and 2022. Where taxonomic resolution allows, bycatch is presented at the Class level, otherwise at the Phylum level. For bottom trawl, row colours refer to VME indicator taxa included in CMM 03-2023 (purple) and other benthic bycatch taxa (white).

Taxon	2018	2019	2020	2021	2022
BOTTOM TRAWL					
Arthropoda					
Hexanauplia (Barnacles)	0.6 (3)	1.9 (3)	0 (0)	0 (0)	0 (0)
Malacostraca (Crabs, prawns)	2.9 (4)	8 (3)	3 (2)	0 (0)	0 (0)
Pycnogonida (Sea spiders)	0 (0)	1.0 (1)	0 (0)	0 (0)	0 (0)
Brachiopoda (Lamp shells)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Bryozoa (Lace corals)	0.4 (2)	0 (0)	0 (0)	0 (0)	0 (0)
Chordata					
Ascidiacea (Sea squirts)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Thaliacea (Tunicates)	0 (0)	0 (0)	14 (4)	0 (0)	0 (0)
Cnidaria					
Anthozoa (Anemones, corals, sea pens)[1]	1252.53 (139)	36.2 (23)	24 (24)	0 (0)	0 (0)
Actiniaria (Anemones)	989.1 (80)	107.8 (29)	83.5 (34)	0 (0)	0 (0)
Alcyonacea (Soft corals)	0 (0)	0 (0)	0.2 (2)	0 (0)	0 (0)
Antipatharia (Black corals)	46.9 (72)	13.7 (43)	2.5 (29)	1.4 (6)	0 (0)
Gorgonian Alcyonacea (Tree-like forms, sea fans, sea whips, bottlebrush)[2]	45.4 (68)	33.5 (38)	4.3 (18)*	0.3 (4)	0 (0)
Pennatulacea (Sea pens)	8.1 (11)	2.1 (10)	1.2 (13)	0 (1)	0 (0)
Scleractinia (Stony corals)[3]	47.5 (31)	8.4 (6)	62.8 (40)	0 (0)	0 (0)
Zoantharia (Hexacorals)	100.9 (57)	1 (1)	9.9 (9)	0 (0)	0 (0)
Hydrozoa (Hydroids)[4]	17.3 (11)	21 (21)	0 (2)	0 (1)	0 (0)
Stylasteridae (Hydrocorals)	2.3 (3)	0 (0)	0.3 (2)	0 (0)	0 (0)
Echinodermata					
Asteroidea (Starfish)	4.0 (3)	30.0 (12)	3.3 (5)	0 (0)	0 (0)
Brisingida ('Armless' stars)	2.3 (2)	0 (0)	0.1 (8)	0 (0)	0 (0)
Crinoidea (Sea lillies)	3.5 (6)	20 (20)	0 (0)	0 (0)	0 (0)
Echinoidea (Sea urchins)	52.5 (6)	80 (3)	19.3 (15)	0 (0)	0 (0)
Holothuroidea (Sea cucumbers)	0 (0)	0 (0)	7.6 (3)	0 (0)	0 (0)
Ophiuroidea (Brittle stars)	2.0 (1)	3.0 (3)	1.6 (3)	0 (0)	0 (0)
Mollusca					
Bivalvia (Mussles, clams)	0.1 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Gastropoda (Snails, whelks, tritons)	0 (0)	0 (0)	0.2 (2)	0 (0)	0 (0)
Phaeophyceae (Brown algae)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Porifera (Sponges)[5]	168.5 (82)	15.4 (26)	22.9 (26)	0 (0)	0 (0)
Sipuncula (Peanut worms)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Unidentified	4 (4)	0 (0)	0 (0)	0 (0)	0 (0)
BOTTOM LONGLINE					
Brachiopoda (Lamp shells)	0 (0)	0 (0)	0 (0)	0 (0)	0.7 (4)

Taxon			2018	2019	2020	2021	2022
Bryozoa (Lace corals)			0 (0)	0 (0)	0.1 (1)	0 (0)	<0.1 (3)
Cnidaria							
	Anthozoa (Anemones, corals, sea pens)[1]		0.1 (1)	0 (0)	0 (0)	0 (0)	0.1 (1)
		Actiniaria (Anemones)	0.3 (1)	0 (0)	0 (0)	0 (0)	0 (0)
		Antipatharia (Black corals)	0.2 (2)	0 (0)	0.2 (1)	0 (0)	0.1 (2)
		Alcyonacea (Soft corals)	0 (0)	0 (0)	0 (0)	0 (0)	0.2 (5)
		Gorgonian Alcyonacea (Tree-like forms, sea fans, sea whips, bottlebrush)[2]	0.6 (3)	0 (0)	1.8 (7)	0 (0)	17.1 (13)
		Scleractinia (Stony corals)[3]	0.3 (1)	0 (0)	0.6 (2)	0 (0)	5 (6)
		Zoantharia (Hexacorals)	0 (0)	0 (0)	0 (0)	0 (0)	2.8 (7)
	Hydrozoa (Hydroids)[4]		0.3 (2)	0 (0)	0.4 (2)	0 (0)	<0.1 (1)
		Stylasteridae (Hydrocorals)	0 (0)	0 (0)	0 (0)	0 (0)	0.1 (1)
Echinodermata							
	Crinoidea (Sea lillies)		0.6 (1)	0 (0)	0 (0)	0 (0)	0 (0)
	Ophiuroidea (Brittle stars)		0 (0)	0 (0)	0 (0)	0 (0)	0.1 (1)
Porifera (Sponges)[5]			0.2 (1)	0 (0)	0.1 (1)	0 (0)	1.6 (13)

* For the 2020 encounter for Gorgonia Alcyonacea the amount that was successfully weighed by the observer (2.7 kg) is included in this data, however a substantial amount was not removed from the net, separated, and weighed by the crew as required by their high seas permit. The coral that was still on the net was lost when the net was reshot 15 minutes later. Using the best available information the total amount of Gorgonia Alcyonacea caught in the net was estimated to be between 18-20 kg. The fishing company, captain and first mate were successfully prosecuted for this by Ministry for Primary Industries in June 2023.

[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 conservation and management measure on fishing gear and marine plastic pollution in the SPRFMO Convention Area was adopted by the SPRFMO Commission in 2019 (now CMM 17-2022), 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 2019-2022. ‘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 2019 - 2022

Year	Trawl – abandoned/lost
2019	0
2020	1
2021	0
2022	0

Table 24: Gear loss recorded by observers from New Zealand bottom line vessels in the SPRFMO Convention Area in 2020. N/A (not applicable) refers to no reported events of lost fishing gear.

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 1,500 m downline 1 x deck knife
2020	323	N/A	N/A
2020 exploratory fishery	1,600	1,450 m	2 x grapnel 3 x floats 1,450 m downline 1 x GPS beacon
2021	N/A	N/A	N/A
2021 exploratory fishery	21,292	29,809 m	4 x grapnel 4 x floats 2,850 m downline 1 x GPS beacon 1 x chain
2022	422	1,500 m	29 x floats 8 x weights
2022 exploratory fishery	12,335	17,270 m	11 x grapnel 6,000 m downline 3 x chain 2 x radio beacon 12 x floats 6 x weights 2 x pole gaff 1 x streamer (part of tori line)

Table 25: Fishing gear (or part thereof) reported by observers as recovered by New Zealand vessels in the SPRFMO Convention Area 2019 - 2022

Year	Fishing gear recovered by trawl vessels	Fishing gear recovered by bottom line vessels
2019	3	0
2020	0	2
2021	0	0
2022	0	0

* 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. The Bottom fishing CMM was most recently updated in 2023 CMM 03-2023.

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).

A COVID-19 case on a research vessel in 2022 delayed an attempt to complete a survey of ORH 7A, this survey was conducted in July 2023 and an updated stock assessment is expected in 2024 that will be presented to the 12th Scientific Committee.

6.3 EXPLORATORY FISHERY FOR TOOTHFISH

New Zealand presented a proposal to the third meeting of the Scientific Committee in 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 12) 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 03-2023) 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 (CMM 14-2016).

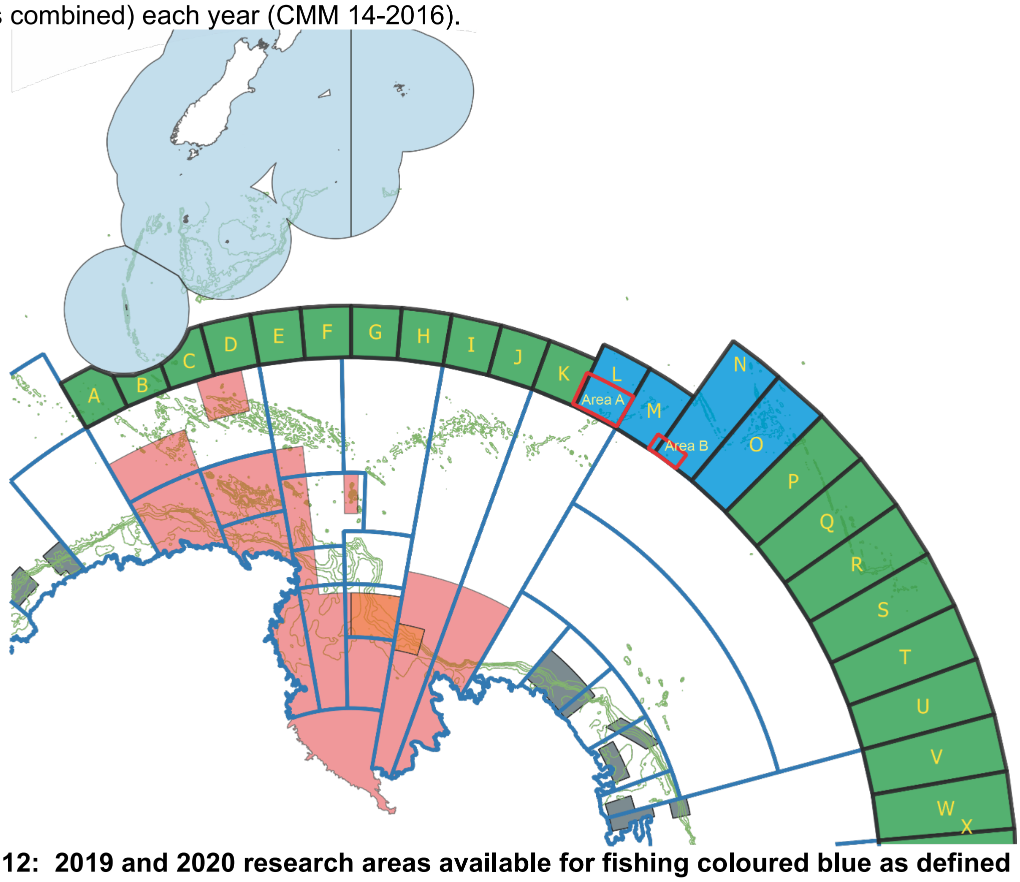


Figure 12: 2019 and 2020 research areas available for fishing coloured blue as defined by CMM-14a-2019. The red boxes (Area A and Area B) show previous research areas from 2016 and 2017.

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 was presented to SC9 (SC9-DW04). A proposal to continue the exploratory fishery for toothfish in 2022–2024 was also presented to SC9 (SC9-DW01_rev1). The SC advised the Commission that the proposal is acceptable in terms of Articles 2 and 22, CMM 13- 2021 (exploratory fisheries), CMM 03-2021 (bottom fisheries), and the BFIAS. New Zealand introduced a proposal (COMM10-Prop07) to extend its exploratory fishery for toothfish for 2022-2024 and this was adopted by the commission at COMM10.

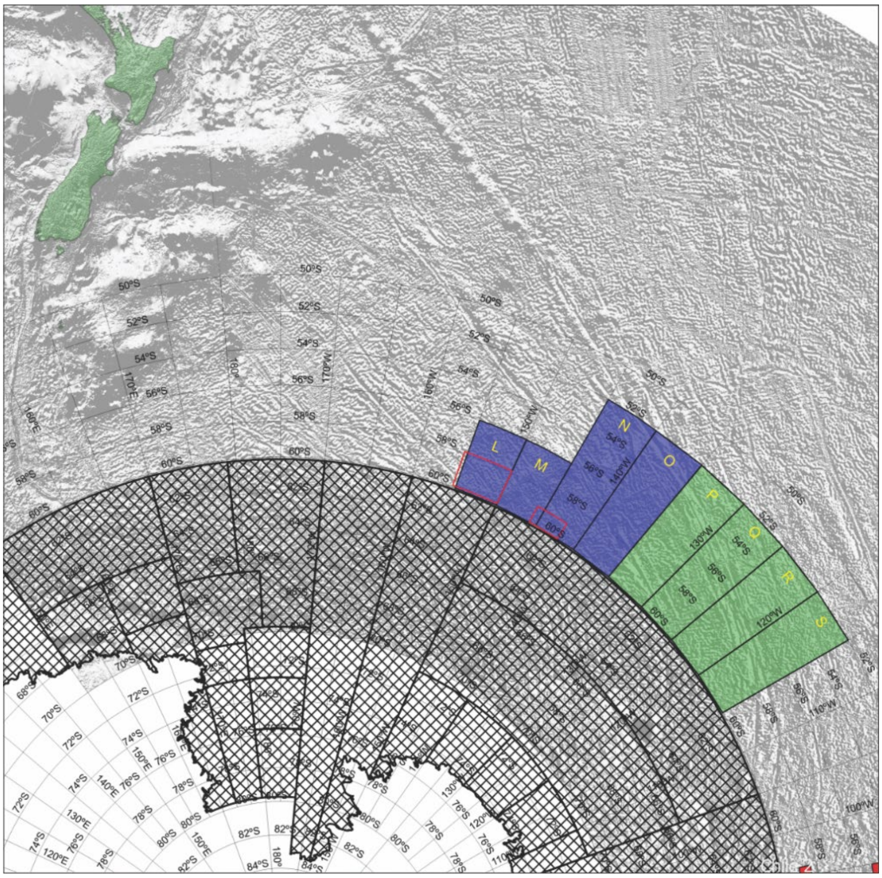


Figure 13: Survey area for 2022-24 research. Research areas P, Q, R, and S are the new areas added, additional to the 2019-21 research areas L, M, N, and O. The open red boxes are the initial research boxes from 2016-2017 which are now included within research areas L-O. The hashed area is the CAMLR Convention Area.

One exploratory research trip was carried out in March 2022, with the preliminary results summarised in SC10-DW07 and made available to SPRFMO during the 2022 meeting (SC10).

During March - April 2023, a second exploratory research trip was completed. New Zealand has developed a paper for SC11 that will provide an annual progress report on the exploratory toothfish fishery for 2022-2023 (SC11-DW11). This summarises the activities undertaken to address the objectives set out in paragraph 7 of CMM 14a-2022 and provide some interim results. A full analysis of all research and associated data for the 2022-2024 work is to be carried out following the third year of the current project.

7 References

Abraham, E., Roux, M-J, Richard, Y., Walker, N. (2017). Assessment of the risk of southern hemisphere surface longline fisheries to ACAP species. WCPFC-SC13-2017/EB-IP-13.

Abraham, E., Richard, Y., Walker, N., Gibson, W., Ochi, D., Tsuji, S., Kerwath, S., Winker, H., Parsa, M., Small, C. and Waugh, S. (2019). Assessment of the risk of surface longline fisheries in the Southern Hemisphere to albatrosses and petrels, for 2016. In Report prepared for the 13th Meeting of the Ecologically Related Species Working Group (ERSWG13) of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT-ERS/1905/17).

Anderson, O.F., Guinotte, J.M., Rowden, A.A., Clark, M.R., Mormede, S., Davies, A.J., Bowden, D.A. (2016a). Field validation of habitat suitability models for vulnerable marine ecosystems in the South Pacific Ocean: Implications for the use of broad-scale models in fisheries management. *Ocean and Coastal Management 120*: 110–126.

Anderson, O.F. Guinotte, J.M., Rowden, A.A., Tracey, D. Mackay, K., Clark, M.C. (2016b). Habitat suitability models for predicting the occurrence of vulnerable marine ecosystems in the seas around New Zealand. *Deep-Sea Research Part I 115*: 265–292.

Clark, M.R. (2004). Descriptive analysis of orange roughy fisheries in the New Zealand region outside the EEZ: Lord Howe Rise, Northwest Challenger Plateau, West Norfolk Ridge, South Tasman Rise, and Louisville Ridge to the end of the 2002–03 fishing year. *New Zealand Fisheries Assessment Report 2004/51*. 36 p.

Clark, M.R. (2008). Descriptive analysis of orange roughy fisheries in the region outside the EEZ: Lord Howe Rise, Northwest Challenger Plateau, West Norfolk Ridge, and Louisville Ridge to the end of the 2005–06 fishing year. *New Zealand Fisheries Assessment Report 2008/66*. 24 p.

Clark, M.R.; Anderson, O.F.; McKenzie, A.; Doonan, I.J. (2016a). Estimating orange roughy stock size on seamounts: a meta-analysis of physical seamount characteristics. *New Zealand Fisheries Assessment Report 2016/47*. 19 p.

Clark, M.R.; Anderson, O.F.; Bowden, D.A; Chin, C.; George, S.G.; Glasgow, D.A.; Guinotte, J.M.; Hererra, S.; Osterhage, D.M.; Pallentin, A.; Parker, S.J.; Rowden, A.A.; Rowley, S.J.; Stewart, R.; Tracey, D.M.; Wood, S.A,; Zeng, C. (2015). Vulnerable Marine Ecosystems of the Louisville Seamount Chain: voyage report of a survey to evaluate the efficacy of preliminary habitat suitability models. *New Zealand Aquatic Environment and Biodiversity Report No. 149*. 86 p.

Clark, M.R., B. Bull & D.M. Tracey, (2010). Development of estimates of biomass and sustainable catches for orange roughy fisheries in the New Zealand region outside the EEZ: CPUE analyses, and application of the “seamount meta-analysis” approach. *New Zealand Fisheries Assessment Report 2010/19*. 47 p. (SWG-09-INF-02).

Clark, M.R., M.J. Roux & M. Cryer, (2015). New Zealand research relevant to the assessment of stocks of orange roughy (*Hoplostethus atlanticus*). Paper for the Scientific Committee of the South Pacific Fisheries Management Organisation. SC-03-xx, 31 pp.

Clark, M.R., McMillan, P.J., Anderson, O.F., Roux, M.-J., (2016b). Stock management areas for orange roughy (*Hoplostethus atlanticus*) in the Tasman Sea and western South Pacific Ocean. *New Zealand Fisheries Assessment Report 2016/19.* 31p.

Conservation Services Programme (2019) Conservation Services Programme Annual Plan 2019/20. Department of Conservation 84p.

Cordue, P.L. (2019). A 2019 stock assessment of ORH 7A including Westpac Bank. *New Zealand Fisheries Assessment Report 2019/33.* 50p.

Dunn M.R. & Forman J.S. (2011). Hypotheses of spatial stock structure in orange roughy *Hoplostethus atlanticus* inferred from diet, feeding, condition, and reproductive activity. PLoS ONE 6(11): e26704. doi:10.1371 / journal.pone.0026704

Dunn, M.R., A’mar, T., and Doonan, I. (2022). Assessment of the Mid-East Coast orange roughy stock for 2022. *New Zealand Fisheries Assessment Report 2022/38*: 77

Fenaughty, J.M. & Cryer, M. (2016). Report on the first year’s fishing under New Zealand’s exploratory fishery for toothfish within the SPRFMO Convention Area. Paper for the 4th Meeting of the Scientific Committee of the South Pacific Fisheries Management Organisation, The Hague, Kingdom of the Netherlands, 10–15 October 2016. SC-04-DW-02. 6 p.

Fisheries New Zealand (2020). Aquatic Environment and Biodiversity Annual Review 2019–20. Compiled by the Aquatic Environment Team, Fisheries Science and Information, Fisheries New Zealand, Wellington New Zealand. 765 p.

Francis, M.P.; Hoyle, S.D. (2019). Estimation of fishing effort in the Southern Hemisphere. *New Zealand Aquatic Environment and Biodiversity Report No. 213*. 24 p.

Georgian, S.E., Anderson, O.F. and Rowden A.A. 2019. Ensemble habitat suitability modelling of vulnerable marine ecosystem indicator taxa to inform deep-sea fisheries management in the South Pacific Ocean. *Fisheries Research, 211 pp. 256-274*

Hanchet, S., Dunn, A., Parker, S., Horn, P., Stevens, D., & Mormede, S. (2015). The Antarctic toothfish (*Dissostichus mawsoni*): biology, ecology, and life history in the Ross Sea region. Hydrobiologia, 761:397–414.

Horn, P.L.; Hulston, D.; Ó Maolagáin. C. (2014). Commercial catch sampling for species proportion, sex, length, and age of jack mackerels in JMA 3 in the 2012-13 fishing year. *New Zealand Fisheries Assessment Report 2014/57.* 16p.

Horn, P.L.; Ó Maolagáin, C.; Hulston, D. (2019a). A comparison of age data of orange roughy (*Hoplostethus atlanticus*) from the central Louisville Ridge in 1995 and 2013-15. *New Zealand Fisheries Assessment Report. In press*

Horn, P.L.; Ó Maolagáin, C.; Hulston, D. (2019b). Commercial catch sampling for species proportion, sex, length, and age of jack mackerels in JMA 7 in the 2017–18 fishing year, with a summary of all available data sets. *New Zealand Fisheries Assessment report 2019/43.*

Langley, A.D.; Middleton, D.A.J.; Wilson, O.L. (2016). Species composition of the jack mackerel (genus *Trachurus*) catch from the JMA 1 purse seine fishery, 2005/06 to 2013/14. *New Zealand Fisheries Assessment Report 2016/11*. 33p.

Ministry of Fisheries, (2008a). *Harvest Strategy Standard for New Zealand Fisheries*. Wellington, New Zealand, ISBN 978-0-478-11914-3, 25 pp.

Ministry of Fisheries, (2008b). *New Zealand Bottom Fishing Activities by New Zealand Vessels Fishing in the High Seas in the SPRFMO Area during 2008 and 2009*. Ministry of Fisheries - Bottom Fishery Impact Assessment submitted to SPRFMO under the requirements of the SPRFMO Interim Measures for Bottom Fisheries, 102 pp.

Moilanen, A., 2007. Landscape zonation, benefit functions and target-based planning. Unifying reserve selection strategies. Biol. Conserv. 134, 571–579. http://dx.doi.org/10.1016/j.biocon.2006.09.008

MPI (2014a). Ministry for Primary Industries. *Report from the Fisheries Assessment Plenary May 2014: stock assessments and yield estimates. Part 1: Introductory Sections to Jack Mackerel*. pp 1-464.

MPI (2014b). Ministry for Primary Industries. *Report from the Fisheries Assessment Plenary May 2014: stock assessments and yield estimates. Part 2: John Dory to Red Gurnard*. pp 465-950.

MPI (2015). Proposal for exploratory bottom longlining for toothfish by New Zealand vessels outside the bottom lining footprint during 2016 and 2017: Description of proposed activities and impact assessment. Paper for the 3rd Meeting of the Scientific Committee of the South Pacific Fisheries Management Organisation, Port Vila, Vanuatu, 28 Sept–3 Oct 2015. SC-03-DW-01_rev1. 56 p.

Parker, S.J., A.J. Penney & M.R. Clark, (2009). Detection criteria for managing trawl impacts on vulnerable marine ecosystems in high seas fisheries of the South Pacific Ocean. *Mar. Ecol. Prog. Ser*., 397: 309 – 317.

Penney, A.J., S.J. Parker & J.H. Brown, (2009). Protection measures implemented by New Zealand for vulnerable marine ecosystems in the South Pacific Ocean. *Mar. Ecol. Prog. Ser*., 397: 341 - 354.

Penney, A.J., (2010a). *An approach to estimation of sustainable catch limits for orange roughy in the SPRFMO Area*. Paper to the SPRFMO SWG, 11 pp. (SWG-09-DW-02).

Penney, A.J., (2010b). Use of geospatial data and predictive habitat models to evaluate the likelihood of presence of vulnerable marine ecosystems in the SPRFMO Area. Paper to the SPRFMO SWG, 12 pp. (SWG-09-DW-02).

Penney, A.J. (2014). Review of the biodiversity component of the New Zealand Vulnerable Marine Ecosystem Evidence Process. *New Zealand Aquatic Environment and Biodiversity Report No 135*. 40 pp. (SC-02-DW-01).

Richard, Y.; Abraham, E.; Berkenbusch, K. (2020). Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006–07 to 2016–17. *New Zealand Aquatic Environment and Biodiversity Report No 237*. 57 p.

Roa-Ureta, R.H. (2012). Modelling in-season pulses of recruitment and hyperstability-hyperdepletion in the *Loligo gahi* fishery around the Falkland Islands with generalized depletion models. ICES Journal of Marine Science, 69: 1403-1415.

Rowden, A.A., Anderson, O.F., Georgian, S.E., Bowden, D.A., Clark, M.R., Pallentin, A. and Miller, A. (2017). High-resolution habitat suitability models for the conservation and management of vulnerable marine ecosystems on the Louisville Seamount Chain, South Pacific Ocean. *Frontiers in Marine Science, 4*, p.335.

Rowden A.A.; Clark M.R.; Lundquist C.J.; Guinotte J.M.; Anderson O.F.; Julian K.A.; Mackay K.A.; Tracey D.M.; Gerring P.K. (2015). Developing spatial management options for the protection of vulnerable marine ecosystems in the South Pacific Ocean region. *New Zealand Aquatic Environment and Biodiversity Report No. 155*. 76 p.

Rowden, A.A.; Guinotte, J.M.; Baird, S.J.; Tracey, D.M.; Mackay, K.A.; Wadhwa, S. (2013). Developing predictive models for the distribution of vulnerable marine ecosystems in the South Pacific Ocean region. *New Zealand Aquatic Environment and Biodiversity Report No. 120*. 70 p.

Rowden, A.A., Stephenson, F., Clark, M.R., Anderson, O.F., Guinotte, J.M., Baird, S.J., Roux, M.J., Wadhwa, S., Cryer, M. and Lundquist, C.J. (2019). Examining the utility of a decision-support tool to develop spatial management options for the protection of vulnerable marine ecosystems on the high seas around New Zealand. *Ocean & Coastal Management*, *170*, pp.1-16.

Sharp, B., Parker, S., and Smith, N. (2009) An impact assessment framework for bottom fishing methods in the CCAMLR Area. *CCAMLR Science* **16**. 195-210 pp.

Tittensor, D.P., A.R. Baco, P.E. Brewin, M.R. Clark, M. Consalvey, J. Hall-Spencer, A.A. Rowden, T. Schlacher, K.I. Stocks & A.D. Rogers, (2009). Predicting global habitat suitability for stony corals on seamounts. *J. Biogeogr.,* 36: 1111–1128.

Tittensor, D.P., A.R. Baco, J.M. Hall-Spencer, J.C. Orr & A.D. Rogers, (2010). Seamounts as refugia from ocean acidification for cold-water stony corals. *Marine Ecology* 31, 212-225.

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 – May 2021

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)
		/ /	:

Form used from May 2021

Vulnerable Marine Ecosystem Evidence Process

Fisheries New Zealand
Tini a Tangaroa

(v4 February 2021)

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		.	25	5
CNIDARIA Anthozoa (class) Anemone, coral and sea pens					
Scleractinia (order) Stony corals	SIA		.	60	5
Antipatharia (order) Black corals	COB		.	5	1
Alcyonacea (order) Soft corals	SOC		.		1
Gorgonian Alcyonacea (Informal group) Sea fans octocorals	GOC		.	15	1
Pennatulacea (order) Sea pens	PTU		.		1
Actiniaria (order) Sea anemones	ATR		.	35	5
Zoantharia (order) Hexacorals	ZAH		.	10	1
Hydrozoa (class) Hydroid	HDR		.		1
Stylasteridae (Family) Hydro corals	COR		.		1
BRYOZOA	COZ		.		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

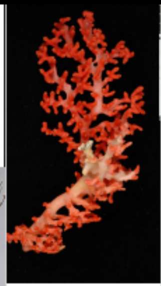
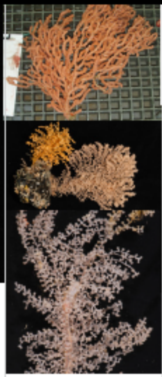
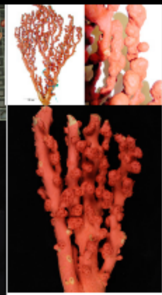
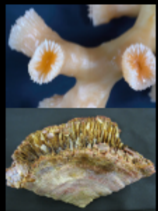
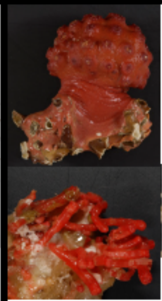
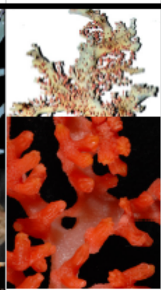
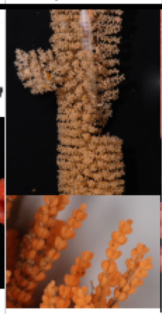
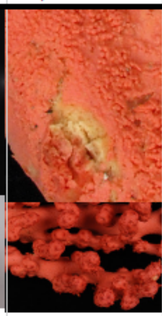
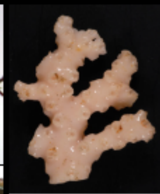
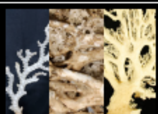
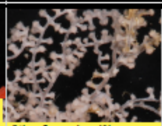
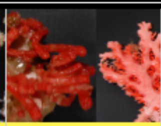
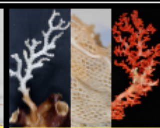
As soon as the form is completed for any tow provide a copy to the person in charge of the vessel.

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

Note these are FNZ / MPI 3-letter species codes

Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area

These groups are not included

Code	SIA	COB	SOC	GOC					COR	HDR
Level	Scleractinia (Order)	Antipatharia (Order)	Alcyonacea (Order) Seafan octocorals (Gorgonian Alcyonacea)						Anthoathecatae (Order)	Leptothecata (Order)
Taxon	Stony corals	Black corals	True soft corals	Keratoisididae Mopseidae (Bamboo)	Coralliidae (Red / Precious)	Primnoidae (Bottle brush, Sea fans)	Paragorgiidae (Bubblegum)	Chrysogorgiidae (Golden)	Stylasteridae Hydrocorals	Hydrozoa (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, pieces of hydrocorals, and bryozoans	 Hydroid if small, or small pieces of dead Gorgonians	 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 Gorgonians or Antipatharia

Revised by D. Tracey, O. Anderson, E. Mackay, National Institute of Water & Atmospheric Research (NIWA), May, 2022

Note these are FNZ / MPI 3-letter species codes

Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area

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

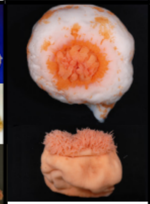
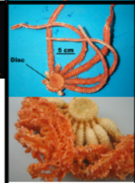
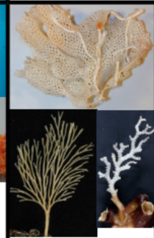
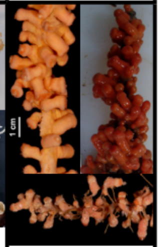
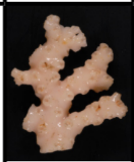
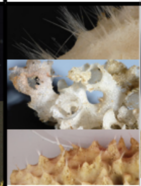
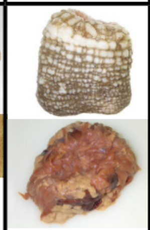
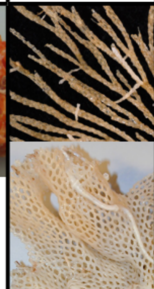
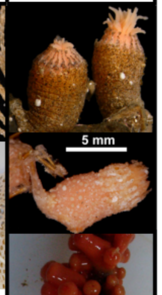
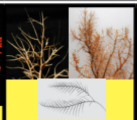
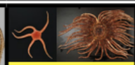
Code	SIA	COB	SOC	GOC						
Level	Scleractinia (Order)	Antipatharia (Order)	Alcyonacea (Order)	Alcyonacea (Order) – Sea fan octocorals (Gorgonian Alcyonacea)						
Taxon	Stony corals	Black corals	True soft corals	Keratoisididae Mopseidae (Bamboo)	Coralliidae (Red / Precious)	Primnoidae (Bottle brush, Sea fans)	Paragorgiidae (Bubblegum)	Chrysogorgiidae (Golden)	Acanthogorgiidae, Plexauridae	Anthothelidae, Victorgorgiidae
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	Acanthorgigidae: Highly branched single plane sea fan; up to 40 cm Plexauridae: Variable form, highly branched, flattened fan-or candelabra like. Up to 1m, usually 20-50cm	Anthothelidae: Stringy, tangled colonies with flexible branches that may fuse. No rigid central core or main branch. Colonies up to 20 cm or more Victorgorgiidae: Branching irregular, branches lack a hard central core. At least up to 30 cm
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. Polyps/calyces are usually arranged in obvious pairs or rosettes	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	Acanthorgigidae: Polyps with protruding spines, matchstick or trumpet-like appearance Tan, brown or yellow-white Plexauridae: Flexible branches and brown and woody core. Polyps conical, mound-like or flat. Red, purple, yellow, brown, white/tan	Anthothelidae: Polyps protrude from branches as tubular warts. Pale beige or tan to a colourless white Polyps often clustered into globular swellings along branches and tips, with smooth, polyp-free segments of branches in-between. Magenta or lavender
Commonly mistaken for:	Branching form can look like hard sponges, pieces of hydrocorals, and bryozoans	Hydroid if small, or small pieces of dead Gorgonians	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. Red stylasterid hydrocorals but these have minute pores	Hydroids but they have no distinct polyps. Small bottlebush forms can resemble black corals	Small pieces of Corallidae	Antipatharia, but tips are not slimy	Other gorgonians, but Acanthogorgiidae, Plexauridae have woody skeletons	Other Gorgonians. Anthothelidae, *Victorgorgia* easily distinguished by colour

Revised by D. Tracey, O. Anderson, E. Mackay, National Institute of Water & Atmospheric Research (NIWA), Shane Geange Department of Conservation, May, 2022

Note these are FNZ / MPI 3-letter species codes

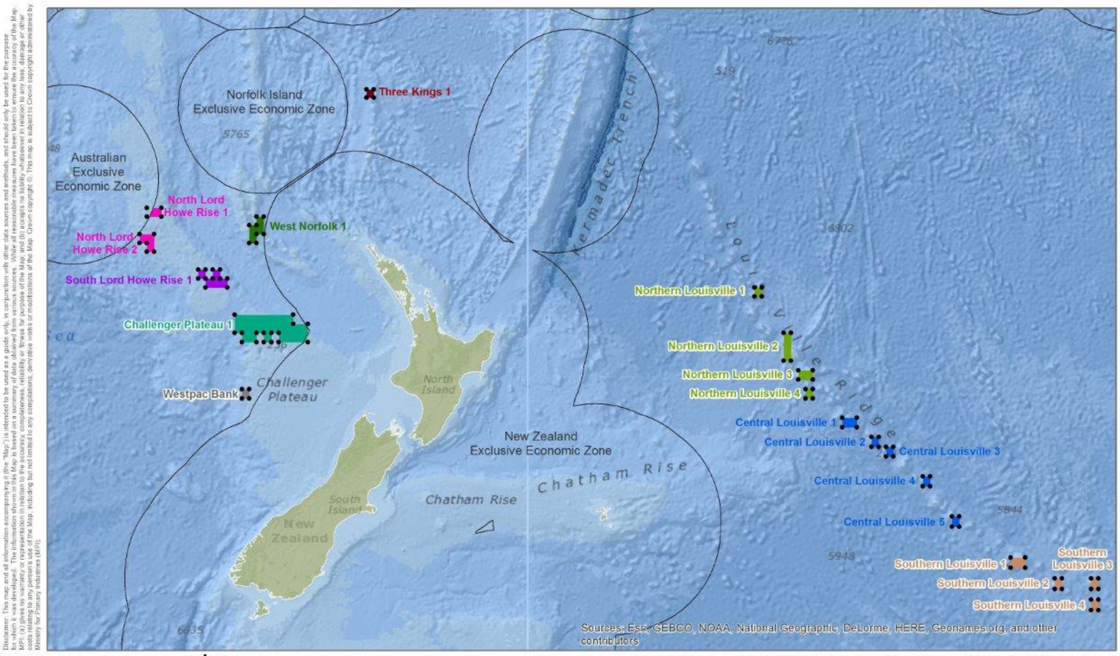
Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area

These groups are not included

Code	COR	HDR	ONG		ATR	PTU	CRI	BRG	COZ	ZAH
Level	Anthoathecata (Order)	Leptothecata (Order)	Porifera (Phylum)		Actiniaria (Order)	Pennatulacea (Order)	Crinoidea (Class)	Brisingida (Order)	Bryozoan (Phylum)	Zoantharia (Order)
Taxon	Stylasteridae Hydrocorals	Hydrozoa (hydroids)	Hexactinellida (Glass sponges)	Demospongiae (Siliceous sponges)	Anemones	Sea pens	Stalked crinoids (sea lilies) Feather stars	Armless stars	Bryozoans (lace corals)	Hexacorals (Zoanthids)
Form, Size	 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	 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 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  Feather stars are similar to sea lilies but lack stalks, using leg-like cirri to grasp the substrate. Feathery arms	 At least 6 arms, usually more than 10. Arms easily separated from central disc and often all that is taken	 Typically small, (<30 cm). Variable forms. Can be hard or soft (most commonly hard) branching, lace-like, or cornflake shaped, calcified, and brittle, surface cannot be scraped off	 Erect "coral-like" colonies. Often grow on, or colonise, other living corals.
Detail (Texture, colour, polyps)	 Coarse sandpaper texture, can't scrape off surface tissue. Has minute pores	 Indistinct polyps, feathery tips	 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	 No polyps	 Large roundish polyps; often bright orange.
Commonly mistaken for:	 Small, hard Bryozoans or pieces of Coralliidae	 Small specimens of Gorgonians or Antipatharia	 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, coral-like anemone	 Alcyonaceans or some Gorgonians, that have large polyps	 Arm fragments can be confused with brisingid and other sea-star arms	 Other sea stars with multiple arms (e.g., brittle stars) and crinoid arms	 Stylasterids if hard, hydroids if soft, carnivorous demosponge	 Large brooding gorgonian coral polyps; branching soft corals

Revised by D. Tracey, O. Anderson, E. Mackay, National Institute of Water & Atmospheric Research (NIWA), Shane Geange Department of Conservation, May, 2022

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

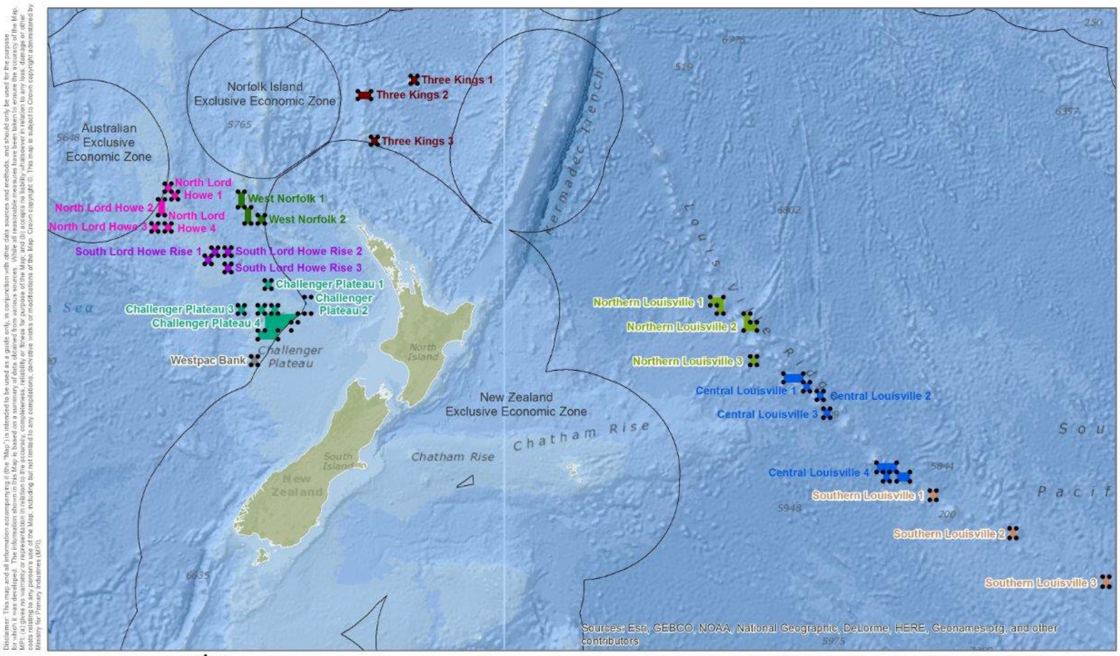
0 250 500 km; 0 125 250 nm

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

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

• Coordinate locations

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



Ministry for Primary Industries
Manatū Ahu Matua

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

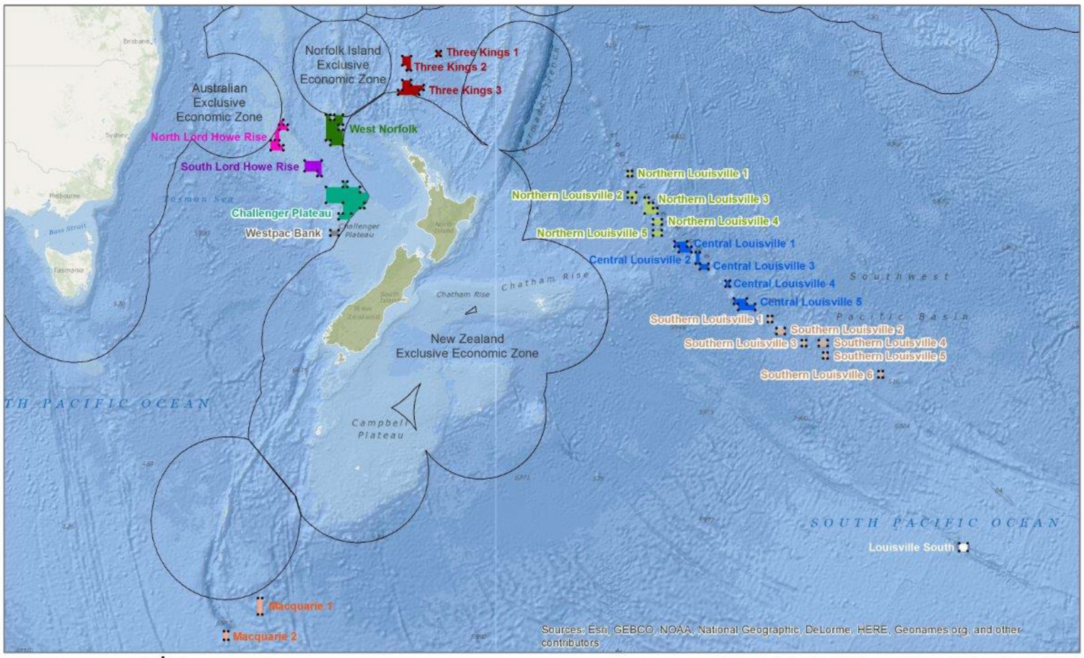
0 250 500 km; 0 125 250 nm

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

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

• Coordinate locations

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



Ministry for Primary Industries
Manatū Ahu Matua

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

0 400 800 km | 0 200 400 nm

1:26,000,000 @ A4

Data Coordinate System: WGS84

Map Coordinate System: WGS Mercator 41

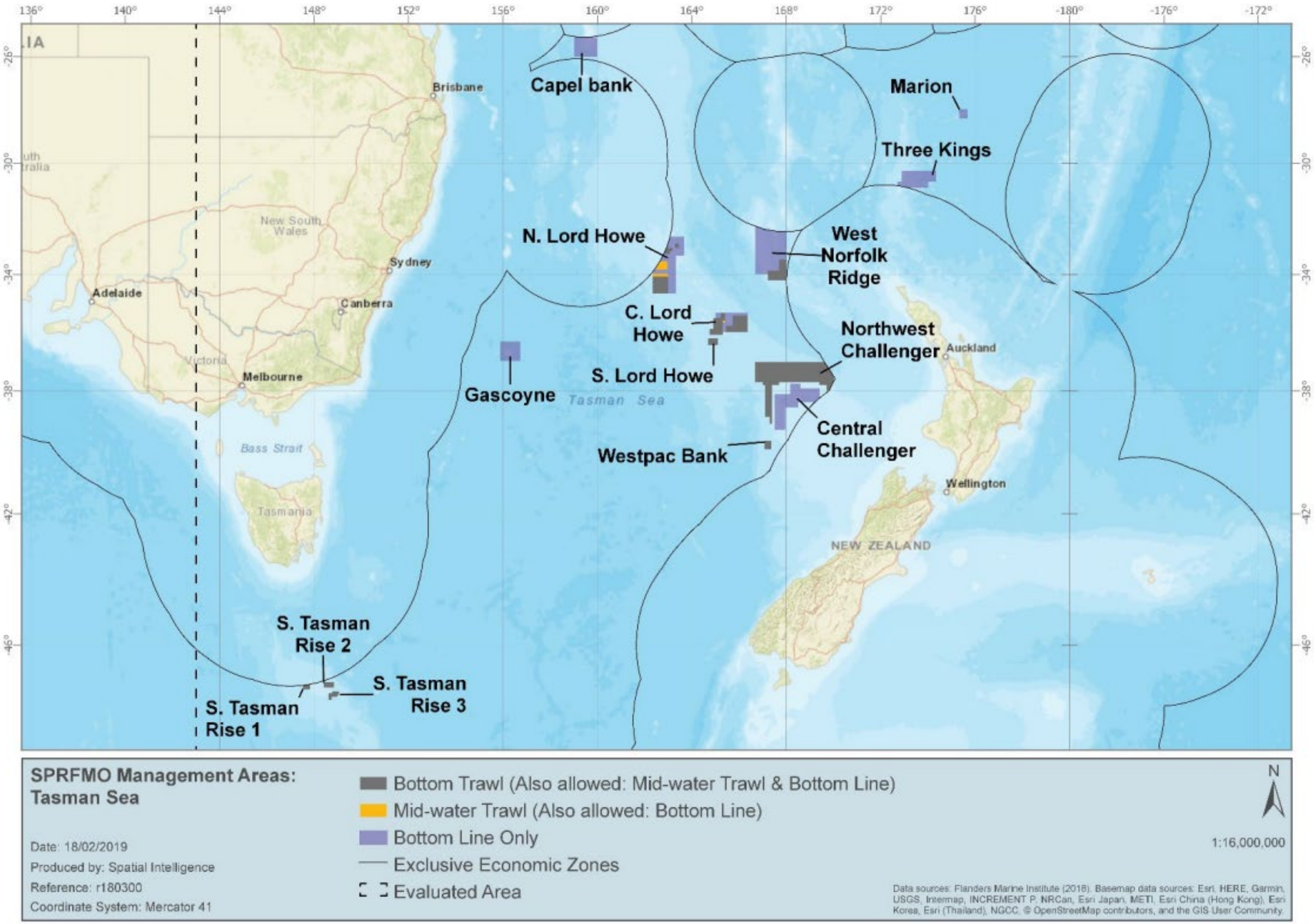
Data Attribution:
This map uses data sourced from LINZ under CC-BY

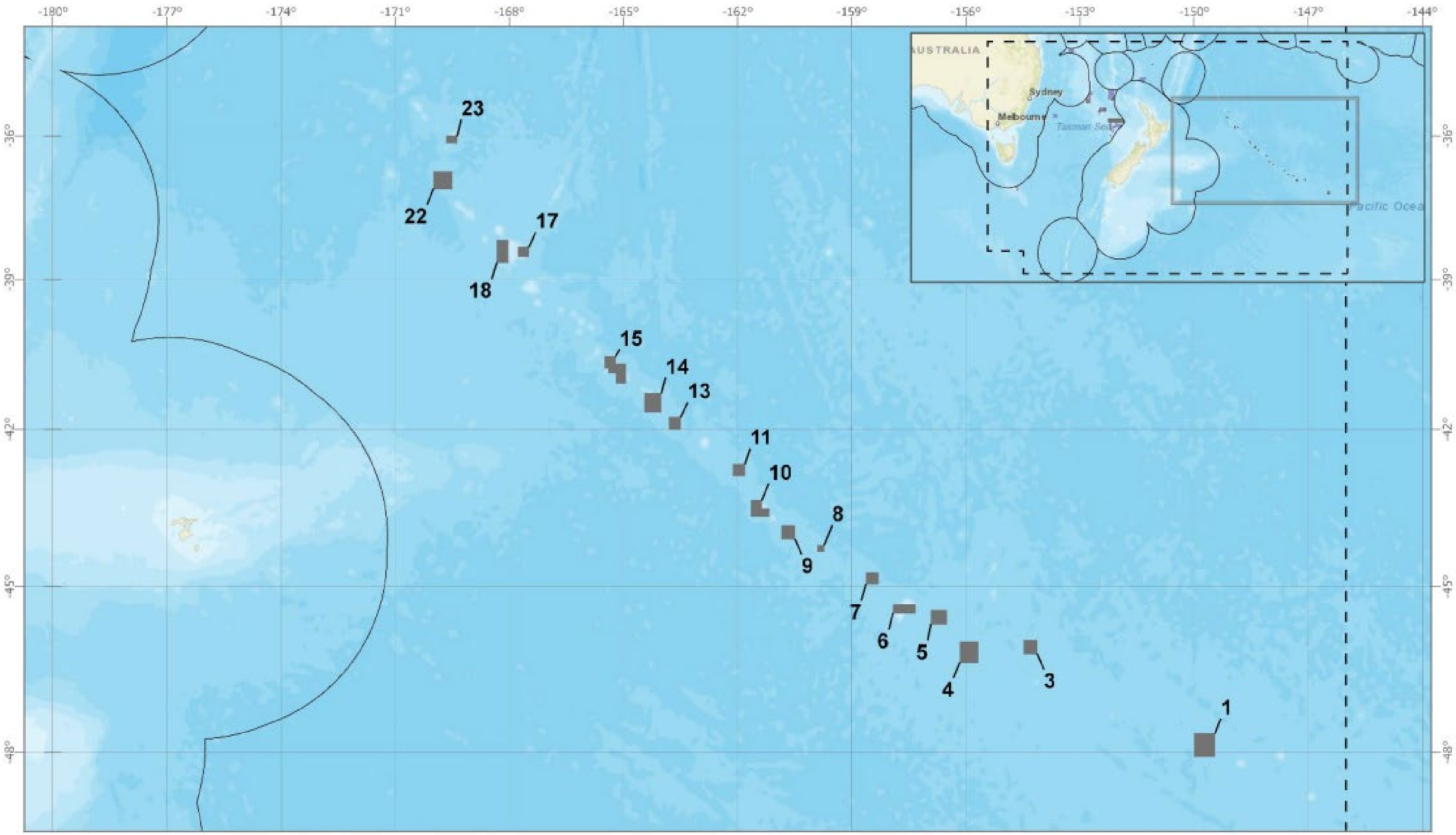
Date: 19/04/2016

Produced by: Spatial Analysis Solutions

Ref: r160094

Appendix 4. Areas open to bottom fishing from May 2019 (per CMM 03-2019-CMM 03-2023)





SPRFMO Management Areas:
Louisville Ridge

Date: 18/02/2019
Produced by: Spatial Intelligence
Reference: r180300
Coordinate System: Mercator 41

- Bottom Trawl (Also allowed: Mid-water Trawl & Bottom Line)
- Mid-water Trawl (Also allowed: Bottom Line)
- Bottom Line Only
- Exclusive Economic Zones
- Evaluated Area

N

1:11,000,000

Data sources: Flanders Marine Institute (2018). Basemap data sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community.