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**SC8-Doc14**

**New Zealand Annual Report**

*New Zealand*



**Fisheries New Zealand**

Tini a Tangaroa

# **1 New Zealand Annual Report on Fishing, Research Activities, and Observer Implementation in the SPRFMO Convention Area during 2019**

**SPRFMO SC8-Doc14**

**September 2020**

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## 2 Description of Fisheries

### 2.1 PELAGIC FISHERIES

#### *Jack mackerel*

New Zealand conducted no fishing for *Trachurus* species in the SPRFMO Convention Area in 2019.

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). There have been no major changes in catch volume in the most recent completed fishing year (2018/19).

#### *Squid*

New Zealand conducted no pelagic fishing for *Dosidicus* species in the SPRFMO Convention Area during 2019.

### 2.2 BOTTOM FISHERIES

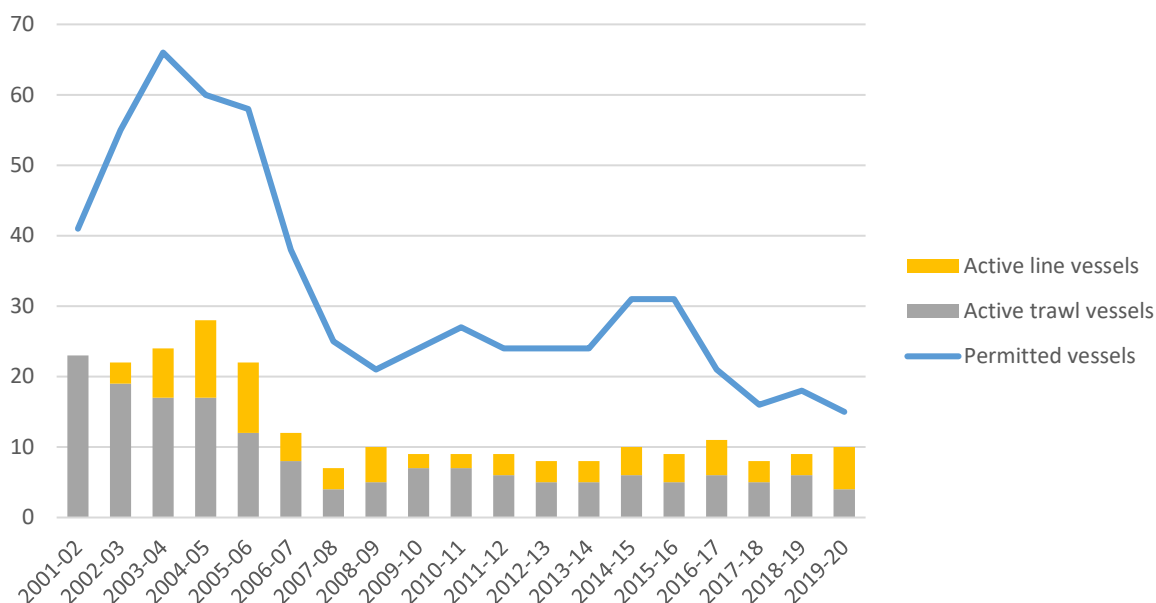
The New Zealand high seas bottom trawl and line fisheries are described in detail in the impact assessment 'New Zealand Bottom Fishing Activities by New Zealand Vessels Fishing in the High Seas in the SPRFMO Area during 2008 and 2009' (New Zealand Ministry of Fisheries 2008b) available at <http://www.southpacificrfmo.org/benthic-impact-assessments/>. Bottom fishing activities conducted during 2019 operated largely as described in that document. New Zealand vessels have been bottom fishing in the now-SPRFMO Convention Area since before 1990.

Specific high seas fishing permits for New Zealand vessels in the now-SPRFMO Convention Area were first authorised in 2007-08. The number of New Zealand vessels permitted to fish in the SPRFMO Convention Area since 2015 and the number of vessels which bottom fished in the Convention Area in the most recent 5 years are shown in Table 1.

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

Vessel Permit Year	Number of Vessels Permitted to Fish SPRFMO Area	No. of Vessels that Actively Bottom Fished in the SPRFMO Area	Bottom Trawling	Bottom Lining
2015–16	31	9	5	4
2016–17	21	11	6	5
2017–18	16	8	5	3
2018–19	18	9	6	3
2019-20	15	10	4	6

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



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

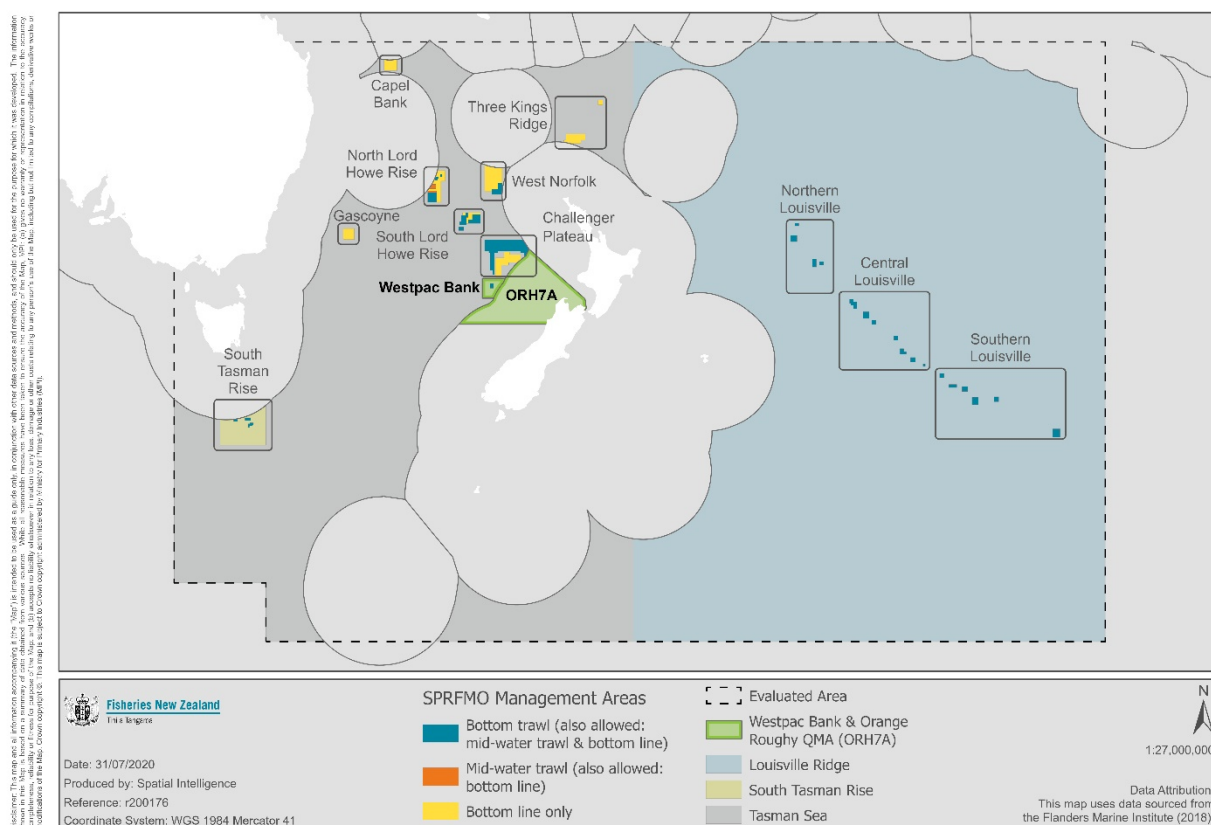
The number of trawl vessels operating in the Area declined from a peak of 23 vessels in 2002 and has been stable since 2008 at between 4 and 7 vessels. The number of vessels bottom line fishing peaked at 11 vessels in 2005 and has been stable between 2 and 6 vessels since.

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

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

Permit year	Length overall (m)									Total
	≤ 11.9	12–17.9	18–23.9	24–29.9	30–35.9	36–44.9	45–59.9	60–74.9	≥ 75	
2015-16	0	1	7	3	4	7	3	4	2	31
2016-17	0	1	3	2	4	6	3	2	0	21
2017-18	0	1	3	0	3	5	3	1	0	16
2018-19	0	1	2	0	4	5	3	3	0	18
2019-20	0	1	4	0	2	4	3	1	0	15

The main areas of bottom fishing utilised by New Zealand vessels outside of the New Zealand EEZ since 2006 are shown in Figure 2, overlaid with the Bottom Trawl, Midwater Trawl, and Bottom Line Areas from CMM 03-2019 (which applied from May 2019).



**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 03-0219**

### 3 Catch, Effort and CPUE Summaries

#### 3.1 TOTAL CATCH

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

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

	2015	2016	2017	2018	2019	
Orange roughy catch	1 287	954	1 093	1 232	210	Tasman Sea
					111	Westpac Bank
					139	Louisville
Orange roughy limit	1 852	1 852	1 852	1 852	277	Tasman Sea
					245	Westpac Bank
					1 026	Louisville
Other species catch	364	545	690	635	269	
Other species limit*	762	762	762	762	762	
Exploratory catch	N/A	29.15	29.06	N/A	42.7	
Exploratory limit	N/A	30	30	N/A	140	

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

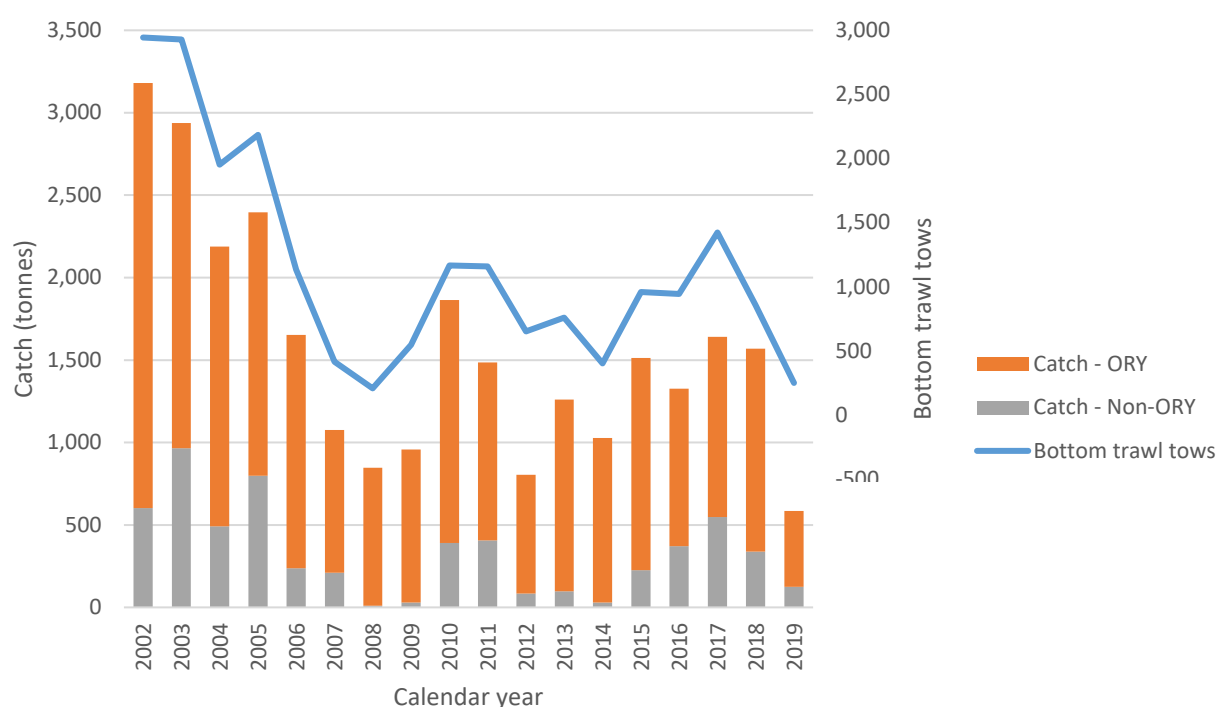
## 3.2 TRAWL FISHERIES

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

### Bottom trawl

The annual bottom trawl fishing effort by New Zealand vessels in the SPRFMO Convention Area is summarised in Table 4. Effort has declined from a maximum of 23 vessels completing over 3 500 tows in 2002 to average 5 vessels and between 860 and 1 400 tows over the most recent three years. Effort was particularly low in 2019, likely as a result of the adoption of CMM03-2019 which significantly changed the management regime for bottom trawling in the Convention Area.

Orange roughy (ORY) is the main target species and has made up 67-99% of the total New Zealand bottom trawl catch since 2002 with tonnages ranging from 460 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.



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

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



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

Year	No. Vessels	No. Tows	Avg. Tows/Vessel	ORY	ONV	BOE	EPI	ALF	SSO	RIB	RTX	SCK	Total (t)
2015	5	959	192	1 287	11	2	48	9	10	5	32	7	1 513
2016	6	943	157	954	27	0	19	87	0	23	55	34	1 326
2017	5	1 423	285	1 093	30	22	1	290	7	36	52	20	1 641
2018	6	858	143	1 232	38	11	7	57	5	24	30	7	1 570
2019	4	251	63	460	3	8	0	33	3	8	0	0	584

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

Year	Challenger Plateau	Westpac Bank	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
2015	582	24	32	124	221	–	959
2016	706	92	–	197	40	–	943
2017	421	44	25	583	352	-	1 423
2018	309	183	13	232	77	44	858
2019*						30	30

\*effort from pre-catch limit implementation

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

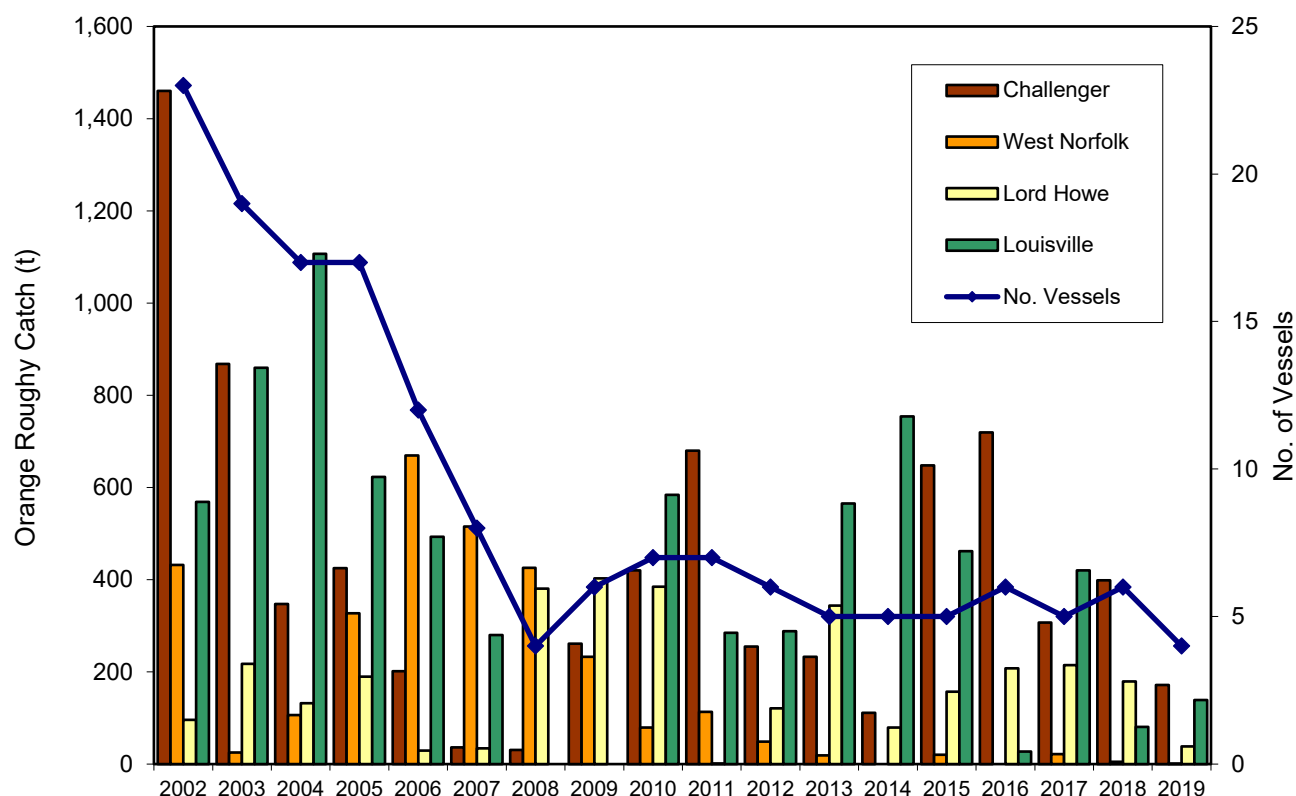
Year	North West Challenger	West Norfolk Ridge	Lord Howe Rise	Tasman Sea Total	Westpac Bank	Louisville Ridge	All Areas
2019	74	1	87	162	23	36	221

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

Year	Challenger Plateau	Westpac Bank	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
2015	530	118	20	157	462	–	1 287
2016	486	234	0	208	27	-	954
2017	307	129	22	215	420	-	1 093
2018	399	569	5	180	81	-	1 232

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

Year	North West Challenger	West Norfolk Ridge	Lord Howe Rise	Tasman Sea Total	Westpac Bank	Louisville Ridge	All Areas
2019	171	0	38	210	111	139	460



**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*

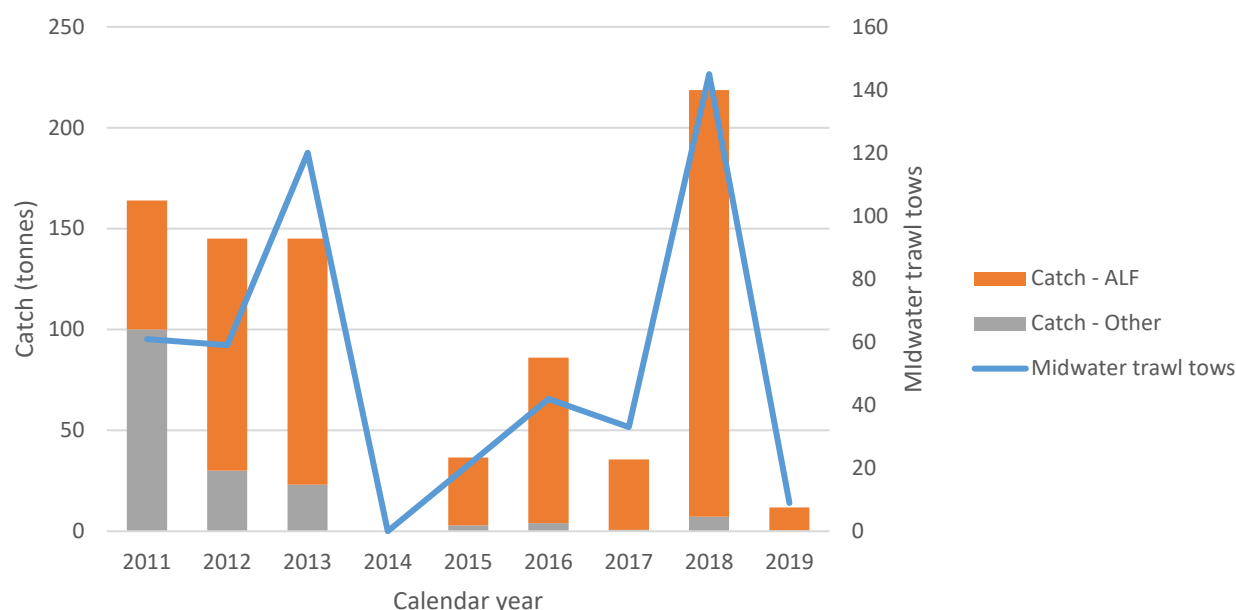
Midwater trawling for benthopelagic species is included in the SPRFMO definition of bottom fishing because the gear occasionally comes into contact with the bottom. Midwater trawling for benthopelagic species by New Zealand vessels has occurred sporadically since 1989 but effort has been greater since 2011 (Figure 5). Effort has been variable over time but reached a peak in 2018 with 145 tows (Table 9). Effort was particularly low in 2019, with only 9 midwater trawl tows completed. This is likely due to the adoption of CMM03-2019 which changed the management regime for bottom fishing.

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

**Table 9: Annual fishing effort (number of vessels and tows) and fisher-reported catch (tonnes) of the main species by weight (identified by FAO species codes – Appendix 1) by New Zealand vessels midwater trawling for benthopelagic 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 (t)
2015	2	21	11	34	0	0	2	37
2016	3	42	14	82	3	0	0	86
2017	1	33	33	35	0	0	0	36
2018	3	145	48	211	3	0	3	219
2019	2	9	5	12	0	0	0	12

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



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

### 3.3 BOTTOM LINE FISHERIES

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

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

Under CMM03-2019, '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 20-46 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 27–63 tonnes annually, over the last 5 years. Together, these species have made up around 80% of the catch in the most recent five years.

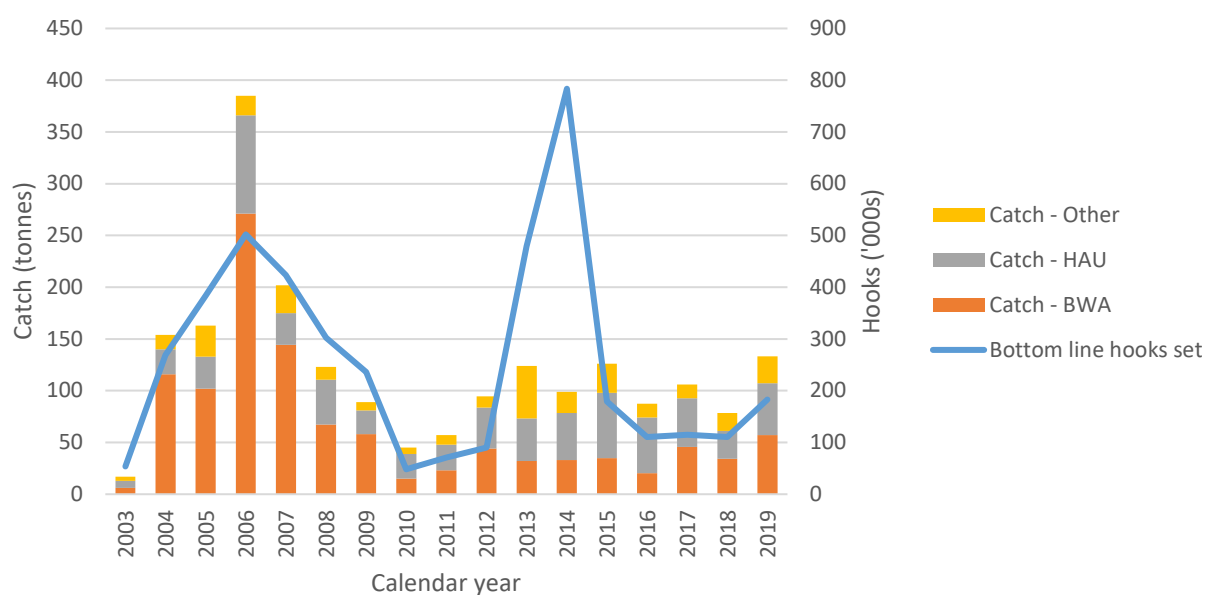
Other species making minor contributions to bottom line catches include spiny dogfish (DGS), king tarakihi (MOW), kingfish (YTC), and sea perch (ROK).

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

Year	No. Vessels	No. Trips	No. Hooks (000s)	Hooks/Vessel (000s)	BWA	HAU	DGS	MOW	RTX	Total catch (t)
2015	4	15	179	45	35	63	4	2	<1	126
2016	5*	10	111	28	20	54	5	3	<1	87
2017	3	14	115	38	46	47	3	3	2	106
2018	3	8	110	37	34	27	10	3	0	78
2019	5	16**	183	37	57	50	9	3	1	133

\* This includes one vessel that fished only using hand lines

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

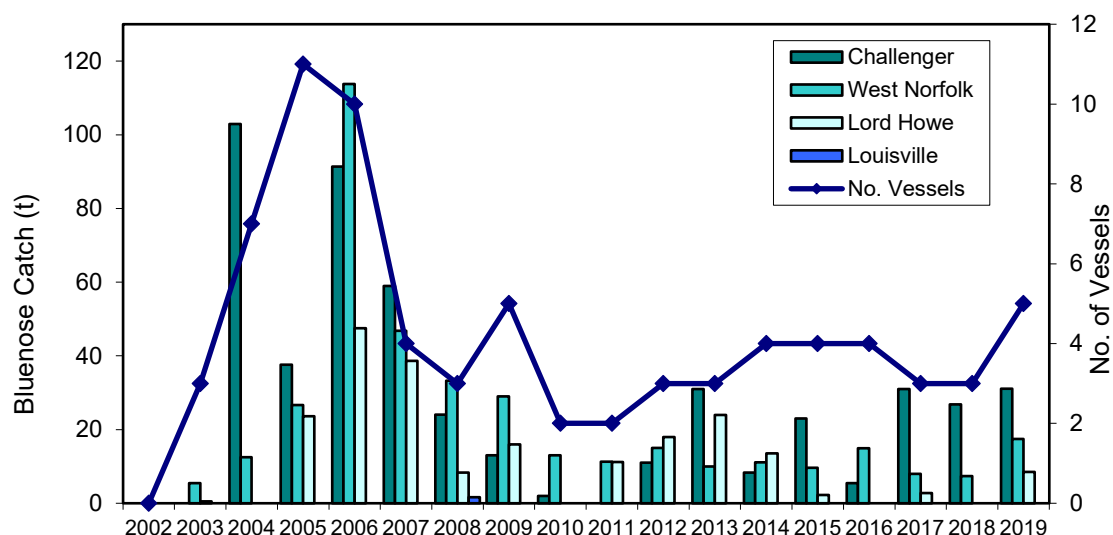


**Figure 6: New Zealand bottom line effort (thousands of hooks) and catch (in tonnes, split between HAU, BWA and other species) from 2003 in the SPRFMO Convention Area.**

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

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

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

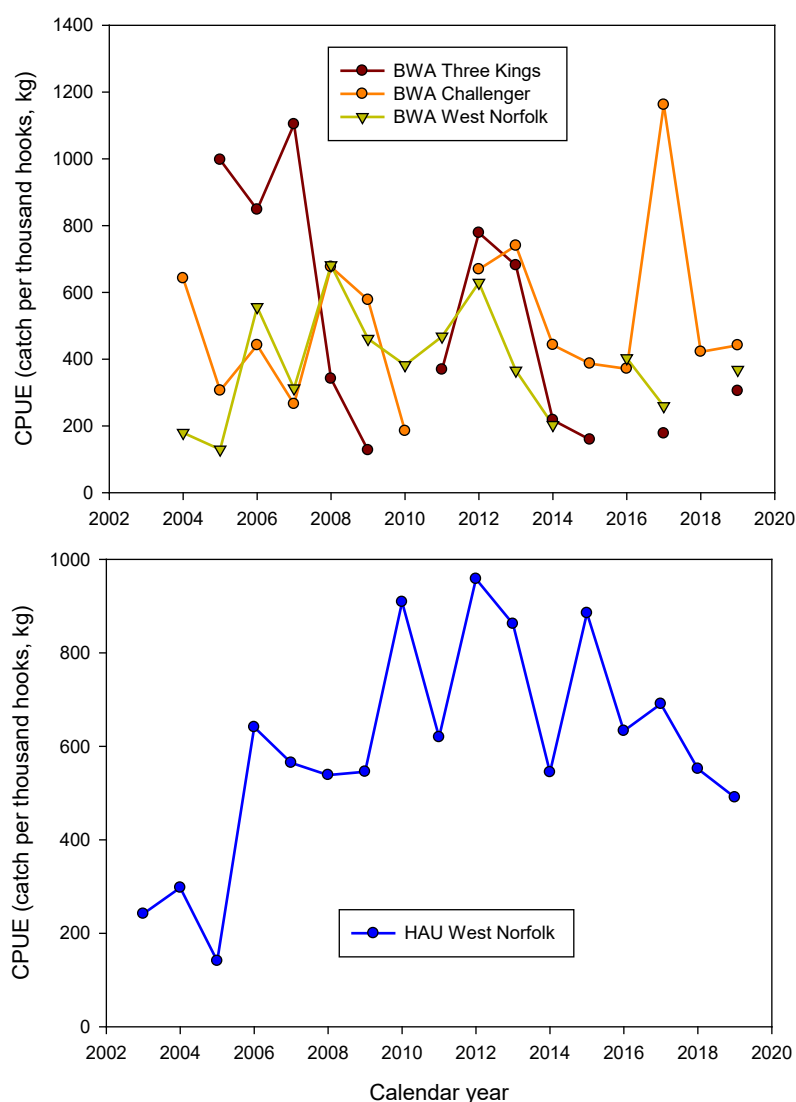


**Figure 7: Trends in number of bottom line vessels and total bluenose catch from the four main areas fished by New Zealand bottom line vessels in the SPRFMO Area by calendar year from 2002.**

Bottom longline comprises the majority of the fishing effort (183,000 hooks in 2019) and catch (133 tonnes in 2019). Effort using other bottom line methods is significantly less and more variable. Table 12 shows effort and catch from fishing using other bottom line methods for the most recent 5 years.

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

Year	No. Vessels	No. Hooks	BWA	HAU	MOW	YTC	Total catch (t)
2015	3	4,861	19	10	4	–	33
2016	1	128	1	<1	1	–	2
2017	1	49	<1	<1	<1	–	<1
2018	1	120	<1	<1	<1	–	<1
2019	1	20	<1	–	<1	–	<1



**Figure 8: Trends in nominal CPUE (kg per 1000 hooks set) for bluenose (top, BWA or BNS) and wreckfish (bottom, HAU or HPB) by New Zealand bottom longline vessels fishing in the SPRFMO Area, 2003–2019. Effort for each species is limited to targeted sets only. Years with 10 or fewer sets in an area are excluded.**

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

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

## 4 Fisheries Data Collection and Research Activities

### 4.1 FISHERIES CATCH & EFFORT DATA COLLECTION SYSTEMS

The data collection systems implemented for New Zealand high seas bottom fishing vessels have been described in detail (Ministry of Fisheries, 2008b). Detailed tow-by-tow catch and effort data for all high seas fishing operations have been collected since 2007 using the 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. Since May 2019, a revised form has been used for all trawl effort reflecting the thresholds and requirements of CMM03-2019.

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.

### 4.2 RESEARCH ACTIVITIES

As presented to the sixth and seventh meetings of the Scientific Committee ([SC6-DW12](#)) and the 2019 SPRFMO Commission ([COMM6-INF05\\_rev1](#), [COMM6-INF09](#)), New Zealand worked with Australia to progress a number of workstreams to inform the development of the comprehensive bottom fishing conservation and management measure (initially implemented as CMM 03-2019). Progress updates on many of these were presented to a number of workshops, the fourth, fifth, and sixth Scientific Committees, and the sixth and seventh meetings of the Commission. A brief summary of each aspect of this work is provided below, noting that most of this work was reported in individual papers to the sixth meeting of the Scientific Committee.

The section below summarises relevant research New Zealand has completed in the last 2 years, including research to support the development and review of the bottom fishing CMM.

#### 4.2.1 Identification of fishing footprint and/or impact analysis

New Zealand provided a spatially-explicit bottom impact evaluation for bottom fisheries in the SPRFMO Area based on the method used in CCAMLR (Sharp, 2009). This method can be used to estimate the likely cumulative impact of one or more bottom fishing methods on benthic organisms with different levels of fragility and allow comparisons between fisheries employing different bottom fishing methods. The results of the application of the method provided an index of the “naturalness” of the benthic community in given locations affected by fishing, which was then used as an input layer for spatial decision-support software. This analysis was provided to SC-05 ([SC5-DW06](#)), and an updated analysis including bottom line methods was provided to SC-06 ([SC6-DW10](#)). Since SC7, further work has been done in collaboration with Australia and the results will be presented to SC8.

#### 4.2.2 Mapping of the distribution of VME indicator taxa

New Zealand has developed habitat suitability models to directly map the predicted distribution of VME (vulnerable marine ecosystem) indicator taxa. The habitat suitability models used to underpin the design of spatial management areas for CMM 03-2019 had a granularity (spatial grid size) of 1 km<sup>2</sup> and were published by [Georgian et al. \(2019\)](#). Finer-scale (~25 m) abundance-based models consistently outperformed presence-absence habitat suitability models on the six seamounts for which suitable data existed [Rowden et al. 2017](#), see also [SCW3-Doc15](#)), but the necessary fine-scale abundance data are not available for the whole evaluated area so this type of model could not be used to design spatial management areas. Before the seventh meeting of the Scientific Committee, New Zealand compiled new data for VME indicator taxa (presented as [SC-07-DW-12](#)) and has subsequently used these

additional data to test and update the habitat suitability models. The predictions of the newest models are incorporated in the Bottom Fishery Impact Assessment conducted jointly by New Zealand and Australia and submitted for consideration by SC8.

### 4.2.3 Spatial management open/closed areas

Predicted distributions of VME indicator taxa from habitat suitability models were combined with the bottom footprint/impact analysis, a naturalness layer, and information on the value of different locations to the fishing industry to support the design of spatial management areas that provide for fishing while avoiding significant adverse impacts on VMEs (in CMM 03-2019). New Zealand used the decision-support tool Zonation (Moilanen 2007) to inform the design of spatial management measures and to explore sensitivity of modelling and scenario choices. A paper demonstrating the application of the approach within the SPRFMO Area was published by Rowden et al (2019). Preliminary results of this work were reported to SC3 ([SC03-DW-04](#)), to the SPRFMO 3<sup>rd</sup> Workshop: Deep Water Working Group in May 2017 ([SCW3-Doc16](#)), at the fifth meeting of the SC ([SC5-DW03](#), [SC5-DW05](#)), and a final update provided to the sixth meeting of the Scientific Committee ([SC6-DW11](#)).

Zonation outputs included maps prioritising the landscape for protection, where areas of highest priority were those that have high habitat suitability scores for VME indicator taxa, high naturalness, and least value for the fishing industry. Other outputs included the proportion of the predicted distribution for each VME taxon that is protected, and the proportion of fishing activities that are displaced. Boundaries for spatial management areas were developed to meet the multiple competing objectives using the Zonation outputs in combination with habitat suitability predictions and the location and direction of trawl tows.

### 4.2.4 Deriving thresholds for VME encounter protocols

The bottom fishing CMM includes an encounter protocol, describing the actions a vessel or Member must take should an encounter with a potential VME occur (often referred to as a 'move-on rule'). SC-05 recommended that *'move-on rules should be viewed only as 'back-stop' measures (if required) to complement spatial closures'* and that *'should a move-on rule be implemented as part of the revised CMM for bottom fisheries, the threshold for triggering such a rule should be high.....involving weights of bycatch of benthic fauna that would indicate the models used to predict the distribution of VME taxa are misleading'*.

Following this advice, New Zealand used a data-informed method based on historical records of VME indicator bycatch from the New Zealand bottom trawl fishery within the SPRFMO Area. The distribution of bycatch weights for individual VME indicator taxa were examined, with bycatch weights greater than a reference value used to identify threshold weights for key VME indicator taxa that would trigger the encounter protocol. Recognizing that several VME indicator taxa in a tow below their taxon-specific threshold weights may indicate that a fishing event has encountered an area with diverse seabed fauna, the encounter protocol also includes a biodiversity component, whereby a single tow returning three or more VME indicator taxa above taxon-specific biodiversity weights would also trigger a move-on event. This work was presented to SC-06 as a standalone document [SC6-DW09](#). The encounter protocol, including thresholds and biodiversity weight triggers was included in CMM 03-2019. Following the initial implementation of the measure in 2019, additional work was done to explore uncertainties in the modelling and the spatial management approaches that had been agreed. In reviewing that work SC7 agreed that lower encounter thresholds for VME indicator taxa would help to mitigate risks of significant adverse impacts (SAIs) on VMEs until key uncertainties with the performance of the spatial management measures could be resolved. Subsequently, the SPRFMO Commission reduced the threshold for Scleractinia (stony corals) from 250 kg to 80 kg in [CMM 03-2020](#).

### 4.2.5 Developing list of VME taxa for the SPRFMO Convention Area

The habitat suitability models and encounter thresholds for VME indicator taxa are based on a range of taxonomic groupings from species to family, class, order and phylum. This was necessary because of data constraints and/or difficulties with identification by non-specialists at sea, but probably results in heterogeneity in life-history traits, distribution patterns and meta-population dynamics among species within the higher taxonomic groups. The Scientific Committee reviewed an analysis by [Geange et al. \(2019\)](#) and agreed that three additional taxonomic groups should be added as VME indicator taxa that could be used in the encounter protocol and that a broader list of VME taxa for the SPRFMO Convention area should be developed. New Zealand therefore reviewed taxonomic records from within the



Evaluated Area of the SPRFMO Area for each of the 15 VME taxa identified in SC7-DW13 that satisfied FAO VME criteria to develop lists of candidate VME taxa at a finer level of taxonomic identification. That work will be presented to SC8 and identified 281 genera and 231 species, that in the opinion of taxonomists and para-taxonomists with a working familiarity of the fauna of the South-West Pacific region, meet the FAO VME criteria and could be considered candidate VME taxa.

#### 4.2.6 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 alfonso (*Beryx* spp.), with orange roughy making up roughly 65% of New Zealand's total catch in the SPRFMO Area. All of these fisheries are relatively data poor; however, there are some data available, including historic catches, various effort data, and some biological data. New Zealand has focused stock assessment efforts on orange roughy in the first instance, as it remains the primary target of New Zealand and Australia's bottom trawl fisheries and makes up most of New Zealand's catch in the SPRFMO Area.

New Zealand has commissioned a range of approaches to estimate stock status and sustainable catch levels for SPRFMO orange roughy stocks. This work culminated in the fifth meeting of the Scientific Committee reviewing a number of stock assessment approaches and providing advice to the Commission on the setting of catch limits for two orange roughy areas ([Report of 5<sup>th</sup> 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 7<sup>th</sup> Scientific Committee](#)). A new stock assessment for NW Challenger will be presented to SC-08 using new age distributions, together with an updated catch-history model for Lord Howe Rise.

#### 4.2.7 Coral biodiversity in deepwater fisheries bycatch

The diversity and relationships among octocoral species affected by deepwater fisheries are not currently understood because identifications by observers and taxonomic experts based on morphology can often only place a given specimen in a higher taxonomic group (than species). Such morphological identification also relies on comparisons with existing species descriptions which may be incomplete. New Zealand has therefore applied DNA sequencing to infer the identity of 74 octocoral species and their relatedness to similar reference specimens, plus related species for which sequence data is available. Initial results indicate a linear relationship between new species discovery and the number of bycatch-containing bottom trawls, suggesting that we have not yet documented the limits of diversity within the bycatch community. The high diversity in bycatch uncovered using genetic barcoding suggests there may be a role for genetic barcoding in routine identification and assessment of fisheries bycatch and impacts. A progress report for this project is available at: <https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/draft-reports/int2019-05-coral-biodiversity-in-deep-water-fisheries-bycatch-draft-report.pdf>.

#### 4.2.8 Identification and storage of cold-water coral bycatch specimens

Accurate identification of coral taxa is important for understanding benthic impacts, but the cryptic nature of many coral species makes their identification at sea by observers very difficult. New Zealand has therefore continued its programme of expert identification of returned bycatch specimens and photographs to assess and progressively improve the accuracy of at sea identification. Observer briefing manuals and training materials will be updated as required. A progress report is available at: <https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/draft-reports/int2019-04-coral-id-draft-report-1-july-19-31-dec-19.pdf>.

#### 4.2.9 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 Fisheries New Zealand's Aquatic Environment & Biodiversity Annual Review ([FNZ 2020](#)).

#### 4.2.10 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.

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](http://www.cms.int)).

## 5 Observer Implementation Report

### 5.1 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.

## 5.2 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 of 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 03-2019](#) (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 03-0219 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 2018. Numbers in () are observed.**

Month & year	Trawl: N vessels (N observed)	Trawl: N days	Bottom line: N vessels	Bottom line: N days	Bottom line: N hooks (000)
Jan-19	1 (1)	12 (12)	1 (0)	5 (0)	15.6 (0)
Feb-19	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mar-19	0 (0)	0 (0)	2 (1)	3 (2)	5.05 (0.75)1
Apr-19	0 (0)	0 (0)	3 (1)	19 (5)	36.08 (4.4)
May-19	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Jun-19	3 (3)	24 (24)	0 (0)	0 (0)	0 (0)
Jul-19	2 (2)	11 (11)	0 (0)	0 (0)	0 (0)
Aug-19	2 (2)	8 (8)	0 (0)	0 (0)	0 (0)
Sep-19	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Oct-19	1 (1)	11 (11)	3 (1)	31 (5)	54.15 (5.83)
Nov-19	0 (0)	0 (0)	3 (2)	29 (7)	48.22 (9.85)
Dec-19	0 (0)	0 (0)	2 (1)	15 (7)	24.13 (13.82)
<b>Total</b>	<b>4 (4)</b>	<b>66 (66)</b>	<b>5 (4)</b>	<b>54 (26)</b>	<b>183.23 (34.65)</b>

Overall, the following levels of coverage were attained in 2019:

- Bottom contacting trawl: 100% (66 days)
- Bottom line: 24% (26 days of 54; 34,000 hooks of 183,000)

A total of four New Zealand vessels bottom fished with trawl gear in the SPRFMO Convention Area during 2019 and all 7 trips carried at least one New Zealand observer, covering 66 vessel days and 268 tows. All fishing days were observed and 265 of the 268 tows (99%) were observed. Scientific observers measured fish from 31% of bottom trawl tows (Table 15). A total of 4 016 fish were measured, 83% of which were the principal catch species, orange roughy.

Midwater trawl gear for bentho-pelagic species was used on one trip comprising 1 vessel days and 1 tow which was observed.

Five New Zealand bottom line vessels operated in the SPRFMO Area during 2019. Four bottom line trips were observed comprising 26 vessel days with 24,000 hooks observed. 396 fish were sampled from 40 sets.

**Table 15: Summary of observer and sampling coverage of bottom and midwater trawl and bottom longlining in the SPRFMO Convention Area during 2019. 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	7	7	268	265	82	4 016
Midwater trawl	4	1	1	1	0	0
Bottom line	15	4	183,000	34,000	51	717

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.

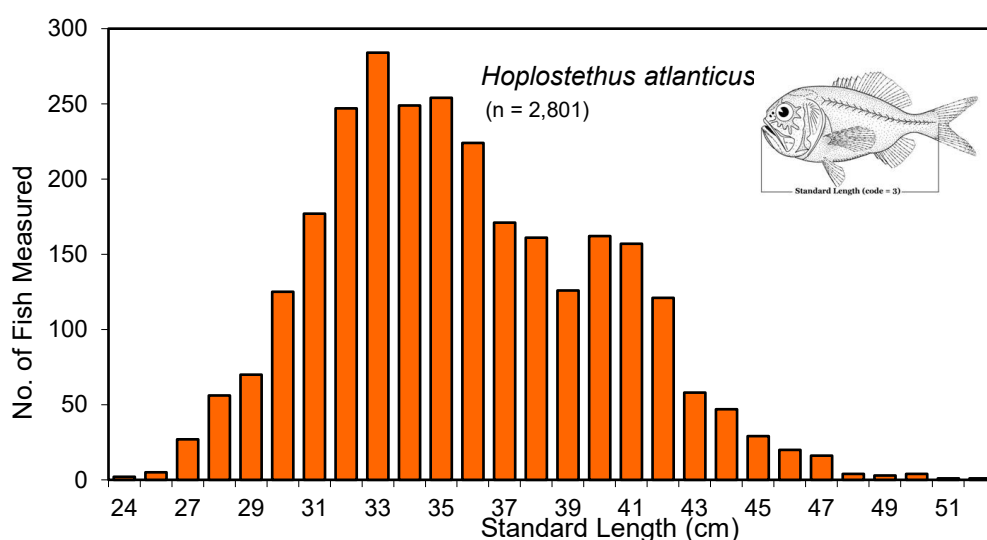
### 5.3 BIOLOGICAL SAMPLING AND LENGTH/AGE COMPOSITION OF CATCHES

The bottom fisheries continued to be monitored by scientific observers during 2019 and a summary of the length-frequency sampling is provided in Table 12. Biological sampling in 2019 was primarily of orange roughy, the principal demersal trawl target species.

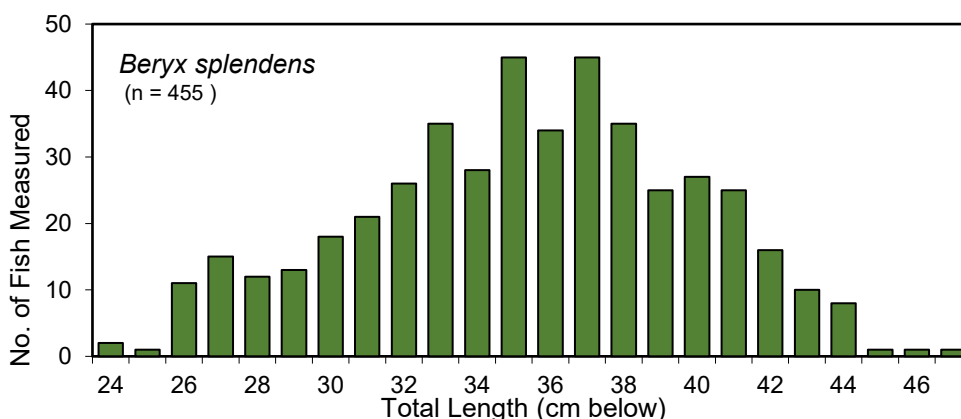
The unscaled length-frequency distribution of orange roughy from bottom trawl and alfonsino from midwater trawl are shown in Figures 5 and 6.

**Table 16: Summary of length-frequency sampling for those species or species groups with a sample size of 100 fish or more conducted by scientific observers aboard New Zealand vessels conducting bottom fishing in the SPRFMO Area in 2019.**

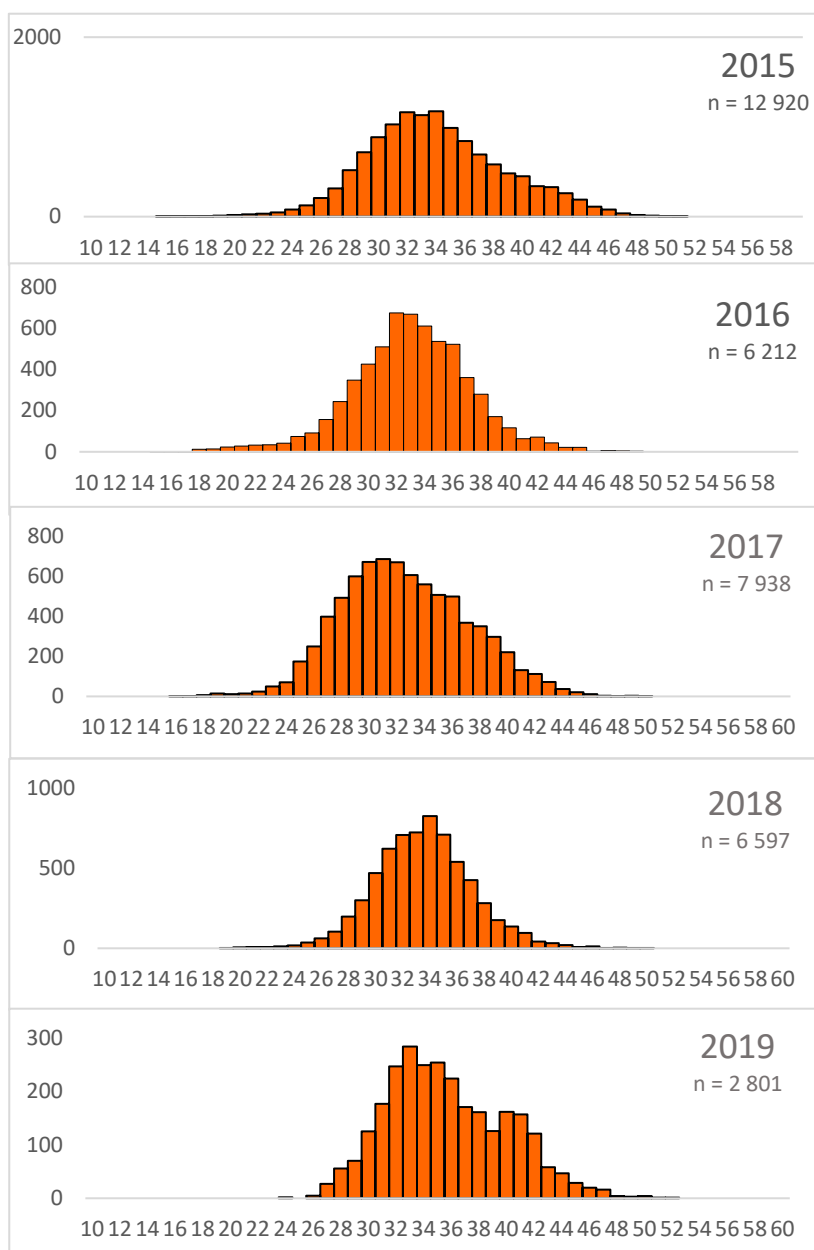
Scientific Name	Method	Common Name	Measure Used	Length (cm)			Number Measured
				Min	Mean	Max	
<i>H. atlanticus</i>	Bottom trawl	Orange roughy	Standard	24	35.60	52	2 801
<i>P. decacanthus</i>	Bottom trawl	Yellow boarfish	Total	17	27.07	39	610
<i>Beryx</i> spp.	Bottom trawl	Alfonsino	Fork	24	35.14	47	455
<i>H. antarctica</i>	Bottom longline	Bluenose	Fork	24	65.4	102	404
<i>Polyprion</i> spp.	Bottom longline	Wreckfish	Total	60	85.1	134	100
<b>Total</b>							<b>4 370</b>



**Figure 5: 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 2019.**

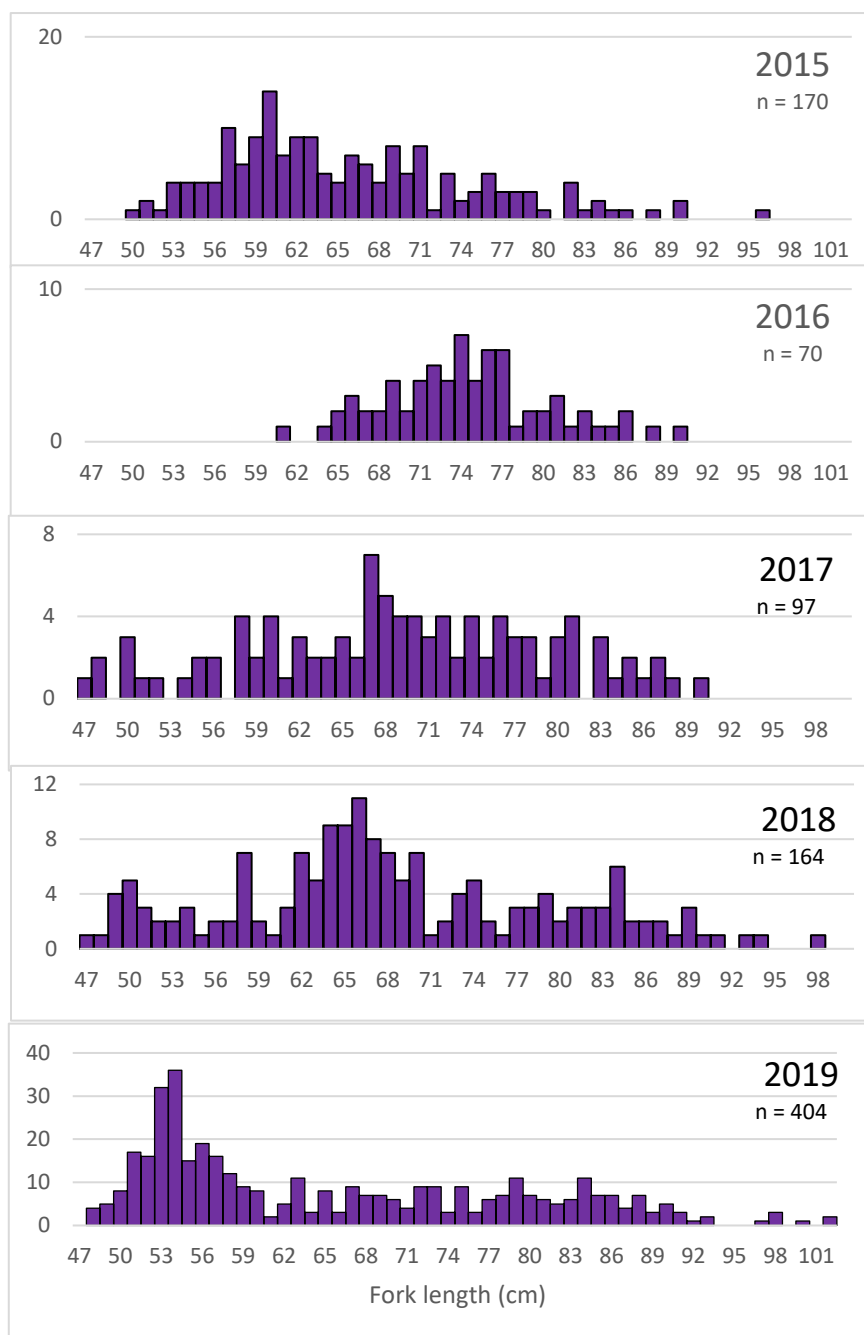


**Figure 6: Length frequency distribution (unscaled) for alfonsino (*Beryx* spp.) measured by scientific observers aboard New Zealand vessels fishing using bottom trawl in the SPRFMO Convention Area in 2019**



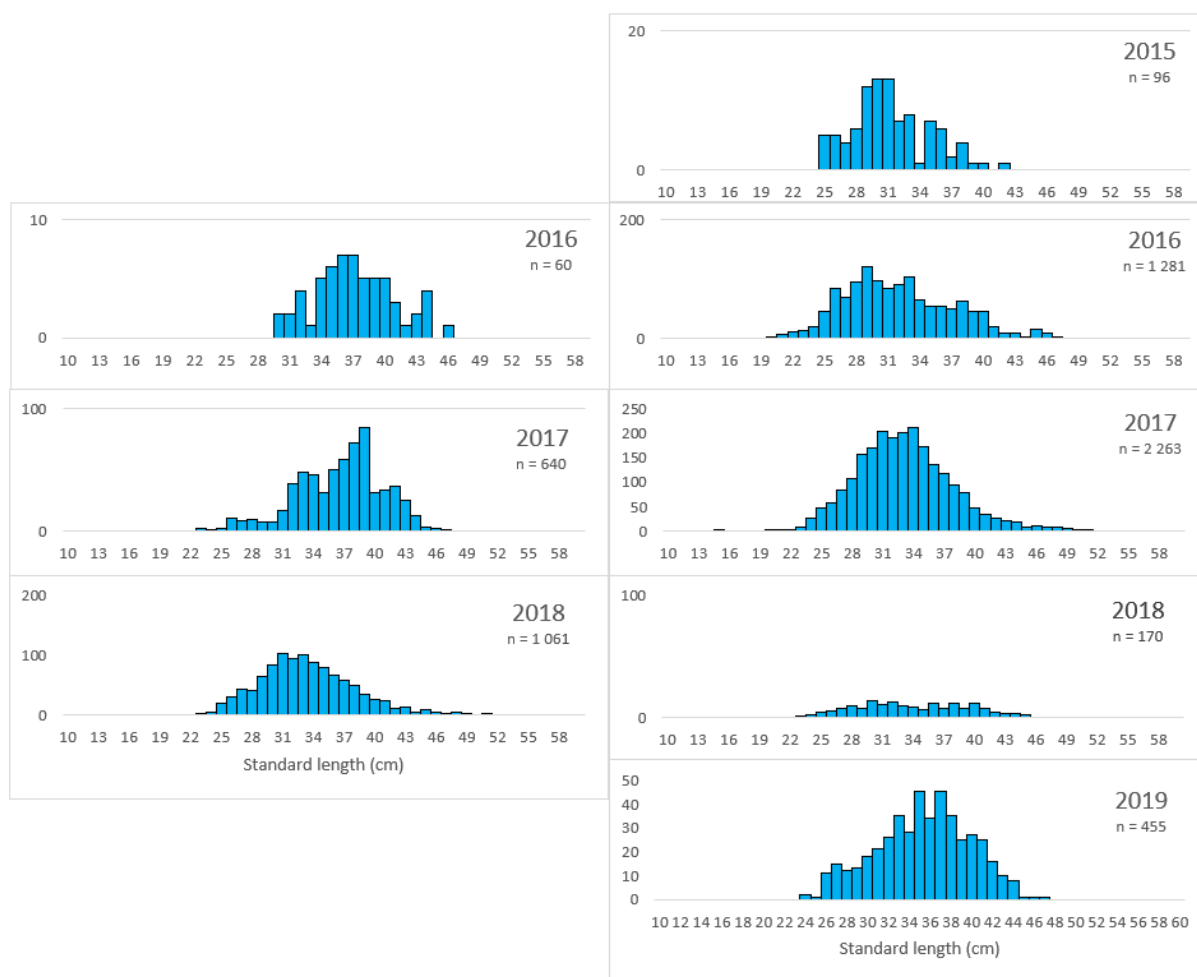
**Figure 7: Length frequency distributions (unscaled – standard length) of orange roughy in the last five years to 2019 in the SPRFMO Convention Area.**

Comparison of length frequency distributions from 2015 to 2019 (Figure 7) suggests that the size of orange roughy caught in bottom trawls is relatively consistent over time. Differences, primarily in 2017, are thought to be a result of changes in the location of fishing.



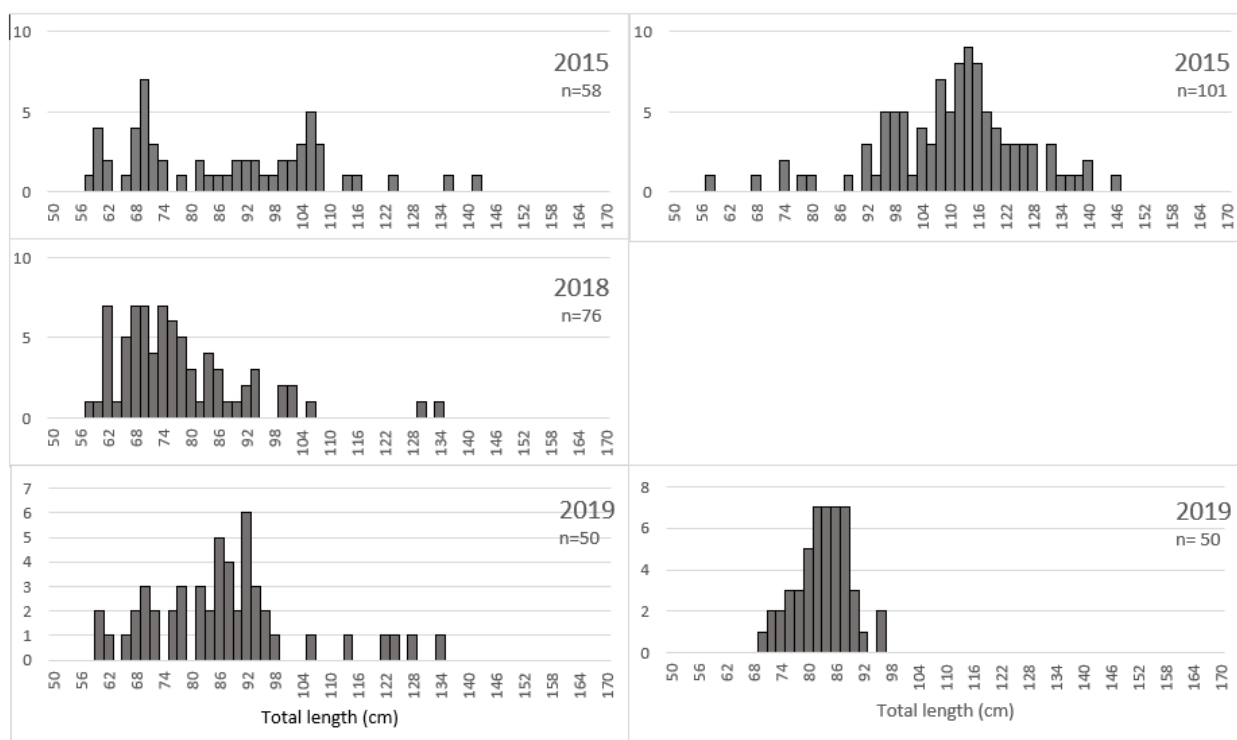
**Figure 8: Length frequency distributions (unscaled) for bluenose measured by scientific observers aboard New Zealand vessels fishing in the five years up to and including 2019 in the SPRFMO Convention Area.**





**Figure 10: Length frequency distributions (unscaled) for alfonsino (*Beryx splendens* and *B. decadactylus* combined) for the five years to 2019 measured by scientific observers aboard New Zealand trawl vessels fishing in the SPRFMO Area where more than 50 fish have been measured. Left panel, from midwater trawls; right, from bottom trawls.**

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



**Figure 9: Length frequency distributions (unscaled, 2 cm bins) for wreckfish measured by scientific observers aboard New Zealand vessels bottom longlining for the five years leading up to and including 2019 in the SPRFMO Area where over 50 fish have been measured. Left panel, bass (*Polyprion americanus*); right, hapuku (*Polyprion oxygeneios*).**

The recorded sizes of bluenose and wreckfish vary considerably between years (Figures 8 and 9), likely as a result of small sample sizes and shifts in fishing locations. Few wreckfish have been measured in recent years.

## 6 Ecosystem Approach considerations

### 6.1 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 baffle 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.

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.

### 6.2 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, ten seabird captures have been observed on New Zealand vessels: four seabirds (all alive) in bottom line fisheries, and six seabirds (all alive) in bottom trawl fisheries.

(Table 13). Species identification of some of the reports is being confirmed by expert analysis and may change.

In relation to other species of concern as specified in Annex 14 of CMM 02-2017, observers reported 50 kg of porbeagle shark (*Lamna nasus*) in 2015 from the Challenger area. No information on the number of individuals or the life status is available.

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

Year	Area	Fishing method	Species	Dead/alive	Catch weight	Notes
2015	Lord Howe Rise	Trawl	Great-winged petrel	Alive		
2015	Lord Howe Rise	Trawl	Great-winged petrel	Alive		
2015	Challenger	Bottom longline	Porbeagle shark		50 kg	
2016	Challenger	Trawl	White-faced storm petrel	Alive		
2017	Southern Ocean	Bottom longline	Prion (unidentified)	Alive		
2017	Lord Howe Rise	Trawl	Great-winged petrel	Alive		
2017	Louisville Ridge	Trawl	Storm petrel	Alive		
						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 petrel	Alive		
2018	West Norfolk Ridge	Bottom longline	Black-browed albatross	Alive		
2018	Lord Howe Rise	Trawl	Great-winged petrel	Alive		

### 6.3 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 14 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 15 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	2015	2016	2017	2018	2019
<b>Teleosts</b>					
Unicorn rattail <i>Trachyrincus</i> spp.	28.3	72.1	45.6	35.9	-
Rattails <i>Macrouridae</i> spp.	36.8	90.2	29.5	12.9	1.5
Ribaldo <i>Mora moro</i>	21.1	42.3	42.6	31.1	9.4
Spiky oreo <i>Neocyttus rhomboidalis</i>	14.1	28.8	33.4	38.7	2.7
Cardinalfish <i>Epigonus telescopus</i>	52.0	19.4	3.3	5.3	0.2
<b>Chondrichthyans</b>					
Shovelnose dogfish <i>Deania calcea</i>	37.7	100.9	58.8	26.0	2.9
Seal shark <i>Dalatias licha</i>	6.6	33.9	20.0	6.7	7.3
Widenosed chimaera <i>Rhinochimaera pacifica</i>	16.1	40.1	10.6	5.9	0.2
Long-nosed chimaera <i>Harriotta raleighana</i>	8.2	14.1	5.9	5.7	0.07
Baxter's lantern dogfish <i>Etmopterus baxteri</i>	4.5	3.5	13.7	3.0	0.8

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

Species	2015	2016	2017	2018	2019
<b>Chondrichthyans</b>					
Spiny dogfish <i>Squalus acanthias</i>	3.8	4.7	3.5	9.6	8.8
Northern spiny dogfish <i>Squalus griffini</i>	1.6	0.5	0.7	0.5	1.2
Thresher shark <i>Alopias</i> sp.	0	0	0	0.1	3.8
Seal shark <i>Dalatias licha</i>	4.3	0	0.01	0	0
Thresher shark <i>Alopias vulpinus</i>	0	0	0	0.1	3.9
Shovelnose dogfish <i>Deania calcea</i>	2.4	0.2	0	0.2	0.6

## 6.4 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 are required to 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 2019.

In the midwater trawl fishery for benthic-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 benthic-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 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

**Table 21: Data relating to the implementation of the move-on rule within the New Zealand midwater trawl fishery for benthic-pelagic species for the last 10 years. The numbers of tows are those fished in the move-on-rule areas only.**

Midwater trawling for benthic-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 present*

From May 2019, management of bottom fisheries has been subject to CMM03-2019, followed by CMM03-2020, 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 are 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	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

**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 Anthothecatae		
	Family Stylasteridae	Hydrocorals	1
Phylum Echinodermata			
	Class Asteroidea		
	Order Brisingida	Armless stars	1
	Class Crinoidea	Sea lillies	1

Since 19 May 2019, New Zealand vessels completed 221 trawl tows. Zero tows recorded catches that exceeded the encounter thresholds, and there were no encounters with potential VMEs in the 2019 calendar year.

***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. This information has been used to inform the development of the comprehensive bottom fishing measure that was adopted by the Commission in 2019.



**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 2015 and 2019. Where taxonomic resolution allows, bycatch is presented at the Class level, otherwise at the Phylum level. Row colors refer to VME indicator taxa included in CMM 03-2019 (purple), other VME taxa (orange), and other benthic bycatch taxa (white).**

Taxon	2015	2016	2017	2018	2019
<b>BOTTOM TRAWL</b>					
Arthropoda					
Branchiopoda (Shrimp)	2 (2)	0 (0)	0 (0)	0 (0)	0 (0)
Hexanauplia (Barnacles)	1.3 (3)	1.7 (4)	0 (0)	0.6 (3)	1.9 (3)
Malacostraca (Crabs, prawns)	0 (0)	6.1 (5)	29.9 (13)	2.9 (4)	8 (3)
Pycnogonida (Sea spiders)	0 (0)	0 (0)	1.0 (1)	0 (0)	1.0 (1)
Brachiopoda (Lamp shells)	2.0 (2)	0 (0)	1.0 (1)	0 (0)	0 (0)
Bryozoa (Lace corals)	0 (0)	0 (0)	0 (0)	0.4 (2)	0 (0)
Chordata					
Ascidiacea (Sea squirts)	0 (0)	0 (0)	20 (4)	0 (0)	0 (0)
Thaliacea (Tunicates)	0 (0)	4.7 (8)	12.1 (13)	0 (0)	0 (0)
Cnidaria					
Anthozoa (Anemones, corals, sea pens) <sup>1</sup>	247.3 (237)	556.7 (191)	3379.7 (123)	1264.9 (175)	37.2 (24)
Actiniaria (Anemones)	1002.9 (221)	906.3 (198)	902.5 (159)	989.1 (80)	107.8 (29)
Alcyonacea (Soft corals)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Antipatharia (Black corals)	61.3 (78)	48.7 (67)	37.9 (58)	46.9 (69)	13.7 (31)
Gorgonian Alcyonacea (Tree-like forms, sea fans, sea whips, bottlebrush) <sup>2</sup>	178.2 (49)	33.6 (54)	78.9 (79)	45.0 (62)	33.5 (30)
Pennatulacea (Sea pens)	1.7 (7)	3.3 (15)	18.3 (28)	8.1 (11)	2.1 (10)
Scleractinia (Stony corals) <sup>3</sup>	8806.2 (48)	32 (18)	633 (60)	41.5 (15)	7.4 (5)
Zoantharia (Hexacorals)	259.9 (168)	194.4 (131)	93.3 (93)	100.9 (57)	1 (1)
Hydrozoa (Hydroids) <sup>4</sup>	2.5 (7)	3 (2)	0.3 (2)	17.3 (11)	21 (21)
Stylasteridae (Hydrocorals)	2.2 (2)	0 (0)	3.7 (4)	2.3 (3)	0 (0)
Echinodermata					
Asteroidea (Starfish)	1.0 (1)	1.0 (2)	11.7 (8)	4.0 (3)	30.0 (12)
Brisingida ('Armless' stars)	10.1 (5)	2.1 (5)	0 (0)	2.3 (2)	0 (0)
Crinoidea (Sea lillies)	0 (0)	3.8 (7)	1.7 (13)	3.5 (6)	20 (20)
Echinoidea (Sea urchins)	0.2 (1)	1037.2 (38)	215.9 (45)	52.5 (6)	80 (3)
Holothuroidea (Sea cucumbers)	0.3 (1)	17.5 (14)	19.6 (7)	0 (0)	0 (0)
Ophiuroidea (Brittle stars)	0 (0)	253.0 (70)	11.3 (16)	2.0 (1)	3.0 (3)
Mollusca					
Bivalvia (Mussels, clams)	0 (0)	0.2 (2)	0.7 (3)	0.1 (1)	0 (0)
Gastropoda (Snails, whelks, tritons)	0 (0)	1.8 (5)	6.1 (7)	0 (0)	0 (0)
Ochrophyta					
Phaeophyceae (Brown algae)	0.2 (2)	10.0 (6)	0 (0)	0 (0)	0 (0)
Porifera (Sponges) <sup>5</sup>	358.4 (181)	191.9 (125)	428.5 (97)	168.5 (73)	15.4 (16)

Taxon		2015	2016	2017	2018	2019
Sipuncula (Peanut worms)		0 (0)	0 (0)	3 (1)	0 (0)	0 (0)
Unidentified		0.2 (2)	15.7 (7)	5.7 (5)	4 (4)	0 (0)
<b>BOTTOM LONGLINE</b>						
Cnidaria						
	Anthozoa (Anemones, corals, sea pens) <sup>1</sup>	0 (0)	0.2 (1)	0 (0)	0.1 (1)	0 (0)
	Actiniaria (Anemones)	0 (0)	0 (0)	1.0 (1)	0.3 (1)	0 (0)
	Antipatharia (Black corals)	0 (0)	0 (0)	0 (0)	0.2 (2)	0 (0)
	Gorgonian Alcyonacea (Tree-like forms, sea fans, sea whips, bottlebrush) <sup>2</sup>	0.3 (2)	0.4 (3)	2.2 (4)	0.6 (3)	0 (0)
	Scleractinia (Stony corals) <sup>3</sup>	0 (0)	0 (0)	0.1 (1)	0.3 (1)	2.0 (2)
	Hydrozoa (Hydroids) <sup>4</sup>	0 (0)	0.8 (2)	2.1 (3)	0.3 (2)	0.1 (1)
	Stylasteridae (Hydrocorals)	0.3 (2)	2.3 (1)	0.1 (1)	0 (0)	0 (0)
Echinodermata						
	Crinoidea (Sea lillies)	0 (0)	0.3 (1)	1.0 (1)	0.6 (1)	0 (0)
	Ophiuroidea (Brittle stars)	0.5 (2)	0.3 (1)	0 (0)	0 (0)	0 (0)
Porifera (Sponges) <sup>5</sup>		0 (0)	0.1 (1)	4.0 (4)	0.2 (1)	1.2 (1)

<sup>1</sup> Includes taxa other than Actiniaria, Gorgonian Alcyonacea, Alcyonacea, Scleractinia, Antipatharia, Pennatulacea, Zoanatharia

<sup>2</sup> Includes all Gorgonacea within the sub-orders Halaxonia, Calcaxonia and Scleraxonia

<sup>3</sup> Includes all taxa within the following genera: Solenosmilia; Goniocorella; Oculina; Enallopsammia; Madrepora; Lophelia

<sup>4</sup> Includes taxa other than Stylasteridae

<sup>5</sup> Includes all Porifera within the classes Demospongiae and Hexactinellidae

## 6.5 INFORMATION RELATING TO ABANDONED, LOST OR DISCARDED FISHING GEAR

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

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

Tables 23-25 provide information on reported incidents of abandoned, lost, discarded or retrieved fishing gear from New Zealand vessels fishing in the SPRFMO Convention Area for 2019. 'Retrieved' currently includes catch of any type of debris identifiable as having come from fishing (e.g. floats, bins, etc...). There were zero incidents of trawl gear lost in the SPRFMO Area by New Zealand vessels in 2019.

**Table 23: Gear loss recorded by observers from New Zealand trawl vessels in the SPRFMO Convention Area in 2019**

Year	Trawl – abandoned/lost
2019	0

**Table 24: Gear loss recorded by observers from New Zealand bottom line vessels in the SPRFMO Convention Area in 2019**

Year	Hooks	Backbone	Other
2019	N/A	N/A	N/A
2019 exploratory fishery	10,510	14,720 m	3 x grapnel 4 x gaff 1,500m sinking lines 1 x deck knife

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

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

\* Includes all records of fishing-related rubbish (eg. "Rubbish-fishing plastics, rubbish-fishing textiles)

## 7 Implementation of Management Measures

### 7.1 DESCRIPTION OF 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<sup>2</sup> 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](#).

### 7.2 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.

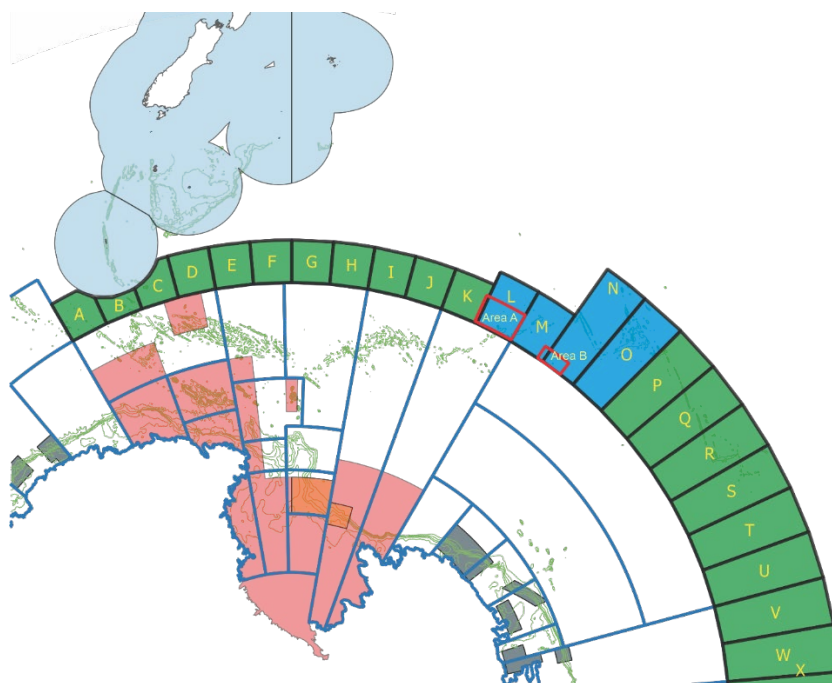
New Zealand vessels fishing on the Westpac Bank in the SPRFMO Area are required to report all catches against New Zealand's SPRFMO allocated catch limit and also balance those catches with New Zealand Annual Catch Entitlement to ensure catches are accounted for within the New Zealand Total Allowable 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. 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 will apply for the New Zealand fishing year 1 October 2019 – 30 September 2020.

New Zealand provided the 2019 Scientific Committee with information on the Southwest Challenger Plateau stock assessment to inform the Committee to make recommendations to the Commission on an appropriate catch limit for the Westpac Bank area (Cordue, 2019, [SC7-DW06](#), [SC7-DW07\\_rev1](#)).

### 7.3 EXPLORATORY FISHERY FOR TOOTHFISH

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



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

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

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

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

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

A summary of results from the 2019 and 2020 exploratory fisheries for toothfish is provided to SC8 as SC8-DW09.

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

#### 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
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### 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	<input type="checkbox"/>	<input type="text"/>	50	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
CNIDARIA							
Anthozoa (class)							
Actiniaria (order)	ATR	<input type="checkbox"/>	<input type="text"/>	0	1	<input type="checkbox"/>	<input type="checkbox"/>
Scleractinia (order)	SIA	<input type="checkbox"/>	<input type="text"/>	30	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Antipatharia (order)	COB	<input type="checkbox"/>	<input type="text"/>	1	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Alcyonacea (order)	SOC	<input type="checkbox"/>	<input type="text"/>	1	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Gorgonacea (order)	GOC	<input type="checkbox"/>	<input type="text"/>	1	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pennatulacea (order)	PTU	<input type="checkbox"/>	<input type="text"/>	0	1	<input type="checkbox"/>	<input type="checkbox"/>
Hydrozoa (class)	HDR	<input type="checkbox"/>	<input type="text"/>	6	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Unidentified Coral	COU	<input type="checkbox"/>	<input type="text"/>	0	1	<input type="checkbox"/>	<input type="checkbox"/>
ECHINODERMATA							
Crinoidea (class)	CRI	<input type="checkbox"/>	<input type="text"/>	0	1	<input type="checkbox"/>	<input type="checkbox"/>
Brisingida (order)	BRG	<input type="checkbox"/>	<input type="text"/>	0	1	<input type="checkbox"/>	<input type="checkbox"/>
<div style="display: flex; justify-content: space-between; align-items: center;"> <div>Sum these scores</div> <div>Count these ticks</div> </div>							
<div style="display: flex; justify-content: space-between; align-items: center;"> <div>Total VME Indicator Score → Sum of scores + count of ticks =</div> <div><input type="text"/></div> </div>							

#### 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)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Form used from May 2019

# Vulnerable Marine Ecosystem Evidence Process

(v2 April 2019)


**Fisheries New Zealand**

Tini a Tangaroa

## 1. Trip, tow, and vessel information

Trip number	Tow number	Observer/s	Name of vessel master
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

## 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	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
End	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

## 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	<input type="checkbox"/>	<input type="text"/>	50 <input type="checkbox"/>	5 <input type="checkbox"/>
CNIDARIA					
Anthozoa (class) Anemone, coral and sea pens					
Scleractinia (order)					
Stony corals	SIA	<input type="checkbox"/>	<input type="text"/>	250 <input type="checkbox"/>	5 <input type="checkbox"/>
Antipatharia (order)					
Black corals	COB	<input type="checkbox"/>	<input type="text"/>	5 <input type="checkbox"/>	1 <input type="checkbox"/>
Alcyonacea (order)					
Soft corals	SOC	<input type="checkbox"/>	<input type="text"/>	60 <input type="checkbox"/>	1 <input type="checkbox"/>
Gorgonacea (Informal group)					
Sea fans octocorals	GOC	<input type="checkbox"/>	<input type="text"/>	15 <input type="checkbox"/>	1 <input type="checkbox"/>
Hydrozoa (class) Hydroid					
Pennatulacea (order)					
Sea pens	PTU	<input type="checkbox"/>	<input type="text"/>		1 <input type="checkbox"/>
Actiniaria (order)					
Sea anemones	ATR	<input type="checkbox"/>	<input type="text"/>	40 <input type="checkbox"/>	5 <input type="checkbox"/>
Anthoathecatae (order)					
Stylasteridae					
Hydro corals	COR	<input type="checkbox"/>	<input type="text"/>		1 <input type="checkbox"/>
ECHINODERMATA					
Brisingida (order)					
Armless stars	BRG	<input type="checkbox"/>	<input type="text"/>		1 <input type="checkbox"/>
Crinoidea (class)					
Sea lillies	CRI	<input type="checkbox"/>	<input type="text"/>		1 <input type="checkbox"/>

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)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**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
















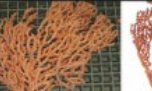



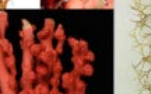
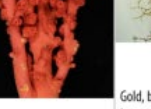


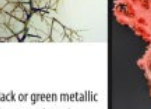








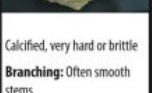



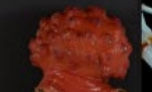

























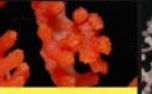









Note these are MFish codes

## Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area

These groups are not included

Bryozoa Snails Sea Stars Clams Urchins Worms Crabs

Code	SIA p71-79	COB p 57-58	SOC pg 55-56	GOC p 59-65					HDR p 9; 66-68	
Level	Scleractinia (Order)	Antipatharia (Order)	Alcyonacea (Order)	Gorgonacea (Order)					Anthoathecata (Family)	Hydroida (Order)
Taxon	Stony corals	Black corals	Soft corals	Isididae (Bamboo)	Coralliidae (Red / Precious)	Primnoidae (Bottle brush, Sea fans)	Paragorgiidae (Bubblegum)	Chrysogorgiidae (Golden)	Stylasterids (Hydrocorals)	Hydroids
Form, Size	   <b>Branching:</b> Can form large matrices, often forms thickets <b>Cups:</b> 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
	   Calcified, very hard or brittle <b>Branching:</b> Often smooth stems <b>Cups:</b> 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 sandpaper) with knobby ends. No pores on skeleton	   Usually no spines, some metallic lustre on skeleton, 3D Bushy branches, obvious polyps	   Chalky material, not hard. No spines, can scrape off surface. Bulbous ends with polyps	   Can be non-branching and whip-like. Usually no spines, metallic lustre. Fine or sparse 3D branching	   Coarse sandpaper texture, can't scrape off surface tissue. Has minute pores	   Indistinct polyps, feathery tips
Commonly mistaken for:	 Branching form can look like hard sponges but sponges are light with spicules	 Hydroid if small, or small pieces of dead Gorgonacea	 Small pieces of Coralliidae. 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 Coralliidae	 Antipatharia, but tips are not slimy	 Small, hard Bryozoans or pieces of Coralliidae	 Small specimens of Gorgonacea or Antipatharia

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






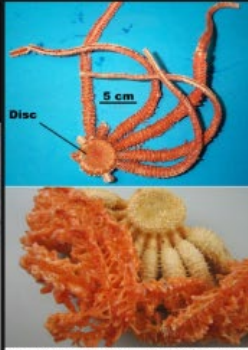














Note these are MFish codes

## Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area

These groups are not included

Bryozoa Snails Sea Stars Clams Urchins Worms Crabs

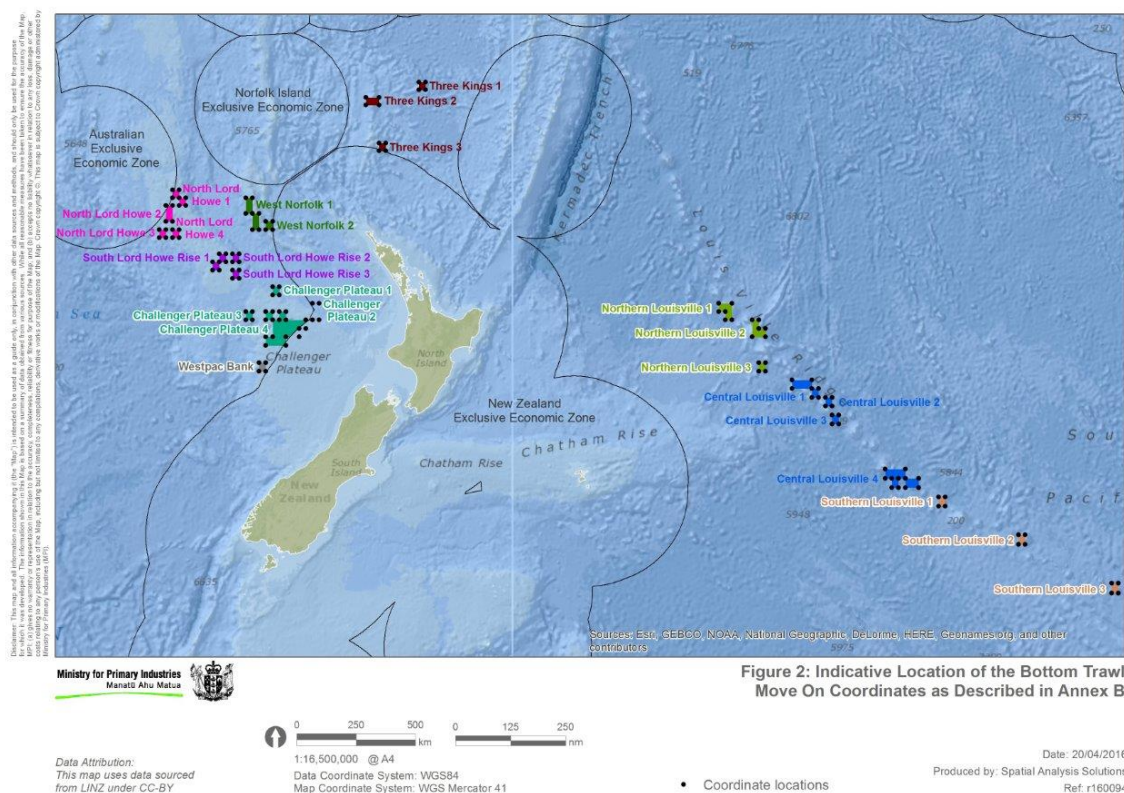
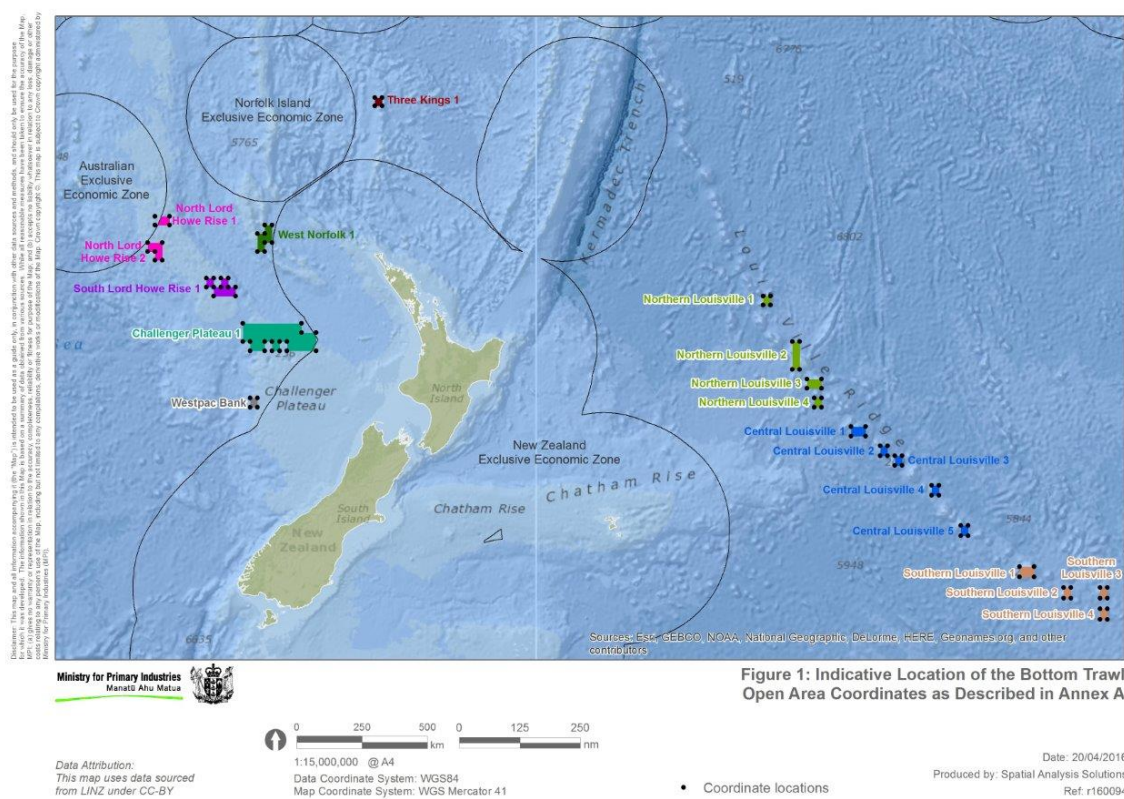
Code	ONG p 30-45		ATR p 51-54	PTU p 69-70	CRI p 230-232	BRG p 207
Level	Porifera (Phylum)		Actiniaria (Order)	Pennatulacea (Order)	Crinoidea (Class)	Brisingida (Order)
Taxon	Hexactinellida (Glass sponges)	Demospongiae (Siliceous sponges)	Anemones	Sea pens	Crinoids	Armless stars
Form, Size						
	Often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

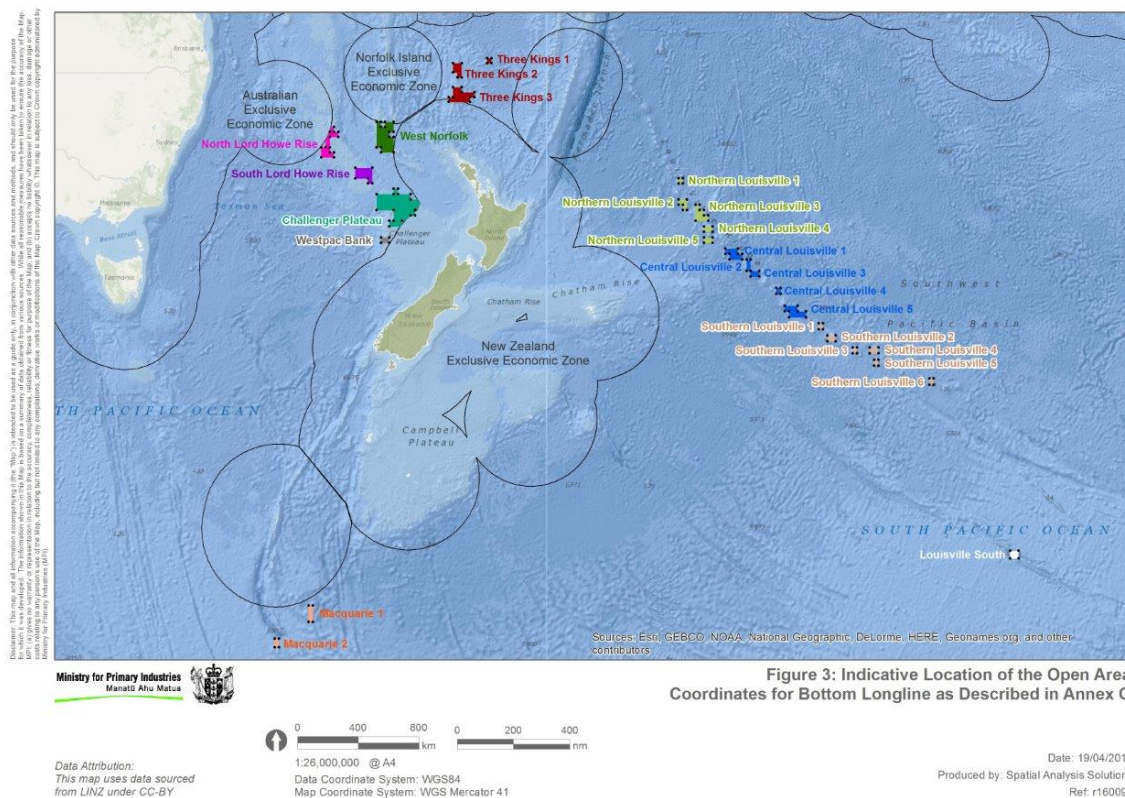
Images used copyright of NIWA, MFish, CCAMLR, LINZ

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



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







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

