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1 Description of Fisheries

1.1 PELAGIC FISHERIES

New Zealand conducted no pelagic fishing for *Trachurus* species in the SPRFMO Convention Area during 2014.

1.2 1.2 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 2014 operated as described in that document, and were conducted in accordance with the impact assessment and management measures described in the assessment.

New Zealand vessels have been bottom fishing in the SPRFMO Convention Area since before 1990. Specific high seas fishing permits for the SPRFMO Convention Area were implemented in 2007-08, following adoption of the SPRFMO interim measures in May 2007. The total number of New Zealand vessels permitted to fish in the SPRFMO Convention Area and with the capability for bottom fishing and the numbers of vessels which actually bottom fished in the Convention Area since 2002 are shown in Table 1.

Table 1: Summary of the number of New Zealand vessels permitted to bottom fish in the SPRFMO Convention Area and with the capability for bottom fishing, and the number of vessels which actually fished in the Area per year with either bottom trawl or line, since 2002. 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
2002–2003	*55	22	19	3
2003–2004	*66	24	17	7
2004–2005	*60	28	17	11
2005–2006	*58	22	12	10
2006–2007	*38	12	8	4
2007–2008	25	7	4	3
2008–2009	21	10	5	5
2009–2010	24	9	7	2
2010–2011	27	9	7	2
2011–2012	24	9	6	3
2012–2013	24	8	5	3
2013–2014	24	8	5	3
2014–2015	31	10	6	4

* There were no specific high seas permits for the SPRFMO Area prior to 2007. These were the numbers of New Zealand vessels issued with general high-seas permits that indicated that they had the capability to bottom trawl.
** Historical numbers in this table have been corrected and differ from those tabulated in New Zealand's 2014 National Report

Bottom trawl fishing effort declined from a peak of 23 vessels in 2002 and has been stable at between 4 and 8 vessels since 2007. The number of vessels line fishing increased from 3 in 2003 to a peak of 11 in 2005 before falling back to fluctuate between 2 and 5 vessel since.

The distribution of vessel size of the permitted vessels from 2007-08 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 Convention Area for the permit years (May - April) from 2007-08.

Length overall (m)	Fishing Permit Year (May – April)							
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
<= 11.9	0	0	0	0	1	1	0	0
12 – 17.9	1		1	1	1	1	1	1
18 – 23.9	4	3	3	3	3	3	3	8
24 – 29.9	3	3	1	3	1	1	2	2
30 – 35.9	3	4	5	4	2	2	2	3
36 – 44.9	8	8	6	8	8	8	7	6
45 – 59.9	0	2		2	2	2	2	3
60 – 74.9	4	6	6	6	6	6	6	7
>= 75	2	0	2	0	0	0	1	1
Total	**25**	**21**	**24**	**27**	**24**	**24**	**24**	**31**

The main areas of bottom fishing utilised by New Zealand vessels outside of the New Zealand EEZ are shown in Figure 1.

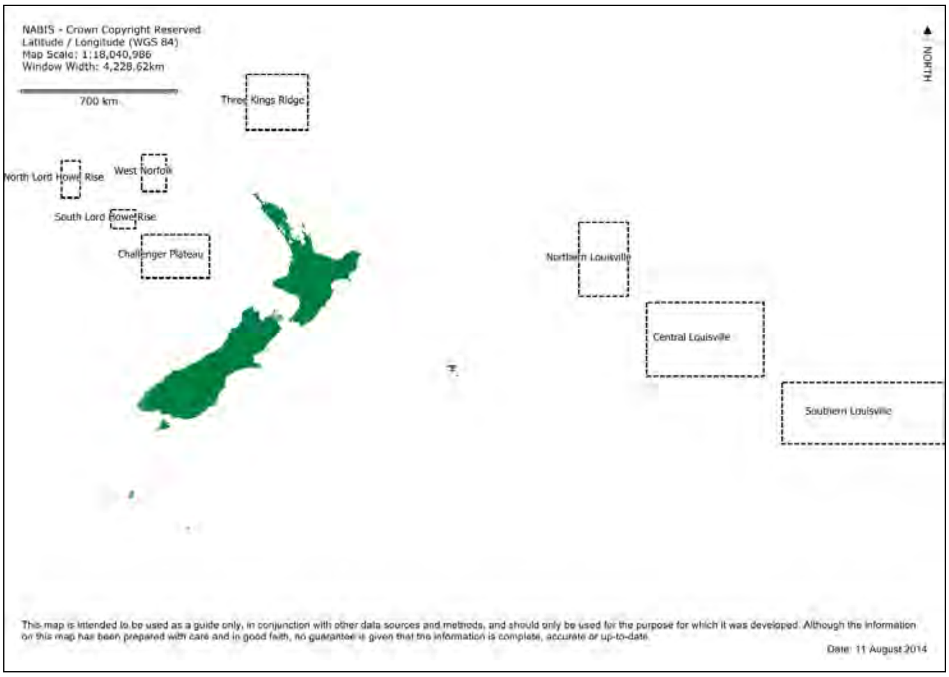

Figure 1: The main areas bottom fished by New Zealand vessels in the SPRFMO Convention Area (from the National Aquatic Biodiversity Information System - http://www.nabis2.govt.nz).

2 Catch, Effort and CPUE Summaries

2.1 BOTTOM TRAWL FISHERY

The annual fishing effort (number of vessels and number of bottom trawl tows which recorded a catch) and landed catch of the main bottom trawl target and bycatch species are summarised in Table 3. The number of bottom trawl tows decreased from about 3,000 per year at the start of the fishery, to a minimum of about 200 in 2008, then increasing again to about 1,200 in 2010 and 2011, dropping to the second lowest recorded since 2000 in 2014. This broadly mirrors the pattern of the number of vessels fishing over the same time period (Table 3).

Orange roughy (*Hoplostethus atlanticus*) continues to be the main bottom trawl target species, contributing 79% of the total bottom trawl catch since 2002 (varying between 67% and 99%) (see Table 3). Other species making minor contributions to catches include oreos 5% (0% to 16%), cardinalfish 4% (0% to 8%) and alfonsino 4% (0% to 13%). There was a substantial increase in the catch of alfonsino and cardinalfish in 2010 and 2011 but dropped back in 2012 and 2013 and neither was reported in 2014. Alfonsino is frequently targeted using midwater trawls close to the seabed but New Zealand conducted no such trawling in 2014.

Table 3: Annual fishing effort (number of vessels and tows) and catch (tonnes) of the main target and bycatch species (identified by FAO species codes) by New Zealand vessels bottom trawling in the SPRFMO Convention Area from 2002 (see Appendix 1 for list of species codes and names). Year is calendar year. 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	Tows/ Vessel	ORY	ONV	BOE	EPI	ALF	SSO	RIB	RTX	SCK	All Species
2002	23	2,944	128	2,578	–	121	159	17	50	43	61	37	3,180
2003	19	2,928	154	1,973	–	62	226	94	25	92	84	56	2,937
2004	17	1,952	115	1,697	–	90	42	85	91	46	34	8	2,188
2005	17	2,186	129	1,597	–	268	189	26	75	63	67	5	2,395
2006	12	1,135	95	1,415	–	57	21	28	6	33	27	15	1,652
2007	8	415	52	866	–	151	–	2	22	9	5	1	1,076
2008	4	208	52	837	2	–	–	2	<0.1	3	0.1	1	846
2009	6	547	91	928	5	–	16	5	<0.1	7	0.1	2	958
2010	7	1,167	167	1,474	9	12	22	244	10	15	6	13	1,864
2011	7	1,158	165	1,079	16	12	108	176	4	22	7	9	1,486
2012	6	652	109	721	10	4	2	39	3	5	7	2	805
2013	5	760	152	1,164	11	20	3	28	5	6	1	-	1,261
2014	5	403	81	998	6	7	0	0	5	2	0	0	1,028

The trends in orange roughy catch and effort from 2002 in the main fishing areas are summarised in Tables 4 and 5 and also shown in Figure 2. The decline in orange roughy catches from 2002 to 2008 was associated with the decline in fishing effort in the main historical fishing areas of the NW Challenger Plateau and Louisville Ridge (Tables 4 and 5). After 2008, effort on the NW Challenger Plateau increased, as did effort on the Lord Howe Rise and Louisville Ridge.

Table 4: Bottom trawl effort (number of tows) in the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Convention Area by calendar year from 2002.

Year	Challenger Plateau	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
2002	2,152	298	181	890	10	3,531
2003	2,072	88	470	774	95	3,499
2004	853	110	449	1,340	14	2,766
2005	1,039	323	256	838	41	2,497
2006	411	264	139	588	18	1,420
2007	76	176	37	126	–	415
2008	26	104	78	–	–	208
2009	156	252	229	–	11	648
2010	409	58	388	303	12	1,170
2011	437	84	379	258	–	1,158
2012	166	58	121	296	11	652
2013	189	27	128	299	7	7600
2014	64	0	70	263	6	403

Table 5: Total landings (tonnes) of orange roughy from the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Convention Area by calendar year from 2002.

Year	Challenger Plateau	West Norfolk Ridge	Lord Howe Rise	Louisville Ridge	Other Areas	All Areas
2002	1,460	432	96	568	22	2,578
2003	868	25	218	859	3	1,973
2004	347	106	132	1,106	5	1,697
2005	425	327	190	623	33	1,597
2006	202	670	29	493	22	1,415
2007	36	515	34	280	–	866
2008	31	426	380	–	–	837
2009	261	233	403	–	31	928
2010	420	79	385	584	6	1,474
2011	680	113	1	285	–	1,079
2012	255	49	121	288	8	721
2013	233	19	344	565	3	1,164
2014	111	0	79	754	54	998

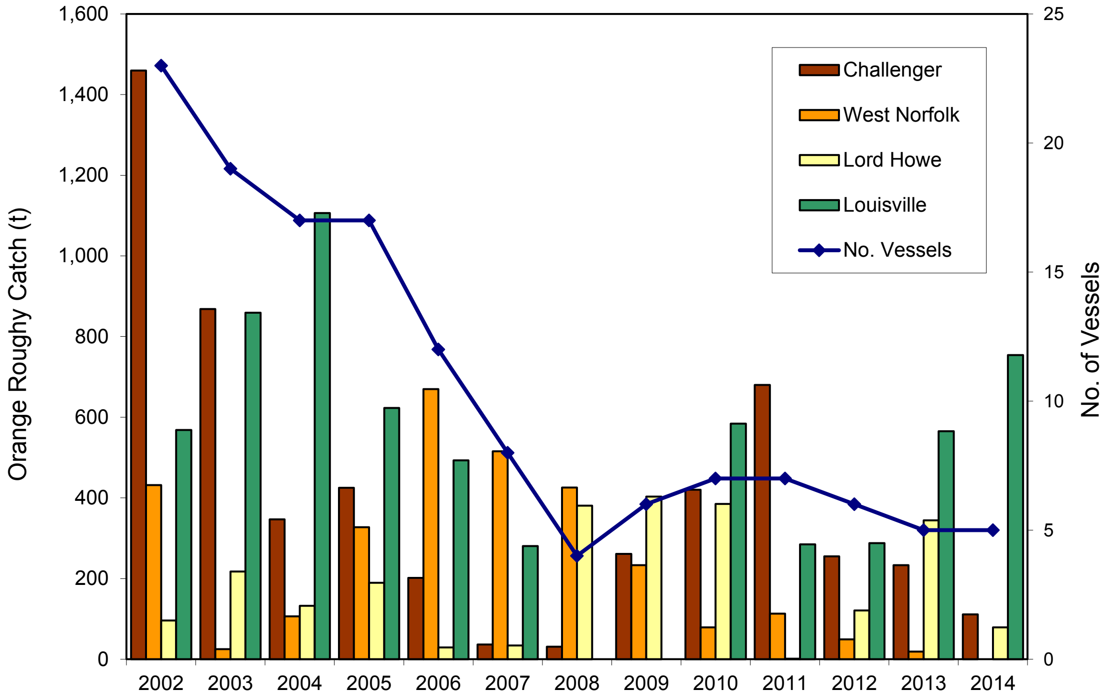

Figure 2: Trends in effort (the number of bottom trawl vessels fishing, number of tows) and total landings of orange roughy (tonnes) for each of the four main areas fished by New Zealand bottom trawl vessels in the SPRFMO Convention Area by calendar year from 2002.

2.2 MIDWATER TRAWL FISHERY FOR BENTHO-PELAGIC SPECIES

2011 saw midwater trawling for bentho-pelagic species for the first time in any quantity (there were 1 and 15 midwater tows in 2009 and 2010 respectively), with three permitted trawlers executing a total of 61 tows principally targeting alfonsino (ALF) close to the seabed. It has been determined that such fishing is included in the SPRFMO definition of bottom fishing. The effort and principal catches by year are shown in Table 6. Effort was the same in this fishery for 2011 and 2012 in terms of numbers of vessels and numbers of tows. In 2013 only one vessel fished using a midwater trawl but there was a marked increase in effort, with 120 tows. The same vessel also fished bottom trawl gear on the same trips as it fished midwater gear. Despite the 2-fold increase in the number of midwater tows in 2013, catches remained similar to previous years. The proportion of the main target species, alfonsino, taken in 2013, showed a further increase to 84% (Table 6). There was no midwater trawling for bentho-pelagic species in 2014.

Table 6: Effort and landings for New Zealand vessels midwater trawling in the SPRFMO Convention Area by calendar year. Catches in tonnes of the target and bycatch species (see Appendix 1 for a list of species codes and names). 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	Tows/ Vessel	ALF	EDR	ONV	BWA	All Species	% ALF
2011	3	61	20	64	76	21	2	164	39%
2012	3	59	20	114	25	-	3	145	79%
2013	1	120	120	122	9	-	10	145	84%
2014	0	0	N/A	0	0	0	0	0	N/A

2.3 BOTTOM LINE FISHERY

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 7. The number of active line vessels increased from 3 in 2003, to 11 in 2005, then declined and has fluctuated between 3 and 5 vessels since 2007. The numbers of hooks set rose from 50,000 in 2003 to peak at 500,000 in 2006 and then declined to a low of 48,000 in 2010, since when it has increasing substantially to a new peak of 780,000 in 2014. The same number of vessels fishing in 2013 set about five times as many hooks as in 2012 while catch increased by only 30%. Four vessels fished in 2014 and set 64% more hooks than in 2013 while the catch declined by 20% (Table 7).

Table 7: Effort and landings for New Zealand vessels bottom lining in the SPRFMO Convention Area by calendar year from 2002. Effort is presented as the number of vessels and number of hooks set, with catches in tonnes of the target and bycatch species (see Appendix 1 for a list of species codes and names).

Year	No. Vessels	No. Hooks	Hooks/ Vessel	BWA	HAU	DGS	MOW	RXX	YTC	ROK	TOP	All Species
2002	–	–	–	–	–	–	–	–	–	–	–	–
2003	3	53,438	17,813	6	7	1	1	–	–	–	1	17
2004	7	268,809	38,401	116	24	–	6	2	1	–	3	154
2005	11	384,031	34,912	102	31	13	10	2	3	1	–	163
2006	10	501,810	50,181	271	95	6	6	2	2	2	–	385
2007	4	423,420	105,855	144	31	4	5	3	3	1	–	202
2008	3	302,310	100,770	67	43	1	2	<1	1	8	–	123
2009	5	236,146	47,229	58	23	7	1	<1	–	<1	–	89
2010	2	48,180	24,090	15	24	–	1	<1	<1	<1	–	45
2011	2	71,183	35,592	23	25	6	<1	<1	<1	<1	–	57
2012	3	90,036	30,012	44	40	2	3	<1	<1	<1	–	95
2013	3	479,042	159,681	64	41	6	3	<1	1	1	–	124
2014	4	783,548	195,887	33	45	4	11	<1	<1	2	–	99

Bluenose BWA (*Hyperoglyphe antarctica*) was the historic main bottom line target species but catches declined from 2006 and the annual catch has been similar to that of wreckfish (HAU, *Polyprion oxygeneios* and *P. americanus*) since about 2010. Together these two reporting codes (three species) made up 76–95% of the catch between 2003 and 2013, averaging 87% overall, and they accounted for 79% of the catch in 2014. Other species making minor contributions to bottom line catches include spiny dogfish (DGS), king tarakihi (MOW) and sea perch (ROK).

The increase and subsequent decrease in bluenose catches by main fishing areas since 2002 is shown in more detail in Table 8, and, together with effort, is also shown in Figure 3. Figure 3 shows that the moderate catches in the mid-2000s have fallen to much lower levels recently, in line with the reduction in effort over time.

Table 8: Total catch of bluenose from the main areas fished by New Zealand bottom line vessels fishing in the SPRFMO Convention Area by calendar year from 2002.

Year	Challenger Plateau	West Norfolk Ridge	Three Kings Ridge	Louisville Ridge	Other Areas	All Areas
2002	–	–	–	–	–	–
2003	–	5	1	–	–	6
2004	103	12	–	–	1	116
2005	38	27	24	–	14	102
2006	91	114	48	–	19	271
2007	59	47	39	–	–	144
2008	24	33	8	2	–	67
2009	13	29	16	–	–	58
2010	2	13	–	–	–	15
2011	–	11	11	–	–	23
2012	11	15	18	–	–	44
2013	31	10	24	–	–	64
2014	8	11	14	–	–	33

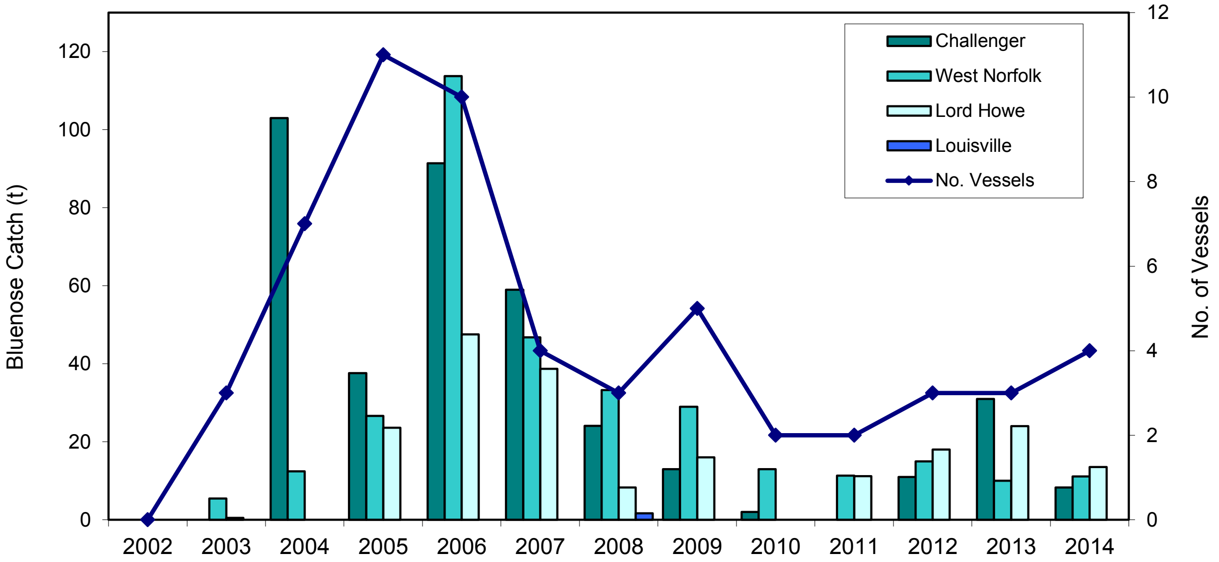

Figure 3: Trends in number of bottom line vessels and total bluenose catch from the four main areas fished by New Zealand bottom line vessels in the SPRFMO Convention Area by calendar year from 2002.

3 Fisheries Data Collection and Research Activities

3.1 FISHERIES CATCH & EFFORT DATA COLLECTION SYSTEMS

The data collection systems implemented for New Zealand high seas bottom trawl and line fishing vessels has 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 described therein.

Detailed observer Benthic Materials Forms have been completed for all observed bottom fishing (trawling and lining) to record benthic bycatch to the lowest possible taxonomic level and, in addition, Vulnerable Marine Ecosystem (VME) Evidence Forms are used by observers in the move-on areas for trawlers.

3.2 ESTIMATION OF ORANGE ROUGHY SUSTAINABLE CATCH LIMITS

During 2009 the Ministry of Fisheries commissioned a research project on ‘Development of Estimates of Annual Sustainable Catches, and of Sustainable Feature Limits, for Orange Roughy Bottom Trawl Catches in Specific Fishing Sub-Areas in the Proposed Convention Area of the South Pacific RFMO’. A final research report for this project was provided as an information paper to the 9th SPRFMO Science Working Group (SWG) meeting (Clark et al. 2010, SWG-09-INF-01). A summary of the results of this work was provided as a paper to the Deepwater Sub-Group (Penney et al. 2010a, SWG-09-DW-02). Figure 4 shows a summary of this work, with the trends in orange roughy catch (t), CPUE (t/tow, with standard errors) and estimated Maximum Constant Yield (MCY), Maximum Annual Yield (MAY), ½MB_0 and 2002-2006 average catch reference levels from Clark et al. (2010) shown for the main fishing areas (from Penney 2010a).

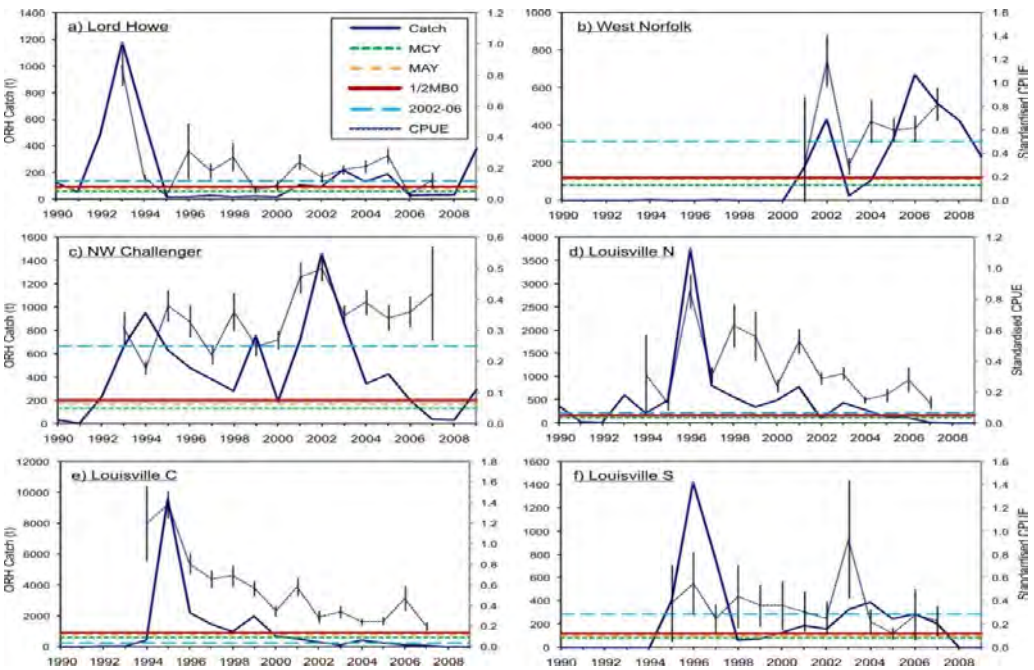

Figure 4: Summary of trends in total orange roughy catch (t), CPUE (t/tow, with standard errors) and estimated MCY, MAY, ½MB_0 and 2002–2006 average catch reference levels for each fishing area (from Penney 2010a).

This work is being updated and papers describing progress will be provided to the third meeting of the Scientific Committee in September 2015 (Clark et al. 2015 has been submitted). Key developments in this work are that:

- recent analysis of stock structure indicators suggests that slight changes to the areas used for stock assessment purposes are required (Figure 5)
- spatially-structured CPUE models have been fitted, showing plausible trends in several areas that are suitable for the fitting of biomass dynamic models (see Figures 6 and 7 for an example from one example area on the NW Challenger Plateau)
- initial biomass dynamic models have been fitted and this work will be reported to the Scientific Committee when the work is complete. This may be at SC3.

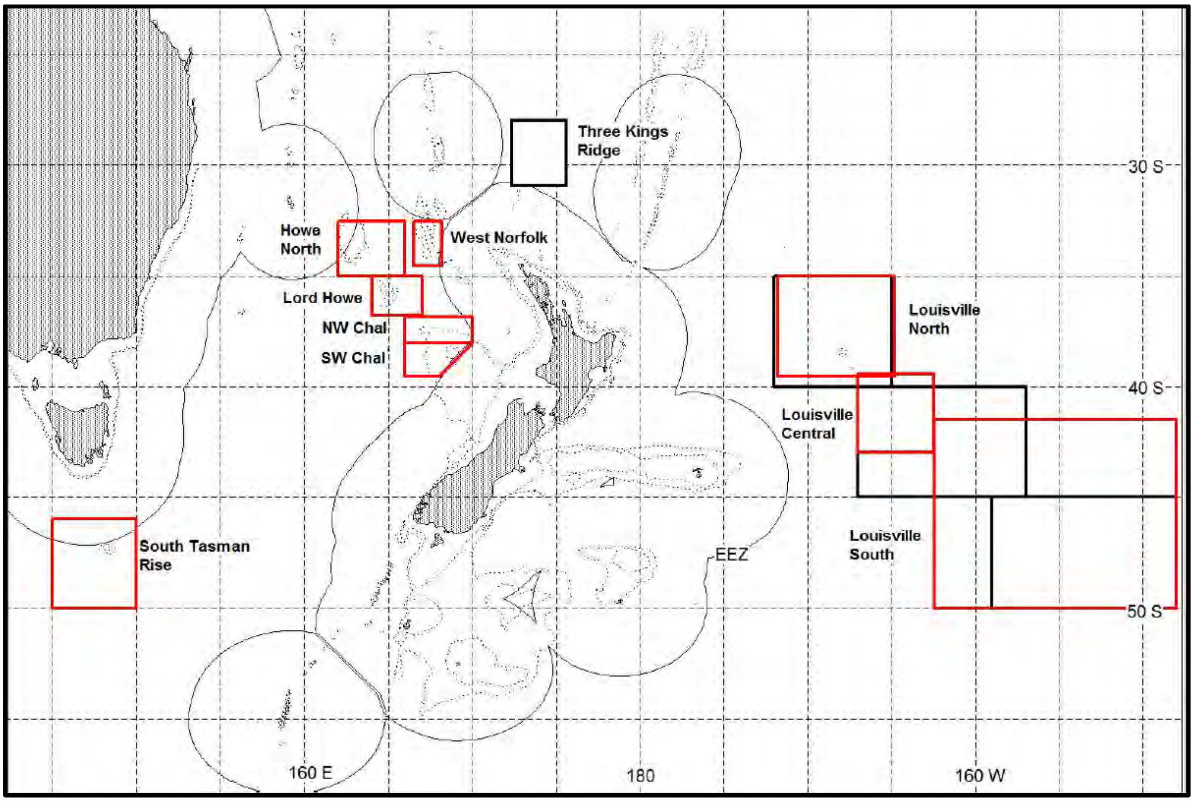

Figure 5: Comparison of new areas assumed for stock assessment purposes (in red) and previous areas (in black). Where both are coincident, red boxes overlie black boxes. There has been no change for the Three Kings Ridge area.

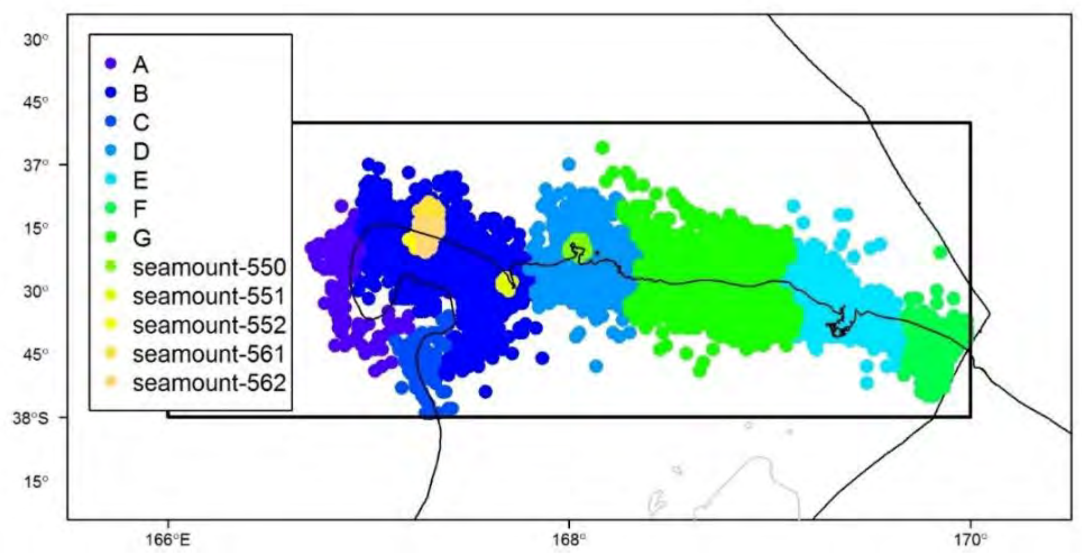

Figure 6. Northwest Challenger Plateau area, showing total effort (n=10302 tows=coloured dots) by subareas (n=12) considered for spatial CPUE analyses of orange roughy.

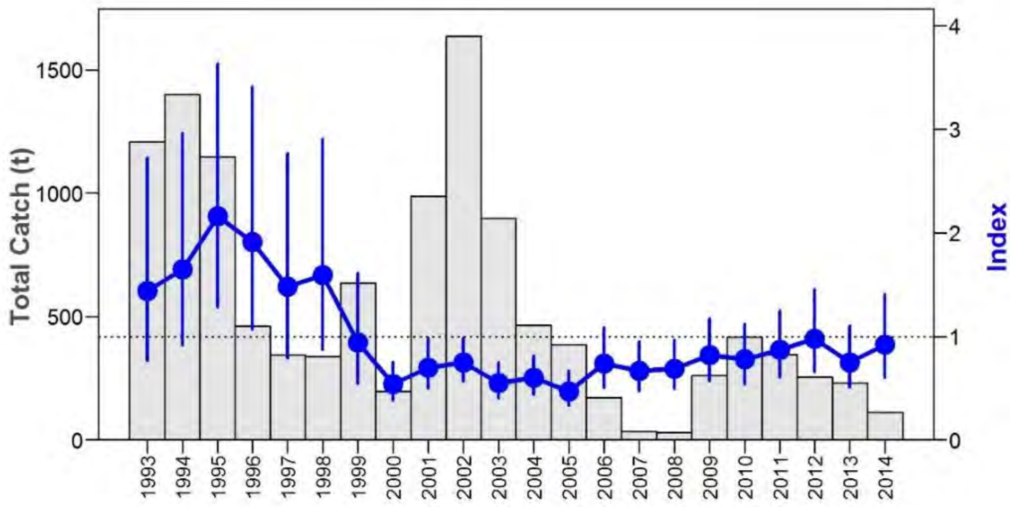

Figure 7. Catch series (grey bars, left axes) and normalised, standardized spatial CPUE abundance indices (blue line/full circles, right axes) for orange roughy stocks on the northwest Challenger Plateau. Error bars are ±1 standard deviation.

3.3 CHALLENGER PLATEAU ORANGE ROUGHY STOCK STATUS

Following stock sustainability concerns, the fishery on the straddling stock of orange roughy on the southern Challenger Plateau was closed in 2000. Since 2006 a programme of combined trawl and acoustic surveys has been conducted to re-assess the status of this stock (MPI, 2013). The 2009 survey gave a minimum biomass estimate of 22,700 t, approximately 25% of the B_0 estimated from the assessment in 2000. This was above the soft limit reference point of 20% B_0 established in the New Zealand Harvest Strategy Standard for re-opening of the fishery

(Ministry of Fisheries 2008a). The fishery was re-opened on 1 October 2010 with a total allowable catch (TAC) limit of 525 tonnes (see Section 4.3).

Scientific biomass surveys for this straddling stock were conducted in each year of 1987–1989, 2006, and 2009–2013. A formal stock assessment was initiated in late 2013 that resulted in a peer-reviewed stock assessment for this stock being accepted by MPI Deepwater Fisheries Assessment Working Group and subsequently by New Zealand's Fishery Assessment Plenary for use in the future management of this fishery (MPI, 2014b). The spawning biomass (New Zealand-specified stock ORH 7A) is estimated to have been steadily increasing since just before the fishery closure in 2000–2001 (Figure 8). According to New Zealand's Harvest Strategy Standard, the stock is now considered to be fully rebuilt (at least a 70% probability that the lower end of the management target range of 30–40% B_0 has been achieved). Since the fishery re-opened in 2010-11, estimated fishing intensity has been low and fairly constant.

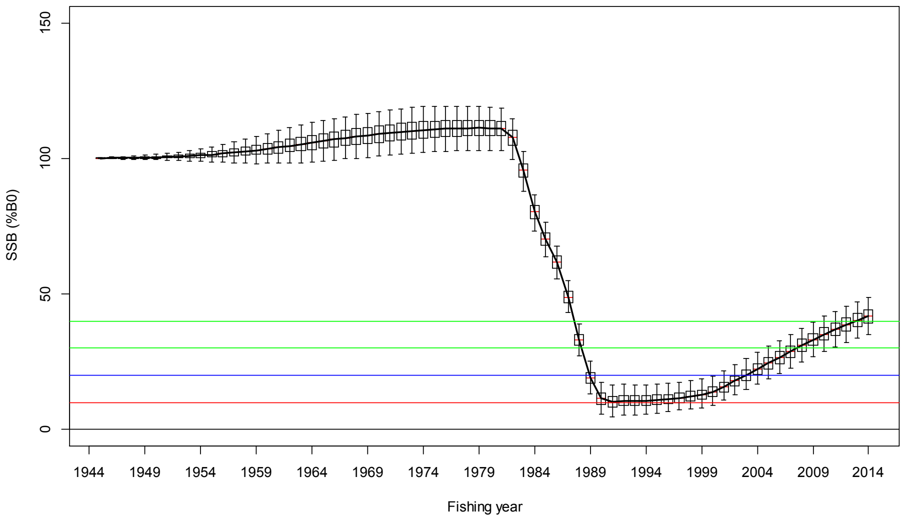

Figure 8: Spawning-stock biomass trajectory for ORH 7A estimated from the base model MCMC chain. The box in each year covers 50% of the estimated distribution and the whiskers extend to 95% of the distribution. The hard limit 10% B_0 (red), soft limit 20% B_0 (blue), and biomass target range 30–40% B_0 (green) are marked by horizontal lines.

3.4 DEVELOPMENT OF STOCK ASSESSMENT OR IN-SEASON MANAGEMENT APPROACH FOR SQUID

New Zealand has been working on methods of assessing its EEZ squid stocks in-season. Hurst et al. (2012) carried out a detailed characterisation of SQU6T (Auckland Islands) and SQU1T (Snares Islands) fisheries and a preliminary evaluation of potential in-season management approaches. McGregor (2013) and McGregor & Tingley (in press) further developed these analyses and the depletion method as described in Roa-Ureta (2012). This approach is currently being refined (see paper by McGregor & Large 2015) for New Zealand's two main trawl fisheries for squid in fishing years 1991 to 2014.

Depletion models have been successfully fitted to standardised indices of CPUE in some weeks of all years, and tended to be successful in later weeks. As an example, Figure 8 shows estimated relative abundance and depletion rates by fishing day for depletion models with data up to fishing weeks 24, 26, 30 and 38 in the 2009 season at the Auckland Islands. Work is continuing on the development of depletion models and they may have application in the SPRFMO Area.

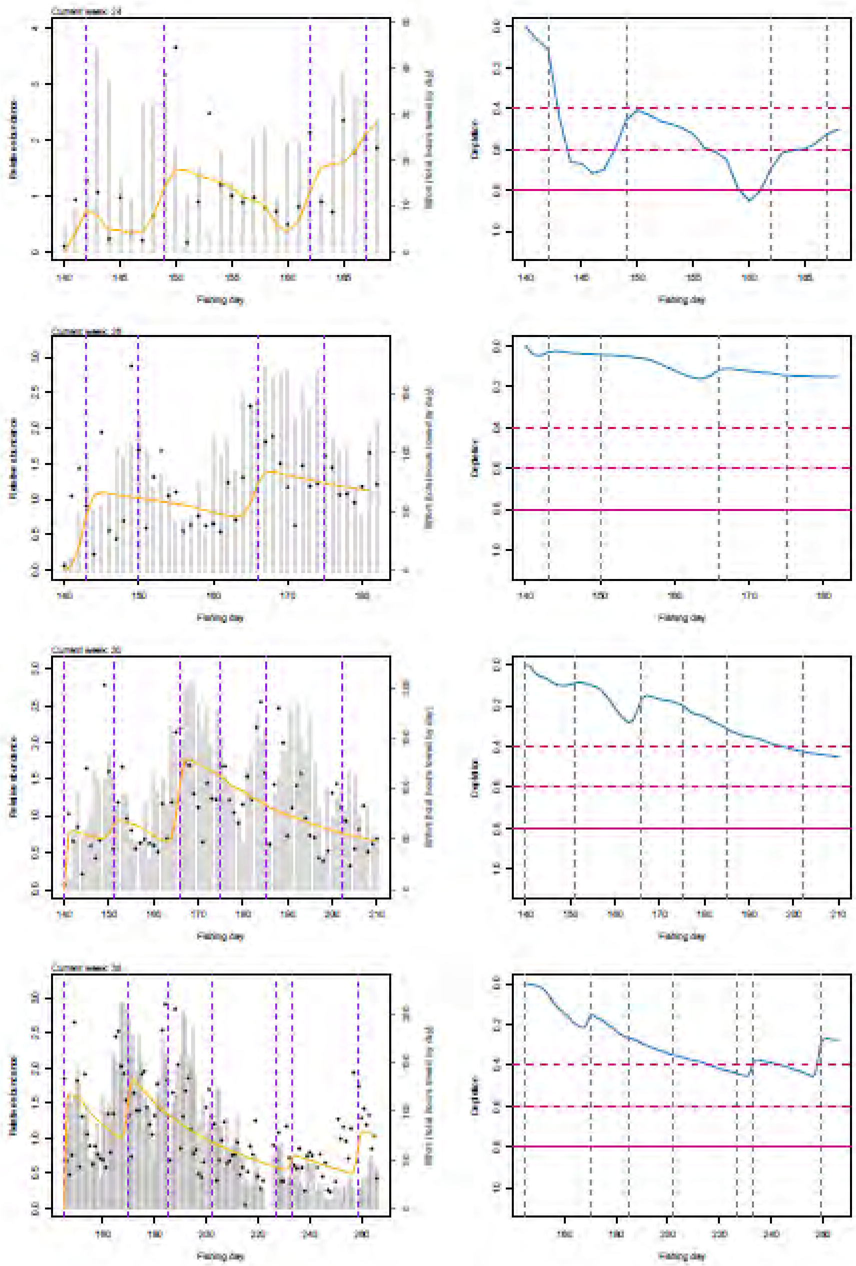

Figure 9: Relative abundance (left) and depletion rates (right) for four depletion models fitted to Auckland Islands data for the 2009 fishing year where the data is available to the current week: week 24 (top), week 26 (second from top), week 30 (second from bottom), week 38 (bottom) . Vertical dotted line indicate the timing of estimated recruitment pulses.

3.5 GEOSPATIAL PREDICTION AND MAPPING OF VMEs

New Zealand continues to develop geospatial data files on seabed bathymetry, fishing footprints and VME distribution for provision to the SPRFMO Secretariat and inclusion in the SPRFMO Geospatial Database.

Following publication of the first global habitat suitability models for scleractinian corals (Tittensor *et al.* 2009, 2010), the Ministry of Fisheries initiated work to evaluate the potential for using such predictive habitat models to evaluate the likelihood of encountering VMEs in the SPRFMO Convention Area. A methods paper describing potential approaches to using geospatial data and habitat prediction models to evaluate likelihood of occurrence of VMEs in the SPRFMO Area, was submitted to the SWG Deepwater Sub-Group (Penney 2010b, SWG-09-DW-03). This area of research continues to be progressed and was the subject of bilateral discussions between New Zealand and Australia during 2013. The work was published in late 2013 (Rowden et al. 2013).

A scientific survey to the Louisville Ridge to collect coral samples and additional data to test the predictive power of coral distribution models was conducted in early 2014 (Figure 10:, Clark et al. 2015). The voyage was funded by New Zealand's Ministry of Business, Innovation, and Employment through project CO1X1229 "*Predicting the occurrence of vulnerable marine ecosystems for planning spatial management in the South Pacific region*" with additional support from Ministry for Primary Industries.

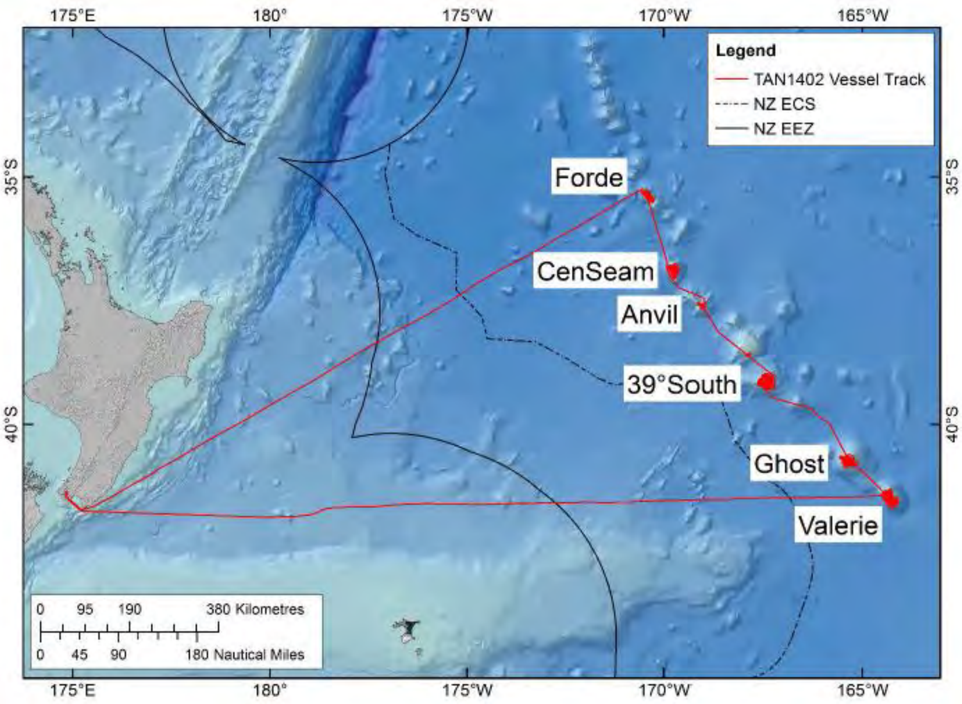

Figure 10: Track of RV Tangaroa during voyage TAN1402 to the Louisville Ridge to test the predictive power of models of the distribution of VME indicator taxa (from Clark et al. 2015).

Stony corals, a key VME indicator taxon, were found at many sites throughout the sampling area (depths summarised in Figure 11), and their locations were compared with model predictions. The models were developed using Boosted Regression Tree (BRT) and Maximum

Entropy (MaxEnt) approaches. Details of these models and the results of a field validation exercise are contained within a manuscript submitted for publication (Anderson et al. submitted). That validation exercise showed that models predicting a suite of four stony coral VME indicator taxa (combined) did not perform very well (Table 9), primarily because many of the environmental predicator variables used were scaled to 1 km resolution using a global bathymetry data set that was found to be very imprecise in the validation area (sometimes biased by many 100s of metres depth). However, the authors consider that the models predict the likelihood of suitable habitat for coral VME indicator taxa at a coarse-scale (i.e., at the scale of a large topographic feature such as a seamount or ridge, but not at within-feature scale.

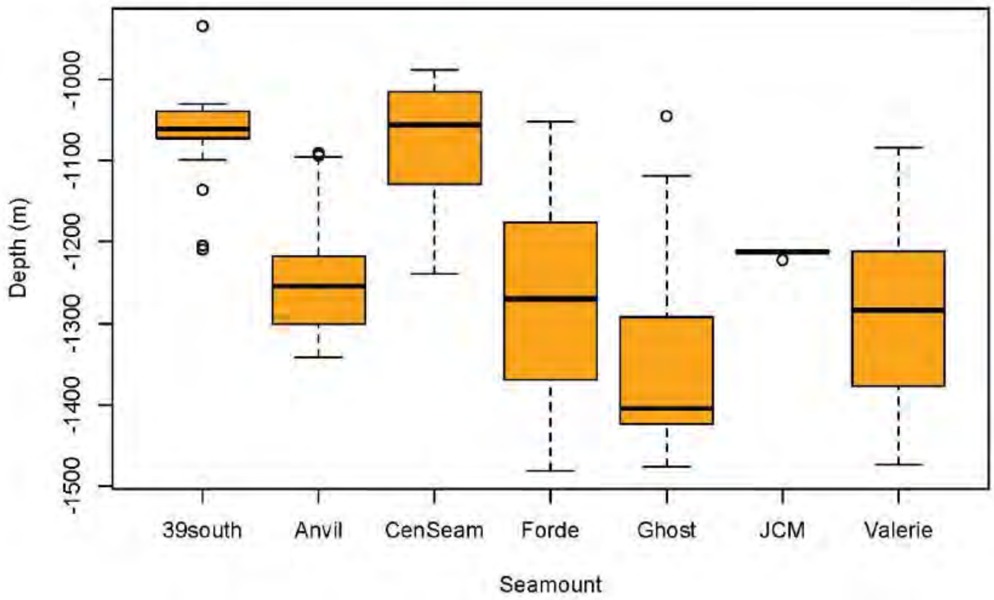

Figure 11: Depth distribution of live scleractinian (stony) corals on the surveyed seamounts. The plot shows the median (bar), upper and lower quartiles (box), and total range (circles) (from Clark et al. 2015).

Table 9: Stratification of sampling on voyage TAN1402 to the Louisville Ridge to test the predictive power of models of the distribution of VME indicator taxa (summarised from Tables 2 and 11 of Clark et al. 2015). BRT, boosted regression tree; MaxEnt, maximum entropy; DTIS, deep-towed imaging system.

Stratum	Conditions	Stony coral predicted?	N DTIS tows	N stony coral observed
1	High probability (>0.8) of suitable habitat for stony corals, both BRT and Maxent models, unfished	Yes	40	19
2	Low probability (<0.2) of suitable habitat for stony corals, both BRT and Maxent models, unfished	No	13	11
3	Models predict different probabilities (one high, one low), unfished	Yes/No	23	2
4	Intermediate probability of suitable habitat for stony corals (neither high nor low), BRT model, unfished	Yes/No	29	12
5	High probability of suitable habitat for stony corals, both BRT and Maxent models, fished.	Yes/No	12	4

Work is continuing on models focussed on the New Zealand Region instead of the whole SPRFMO Area and to develop tools for designing spatial management measures (work to date was summarised by Rowden et al. 2015). Further scientific papers will be submitted to the SPRFMO Scientific Committee as they become available following adequate review. A summary will be available for SC3.

4 Summary of the Observer Programme

4.1 OBSERVER COVERAGE

Reporting of the New Zealand observer programme activities in the SPRFMO Convention Area during 2014, are included in a separate New Zealand SPRFMO Annual Observer Implementation Report (SC-03-xx).

A total of five New Zealand bottom trawlers operated under permit in the SPRFMO Convention Area during 2014, all trips carried scientific observers. Scientific observers were present on 8 trips, representing 110 vessel days and 403 bottom tows, of which 340 (84%) were observed. Scientific observers measured fish from 11% of tows (Table 10). A total of 2,838 fish were measured, most of which were the principal catch species, orange roughy. No New Zealand trawlers operated midwater trawl gear for bentho-pelagic species in the SPRFMO Convention Area during 2014.

Three New Zealand bottom longline vessels operated in the SPRFMO Convention Area during 2014, with two trips carrying a scientific observer. During the observed trips, a total of 11 vessel days and 30 longline sets made were observed (Table 10). A total of 652 fish were measured, including 344 (53%) of the principal catch species, bluenose.

Table 10: Summary of observer and sampling coverage of bottom trawl and bottom longlining fishing effort in the SPRFMO Convention Area during 2014.

Method	No. of Trips	Total Tows or Sets	Tows or Sets Observed	Tows or Sets Measured	Landings (t)	Measured Catch (t)	No. Fish Measured
Bottom Trawl	8	403	340	46	1,161	4.9	2,838
Bottom Longline	2	41	30	33	13	3.3	652

Note: Tows/sets reported here are all tows conducted, including those which made no catch, and so may exceed the tows which made a catch, as reported in the effort summary tables. Landings in this table are in greenweight and include all species caught. The number of trawl-caught fish measured excludes 30 black oreo, BOE, recorded without a correct sample weight.

4.2 BIOLOGICAL SAMPLING AND LENGTH/AGE COMPOSITION OF CATCHES

The deepwater fisheries continued to be monitored by scientific observers during 2014. A summary of the length-frequency sampling conducted in 2014 is provided in Table 11. A high proportion of all fish measured were orange roughy, the principal demersal trawl target species, with most of the remaining fish measured being the principal bottom longline target species, bluenose.

The length-frequency distribution of the orange roughy measured from demersal trawl fishing is shown in Figure 12. A similar length-frequency distribution plot for the principle bottom longline caught species bluenose is shown in Figure 13.

Table 11: Summary of length-frequency sampling for those species with a sample size of greater than 100 fish conducted by scientific observers aboard New Zealand vessels conducting bottom fishing in the SPRFMO Convention Area during 2014.

Scientific Name	Method	Common Name	Measure Used	Length (cm) Min	Mean	Max	Number Measured
Hoplostethus atlanticus	Bottom trawl	Orange roughy	standard	24	37.00	48	2,838
Hyperoglyphe antarctica	Bottom longline	Bluenose	fork	50	71.34	99	344
						Total	**3,182**

Comparison of length frequency distributions from the past 5 years (Figure 14 and 15) suggests that the size of orange roughy caught in bottom trawls is quite consistent between years (Figure 14, left panel) whereas the size of bluenose varies considerably (Figure 14, right panel). This could be a result of small sample sizes for bluenose or shifts in fishing locations. Length frequency distributions for alfonsino (Figure 15) suggest broadly similar sizes caught in bottom and midwater trawls, with some variation between years, especially when few fish were measured.

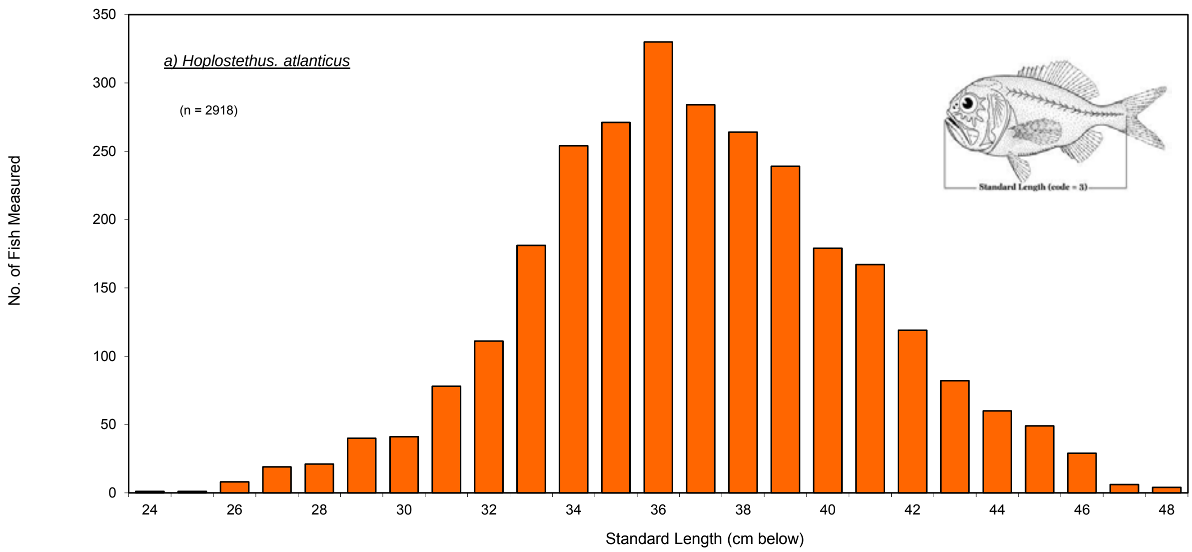

Figure 12: Length frequency distributions for orange roughy (*Hoplostethus atlanticus*) measured by scientific observers aboard New Zealand bottom trawl vessels fishing in the SPRFMO Convention Area during 2014.

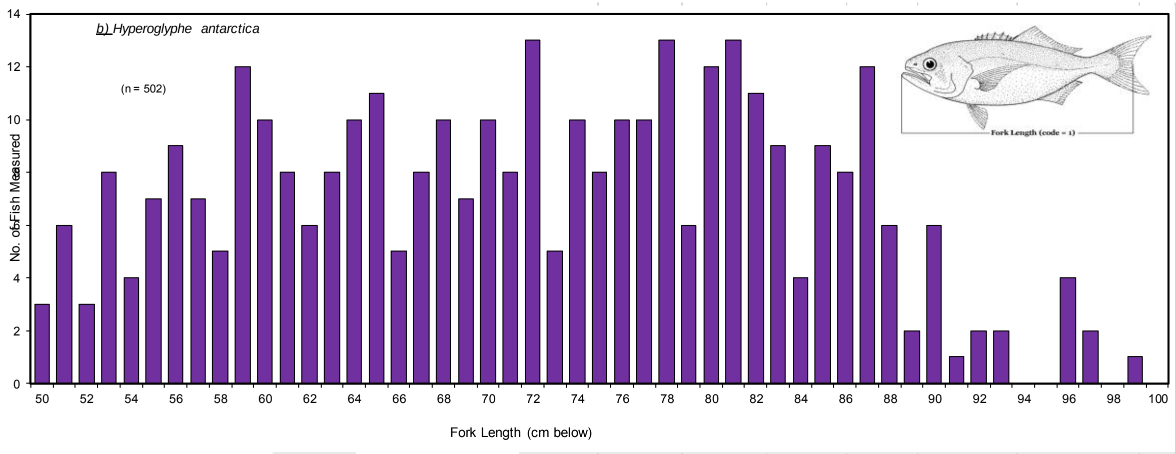

Figure 13: Length frequency distribution for bluenose (*Hyperoglyphe antarctica*) measured by scientific observers aboard New Zealand bottom longlining vessels fishing in the SPRFMO Convention Area during 2014.

Figure 14: Length frequency distributions for the main demersal target species between 2010 and 2014 measured by scientific observers aboard New Zealand vessels fishing in the SPRFMO Convention Area. Left panel, orange roughy from bottom trawls; right, bluenose from bottom longlines.

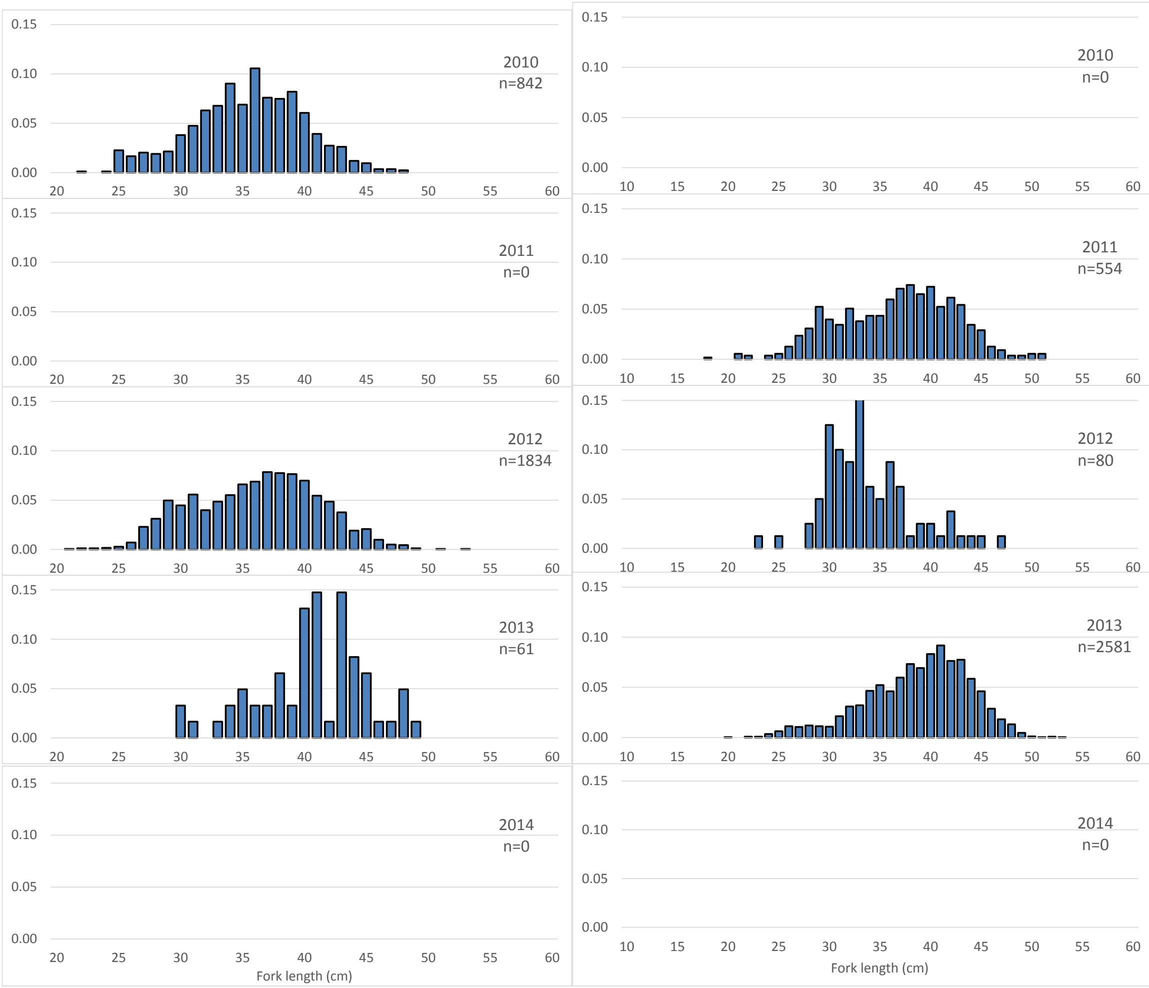

Figure 15: Length frequency distributions for alfonsino between 2010 and 2014 measured by scientific observers aboard New Zealand trawl vessels fishing in the SPRFMO Convention Area. Left panel, from bottom trawls; right, from midwater trawls.

5 Implementation of Management Measures

5.1 DESCRIPTION OF MANAGEMENT MEASURES

A detailed description of New Zealand's implementation of the SPRFMO interim conservation and management measures adopted in 2007 can be found in Ministry of Fisheries (2008b) and Penney *et al*. (2009). The management approach is summarised below:

High seas bottom trawling measures were established in the SPRFMO Convention Area in the form of high seas fishing permit conditions, imposed from 1 May 2008. 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 Convention Area.

- 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 trawling trips. Observers are provided by the Ministry for Primary Industries and cost recovered from industry.

The effect of these measures has been to close bottom trawling in 41% of the total 217,463 km^2 New Zealand bottom trawl footprint surface area, with 30% made subject to a move-on rule, and 29% left open to bottom trawling. The open area represents 0.13% of the entire SPRFMO Convention Area.

The interim measures adopted in 2009 were implemented through high seas fishing permit conditions that came into effect in February 2010. Fishing for *Trachurus* species and the use of gillnets are prohibited, and notice to the Ministry for Primary Industries is required in advance of transiting the SPRFMO Convention Area with gillnets.

5.2 IMPLEMENTATION OF THE VME EVIDENCE PROCESS AND MOVE-ON RULE

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

The number of occasions the move-on-rule has been triggered in the demersal fishery has been relatively few, amounting to six in total from 2008 to 2013, at an average of 3.3% of tows in the move-on-rule areas per year (Table 11). This rate of triggering move-on events is less than the expected rate of about 8% (Penney, 2014), which is probably due to the catch rates of VME taxa in the SPRFMO Convention Area being lower than from inside the New Zealand EEZ. The move-on-rule was triggered either by exceeding one or more of the weight thresholds of individual VME taxa or by exceeding the maximum permitted count (3) of indicator taxa that make up the biodiversity component of the evidence process (Table 11).

Table 11: Data relating to the implementation of the move-on-rule within the New Zealand bottom trawl fishery. 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
2008	3	2	67%	0	–	–	0.0%
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	–	–	0.0%
2014	2	2	100%	0	–	–	0.0%

In the midwater trawl fishery for bentho-pelagic species, the move-on-rule has never been triggered but there have been relative few tows (Table 12). Such fishing is now considered to be included within the SPRFMO definition of bottom fishing. New Zealand conducted no midwater trawling for bentho-pelagic species in 2014.

Table 12: Data relating to the implementation of the move-on-rule within the New Zealand midwater trawl fishery for bentho-pelagic species. The numbers of tows are those fished in the move-on-rule areas only.

Midwater 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
2008	0	0	–	–	–	–	–
2009	0	0	–	–	–	–	–
2010	6	6	100%	0	–	–	0.0%
2011	16	16	100%	0	–	–	0.0%
2012	7	7	100%	0	–	–	0.0%
2013	5	5	100%	0	–	–	0.0%
2014	0	0	–	0	–	–	–

5.3 RE-OPENING OF THE CHALLENGER PLATEAU STRADDLING STOCK ORANGE ROUGHY FISHERY

The fishery on the straddling orange roughy stock on the Challenger Plateau, which was closed from 2000 to 2009, was re-opened on 1 Oct 2010 following assessments that indicated that the biomass has increased above the reference level for re-opening of the fishery (at least a 70% probability that the biomass has rebuilt above 20% B_0, Ministry of Fisheries 2008a) (see Section 2.6). Applying a harvest strategy consistent with that implemented for orange roughy fisheries within the New Zealand EEZ could have indicated a TAC of up to 1,022 t for this stock. However, a cautious approach was taken to ensure continued re-building towards B_{MSY}, and it was reopened with a Total Allowable Catch (TAC) of 525 t. The TAC comprised a 500 t Total Allowable Commercial Catch (TACC) and an allowance of 25 tonnes for other sources of fishing-related mortality. Since 2014, the New Zealand bottom trawl footprint has included two blocks on the Westpac Bank in the SPRFMO Convention Area where the stock straddles the New Zealand EEZ.

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

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