Ministry for Primary Industries
Manatū Ahu Matua

New Zealand National Report on Fishing and Research Activities in the SPRFMO Area during 2011

1. Description of Fisheries

1.1 Pelagic Fisheries

New Zealand conducted no pelagic fishing for *Trachurus* species in the SPRFMO Area during 2011.

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 2011 continued 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 Area since before 1990. Specific high seas fishing permits for the SPRFMO Area were only 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 Area and with the capability for bottom fishing and the numbers of vessels which actually bottom fished in the Area since 2002 are shown in Table 1[1].

Table 1. Summary of the number of New Zealand vessels permitted to bottom fish in the SPRFMO 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.

Fishing Year	Number of Vessels Permitted to Fish SPRFMO Area	No. Vessels that Actively Bottom Fished in the SPRFMO Area	Bottom Trawling	Bottom Lining
2002	41*	23	23	-
2003	55*	22	19	3
2004	66*	24	17	7
2005	60*	28	17	11
2006	58*	22	12	10
2007	38	12	8	4
2008	25	7	4	3
2009	21	10	6	5
2010	24	9	7	2
2011	27	9	7	2

* 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, and that indicated that they had the capability to bottom trawl.

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.

[1] Vessel information is reported in Tables 1 and 2 for the New Zealand high seas fishing permit year of May – April. All other information on catch and effort is reported by calendar year, January – December.

The distribution of vessel size of the permitted vessels from 2007-08 to 2011-12 is shown in Table 2, with no observed 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 permit years from 2007-08.

Length overall (m)	Fishing Permit Year (May - April) 2007-08	2008-09	2009-10	2010-11	2011-12
<= 11.9	-	-	-	-	-
12 - 17.9	1	1	1	1	1
18 - 23.9	6	4	2	3	3
24 - 29.9	8	3	1	1	3
30 - 35.9	3	3	3	5	4
36 - 44.9	8	8	5	6	8
45 - 59.9	2	-	-	-	2
60 - 74.9	8	4	7	6	6
>= 75	2	2	2	2	-
Total	**38**	**25**	**21**	**24**	**27**

The main areas of bottom fishing utilised by New Zealand vessels outside of the New Zealand EEZ are shown in Figure 1, except for the Louisville Ridge, which lies to the east of New Zealand.

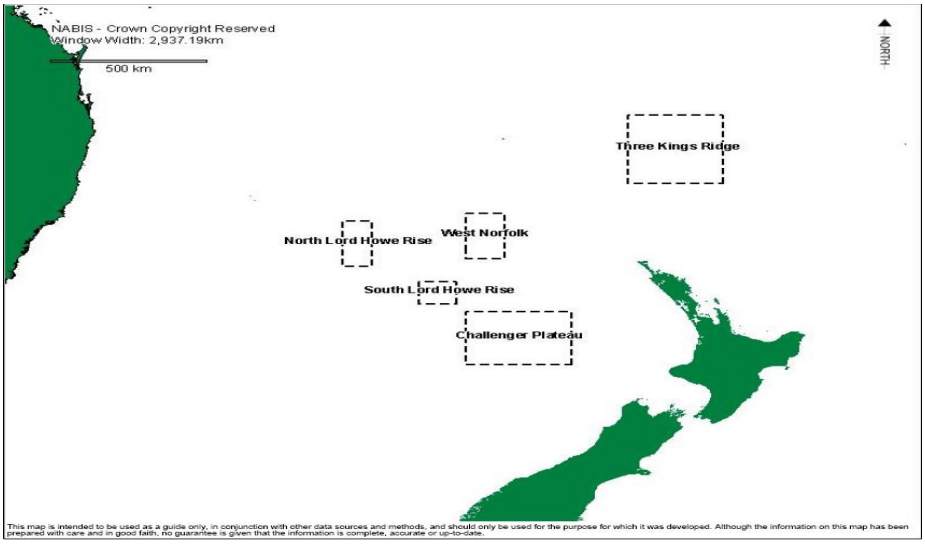

Figure 1. The main areas bottom fished by New Zealand vessels in the SPRFMO Area (from the National Aquatic Biodiversity Information System - http://www.nabis.govt.nz).

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 per year in the last two years. This essentially mirrors the pattern of the number of vessels fishing over the same time period.

Orange roughy (*Hoplostethus atlanticus*) continues to be the main bottom trawl target species, contributing the majority of the total bottom trawl catch of 73% since 2002 (varying between 67% and 99%) (see Table 3). Other species making minor contributions to catches include oreos (0% to 11%), cardinalfish (0% to 7%) and alfonsino (0% to 8%). There was a substantial increase in the catch of alfonsino in 2010 which was maintained in 2011.

Table 3. Annual fishing effort (number of vessels and tows) and catch (tonnes) of the main target and bycatch species (FAO species codes) by New Zealand vessels bottom trawling in the SPRFMO Area from 2002 (see Appendix 1 for list of species codes and names).

Fishing Year	No. Vessels	No. Tows	ORY	BOE	EPI	ALF	SSO	RIB	RTX	SCK	All Species
2002	23	2,944	2,578	121	159	17	50	43	61	37	3,180
2003	19	2,928	1,973	62	226	94	25	92	84	56	2,937
2004	17	1,952	1,697	90	42	85	91	46	34	8	2,188
2005	17	2,186	1,597	268	189	26	75	63	67	5	2,395
2006	12	1,135	1,415	57	21	28	6	33	27	15	1,652
2007	8	415	866	151	-	2	22	9	5	1	1,076
2008	4	208	837	-	-	2	<0.1	3	0.1	1	846
2009	6	547	928	-	16	5	<0.1	7	0.1	2	958
2010	7	1,167	1,474	12	22	244	10	15	6	13	1,864
2011	7	1,158	1,079	12	108	176	4	22	7	9	1,486

(Note: The number of tows reported here is the number of tows which recorded a fish catch, and excludes tows where there was no catch).

The trends in orange roughy catch from 2002 in the main fishing areas are summarised in Table 5 and also shown in Figure 2. The decline in orange roughy catch from 2002 to 2008 was associated with declines in fishing effort (and catch) in the main historical target 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. Distribution of bottom trawl effort (number of tows) between the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Area from 2002.

Year	Challenger	West Norfolk	Lord Howe	Louisville	Other	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

Table 5. Distribution of total annual landings (tonnes) of orange roughy between the main areas fished by New Zealand bottom trawl vessels fishing in the SPRFMO Area from 2002.

Year	Challenger	West Norfolk	Lord Howe	Louisville	Other	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

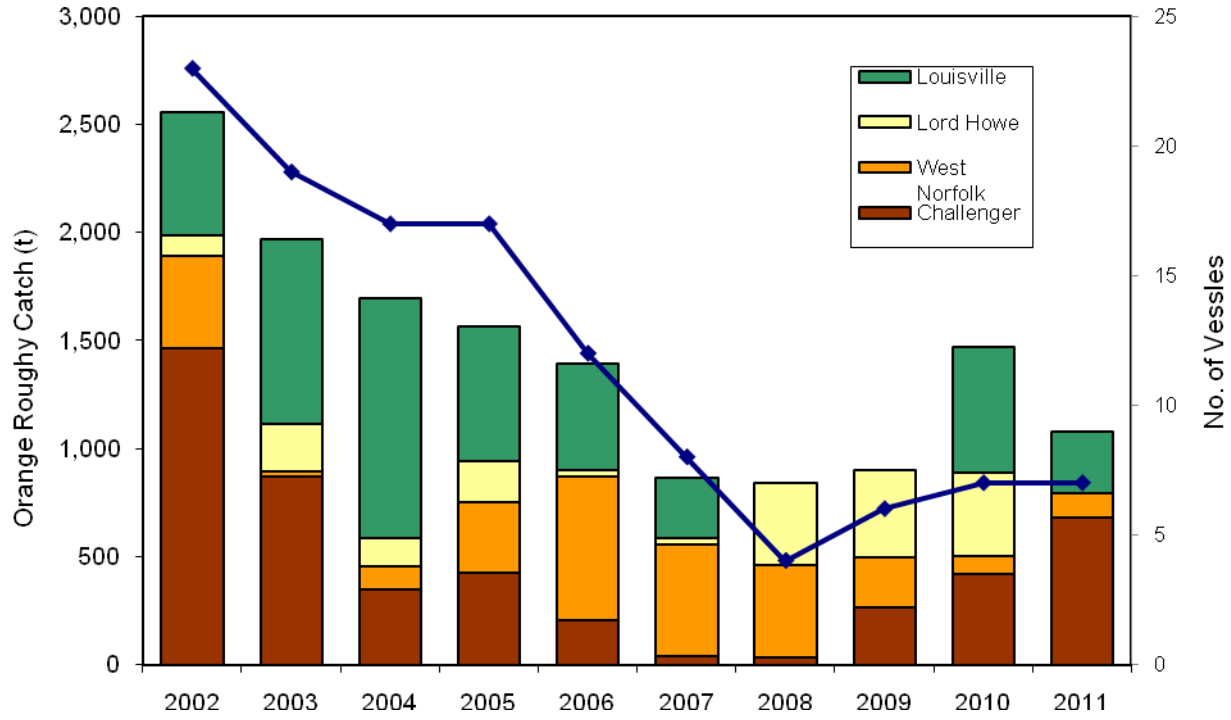

Figure 2. Trends in the annual number of bottom trawl vessels fishing and total landings of orange roughy for each of the four main areas fished by New Zealand bottom trawl vessels in the SPRFMO Area from 2002.

2.2 Midwater Trawl Fishery

2011 saw the operation of midwater trawling for the first time, with three permitted trawlers executing a total of 61 tows with a total catch of 164 tonnes, principally southern boarfish (46%) and alfonsino (39%).

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 6. 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. Vessel numbers in 2011 remained at 2 but they set about 50% more hooks than in 2010.

Table 6. Annual catch and effort for New Zealand vessels bottom lining in the SPRFMO Area 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	BWA	HAU	DGS	MOW	RXX	YTC	ROK	TOP	All Species
2002	-	-	-	-	-	-	-	-	-	-	-
2003	3	53,438	6	7	1	1	-	-	-	1	17
2004	7	268,809	116	24	-	6	2	1	-	3	154
2005	11	384,031	102	31	13	10	2	3	1	-	163
2006	10	501,810	271	95	6	6	2	2	2	-	385
2007	4	423,420	144	31	4	5	3	3	1	-	202
2008	3	302,310	67	43	1	2	<1	1	8	-	123
2009	5	236,146	58	23	7	1	<1	-	<1	-	89
2010	2	48,180	15	24	-	1	<1	<1	<1	-	45
2011	2	71,183	23	25	6	<1	<1	<1	<1	-	57

The numbers of hooks set rose from 50,000 in 2003 to peak at 500,000 in 2006 and then declined slowly to 2009 and dropped sharply in 2010 (Table 6).

Bluenose (*Hyperoglyphe antarctica*) was the historic main bottom line target species but catches declined from 2006 until the annual catch was similar to that of wreckfish (*Polyprion oxygeneios* and *P. americanus*) (Table 6). Together these two species have made up more than 80% of the catch for the last two years, down from 90% previously. Other species making minor contributions to bottom line catches include spiny dogfish and king tarakihi.

The increase and subsequent decrease in bluenose catch since 2002 is summarised in Table 7, and, together with effort, is also shown in Figure 3. Apart from the high catch of bluenose reported from the NW Challenger Plateau in 2004, trends in effort and bluenose catch have been generally similar between areas, with a slightly higher proportional contribution from the West Norfolk Ridge area over the past three years.

Table 7. Distribution of total annual catch of bluenose between the main areas fished by New Zealand bottom line vessels fishing in the SPRFMO Area from 2002.

Year	Challenger	West Norfolk	Three Kings	Louisville	Other	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

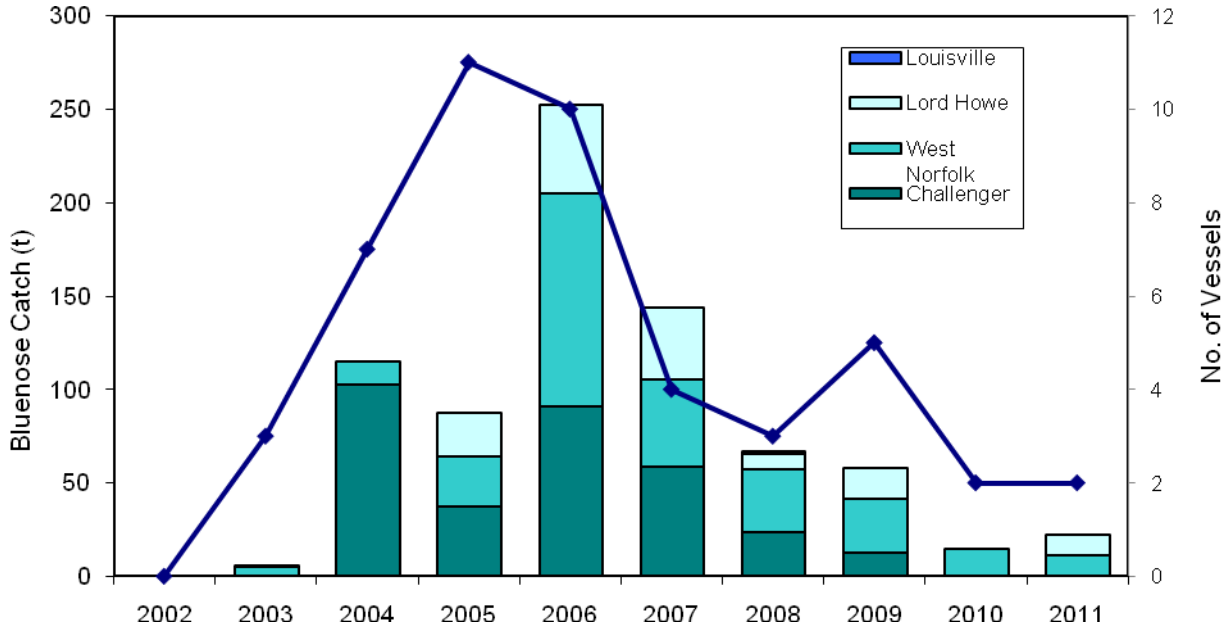

Figure 3. Trends in number of bottom line vessels and total bluenose catch from the four main areas fished by New Zealand bottom line vessels in the SPRFMO Area from 2002.

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 were collected from 2007 using the at-sea catch and effort logbooks and landings recording forms described therein.

Both vulnerable marine ecosystem (VME) evidence forms used by observers in the move-on areas and detailed observer Benthic Materials Forms have been completed on all observed bottom trawls to record all benthic bycatch to the lowest possible taxonomic level.

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 has been provided as an information paper to the 9th SPRFMO SWG meeting (Clark *et al*. 2010, SWG-09-INF-01). A summary of the results of this work has been provided as a paper to the Deepwater Sub-Group (Penney *et al*. 2010a, SWG-09-DW-02).

Figure 4 shows a summary of 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) for the main fishing areas (from Penney 2010a).

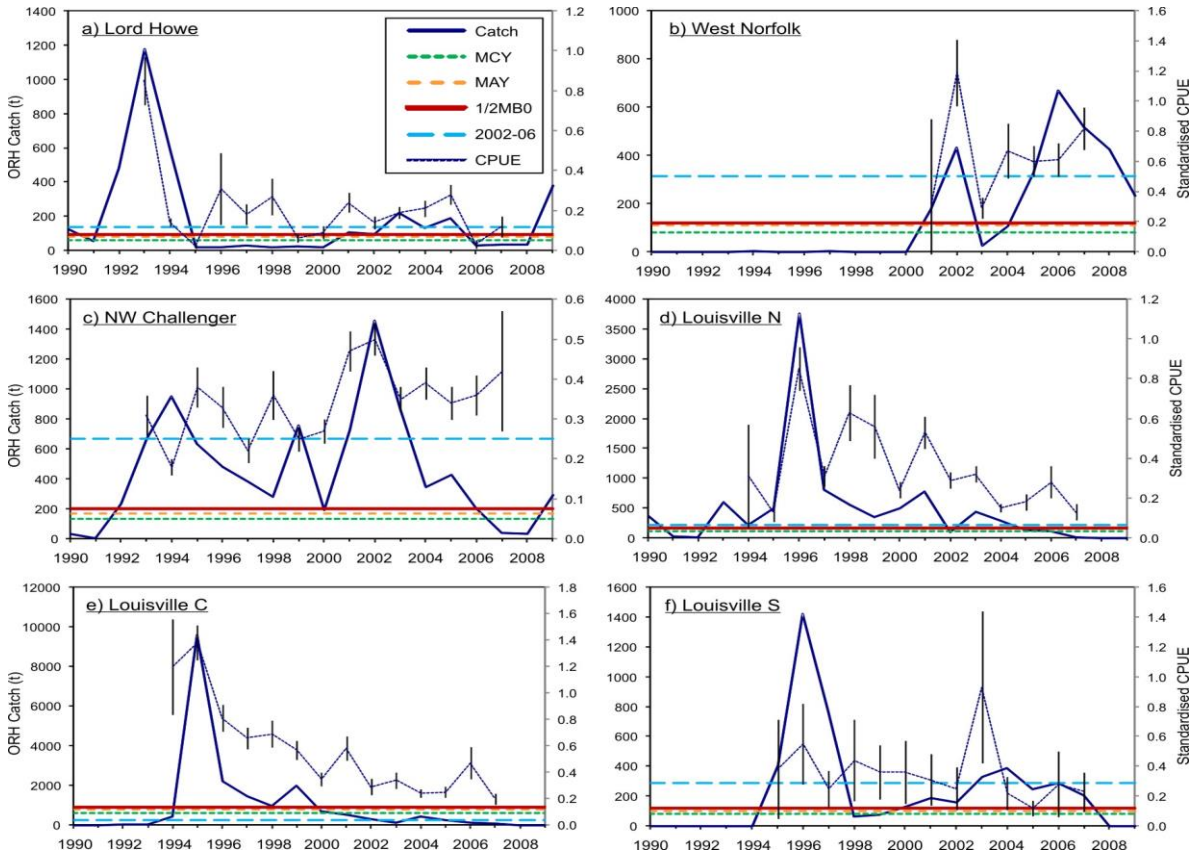

Figure 4. Summary of trends in total orange roughy catch (t), CPUE (t/tow, with standard errors) and estimated MCY, MAY, ½MB_0 and 2002-2006 average catch reference levels for each fishing area (from Penney 2010a).

3.3 Challenger Plateau Orange Roughy Trawl and Acoustic Surveys

Due to stock sustainability concerns, the fishery on the straddling orange roughy stock in the extreme southern part of the Challenger Plateau area was closed in 2000. Since 2005 a programme of trawl and acoustic surveys has been conducted to re-assess the status of this stock.

Trawl and acoustic surveys were conducted in 2009 and 2010, from which the biomass in 2009 was conservatively estimated to have increased to 22,700 t, which is approximately 25% of B_0. This is 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 6). Copies of the final research reports for these surveys will be provided to the SPRFMO SWG. Results from a survey conducted in 2011 were similar to those obtained in 2010 (MPI, 2012). A further survey in mid-2012 has yet to be analysed, reported and reviewed.

3.4 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 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 further papers will be submitted to the SWG as they become available.

4. Biological Sampling and Length / Age Composition of Catches

The deepwater fisheries continued to be monitored by scientific observers in 2011. A summary of the length-frequency sampling conducted in 2011 is provided in Table 8.

Table 8. Summary of length-frequency sampling conducted by scientific observers aboard New Zealand bottom trawlers in the SPRFMO Area during 2011.

Scientific Name	Common Name	Measure Used	Length (cm)			Number Measured
			Min	Mean	Max	
Hoplostethus atlanticus	orange roughy	standard	16	34.4	57	11,313
Beryx splendens	alfonsino	fork	21	36.2	53	1,895
Mora moro	ribaldo	total	26	49.4	73	617
Epigonus telescopus	cardinalfish	fork	40	58.4	75	359
				Total		14,184

About 80% percent of the fish measured were orange roughy, which was the target species in all tows. The numbers of all species measured in 2011 increased significantly over the those measured in previous years. Plots of the length-frequency distributions of these species are provided in Figure 5.

Gonad maturity was determined for orange roughy measured during length-frequency sampling.

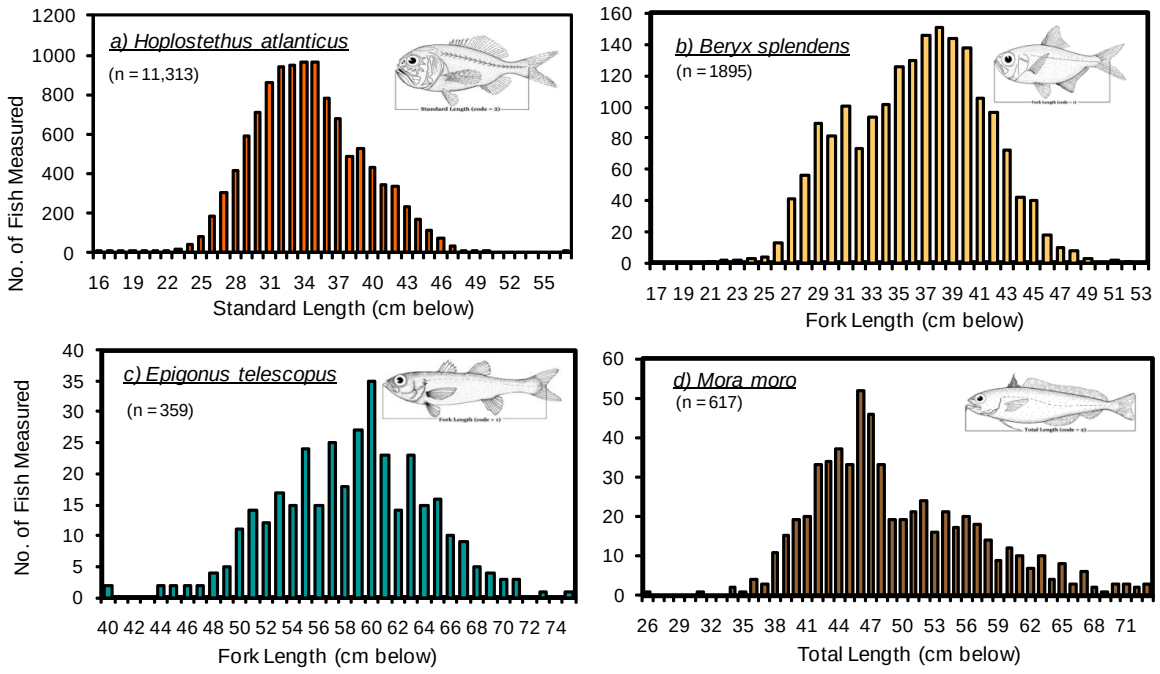

Figure 5. Length frequency distributions of *a)* orange roughy (*Hoplostethus atlanticus*) standard length; *b)* alfonsino (*Beryx splendens*) fork length; *c)* cardinalfish (*Epigonus telescopus*) fork length and *d)* ribaldo (*Mora moro*) total length, as measured by scientific observers aboard New Zealand bottom trawl vessels fishing in the SPRFMO Area during 2011.

5. Summary of Observer Programmes

Detailed summary tables describing New Zealand observer programme activities in the SPRFMO Area during 2011, are included in the New Zealand SPRFMO Annual Observer Implementation Report for 2011.

Seven New Zealand trawlers operated in the SPRFMO Area during 2011, with 291 vessel days recorded for bottom trawl vessels and 31 vessel days for midwater trawl vessels. These vessels conducted 1,160 bottom tows and 51 midwater tows in total, with 1,137 bottom tows observed (98%) and all 51 midwater tows observed. Scientific observers were deployed on all bottom trawl vessel trips, observing 98% of the tows and measuring fish from 26% of the tows (Table 9). The total weight of fish sampled was about 28 t, or 1.8% of the estimated 1,597 t retained catch. A total of 17,073 fish were measured, 66% of which were the target species, orange roughy.

Observers sampled from 30 of the 50 midwater tows, i.e. nearly 60%, measuring 1.2% of the estimated retained catch of 194 t. A total of 1,348 fish were measured, about half of which were alfonsino.

Table 9. Summary of bottom trawl and bottom lining fishing effort, observer coverage and sampling coverage in the SPRFMO Area during 2011.

Method	No. of Vessels	Total Tows / Sets	Tows / Sets Observed	Tows / Sets Measured	Retained Catch (t)	Measured Catch (t)	No. Fish Measured
Trawl	7	1,160	1,137	304	1,597	28	17,073
Line	2	n/a	0	0	n/a	0	0

n/a = not available.
(Note: Catch weights shown here are onboard estimates, and not final landed weight data. Tows reported 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 table.)

6. Implementation of Management Measures

6.1 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 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 on the high seas.
- 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 5nm 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 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.

6.2 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 Area are required to complete VME Evidence Process forms for each tow conducted within a move-on area.

6.3 Re-Opening of the Challenger Plateau Straddling Orange Roughy Fishery

The fishery on the straddling orange roughy stock on the Challenger Plateau, which was closed from 2000-2009, was re-opened on 1 Oct 2010 following assessments that indicated that the biomass has increased above the reference level (20% B_0) for re-opening of the fishery (Ministry of Fisheries 2008a) (see Section 3). Applying a harvest strategy consistent with that implemented for orange roughy fisheries within the New Zealand EEZ would have indicated a TAC of 1,022 t for this stock. However, a cautious approach was taken to ensure continued re-building towards B_{MSY} levels, and it was reopened with a total allowable catch (TAC) of 525 t. The TAC is comprised of a 500 t total allowable commercial catch (TACC) and an allowance of 25 tonnes for other sources of fishing-related mortality. This TAC may only be taken inside the EEZ as the high seas area where the stock straddles is outside of the New Zealand bottom trawl footprint and is therefore closed to commercial fishing.

7. References

Clark, M.R., M.R. Dunn and O.F. Anderson, 2010. The estimation of catch levels for new range roughy fisheries on seamounts: a meta-analysis of seamount data. New Zealand Fisheries Assessment Report 2001/75, 40 pp. (SWG-09-INF-01)

Clark, M.R., B. Bull and D.M. Tracey, 2001. 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 pp. (SWG-09-INF-02)

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.

MPI, 2012. Ministry for Primary Industries. Report from the Fisheries Assessment Plenary May 2012: stock assessments and yield estimates. Part 2: John Dory to Red Crab pp 399-790.

Parker, S.J., A.J. Penney and 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 and 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)

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 and 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 and A.D. Rogers, 2010. Seamounts as refugia from ocean acidification for cold-water stony corals. *Mar. Ecol*. (in press)

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
SSO	SSO	*Pseudocyttus maculatus*	Smooth oreo
TOP	PTO	*Dissostichus eleginoides*	Patagonian toothfish
YTC	KIN	*Seriola lalandi*	Kingfish