Appendix O

Fishery Report:
***Dissostichus eleginoides* and *Dissostichus mawsoni* (TOT)**
South Sandwich Islands (Subarea 48.4)

CONTENTS

Throughout this report the CCAMLR fishing season is represented by the year in which that season ended, e.g. 2012 represents the CCAMLR fishing season from 1 December 2011 to 30 November 2012.

FISHERY REPORT:
***DISSOSTICHUS ELEGINOIDES* AND *DISSOSTICHUS MAWSONI* (TOT)**
SOUTH SANDWICH ISLANDS (SUBAREA 48.4)

1. Details of the fishery

1. The fishery for *Dissostichus eleginoides* in Subarea 48.4 was initiated as a new fishery in 1993 following notifications from Chile and the USA (SC-CAMLR-XI, Annex 5, paragraph 6.22), and the adoption of Conservation Measure (CM) 44/XI which set a precautionary catch limit for *D. eleginoides* of 240 tonnes for that season. Subsequently, the USA withdrew from the fishery and the Chilean longline vessel abandoned fishing after one week of poor catches (SC-CAMLR-XII, Annex 5, paragraph 6.2). In addition, a Bulgarian-flagged longliner fished in November and December 1992 and reported a catch of 39 tonnes of *D. eleginoides* (SC-CAMLR-XII, Annex 5, paragraph 6.1).

2. Haul-by-haul data from the Chilean and Bulgarian vessels were submitted to CCAMLR, and WG-FSA used these data to estimate an annual yield of 28 tonnes of *D. eleginoides* for the subarea (SC-CAMLR-XII, Annex 5, paragraph 6.3, Table 1). The Commission adopted a precautionary catch limit for *D. eleginoides* of 28 tonnes per season. In addition, the taking of *D. mawsoni*, other than for scientific research purposes, was prohibited. These limits remained in force until 2004.

3. In 2005, the UK conducted a pilot tagging program using a longline fishing vessel. The vessel caught 27 tonnes of *D. eleginoides* and tagged 42 individuals, and the results of this research fishing were reported to WG-FSA (SC-CAMLR-XXIV, Annex 5, paragraphs 5.140 and 5.141).

4. Following the pilot study, the Commission agreed to a mark recapture experiment in Subarea 48.4 between 2006 and 2008, with fishing conducted in accordance with CM 24-01 (CCAMLR-XXIV, paragraphs 11.46 and 11.47; SC-CAMLR-XXIV, paragraphs 4.113 to 4.117). The experiment resulted in a CASAL assessment of toothfish in the northern part of Subarea 48.4 in 2009 and subsequent updates in 2010, 2011 and 2012.

5. In 2008, the Commission agreed to a continuation of the tagging experiment and to dividing Subarea 48.4 into a northern area (Subarea 48.4 North) and a southern area (Subarea 48.4 South) (Figure 1), with a directed longline fishery on *D. eleginoides* in Subarea 48.4 North and *Dissostichus* spp. in Subarea 48.4 South.

6. The limits on the fishery for *Dissostichus* spp. in Subarea 48.4 are described in CM 41-03. In 2012, the catch and by-catch limits were as follows:

Subarea 48.4 North

(i) a catch limit of 48 tonnes for *D. eleginoides*, derived from the CASAL assessment

(ii) the continued prohibition of the targeting of *D. mawsoni* other than for scientific research purposes

(iii) catch limits for by-catch species, with a limit for macrourids of 7.5 tonnes (16% of the catch limit for *D. eleginoides*) and a limit for rajids of 2.5 tonnes (5% of the catch limit for *D. eleginoides*).

Subarea 48.4 South

(i) an experimental precautionary catch limit of 33 tonnes for *Dissostichus* spp. (*D. eleginoides* and *D. mawsoni* combined)

(ii) a move-on rule for by-catch species, if the catch of rajids exceeds 5% of the catch of *Dissostichus* spp. in any one haul or set, or if the catch of macrourids reaches 150 kg and exceeds 16% of the catch of *Dissostichus* spp. in any one haul or set.

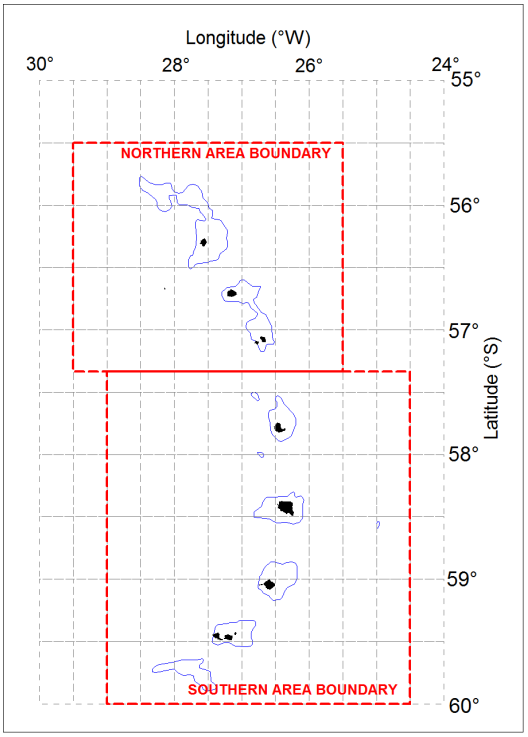


Figure 1: Positions of the boundaries of the northern area (Subarea 48.4 North) and southern area (Subarea 48.4 South) in Subarea 48.4. The 1 000 m depth contour is indicated.

1.1 Reported catch

7. Licensed longline vessels commenced fishing for *D. eleginoides* in Subarea 48.4 in 1992 and 1993; fishing was abandoned following poor catches. Fishing resumed in Subarea 48.4 North in 2005 with the implementation of the mark recapture experiment which was extended to Subarea 48.4 South in 2009. In 2012, one New Zealand-flagged vessel and one UK-flagged vessel conducted fishing operations and reported a total catch of 77 tonnes of

Dissostichus spp. from Subarea 48.4 (Table 1a). The reported catch of *Dissostichus* spp. in Subarea 48.4 North and Subarea 48.4 South was 44 tonnes and 33 tonnes respectively.

1.2 Total removals

8. There is no information to derive an estimate of the level of IUU fishing in Subarea 48.4 (Table 1a).

Table 1(a): Catch history for *Dissostichus* spp. in Subarea 48.4 (Subarea 48.4 North and Subarea 48.4 South combined). (Source: STATLANT data for past seasons, catch and effort reports for current season and past reports for IUU catch.)

Season	Regulated fishery						Estimated IUU catch (tonnes)	Total removals (tonnes)
	Effort (number of vessels)		*Dissostichus* spp.					
			Catch limit (tonnes)*	Reported catch (tonnes)				
	Limit	Reported		*D. eleginoides*	*D. mawsoni*	Total		
1992	-	1	-	30	0	30	-	30
1993	-	1	240[a]	10	0	10	-	10
1994	-	0	28[a]	0	0	0	-	0
1995	-	0	28[a]	0	0	0	-	0
1996	-	0	28[a]	0	0	0	-	0
1997	-	0	28[a]	0	0	0	-	0
1998	-	0	28[a]	0	0	0	-	0
1999	-	0	28[a]	0	0	0	-	0
2000	-	0	28[a]	0	0	0	-	0
2001	-	0	28[a]	0	0	0	-	0
2002	-	0	28[a]	0	0	0	-	0
2003	-	0	28[a]	0	0	0	-	0
2004	-	0	28[a]	0	0	0	-	0
2005	-	1	100[b]	27	<1	27	-	27
2006	-	2	100[b]	18	<1	19	-	19
2007	-	2	100[b]	54	<1	54	-	54
2008	-	2	100[b]	98	<1	98	-	98
2009	-	2	150[c]	74	59	133	-	133
2010	-	2	116[d]	57	56	114	-	114
2011	-	2	70[e]	39	15	54	-	54
2012	-	2	81[f]	55	22	77	-	77

[a] Applies to *D. eleginoides* in the subarea
[b] Applies to *D. eleginoides* in Subarea 48.4 North only
[c] 75 tonnes for *D. eleginoides* in Subarea 48.4 North and 75 tonnes for *Dissostichus* spp. in Subarea 48.4 South
[d] 41 tonnes for *D. eleginoides* in Subarea 48.4 North and 75 tonnes for *Dissostichus* spp. in Subarea 48.4 South
[e] 40 tonnes for *D. eleginoides* in Subarea 48.4 North and 30 tonnes for *Dissostichus* spp. in Subarea 48.4 South
[f] 48 tonnes for *D. eleginoides* in Subarea 48.4 North and 33 tonnes for *Dissostichus* spp. in Subarea 48.4 South

Table 1(b): Catch of *Dissostichus* spp. in Subarea 48.4 North (N) and Subarea 48.4 South (S). (Source: fine-scale data pro-rated by total reported catch in Table 1a.) Subarea 48.4 South was closed to fishing between 2005 and 2008.

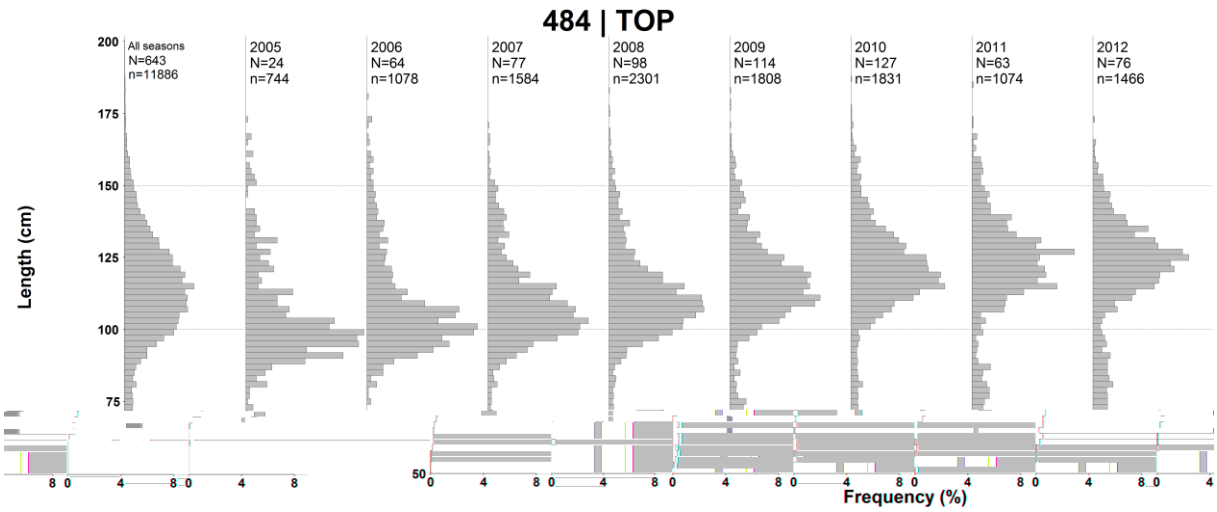
Season	*D. eleginoides*		*D. mawsoni*	
	N	S	N	S
2005	27			
2006	18		<1	
2007	54		<1	
2008	98		<1	
2009	59	15	<1	59
2010	40	18	<1	56
2011	36	3	1	14
2012	43	11	1	22

1.3 Size distribution of catches

9. The length-frequencies for catches of *D. eleginoides* and *D. mawsoni* from Subarea 48.4 are shown in Figure 2. These length-frequency distributions of catches are unweighted, and the interannual variability shown in the figure may reflect differences in the fished population, but are also likely to be biased by changes in factors such as the characteristics/number of vessels in the fishery and the spatial and temporal distribution of fishing. A description of how length data are used in assessments is provided in the relevant section of this report.

10. Most *D. eleginoides* caught in the fishery ranged from 80 to 140 cm in length, with a broad mode at approximately 90 130 cm whereas *Dissostichus mawsoni* caught in Subarea 48.4 South had a mode at approximately 140 170 cm.

(a)



(b)

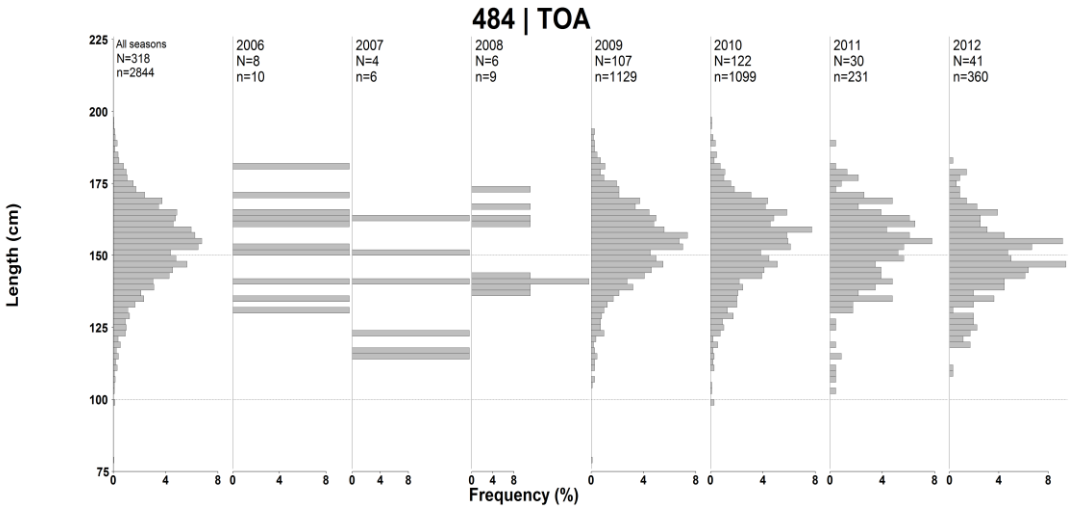


Figure 2: Length frequencies for (a) *Dissostichus eleginoides* (TOP) and (b) *D. mawsoni* (TOA) in Subarea 48.4 from 1996 to present from observer data. The number of hauls (N) and the number of fish measured (n) in each year are given at the top of each panel.

2. Stocks and areas

11. WG-FSA-09/17 and 09/18 provided a comprehensive analysis of the distribution of the two species in Subarea 48.4 (Figure 3).

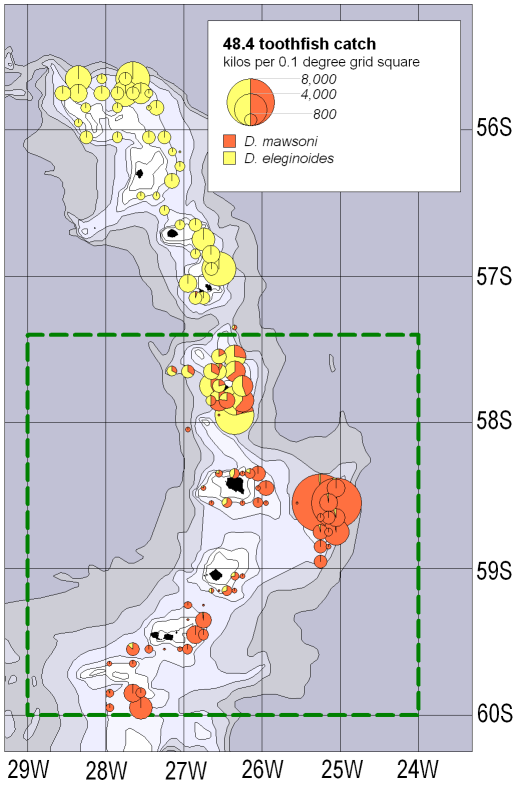


Figure 3: Catch distribution of the two *Dissostichus* species in Subarea 48.4.

3. Assessment of the northern stock of *D. eleginoides*

3.1 Mark–recapture data

12. Since 2006, vessels operating in this fishery have been required to tag and release *Dissostichus* spp. at a rate of five fish per tonne of green weight caught. A total of 2 475 *D. eleginoides* and 636 *D. mawsoni* have been tagged and released, and 143 *D. eleginoides* and 33 *D. mawsoni* have been recaptured in the subarea (Table 2).

Table 2: Number of individuals of *Dissostichus* spp.: (a) tagged and released, (b) tagging rates reported by vessels operating in the exploratory fishery for *Dissostichus* spp. in Subarea 48.4 since 2007, and (c) total number of tagged fish released and recaptured. (Source: observer data and catch and effort reports.)

(a) Number of individuals of *Dissostichus* spp. tagged and released. The number of *D. eleginoides* is indicated in brackets.

Flag State	Vessel name	Season					
		2007	2008	2009	2010	2011	2012
New Zealand	*San Aspiring*	252 (251)	252 (252)	432 (309)	310 (162)	135 (110)	246 (218)
UK	*Argos Froyanes*		252 (252)		310 (256)		
	Argos Georgia			319 (249)		173 (115)	204 (85)
	Argos Helena	40 (40)					

(b) Tagging rate (number of fish tagged per tonne of green weight caught) of *Dissostichus* spp.

Flag State	Vessel name	Season					
		2007	2008	2009	2010	2011	2012
New Zealand	*San Aspiring*	5.2	5.1	5.8	5.4	5.8	6.5
UK	*Argos Froyanes*		5.2		5.5		
	Argos Georgia			5.4		5.7	5.2
	Argos Helena	6.4					
Required rate		5	5	5	5	5	5

(c) Total number of tagged *Dissostichus* spp. released and recaptured in Subarea 48.4.

Season	Number tagged and released			Number recaptured		
	D. eleginoides	*D. mawsoni*	Total	*D. eleginoides*	*D. mawsoni*	Total
2005	42	0	42	0	0	0
2006	134	10	144	0	0	0
2007	291	1	292	2	0	2
2008	504	0	504	23	0	23
2009	558	193	751	29	2	31
2010	418	202	620	32	22	54
2011	225	83	308	24	3	27
2012	303	147	450	33	6	39
Total	2475	636	3111	143	33	176

3.2 Length frequency

13. Length-frequency data from the fishery for *D. eleginoides* in Subarea 48.4 North suggested the presence of a single modal length class progressing each year. The 2009 data suggested the recruitment of a new strong year class into the fishery (70 80 cm length class). This year class was also observed in the length-frequency data for subsequent years, although it will become more difficult to identify from length distributions as it approaches the asymptotic length.

3.3 Stock assessment

14. WG-FSA-12/36 presented an updated assessment for *D. eleginoides* using CASAL software in Subarea 48.4 North only. The model incorporated catch-at-length data from 2005 to 2012, with the exception of 2009 and 2011 for which catch-at-age data were used based on ageing of a random sample of otoliths collected during 2009 and 2011. Size-at-age data were also included to inform estimates of von Bertalanffy parameters within the model. CPUE data were not included in the model and the model did not include catches in 1991 and 1992 in line with the 2010 assessment (SC-CAMLR-XXIX, Annex 8, Appendix N).

15. Data from the fishery in Subarea 48.4 were used to estimate biological parameters for the stock, although some parameter values were taken from the Subarea 48.3 model if insufficient data were available to estimate the parameter values for the Subarea 48.4 stock. These were:

natural mortality 0.13 y^{-1}

stock recruitment parameters steepness 0.75

growth parameters L 180 cm, t_0 0.0

maturation parameters maturation proportion-at-length from the Subarea 48.3 assessment

tag loss rate 0.0064 (day^{-1}, $month^{-1}$ or y^{-1} ?)

tagging mortality rate 0.1 unit, at the upper end of estimates of those available for Subarea 48.3 to reflect the large size of animals in Subarea 48.4

tag detection probability 1.

16. The Working Group agreed that this model should be used to assess the *D. eleginoides* stock in Subarea 48.4 North.

3.4 CASAL model structure and assumptions

Population dynamics

17. The CASAL population model used in the assessment of toothfish in Subarea 48.4 was a combined-sex, single-area, three-season model. The annual cycle was defined as follows: the first season (December to April) is where only recruitment (at the start) and natural mortality occurs; the second season, ranging from the beginning of May to the end of August, includes both natural mortality and fishing and contains the spawning period half the mortality in that particular season being accounted for before spawning occurs; the final season runs from the beginning of September to the end of November, thus completing the annual cycle, with only natural mortality occurring. It was assumed throughout that the proportions of natural mortality and growth that occurred within each season were equal to The model was run over the years 1990 to 2012, with an initial unexploited equilibrium age structure, and with a Beverton-Holt stock-recruit relationship with fixed steepness.

Model estimation

18. The catch proportions-at-length and age data were fitted to the model-expected proportions-at-length and age composition, using a multinomial likelihood.

19. Tag-release events for the years 2005 to 2011 were incorporated into the model with recaptures used from 2006 to 2012. Within-year/season recaptures were omitted from the observations to allow for possible incomplete mixing in the first few months after release. Tag-release and recapture events occurred during the fishing season (season 2), with a

probability of detection of recaptured tags of 1. The estimated numbers of scanned fish for each length class relevant to those in the recapture data were calculated using the total catch biomass, the catch-at-length proportions and the mean weight of the fish.

Data weighting

20. The appropriate effective sample sizes to be used to weight the length-frequency data, and the levels of possible overdispersion apparent in the estimated tagged populations, were investigated. For both sets of observations, standard formulae were used to estimate these quantities after an initial maximum posterior density (MPD) run of the model with the original sample sizes/dispersion values, implementing the same reweighting process as used in the assessment of *D. eleginoides* in Subarea 48.3. The actual effective sample

and a secondary MPD run was performed. Tag overdispersion was fixed at 9.0 for release events, as used in previous assessments for the stock.

Penalties

21. Two types of penalties were included within the model. First, a penalty on the catch constrained the estimated harvest rate in any year from exceeding a specified maximum, set at 0.999 (see the *U_max* parameter in the fishery definition in the population.csl file) in the CASAL assessment models. Second, a tagging penalty discouraged population estimates that were too low to allow the correct number of fish to be tagged.

Priors

22. Table 3 shows the free parameters estimated in the CASAL model, along with their respective bounds and prior parameterisations.

Table 3: Free parameters, and their priors and bounds in the CASAL assessment models.

Parameter	Prior	Lower bound	Upper bound
B_0 (virgin SSB)	Uniform-log	500	5000
k (von Bertalanffy)	Uniform	0.03	0.15
a_1 (max. sel. age)	Uniform	1	50
s_L (left sel. decay)	Uniform	0.05	50
s_R (right sel. decay)	Uniform	0.05	500
YCS	Lognormal	0.001	20

3.5 Selectivity and growth

23. A double normal selectivity was assumed, of the form:

$$s(l) = 2^{-\left[\frac{(l-a_1)}{s_L}\right]^2}, \quad (l \le a_1)$$
$$2^{-\left[\frac{(l-a_1)}{s_R}\right]^2}, \quad (l > a_1)$$

where $s(l)$ is the selectivity at length l, a_1 is the age at maximum selectivity and s_L and s_R are decay parameters for the left- and right-hand limbs respectively.

3.6 Point-estimate (MPD) results

24. An updated CASAL assessment for 2012 produced estimates of biomass and selectivity parameters that were similar to those from the previous season, though the shape of the VB growth curve was slightly different, with an increased L and decreased k (Table 4).

Table 4: Summary of selected parameter values estimated by the CASAL model, comparing updated values with those from the previous season. Values given to four significant figures.

Final season	B_0 (tonnes)	Selectivity parameters (see equation 1)	Growth parameters
2010	1114	a_{50} 11.41, a_{to95} 4.266	k 0.06255, L 160.3, t_0 1.490*
2011	1550	a_1 15.85, s_L 4.321, s_R 10.93	k 0.04079, L 216.6, t_0 0.7972
2012	1697	a_1 18.99, s_L 5.456, s_R 7.333	k 0.0588, L 180.0*, t_0 0.0*

* Fixed parameter in the 2010 and 2012 assessments.

25. Model-fit diagnostics and goodness-of-fit achieved by the reference model are shown in Figures 4 to 7.

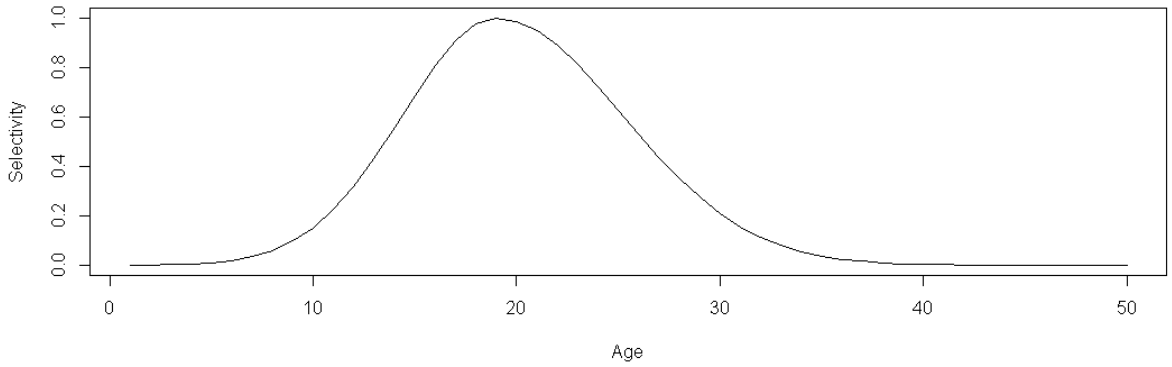


Figure 4: Estimated selectivity curve in the assessment model.

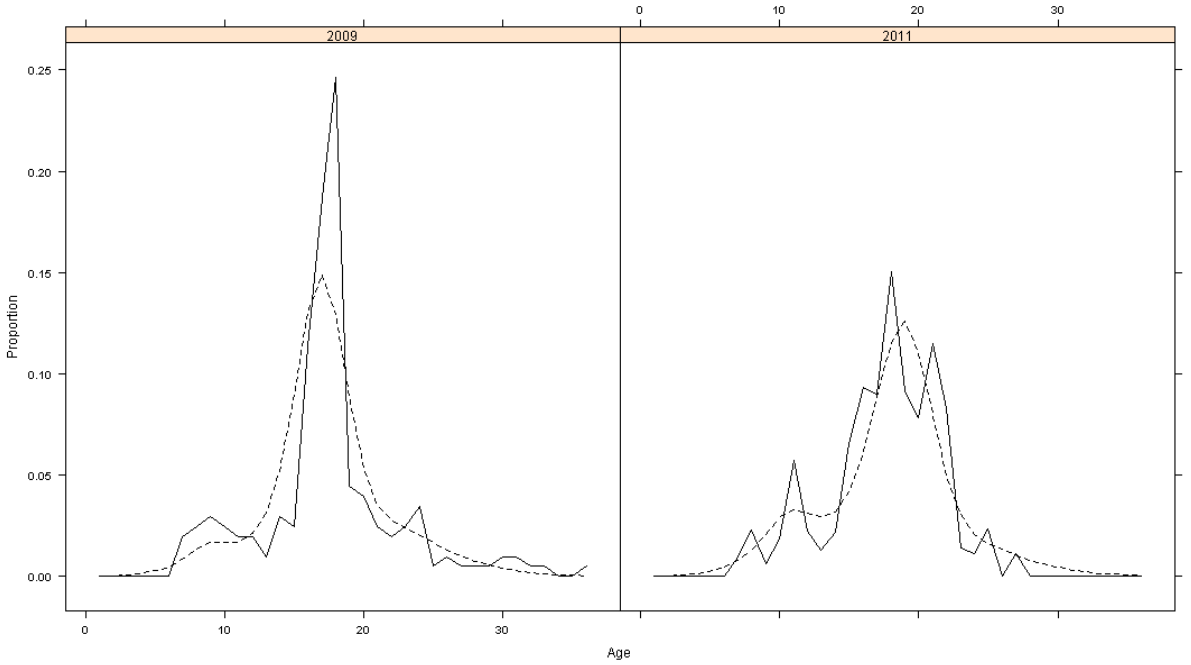


Figure 5: Fit to fleet catch-age proportions for the assessment model. The full and dotted lines represent the observed and predicted length frequencies respectively.

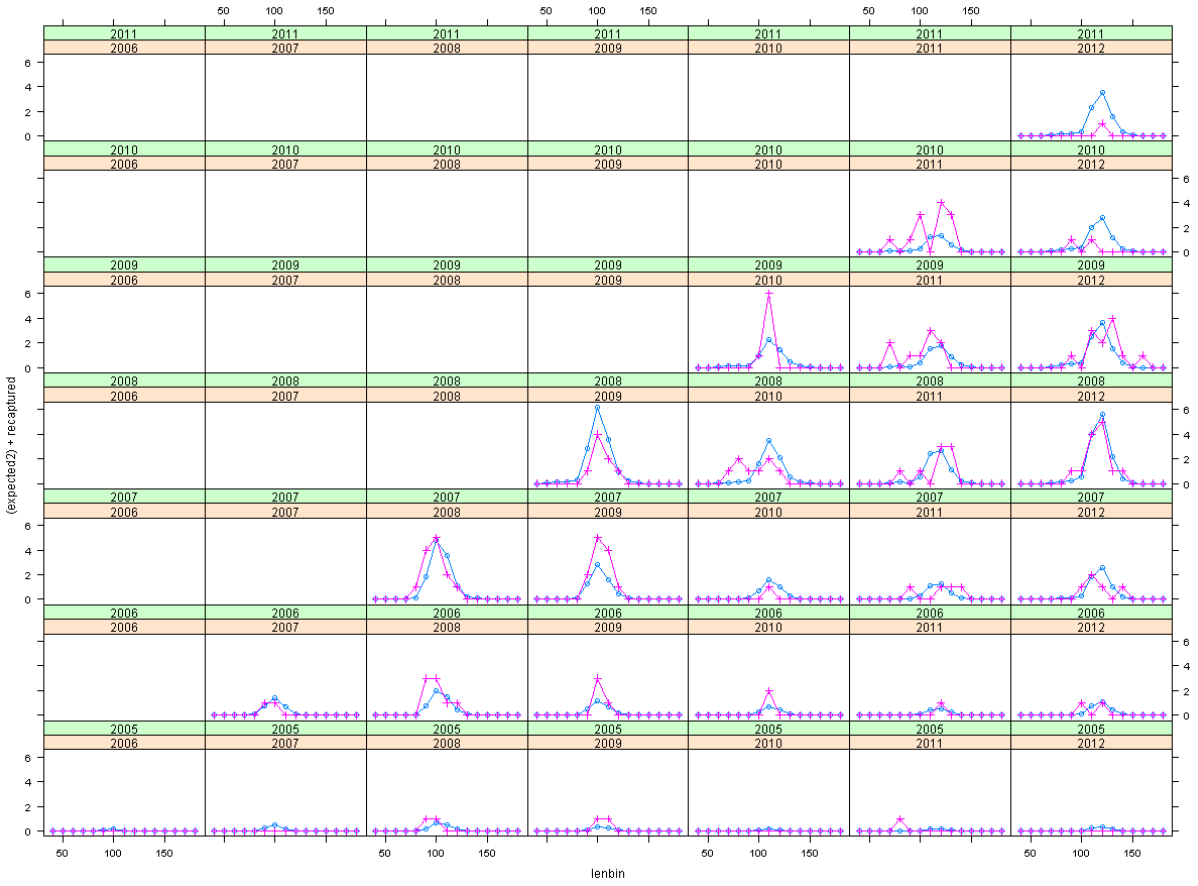


Figure 6: Fits to the tag-release data observed recapture (crosses), expected recaptures (circles). Release years are shown along rows and recapture years down columns.

26. Stock trajectories and key indices are shown in Figure 7.

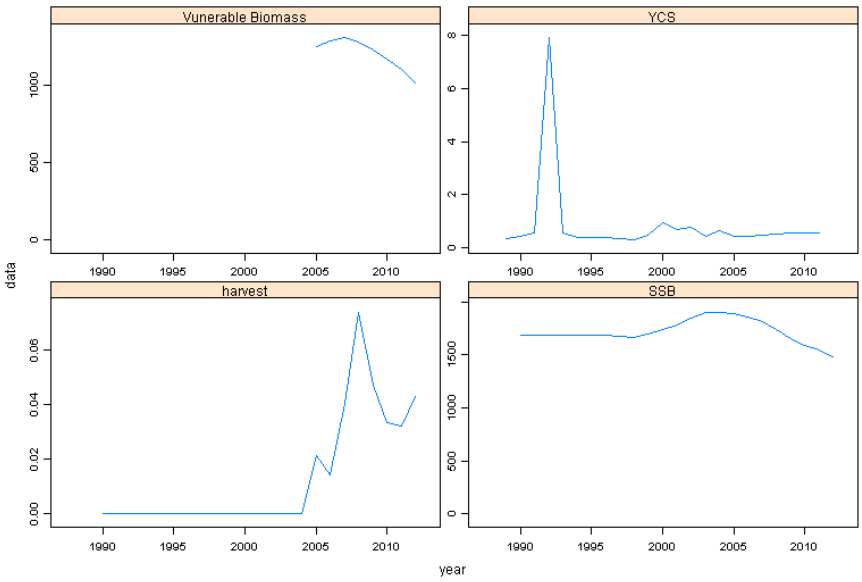


Figure 7: Stock trajectories for the assessment model.

27. Good fits were achieved to catch-at-length and catch-at-age datasets with reasonable fits to tag-recapture data. The fits are particularly good considering the short time series available for the datasets. The selectivity pattern (Figure 4) is estimated further to the right than in previous years, reflecting the progression of the large 1992 year class through the population.

28. Figure 8 shows the likelihood profile for the current assessment model for the virgin biomass parameter. Tag-recapture data indicate a fairly consistent biomass estimate close to that determined from the overall model.

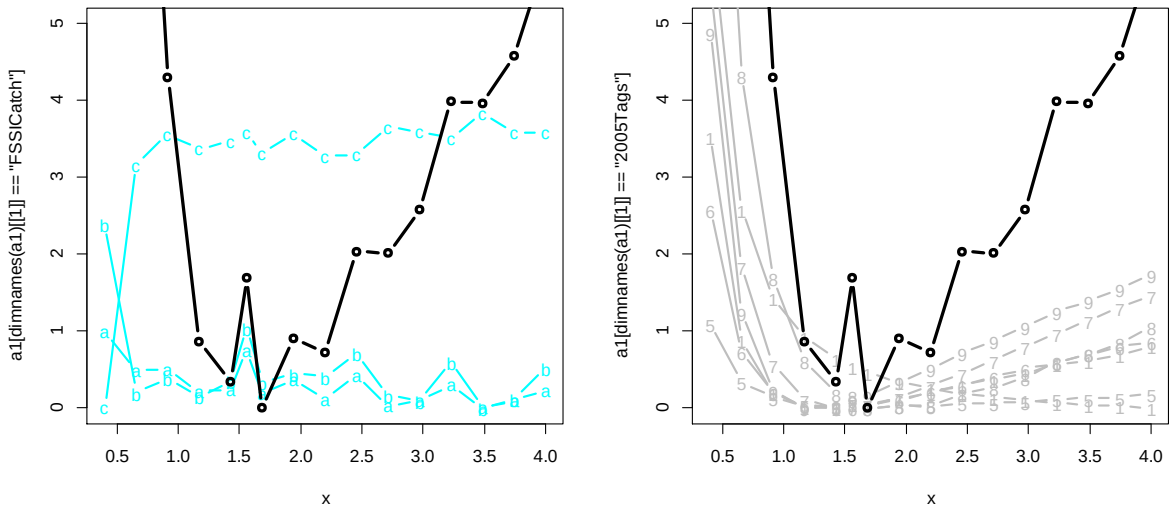


Figure 8: Likelihood profiles for the reference model for Subarea 48.4 North. Profiles for catch-at-age and size-at-age data (left) and tag-recapture data (right). The total likelihood (bold line) is shown in both plots.

3.7 MCMC results

29. The uncertainty in the MCMC samples about the posterior median is quite large (Table 5), primarily due to the low levels of data available. The convergence of the MCMC chains was assessed using the methods already outlined in WG-FSA-05 (SC-CAMLR-XXIV, Annex 5).

Table 5: Median biomass and 95% CIs for the initial equilibrium SSB (B_0), the current SSB ($B_{current}$) and the ratio of current to initial SSB ($B_{current}/B_0$).

Model	B_0 (tonnes)	$B_{current}$ (tonnes)	$B_{current}/B_0$
2009 Model	997 (547.4 2487.1)	1103 (546.6 2777.3)	1.09 (0.82 1.41)
2010 Model	991.4 (552.1 2122.3)	1160.7 (597.9 2587.4)	1.14 (0.90 1.51)
2011 Model	1655 (1078 2592)	1537 (909.3 2531)	0.9272 (0.8476 0.9737)
2012 Model	1868 (1196 3287)	1691 (999 3119)	0.903 (0.817 0.990)

3.8 Sensitivity runs

30. No sensitivity runs were undertaken.

3.9 Yield calculations

31. CASAL allows the historic stock dynamics to be projected into the future, for a variety of future scenarios. A constant catch projection allows calculation of the long-term yield that satisfies the CCAMLR decision rules:

(i) $_1$, so that the probability of the spawning biomass dropping below 20% of its median pre-exploitation level, over a 35-year harvesting period, is 10% (depletion probability).

(ii) $_2$, so that the median escapement in the SSB over a 35-year period is 50% of the median pre-exploitation level, at the end of the projection period.

(iii) $_1$ $_2$ as the yield.

32. The depletion probability was calculated as the proportion of samples from the Bayesian posterior, where the predicted future SSB was below 20% of B_0 in the respective sample of any one year, for each year in the 35-year projection period.

33. The level of escapement was calculated as the proportion of samples from the Bayesian posterior, where the projected future status of the SSB was below 50% of B_0 in the respective sample, at the end of the 35-year projection period.

34. Lognormal recruitment was used for the projection with a CV of 1.0. The reason for this very high variability is the identification in the current assessment of a single dominating

cohort. Because of this very high recruitment variability, the future catch limit was constrained by the first (γ_1) decision rule. Figure 9 shows the historic and future SSB dynamics for a constant yield of 63 tonnes projected from 2012 to 2046.

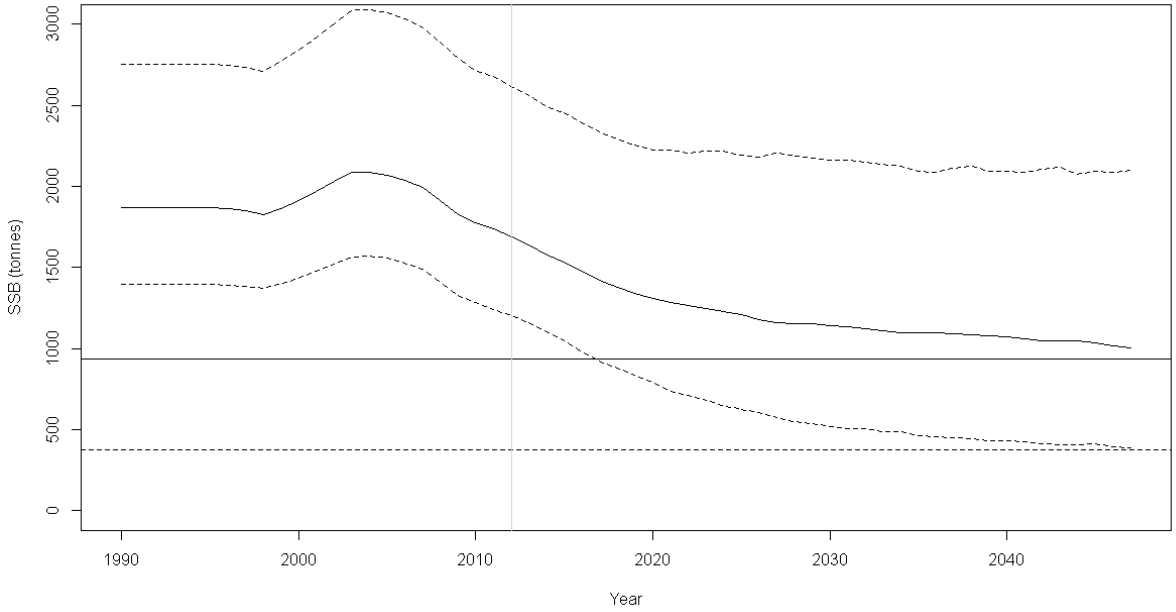


Figure 9: Historic and projected SSB dynamics for a constant future (2012 2046) yield of 63 tonnes. The solid line represents the median with the dotted lines representing the 80% credible interval. The blue and red lines are the medians of 50% and 20% of virgin biomass respectively.

3.10 Future work

35. The Working Group recommended that the model be developed to include data from fishing in Subarea 48.4 South, such that the sub-population of *D. eleginoides* in the northern part of this subarea is incorporated into the assessment.

4. Assessment of toothfish in Subarea 48.4 South

36. A tagging experiment ran from 2009 to 2012 to help develop an assessment for *Dissosstichus* spp. in the south of Subarea 48.4. Tag returns throughout the experiment have been relatively low leading to variable estimates of population abundance. However, in spite of low quantities of tag returns, a high tag-overlap statistic has been maintained throughout. This would indicate that the data should be suitable for inclusion in an integrated stock assessment model. The Working Group discussed options for the development of such a model that would lead to separate assessments of *D. mawsoni* and *D. eleginoides* for the whole of Subarea 48.4.

37. Petersen estimates from tag recaptures to date suggest a vulnerable population of approximately 800 tonnes for *D. mawsoni*. Limited tag recaptures of *D. eleginoides* suggest a vulnerable biomass in the region of around 560 tonnes. This is slightly greater than estimates

made in 2011 (SC-CAMLR-XXX). Application of the from the most recent Subarea 48.3 assessment (0.038) to the current estimates of vulnerable biomass results in a yield estimate of 52 tonnes. The Subarea 48.3 assessment value is applied because the assessment is considered to be more stable than that for *D. eleginoides* in Subarea 48.4 North and furthermore provides a more conservative harvest rate value.

5. By-catch of fish and invertebrates

5.1 By-catch removals

38. Catches of by-catch species groups (macrourids, rajids and other species) reported in fine-scale data, and number of rajids cut from lines and released alive, are summarised in Tables 6 and 7. In 2010, catch limits for by-catch species were introduced in Subarea 48.4 North and by-catch move-on rules were introduced in Subarea 48.4 South at 16% of the toothfish catch where more than 150 kg of macrourids were caught.

Table 6: Catch history for by-catch species in Subarea 48.4 North (macrourids, rajids and other species) and number of rajids released alive in Subarea 48.4. (Source: fine-scale data.)

Season	Catch limit		Catches taken		Rajids number released	Other species reported catch (tonnes)
	Macrourids (tonnes)	Rajids (tonnes)	Macrourids (tonnes)	Rajids (tonnes)		
2005	-	-	3	0	0	<1
2006	-	-	5	1	4359	<1
2007	-	-	14	2	6515	<1
2008	-	-	16	4	8276	<1
2009	12	4	12	1	6501	<1
2010	6.5	2	4	1	3742	<1
2011	6.5	2	3	<1	3697	<1
2012	7.5	2.5	5	<1	5256	<1

Table 7: Catch history for by-catch species in Subarea 48.4 South (macrourids, rajids and other species) and number of rajids released alive in Subarea 48.4. (Source: fine-scale data.)

Season	Catches taken		Rajids number released	Other species reported catch (tonnes)
	Macrourids (tonnes)	Rajids (tonnes)		
2009	14	<1	3266	<1
2010	12	<1	2441	<1
2011	2	<1	983	<1
2012	2	<1	326	<1

5.2 Assessment of impacts on affected populations

39. The distribution of rajids and macrourids in Subarea 48.4 has been investigated and initial results of their distributions were provided in WG-FSA-09/17 and 09/18. To 2011,

472 skates have been tagged in Subarea 48.4 North. Rajids are generally distributed to the east, compared to toothfish being generally distributed to the north and west. In Subarea 48.4 South, rajids are not so common, although 451 have now been tagged. To date there have been three rajiids recaptured in Subarea 48.4 South. A further 203 skates have been tagged in Subarea 48.4 during 2012 with one recapture.

40. Although catch rates for macrourids in Subarea 48.4 North were initially high at the start of the fishery, vessels have altered their fishing techniques and rates have subsequently dropped to 8% of the catch weight for *D. eleginoides*. Both macrourid and rajid catches were within the catch limits in 2012.

41. Macrourid catches were previously thought to almost entirely comprise *Macrourus whitsoni*. Genetic analyses now suggest that the macrourid population may comprise two species, including *M. whitsoni* and a new undescribed *Macrourus* species (WG-FSA-10/33).

5.3 Identification of levels of risk

42. None available for this fishery.

5.4 Mitigation measures

43. By-catch limits and move-on rules are included in the annual conservation measure established for this fishery (CM 41-03). WG-FSA recommended that the move-on rules for macrourids and rajids should remain unchanged in 2012. In addition, mitigation measures for rajids include using Year-of-the-Skate protocols for releasing skates caught alive.

44. In 2012, the total catch of macrourids in Subarea 48.4 South was 1.8 tonnes, representing 5.3% of the catch of *Dissostichus* spp. and the rajid by-catch was 0.2 tonnes, representing 0.5% of the *Dissostichus* spp. catch. The move-on rule was triggered just once in 2012, representing less than 1% of the hauls made. This compares to less than 1% of the hauls made in 2011, 8% in the previous year and 70% in the first year that the rule was brought in.

6. Incidental mortality of birds and mammals

6.1 Incidental mortality reported

45. There have been no observed seabird or marine mammal mortalities in the Subarea 48.4 fishery.

6.2 Identification of levels of risk

46. The level of risk of incidental mortality of seabirds in Subarea 48.4 is category 3 (medium) (SC-CAMLR-XXX, Annex 8, paragraph 8.1).

6.3 Mitigation measures

47. CM 25-02 applies to this fishery, except paragraph 5, if requirements of CM 24-02 are met. There is a limit of three (3) seabirds per vessel during daytime setting. Fishing in December, January, February, March, October and November shall be in accordance with CM 24-02.

7. Ecosystem implications/effects

48. No evaluation available for this fishery.

8. Harvest controls and management advice

8.1 Conservation measures

49. The limits on the fishery for *D. eleginoides* and *D. mawsoni* in Subarea 48.4 are defined in CM 41-03. the Scientific Committee for the forthcoming season are summarised in Table 8.

Table 8: Limits on the fishery for *Dissostichus eleginoides* and *D. mawsoni* in Subarea 48.4 in force (CM 41-03) and advice to the Scientific Committee for 2013.

Element	Limit in force	Advice for 2013
Access	Subarea 48.4 North: directed longline fishery on *Dissostichus eleginoides*	Carry forward
	Subarea 48.4 South: directed longline fishery on *Dissostichus* spp.	Carry forward
Catch limit	Subarea 48.4 North: precautionary catch limit for *D. eleginoides* was 63 tonnes and the taking of *D. mawsoni*, other than for scientific research purposes, is prohibited.	Revise
	Subarea 48.4 South: precautionary catch limit for *Dissostichus* spp. was 52 tonnes	Revise
Season	1 December to 30 November	Carry forward
By-catch	Subarea 48.4 North: precautionary catch limits for *Macrourus* spp. (7.5 tonnes) and rajids (2.5 tonnes).	Revise
	Subarea 48.4 South: By-catch move-on rules for *Macrourus* spp. (more than 150 kg and 16% of toothfish catch in one haul) and rajids (5%).	Carry forward
Mitigation	In accordance with CM 25-02, except paragraph 5, if requirements of CM 24-02 are met.	Carry forward
	Fishing in December, January, February, March, October and November shall be in accordance with CM 24-02.	
	Limit of three (3) seabirds per vessel during daytime setting.	
Observers	At least one (1) scientific observer appointed in accordance with the CCAMLR Scheme of International Scientific Observation.	Carry forward

(continued)

Table 8 (continued)

Element	Limit in force	Advice for 2013
Data	Five-day catch and effort reporting Haul-by-haul catch and effort data Biological data reported by the CCAMLR scientific observer.	Carry forward Carry forward Carry forward
Research	Each vessel taking part in the fishery for *D. eleginoides* shall undertake a tagging program in accordance with the CCAMLR tagging protocol.	Carry forward
	Toothfish tagged at a rate of at least five fish per tonne of green weight caught.	Carry forward
Environmental protection	Regulated by CM 26-01.	Carry forward

8.2 Management advice

50. In 2012 WG-FSA recommended the following limits for toothfish and by-catch in Subarea 48.4:

Subarea 48.4 North

(i) a catch limit of 63 tonnes for *D. eleginoides*

(ii) the continued prohibition of the targeting of *D. mawsoni* other than for scientific research purposes

(iii) maintenance of catch limits for by-catch species, with a limit for macrourids of 10 tonnes (16% of the catch limit for *D. eleginoides*) and a limit for rajids of 3 tonnes (5% of the catch limit for *D. eleginoides*).

Subarea 48.4 South

(i) a catch limit of 52 tonnes for *Dissostichus* spp. (*D. eleginoides* and *D. mawsoni* combined)

(ii) maintenance of a move-on rule for by-catch species, with a macrourid trigger of 150 kg and 16% of the catch of *Dissostichus* spp., and a trigger for rajids set at 5% of the catch of *Dissostichus* spp.

51. In 2012, further to the limits recommended by WG-FSA, the Commission agreed that in Subarea 48.4 North any *D. mawsoni* that are retained (i.e. are not suitable for tagging) shall be counted against the catch limit of *Dissostichus* spp. in the southern area.