APPENDIX G

FISHERY REPORT: *DISSOSTICHUS ELEGINOIDES* SOUTH GEORGIA (SUBAREA 48.3)

CONTENTS

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1. Details of the fishery

1.1 Reported catch (time series)

In 2004, the Commission agreed to subdivide Subarea 48.3 into one area containing the South Georgia–Shag Rocks (SGSR) stock and other areas, to the north and west, that do not include the SGSR stock. Within the SGSR area, the Commission defined three Management Areas (A, B and C) (CM 41-02/A).

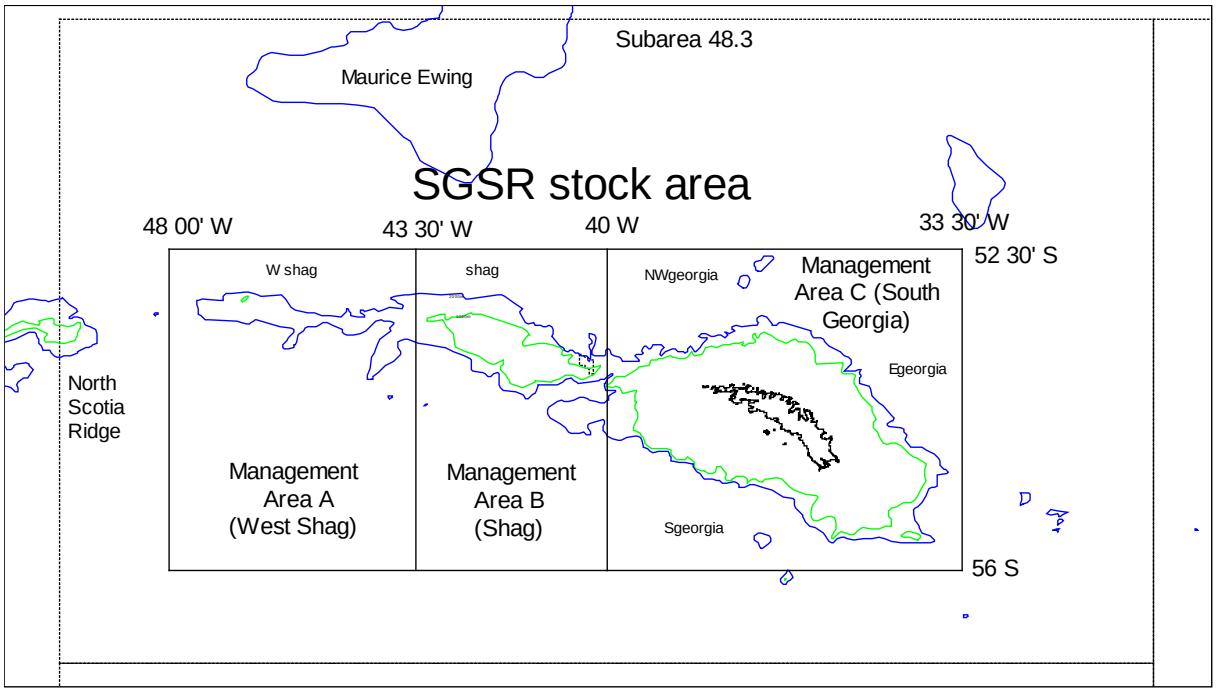

Figure 1: Definition of the SGSR stock area, with its three Management Areas A, B and C.

2. The catch limits in the 2010/11 season for Management Areas A, B and C were 0, 900 and 2 100 tonnes respectively, with an overall catch limit for SGSR of 3 000 tonnes. The total declared catch was 1 788 tonnes. Catches in Management Areas B and C were 571 tonnes and 1 215 tonnes respectively (in addition, 2 tonnes were taken during a research survey). The fishing season in both management areas commenced on 21 April 2011 (CM 41-02, paragraph 5 and CCAMLR-XXIX, paragraph 12.24) and both areas remained open to fishing during the prescribed season. Tagging of toothfish continued at a rate of 1.3 fish per tonne with a total of 2 910 fish tagged (with 524 recaptures).

3. Most catch has been taken by longlines, but 66 tonnes were taken by pots in 2000/01, 24 tonnes in 2005/06 and 55 tonnes in 2007/08. These data are included in the total catch. With respect to the distribution of effort, previous reports have displayed the spread of the effort in the fishery over time. Current effort is spread evenly over the fished areas.

1.2 Total removals

4. The catch series is shown in Table 1. There has been no evidence of IUU fishing in Subarea 48.3 since 2005/06.

Table 1: Catch history for *Dissostichus eleginoides* in Subarea 48.3. SGSR: South Georgia–Shag Rocks stock; West: area outside the SGSR stock area. (Source: STATLANT data for past seasons, and catch and effort reports for current season, WG-FSA-11/10 and past reports for IUU catch.)

Season	Regulated fishery			Estimated IUU catch (tonnes)	Total removals (tonnes)		
	Effort (no. vessels)	*D. eleginoides* catch (tonnes)			SGSR	West	Subarea
		Limit	Reported				
1984/85	1	-	521	0	517	4	521
1985/86	1	-	733	0	733	0	733
1986/87	1	-	1954	0	1954	0	1954
1987/88	2	-	876	0	876	0	876
1988/89	3	-	7060	144	6963	241	7204
1989/90	2	-	6785	437	6838	384	7222
1990/91	1	2500	1756	1775	3531	0	3531
1991/92	23	3500	3809	3066	6864	11	6875
1992/93	18	3350	3020	4019	7039	0	7039
1993/94	4	1300	658	4780	5246	191	5438
1994/95	13	2800	3371	1674	4972	73	5045
1995/96	13	4000	3602	0	3530	72	3602
1996/97	10	5000	3812	0	3808	4	3812
1997/98	9	3300	3201	146	3347	0	3347
1998/99	12	3500	3627	667	4293	0	4293
1999/00	17	5310	4904	1015	5910	9	5919
2000/01	18	4500	4047	196	4232	11	4243
2001/02	17	5820	5742	3	5717	29	5745
2002/03	19	7810	7528	0	7510	18	7528
2003/04	17	4420	4497	0	4460	37	4497
2004/05	8	3050	3034	23	3057	0	3057
2005/06	11	3556	3535	0	3535	0	3535
2006/07	11	3554	3539	0	3537	2	3539
2007/08	12	3920	3864	0	3864	0	3864
2008/09	11	3920	3382	0	3382	0	3382
2009/10	9	3000	2522	0	2522	0	2522
2010/11	6	3000	1788	0	1788	0	1788

5. WG-FSA-10/P6 presented an analysis of cetacean depredation on longlines. An updated analysis was undertaken with data up to the 2010/11 season inclusive. Adding the fish taken by cetaceans, the total catches would increase by between 2% and 3.6% over the reported figures depending on the year, for the 2003/04 season onwards. The resultant catch series is shown in Table 2.

Table 2: Total removals (tonnes) taking into account cetacean depredation.

Year	Total removals	Year	Total removals
1985	517	1999	4387
1986	732	2000	6087
1987	1954	2001	4358
1988	876	2002	5887
1989	6962	2003	7736
1990	6828	2004	4581
1991	3566	2005	3141
1992	6933	2006	3661
1993	7109	2007	3618
1994	5297	2008	3956
1995	5021	2009	3450
1996	3607	2010	2606
1997	3888	2011	1848
1998	3410		

1.3 Size distribution of catches (time series)

6. Catch-weighted length frequencies for *D. eleginoides* from 1984/85 to 2010/11 are shown in Figure 2.

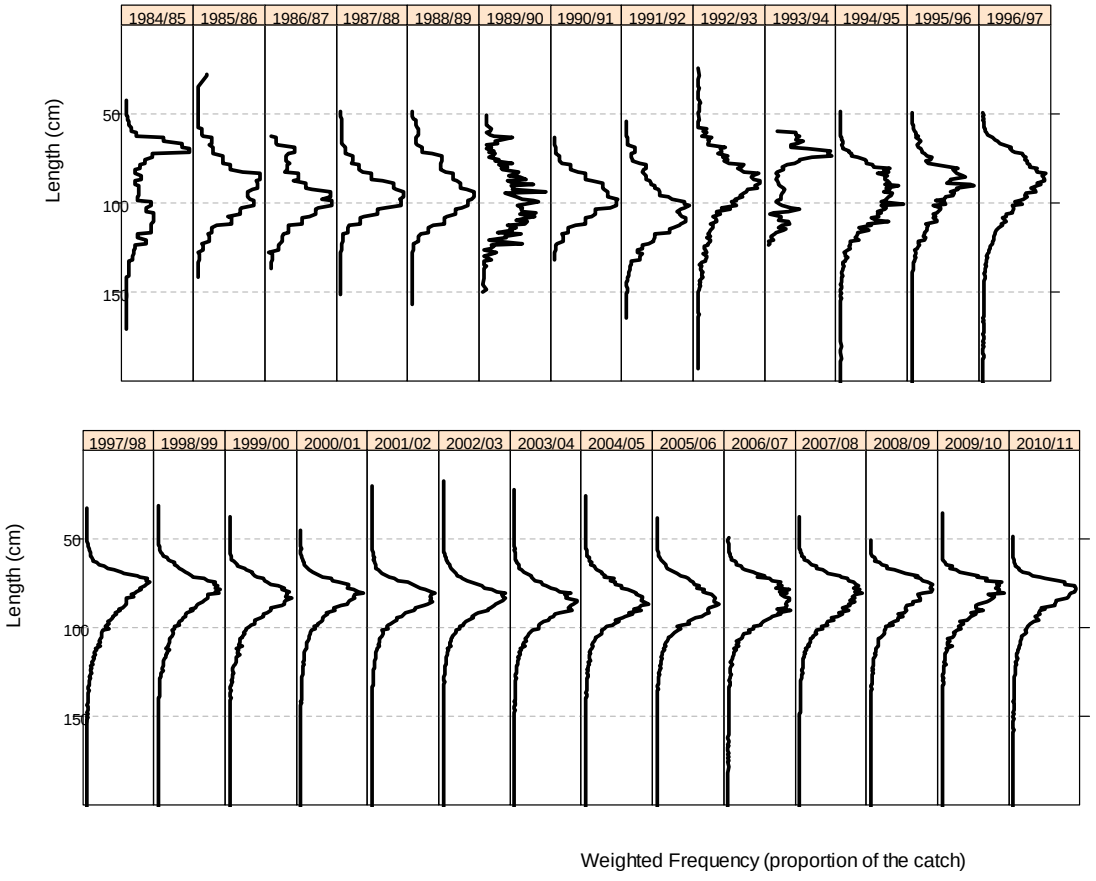

Figure 2: Catch-weighted length frequencies for *Dissostichus eleginoides* in Subarea 48.3 for the early time series (1984/85 to 1996/97) and later time series (1996/97 to present) (source: observer, fine-scale and STATLANT data).

7. The age distribution of catches has been determined by simple random sampling of fish in the catch for all years since 1998 (Table 3).

Table 3: Sample size for age determination of fish caught in Subarea 48.3.

Year	Sample size for age determination
1998	250
1999	259
2000	298
2001	467
2002	200
2003	200
2004	418
2005	251
2006	250
2007	250
2008	249
2009	512
2010	254
2011	255

8. Catch proportions by age and year are provided in Figure 3. Cohorts in the region of 1990 dominated commercial catch-at-age in the early 2000s, with the 1993 cohort increasing in dominance from 2004/05 to 2006/07. The next clear evidence of a cohort recruiting to the fishery is observed in 2008/09, 2009/10 and 2010/11, when strong signals of the 2001 cohort were evident. It is important to note that the 1999 cohort dominated catches in 2007/08, however, no clear evidence of a strong 1999 cohort has been seen in subsequent seasons.

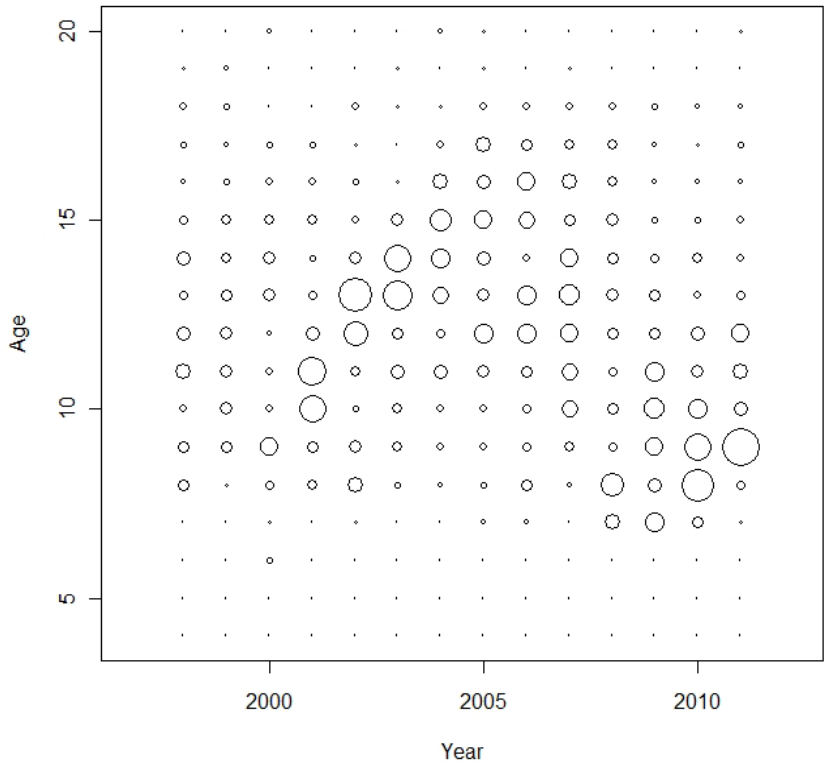

Figure 3: Commercial catch proportion at age (graduated bubbles) by age and year from ageing of randomly sampled otoliths (Table 3).

2. Stocks and areas

9. It has been demonstrated that there is genetic separation of those fish present in Subarea 48.3 from those found on the Patagonian Shelf (FAO Area 41) (Shaw et al., 2004). The SGSR stock, occurring within management areas A, B and C (Figure 1), is genetically separate from fish taken in the extreme north and west of Subarea 48.3.

10. All assessments consider only the SGSR stock.

3. Parameters and available data

3.1 Standardised CPUE

11. The GLM (catch per hook as the response variable; season, month, nationality, depth class, area and cetacean presence for 2002/03 onwards as effects) standardised CPUE analysis was undertaken with a separate series for years where data on cetacean presence is available (see WG-FSA-11/33 Rev. 1). Figure 4 shows that the rate of decline in standardised CPUE slowed from 2008/09 onwards, and has levelled off from 2009/10 to 2010/11.

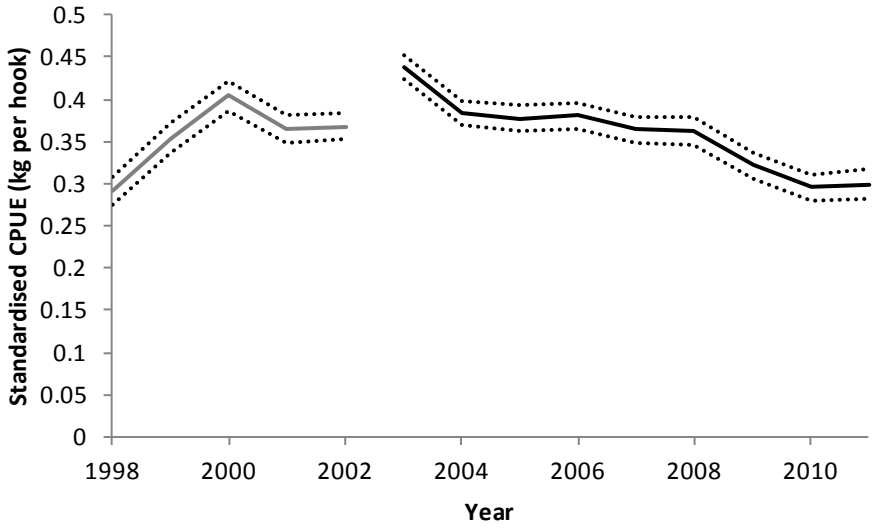

Figure 4: Standardised longline CPUE by fishing season for Subarea 48.3 calculated using GLMs for the 1997/98 season onwards. The standardised CPUE series from 2002/03 onwards (black) includes cetacean presence as a factor, the series from 1997/98 to 2002/03 does not include cetacean presence as a factor.

3.2 Recruitment

12. Estimates of juvenile toothfish abundance, and length density, are available from a number of surveys in shallow water (<400 m) around Shag Rocks, which is the primary juvenile area in Subarea 48.3 (Table 4). The 2001 cohort was consistently tracked from the 2004 survey, as 30 cm fish, through to the 2008 survey (Table 5) and the 2007 cohort dominated catches in both the 2010 and 2011 survey.

Table 4: Average density and bootstrap CV estimates for juvenile toothfish caught in the groundfish survey hauls shallower than 400 m around Shag Rocks.

Year	Average numbers/km^2	Bootstrap CV
1987	301.8	0.302
1988	727.3	0.680
1990	5142.6	0.567
1991	771.5	0.353
1992	1379.8	0.359
1994	1467.5	0.506
2000	502.5	0.452
2002	758.2	0.362
2004	323.3	0.407
2005	410.2	0.351
2006	392.9	0.393
2007	15.4	0.578
2008	79.8	0.433
2009	61.9	0.549
2010	137.1	0.284
2011	2633.3	0.771

Table 5: Proportions at length of juvenile toothfish caught in the groundfish survey hauls shallower than 400 m around Shag Rocks.

Year	10	15	20	25	30	35	40	45	50	55	60	65	70
1987	0.01	0.05	0.02	0.08	0.03	0.52	0.22	0.07	0.01	0.00	0.00	0.00	0.00
1988	0.05	0.41	0.09	0.32	0.04	0.01	0.02	0.02	0.01	0.02	0.01	0.00	0.00
1990	0.00	0.06	0.38	0.12	0.12	0.01	0.03	0.14	0.01	0.12	0.01	0.00	0.00
1991	0.01	0.11	0.01	0.12	0.61	0.10	0.01	0.00	0.01	0.00	0.01	0.00	0.00
1992	0.00	0.00	0.01	0.06	0.03	0.40	0.48	0.03	0.00	0.00	0.00	0.00	0.00
1994	0.00	0.42	0.25	0.13	0.06	0.03	0.05	0.03	0.02	0.01	0.00	0.00	0.00
2000	0.00	0.22	0.04	0.05	0.36	0.10	0.20	0.02	0.00	0.00	0.00	0.00	0.00
2002	0.00	0.00	0.01	0.09	0.51	0.13	0.13	0.05	0.04	0.03	0.01	0.00	0.00
2004	0.00	0.00	0.00	0.02	0.61	0.21	0.02	0.10	0.03	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.01	0.21	0.64	0.10	0.02	0.02	0.00	0.00	0.00
2006	0.00	0.00	0.00	0.02	0.09	0.03	0.05	0.51	0.27	0.01	0.01	0.00	0.00
2007	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.27	0.08	0.39	0.11	0.00	0.00
2008	0.04	0.00	0.00	0.00	0.00	0.00	0.01	0.08	0.12	0.08	0.36	0.21	0.09
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.23	0.47	0.19	0.06	0.00
2010	0.00	0.02	0.02	0.04	0.71	0.15	0.00	0.00	0.00	0.04	0.01	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.08	0.08	0.62	0.22	0.00	0.00	0.00	0.00	0.00

3.3 Mark–recapture data

13. In total, 31 872 *D. eleginoides* have been tagged and released in Subarea 48.3 since the start of the program in 2000 (Table 6). Tagging effort, fishing effort and recaptures have been well distributed over the whole of the fishable grounds in Subarea 48.3 since 2004.

Table 6: Tagging results from Subarea 48.3. Tags released and recaptured in the same season are not included in this table. These data are used as an input to the CASAL model, and therefore also exclude tags released on research cruises and recaptures of animals greater than 110 cm in length.

Release year	Numbers released	Recapture year										
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2000	134	1	1	3	1	2	0	0	1	2	0	0
2001	348		23	32	11	5	9	6	6	8	1	0
2002	401			33	6	15	12	8	9	4	3	0
2003	454				26	16	19	13	13	5	2	4
2004	3217					96	126	111	108	50	35	32
2005	3951						181	145	142	114	82	44
2006	4844							223	192	138	125	69
2007	4750								234	170	137	76
2008	4581									229	145	102
2009	3321										138	64
2010	2961											71

3.4 Biological parameters

14. The Von Bertalanffy growth parameters and maturity ogive were updated with data collected during 2009/10 and 2010/11. In addition, the tag-loss rate parameter was updated in order for CASAL to more accurately estimate the loss rate of double tagged fish due to tag shedding, in line with recommendations of the Working Group on Statistics, Assessments and Modelling in 2011 (SC-CAMLR-XXX, Annex 5, paragraph 3.6).

Table 7: Biological parameter values for *Dissostichus eleginoides* in Subarea 48.3.

Component	Parameter	Value	Component	Parameter	Value
Natural mortality	M	0.13	Tag-related growth retardation		0.75
VBGF	K	0.08	CASAL tag loss rate		0.006377
VBGF	t_0	–0.7	Immediate tagging survivorship		Applied as a vector to length-based tag-release data
VBGF	L_∞	126	Tag probability of detection		1
Length to mass (cm to t)	a	2.54E-08			
Length to mass	b	2.8	Stock-recruit relationship steepness	h	0.75
Maturity range: 0 to full maturity		1–23	Lognormal recruitment SD		Estimated, see section 4.7

4. Stock assessment

15. WG-FSA-11/33 Rev. 1 presented an updated assessment of *D. eleginoides* in Subarea 48.3. Two CASAL models were presented. The Working Group agreed that the two-fleet model gave more plausible estimates of selectivity and year-class strength estimates

at the time of the meeting, provided a good overall fit to the data and should be used as the basis for the assessment. Model input files and runs were validated by the Secretariat and the Working Group.

4.1 CASAL model structure and assumptions

Population dynamics

16. The CASAL population model used in the assessment of toothfish in Subarea 48.3 was a combined-sex, single-area, three-season model. The annual cycle was defined as follows: the first season (1 December to 31 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 that season's length as a proportion of a year. The models were run over the years 1985 to 2011, with an initial unexploited equilibrium age structure, and with a Beverton-Holt stock-recruit relationship with fixed steepness.

Model estimation

17. The following data were used in the model estimation

- GLM standardised commercial CPUE for 1998–2002, treated as a relative index of abundance (Figure 3)
- GLM standardised commercial CPUE including cetacean presence as an effect, 2003–2011, treated as a relative index of abundance (Figure 3)
- proportional catches-at-length for the early fishery 1988–1997
- proportional catches-at-age for the later fishery 1998–2011
- survey density of juvenile fish at Shag Rocks, treated as a relative index of abundance (Table 4)
- survey proportional density-at-length for juvenile fish (Table 5)
- tag-recaptures-at-length from tagging events in 2003–2008 and tag-recapture events in 2006–2011 (Table 6).

18. Relative indices of abundance were assumed to be lognormally distributed about the model-predicted vulnerable biomass, for CPUE halfway through the fishing season and for survey abundance in the first quarter of the year, via a constant catchability q.

19. Within-season recapture events were eliminated from the tagging data. Initial tag-induced mortality was used to adjust the number of released tags prior to adding them to the model, (determined during the tag survivorship experiment; Agnew et al., 2006).

20. Exploratory runs and sensitivity analyses were run using a point estimate Bayesian analysis (MPD: maximum posterior density). MCMC samples were obtained by first running the sampler for a 'burn-in' period of 100 000 iterations, and a further 1 000 000 iterations of the sampler were obtained, which were then thinned by a factor of 1 000, to yield a parameter sample of length 1 000. Chain behaviour was good.

Process error and data weighting

21. As well as process error being estimated for the CPUE observations, the appropriate effective sample sizes to be used to weight the length-frequency data were investigated. For both sets of observations, standard formulae were used to estimate these quantities after an initial MPD run of the model with the original sample sizes/dispersion values using the same re-weighting process as in the 2009 assessment (SC-CAMLR-XXVIII, Annex 5, Appendix L). The actual effective sample sizes/dispersion values predicted by the model's fit to the relevant dataset were then adopted, and a secondary MPD run was performed. Tag over-dispersion was calculated, as described in WG-FSA-11/33 Rev. 1.

Penalties

22. 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 0.99999 (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

23. Within a Bayesian model, all free parameters estimated require both the definition of a prior and bounds that constrain the estimation. Table 8 shows the free parameters estimated in the CASAL models, along with their respective bounds and prior parameterisations.

Table 8: Free parameters, and their priors and bounds in the CASAL assessment models.

Parameter	Prior	Lower bound	Upper bound
B_0 (virgin SSB)	Uniform-log	20 000	1.00E+06
q (catchabilities)	Uniform-log	1.00E-08	1.00E-01
m (max. sel. age)	Uniform	1	50
l (left sel. decay)	Uniform	0.05	50
r (right sel. decay)	Uniform	0.05	500
CV (CPUE obs.)	Uniform	0.001	5
YCS	Lognormal	0.001	20

4.2 Selectivity

24. Selectivity-at-age was expressed as a double-normal curve, i.e. with a declining right hand limb.

4.3 CASAL runs

25. A single assessment model was run for WG-FSA. Table 9 summarises the estimated parameter values of the MPD.

Table 9: Review of parameter estimates for the CASAL model, using the MPD estimation results.

Model	SSB_0 ('000 tonnes)	Selectivity parameters for the early fleet, the later fleet, and the survey	Process error CV (CPUE 1998–2002 and CPUE 2003–2011)
Reference	84.805	13.18, 2.60, 431.20 10.56, 2.12, 393.52 3.87, 1.96, 1.68	0.092, 0.052

4.4 Point-estimate (MPD) results

26. Model-fit diagnostics and goodness-of-fit achieved by the reference model are shown in Figures 5 to 11.

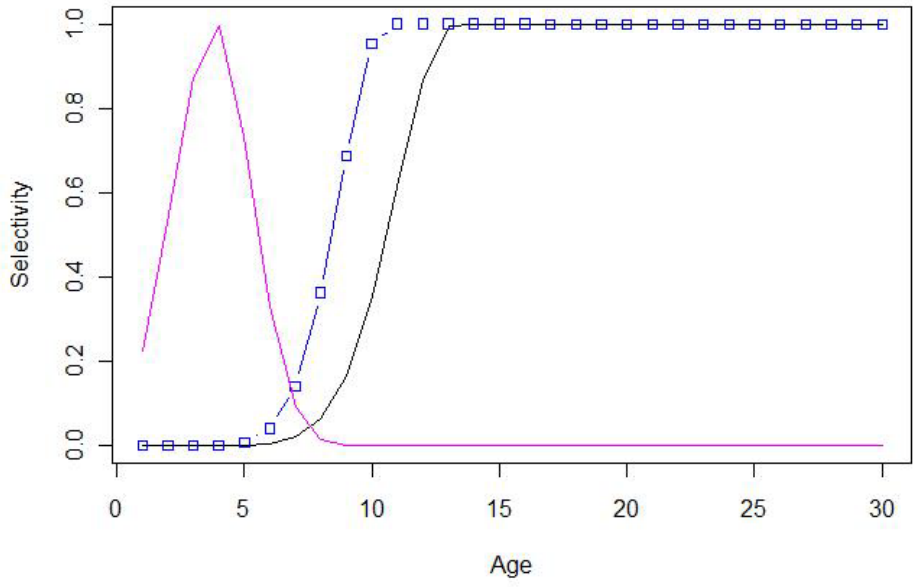

Figure 5: Estimated selectivity curves in the reference model for the survey (pink), old fleet (black) and new fleet (broken blue line with squares).

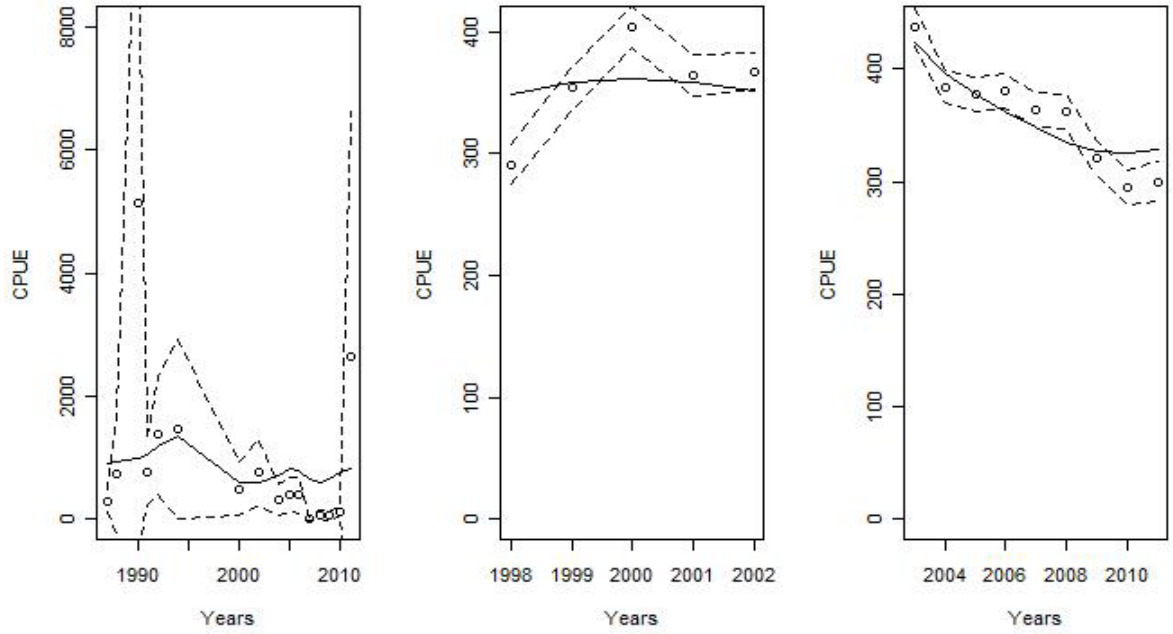

Figure 6: Model fits (solid line) to the survey (left), non-cetacean corrected new fleet (middle) and cetacean corrected new fleet CPUE series (circle points with CVs shown as broken lines) of the reference model.

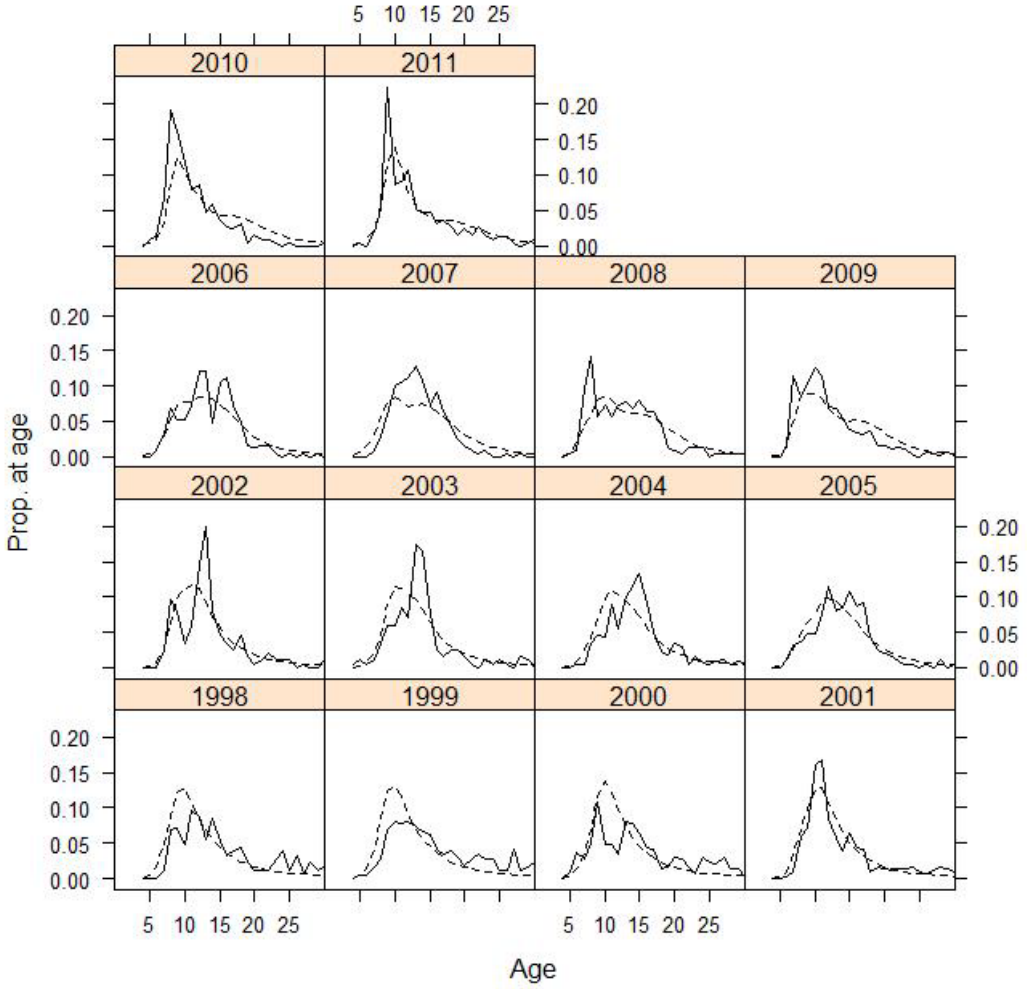

Figure 7: Fit to second-fleet catch-age frequencies for the reference model. The full and broken lines represent the observed and predicted length frequencies respectively.

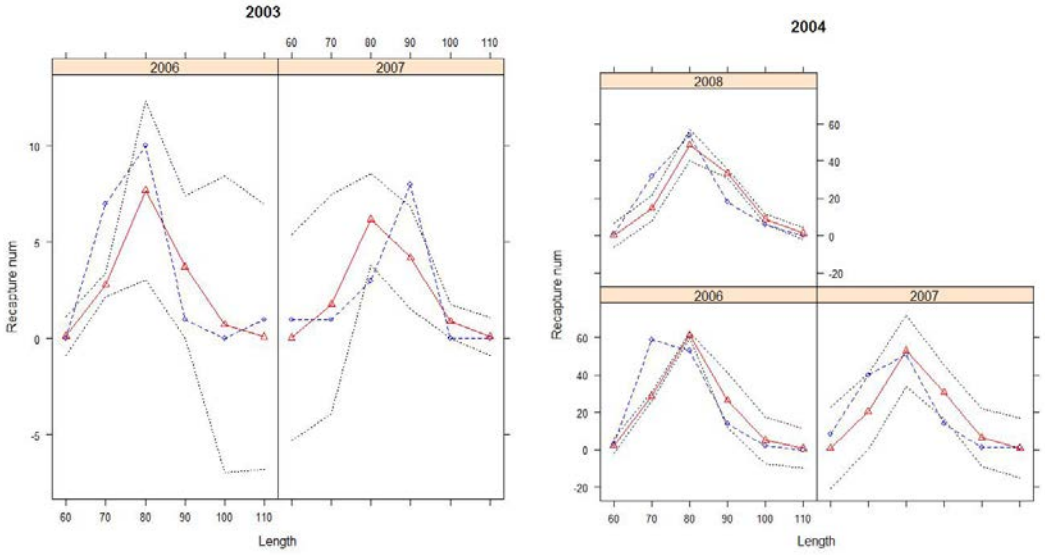

Figure 8: Fits to the 2003(left) and 2004 (right) tag-release data – observed recapture probabilities are the (blue) lines with circles, expected recapture probabilities are the (red) lines with triangles with s.e.'s shown.

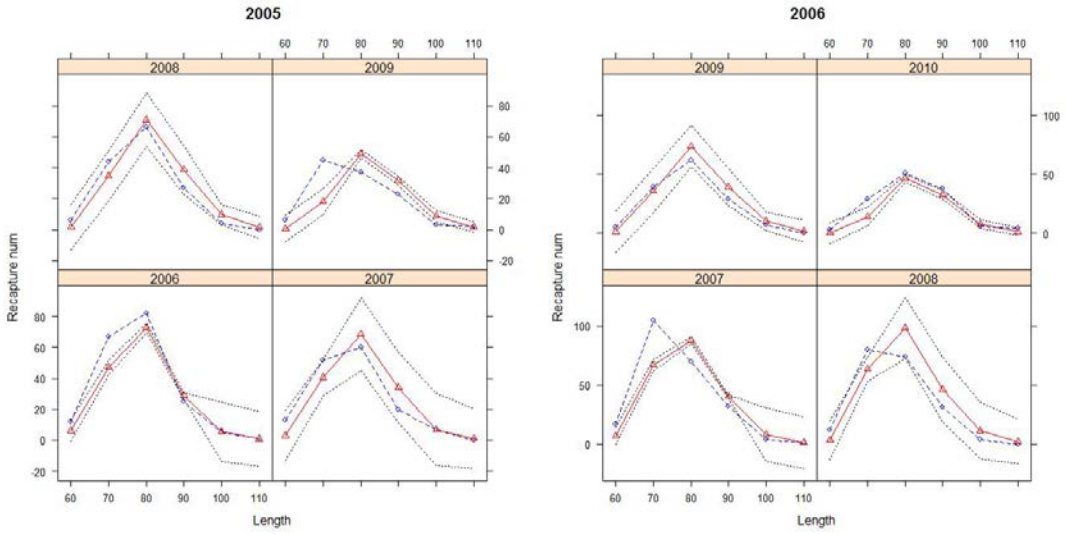

Figure 9: Fits to the 2005 (left) and 2006 (right) tag-release data – observed recapture probabilities are the (blue) lines with circles, expected recapture probabilities are the (red) lines with triangles with s.e.'s shown.

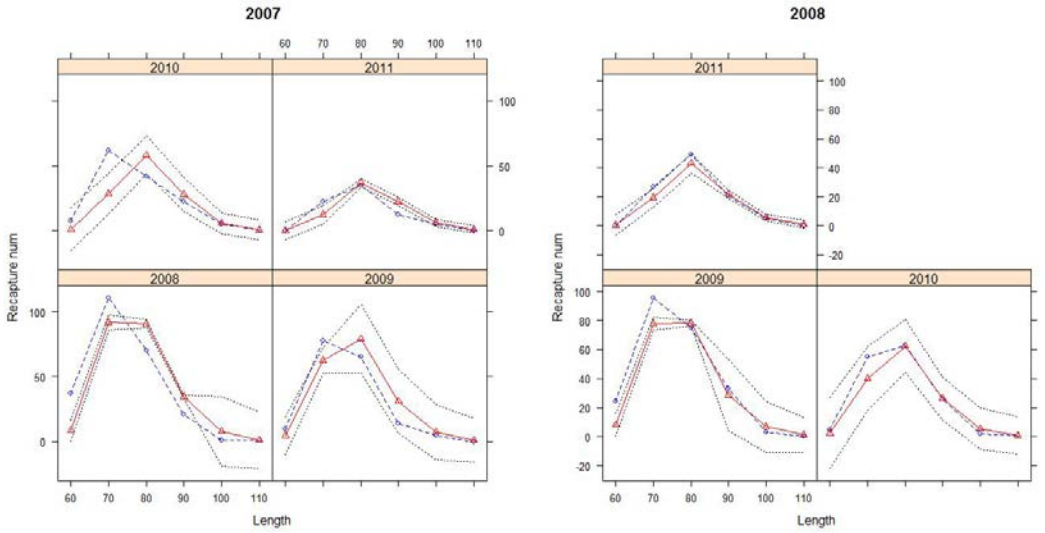

Figure 10: Fits to the 2007 (left) and 2008 (right) tag-release data – observed recapture probabilities are the (blue) lines with circles, expected recapture probabilities are the (red) lines with triangles with s.e.'s shown.

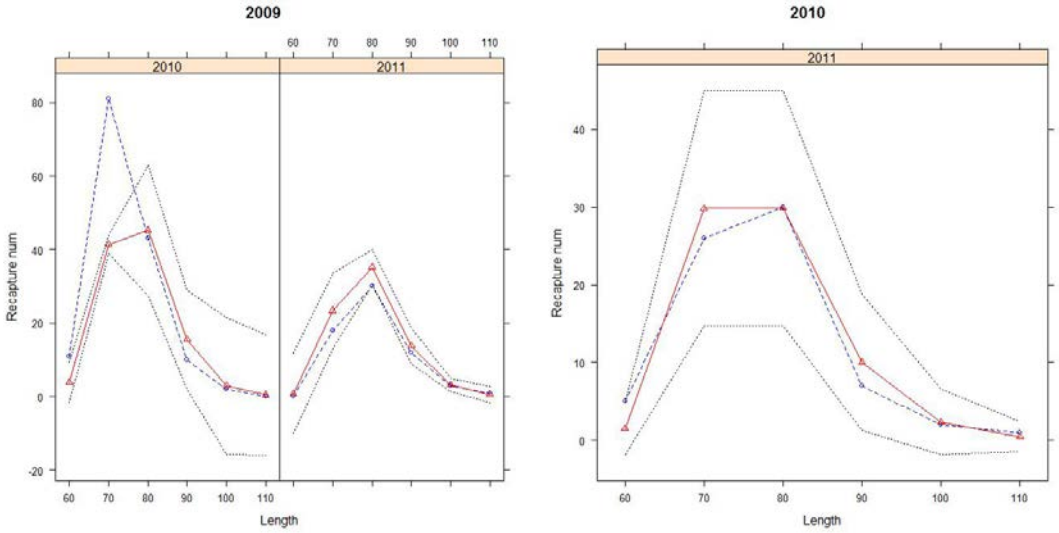

Figure 11: Fits to the 2009 (left) and 2010 (right) tag-release data – observed recapture probabilities are the (blue) lines with circles, expected recapture probabilities are the (red) lines with triangles with s.e.'s shown.

27. Stock trajectories and key indices are shown in Figure 12.

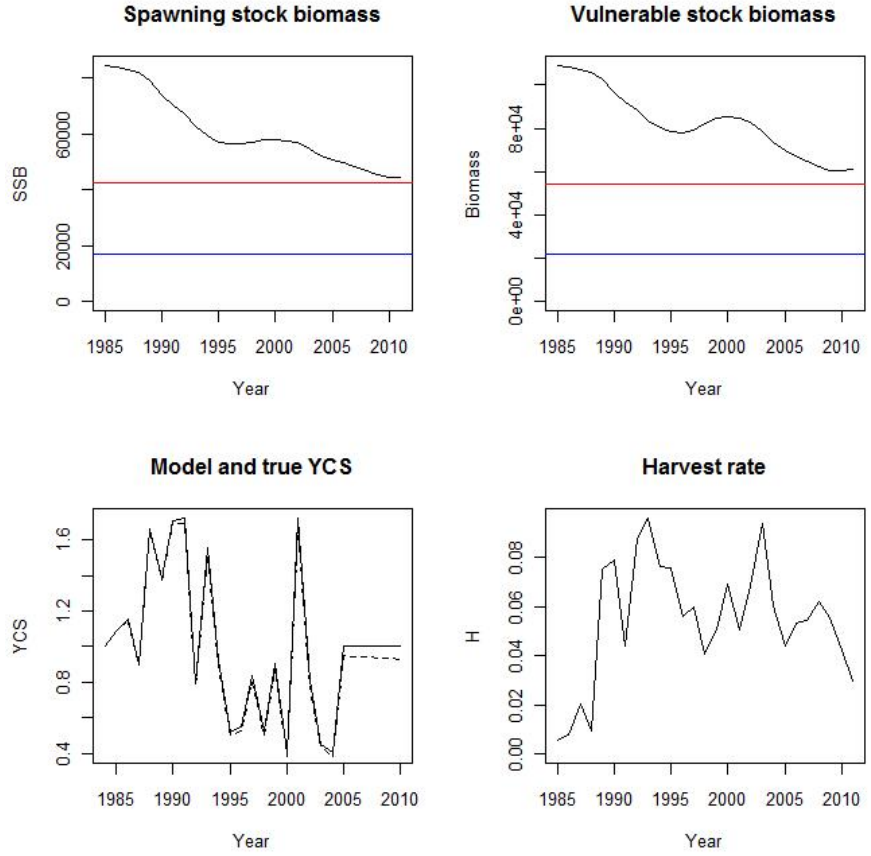

Figure 12: Stock trajectories for the reference model.

28. Good fits are achieved to all datasets. In particular, fits to the catch-at-age data in 2009 are improved over the 2009 assessment model. Fits to tag-recaptures are also improved compared to the 2009 assessment model. Estimates of SSB suggest that the rate in decline in SSB has decreased in recent years, with SSB levelling off between 2010 and 2011.

29. The Working Group noted that there is still uncertainty surrounding the estimate of the 2001 cohort. The cohort was tracked consistently through the groundfish survey from 2004 to 2008 (Table 5) and has dominated catch-at-age proportions since the 2009 season (Figure 3).

30. The likelihood profile plot (Figure 13) demonstrated that catch-at-length data from the early fleet and the survey abundance index were relatively uninformative on SSB_0. The tagging dataset as a whole was most informative, with a consistent region of maximum likelihood for each release event.

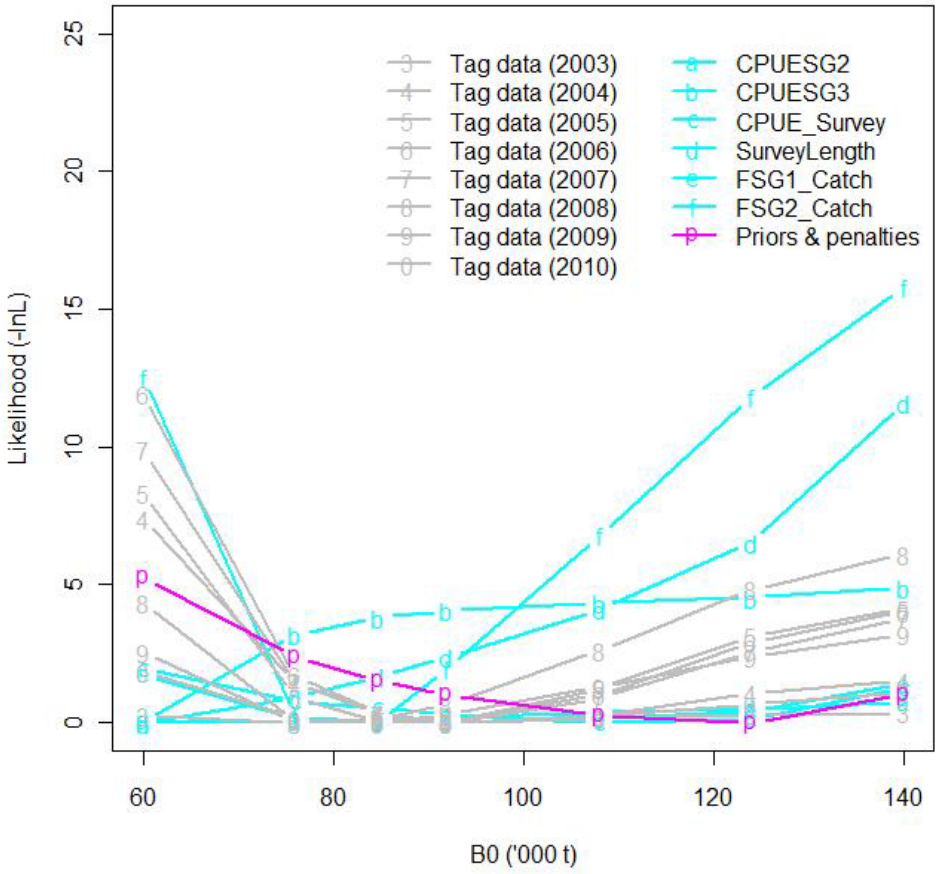

Figure 13: Likelihood profiles for the update model. The legend refers the particular lettered curve in the figure to the relevant dataset etc. used in the assessment.

4.5 MCMC results

31. The uncertainty in the MCMC samples about the posterior median is small (Table 10), due to the continuing precision coming from the tagging data. The estimate of SSB status of 53.8% is slightly lower than for the 61% estimate from the 2009 assessment.

Table 10: Median biomass and 95% CIs for the initial equilibrium SSB (B_0), the current SSB ($B_{current}$ (2007 or 2009)), the ratio of current to initial SSB ($B_{current}/B_0$). The results of the 2007 assessment are provided for comparison as well as the new (2009) assessment.

Model	B_0 (1 000 tonnes)		$B_{current}$ (1 000 tonnes)		$B_{current}/B_0$	
2007 assessment	112	(98.7–125)	67.1	(52.9–79.9)	0.59	(0.54–0.64)
2009 assessment	98.5	(93.6–103.8)	60.2	(55–65.7)	0.61	(0.58–0.64)
2011 assessment	85.1	(78.9–92.1)	44.9	(38.9–51.9)	0.53	(48.9–55.9)

4.6 Sensitivity runs

32. No sensitivity runs were suggested by the Working Group this year.

4.7 Yield calculations

33. 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) Choose a yield γ_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) Choose a yield γ_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) Select the lower of γ_1 and γ_2 as the yield.

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

35. 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.

36. The current assessment shows very little uncertainty over current stock size (Table 10) but there is some uncertainty about future recruitment, with estimated year-class strengths for 1992 to 2003 below the long-term average.

37. The yield satisfying the CCAMLR decision rules is 3 200 tonnes, using future recruitment with log-normally distributed year class strengths (YCS) with a mean equal to the long-term average YCS estimate and a CV of 0.6 based on YCS estimates from 1985 to 2003 (Figure 14). WG-FSA-11/33 Rev. 1 noted that CASAL model estimates of recent YCS are lower than the long-term average, with the exception of 2001. Consequently, WG-FSA-11/33 Rev. 1 suggested that a more precautionary estimation of future recruitment would be appropriate at this time. Instead, projections were undertaken using recruitment with empirical log-normally distributed year class strengths with a mean and CV set using a truncated range of year class strength estimates from the CASAL model. The Working Group agreed that year class strengths from 1991 to 2003 would provide an appropriate mean and CV of year class strength for this purpose, which includes mostly below average year class strengths, although with some strong cohorts. This resulted in a yield of 2 600 tonnes that satisfies the CCAMLR decision rules, using the CASAL model's estimate of SSB_0 in the decision rule (Figure 14).

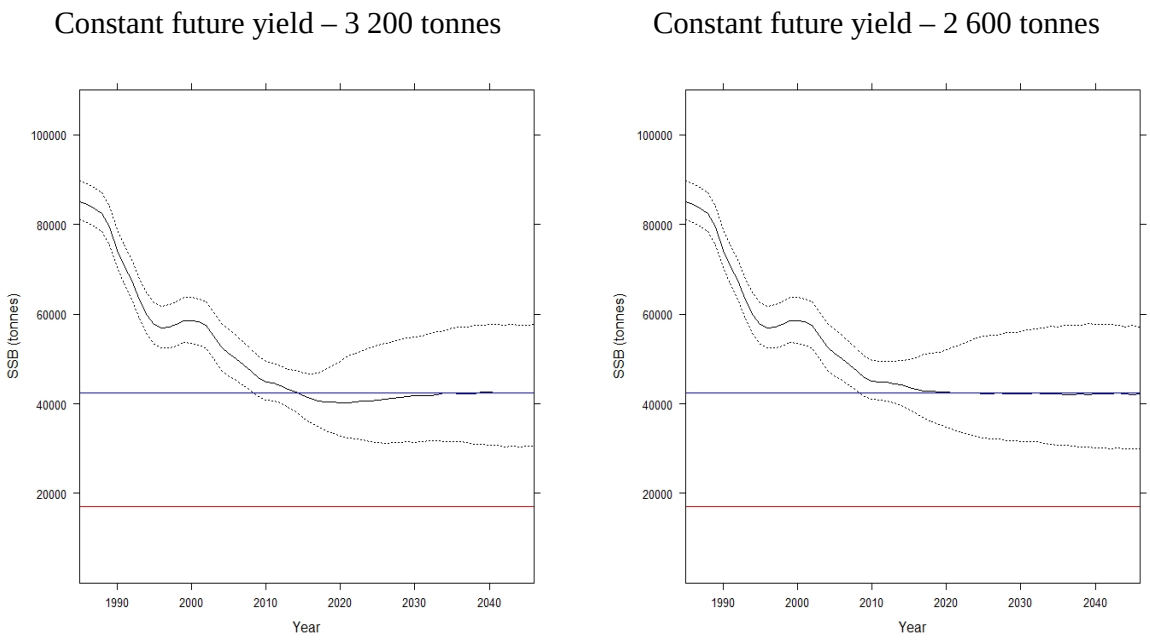

Figure 14: Estimated spawning stock biomass median using lognormal mean recruitment (left panel) and lognormal empirical (1991–2003) recruitment (right panel).

4.8 Future work

38. With regards to future developmental work for the stock assessment model used for this stock, the Working Group noted the importance of the assumptions of fleet structure on estimates of yield class strength, and the effects of this on long-term yield estimates. Consequently the Working Group recommended further examination of historical changes in fleet selectivity to be completed intersessionally.

5. By-catch of fish and invertebrates

5.1 Estimation of by-catch removals

39. The priority by-catch taxa for which assessments of status are required are macrourids and rajids (SC-CAMLR-XXI, Annex 5, paragraphs 5.151 to 5.154). Catches of by-catch species groups (macrourids, rajids and other species) reported in fine-scale data, their respective catch limits, and number of rajids cut from lines and released alive, are summarised in Table 11. Both macrourid and rajid catches were well within the catch limits and rajid catches were slightly lower than in the 2009/10 fishing season.

Table 11: Catch history for by-catch species (macrourids, rajids and other species), catch limits and number of rajids released alive in Subarea 48.3. Catch limits are for the whole fishery (see CM 41-02 for details). (Source: fine-scale data)

Season	Macrourids		Rajids			Other species	
	Catch limit (tonnes)	Reported catch (tonnes)	Catch limit (tonnes)	Reported catch (tonnes)	Number released	Catch limit (tonnes)	Reported catch (tonnes)
1987/88	-	0	-	1	-	-	0
1988/89	-	1	-	11	-	-	0
1989/90	-	0	-	1	-	-	0
1990/91	-	1	-	4	-	-	0
1991/92	-	1	-	2	-	-	0
1992/93	-	2	-	0	-	-	0
1993/94	-	0	-	12	-	-	0
1994/95	-	12	-	90	-	-	10
1995/96	-	37	-	54	-	-	0
1996/97	-	34	-	43	-	-	2
1997/98	-	21	-	13	-	-	2
1998/99	-	21	-	19	-	-	9
1999/00	-	18	-	12	-	-	3
2000/01	-	21	-	27	-	-	1
2001/02	291	51	291	25	-	-	29
2002/03	390	75	390	38	-	-	14
2003/04	221	82	221	38	-	-	10
2004/05	152	121	152	9	-	-	20
2005/06	177	137	177	7	21 056	-	38
2006/07	177	130	177	4	9 265	-	27
2007/08	196	162	196	12	19 558	-	37
2008/09	196	110	196	22	23 709	-	33
2009/10	150	70	150	7	15 810	-	16
2010/11	150	74	150	4	12 830	-	9

5.2 Assessments of impact on affected populations

40. A preliminary assessment of rajid populations in Subarea 48.3 using a surplus production model implemented in a Bayesian framework was presented at WG-SAM-07 (WG-SAM-07/11). In 2007, the Working Group noted that there were currently insufficient data to inform the assessment and that the results were strongly dependent on the informative priors for the two catchability parameters, and the intrinsic rate of increase, *r*. Nevertheless, these preliminary results suggested that the catch limit in Subarea 48.3 for rajids would be sustainable.

41. A rajid tagging program has been under way for four years in Subarea 48.3. Progress has been made on the assessment, however, this is not yet ready to be presented.

5.3 Mitigation measures

42. By-catch limits and move-on rules are included in the annual conservation measure established for this fishery (CM 41-02). In addition, mitigation measures for rajids include using Year-of-the-Skate protocols for releasing skates caught alive.

6. By-catch of birds and mammals

43. No seabird mortalities were observed in 2010/11, however one white chinned petrel mortality was reported by the vessel in the C2 data (WG-IMAF-11/5 Rev. 2, paragraph 6). No new estimates of potential seabird removals by IUU fishing were calculated in 2011. Previous estimates are summarised in SC-CAMLR-XXVI/BG/32 and SC-CAMLR-XXVI, Annex 6, Part II, Table 20.

Table 12: Observed seabird mortality rate and total estimated mortality of seabird by-catch in Subarea 48.3.

Season	Mortality rate (birds per thousand hooks)	Total estimated mortality (number of birds)
1996/97	0.23	5 755
1997/98	0.032	640
1998/99	0.013*	210*
1999/00	0.002	21
2000/01	0.002	30
2001/02	0.0015	27
2002/03	0.0003	8
2003/04	0.0015	27
2004/05	0.0015	13
2005/06	0	0
2006/07	0	0
2007/08	0	0
2008/09	0.0005	8
2009/10	0.0005	7
2010/11	0	0

* Excluding *Argos Helena* line weighting experiment cruise.

44. No additional data were provided this year on distribution of seabirds, WG-IMAF therefore agreed the level of risk of incidental mortality of seabirds in Subarea 48.3 remains at category 5 (high) (SC-CAMLR-XXX, Annex 8, paragraph 8.1). The fishing season has previously been set as 1 May to 31 August, with an allowance for an extension to 14 September for any vessel that has demonstrated full compliance with CM 25-02 in the previous season. In the 2010/11 fishing season, an early extension was allowed so that the fishery started on 21 April 2011.

45. The following decision rule was agreed (CM 41-02) to apply to the 2011/12 fishing season (CM 41-02, paragraphs 5, 6 and 7):

> 5. For the purpose of the longline fishery for *Dissostichus eleginoides* in Statistical Subarea 48.3, the 2011/12 and 2012/13 seasons are defined as the period from 1 May to 31 August in each season, or until the catch limit is reached, whichever is sooner. For the purpose of the pot fishery for *Dissostichus eleginoides* in Statistical

Subarea 48.3, the 2011/12 and 2012/13 seasons are defined as the period from 1 December to 30 November, or until the catch limit is reached, whichever is sooner. The 2011/12 season for longline fishing operations may be extended in two periods: (i) to start on 16 April and (ii) to end on 14 September for any vessel which has demonstrated full compliance with Conservation Measure 25-02 in the previous season.

6. The following decision rule shall apply to the extension of the 2012/13 season:

   (i) if, on average, less than one bird per vessel is caught during the two extension periods in the 2011/12 season, the 2012/13 season shall start on 11 April 2013;

   (ii) if, on average, between one and three birds per vessel, or more than 10 and fewer than 16 birds in total, are caught during the extension periods in the 2011/12 season, the 2012/13 season shall start on 16 April 2013; or

   (iii) if, on average, more than three birds per vessel, or more than 15 birds in total, are caught during the extension periods in the 2011/12 season, the 2012/13 season shall start on 21 April 2013.

7. The extensions to the seasons in 2011/12 and 2012/13 shall be subject to a combined catch limit of three (3) seabirds per vessel per season. If a total of three seabirds are caught by one vessel during the two extension periods in any one season, fishing shall cease immediately for that vessel. In the case of the extension at the start of the season, fishing shall not resume until 1 May of the corresponding season and the extension at the end of that season shall not apply.

46. The 2010/11 fishing season, had a seabird mortality rate of 0.0 (Table 12).

47. There were no observed marine mammal mortalities in the toothfish fishery in Subarea 48.3 for the 2010/11 season.

6.1 Mitigation measures

48. CM 25-02 applies to this subarea.

6.2 Interactions involving marine mammals with longline fishing operations

49. Interactions with cetaceans continue to be reported by observers in Subarea 48.3 and are analysed in WG-FSA-11/33 Rev. 1.

7. Ecosystem effects

50. The Working Group did not examine the ecosystem effects of the longline fishery for toothfish in Subarea 48.3.

8. Harvest controls and management advice

8.1 Conservation measures

51. The limits on the fishery for *D. eleginoides* in Subarea 48.3 are defined in CM 41-02. The limits in force applying to 2009/10 and 2010/11 and the Working Group's advice to the Scientific Committee are summarised in Table 13.

Table 13: Limits on the fishery for *Dissostichus eleginoides* in Subarea 48.3 in force (CM 41-02) and advice to the Scientific Committee.

Element	Limits in force	Advice
Access (gear)	Longlines and pots only	Carry forward
Subdivision of Subarea 48.3	Definition of area open to the fishery	Carry forward
Closure of other areas of Subarea 48.3	Closure of fishing outside the area of the fishery	Carry forward
Catch limit	Catch limit for *D. eleginoides* was 3 000 tonnes for the subarea, applied as follows: Management Area A: 0 tonnes Management Area B: 900 tonnes Management Area C: 2 100 tonnes.	Revise catch limit
Season: longline	1 May to 31 August In 2009/10, extension possible to start on 26 April and end on 14 September for vessels complying fully with CM 25-02 in the previous season. In 2010/11, extension possible subject to decision rule.	Revise start date
Pots	1 December to 30 November	Carry forward
Seabirds	During extension period and in each season any vessel catching three (3) seabirds to cease fishing.	Carry forward
By-catch: crabs	By-catch of crabs to be counted against crab catch limit.	Carry forward
finfish	Total combined catch of skates and rays 150 tonnes. Total catch of *Macrourus* spp. 150 tonnes.	Revise
any species	Move-on rule	Carry forward
Mitigation	In accordance with CM 25-02.	Carry forward
Observers	Each vessel to carry at least one CCAMLR scientific observer and may include one additional scientific observer.	Carry forward
Data	Five-day catch and effort reporting under CM 23-01. Haul-by-haul catch and effort data under CM 23-03. Biological data reported by the CCAMLR scientific observer.	Carry forward Carry forward Carry forward

(continued)

Table 13 (continued)

Element	Limits in force	Advice
Target species	For the purposes of CMs 23-01 and 23-04, *D. eleginoides* is the target species and the by-catch is any species other than *D. eleginoides.*	Carry forward
Jellymeat	Number and weight of *D. eleginoides* discarded, including those with jellymeat condition, to be reported. These catches count towards the catch limit.	Carry forward
Research fishing	Catches of *D. eleginoides* taken under CM 24-01 in the area of the fishery shall be considered as part of the catch limit.	Carry forward
Environmental protection	Regulated by CM 26-01.	Carry forward

8.2 Management advice

52. The Working Group noted the advice of WG-IMAF that the 2011/12 season for longline fishing operations may be extended in two periods: (i) to start on 16 April and (ii) to end on 14 September for any vessel which has demonstrated full compliance with CM 25-02 in the previous season (SC-CAMLR-XXX, Annex 8, paragraph 8.11).

53. The Working Group recommended a catch limit of 2 600 tonnes for 2011/12 and 2012/13.

References

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