APPENDIX P

FISHERY REPORT: *DISSOSTICHUS ELEGINOIDES* PRINCE EDWARD ISLANDS SOUTH AFRICAN EEZ (SUBAREAS 58.6 AND 58.7)

CONTENTS

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1. Details of the fishery

A licensed fishery within the South African EEZ at the Prince Edward Islands started in October 1996. Part of the South African EEZ is outside the CAMLR Convention Area (Area 51) and part falls within Subareas 58.6 and 58.7 and Division 58.4.4 (Figure 1).

2. Although the fishery began in 1996, intelligence reports indicated that IUU vessels were operating in the area in 1995 and possibly 1994. Since the start of the licensed fishery, the estimated IUU catch has exceeded the reported catch for most years (Table 1). Since the start of the fishery, a maximum of five operators have been licensed by South Africa to fish in any one year. During the 2003/04 and 2004/05 fishing seasons, two licensed vessels were active in the fishery.

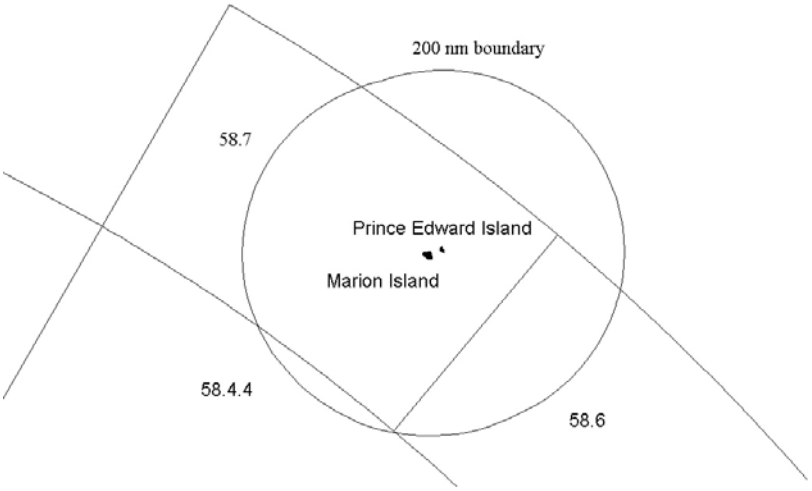

Figure 1: Map showing the position of the South African EEZ at the Prince Edward Islands and the boundaries of the relevant CCAMLR areas.

1.1 Reported catch (time series)

3. The total annual catches taken in Subarea 58.7 as reported to CCAMLR are presented in Table 1.

Table 1: Catch history for *Dissostichus eleginoides* in Subarea 58.7 (source: WG-FSA-06/4). Fishing season is from 1 December to 30 November.

Fishing season	Total reported catch (tonnes)	IUU catch (tonnes)	Total removals (tonnes)
1995/96	869	4 958	5 827
1996/97	1 193	7 327	8 520
1997/98	637	598	1 235
1998/99	301	173	474
1999/00	1 015	191	1 206
2000/01	235	120	355
2001/02	98	78	176
2002/03	219	120	339
2003/04	133	48	181
2004/05	142	60	202
2005/06	41	0	41

4. The status of the resource within the South African EEZ was assessed in WG-FSA-06/58. For that assessment, the removals from the South African EEZ were estimated (Table 2). The reported catch column includes catches taken in the South African EEZ within Subareas 58.6 and 58.7 as well as catches from Area 51 outside the CCAMLR region. In WG-FSA-06/58 the authors noted that the reported catches underestimate total mortality as losses through depredation by cetaceans are not included.

Table 2: Catch history for *Dissostichus eleginoides* in the South African EEZ as used in the assessment (source: WG-FSA-06/58). The limited data for 1996 have been pooled with the 1996/97 season and catches for 2005/06 are based on part of a year only. Cetacean depredations, not included in the totals, are reported as beginning in 2000/01 and now constitute up to twice the total catch.

Fishing season	Vessels (non-IUU)	Catch limit (tonnes)	Reported landed catch (tonnes)	IUU catch (tonnes)	Total removals (tonnes)
1996/97	7	2 500	2 921	21 350	24 271
1997/98	4	3 000	1 011	1 808	2 819
1998/99	4	2 750	956	1 014	1 970
1999/00	3	2 250	1 562	1 210	2 772
2000/01	5	2 250	352	352	704
2001/02	2	600	200	306	506
2002/03	2	500	313	256	569
2003/04	2	500	268	156	424
2004/05	2	450	232	156	388
2005/06	1	450	47	156	203

1.2 IUU catch

5. The estimated IUU catch in Subarea 58.7 is presented in Table 1, whereas the estimated IUU catch from the South African EEZ (as used in the assessment in WG-FSA-06/58) is presented in Table 2.

6. IUU fishing has occurred since at least 1995 (and possibly 1994), and in most years the estimated IUU catch within the South African EEZ has exceeded the reported catch (Table 2). The IUU catch in the South African EEZ prior to 2003 (Table 2) was estimated as the sum of the IUU catch estimated for Subarea 58.7 and 50% of that estimated for Subarea 58.6 (Brandão et al., 2002). For 2003 to 2004 the IUU catch estimates are based on the number and duration of fishing activities of illegal vessels known, or believed, to have operated in the South African EEZ and on the average green weight tonnages of vessels operating legally in that area in the corresponding years (WG-FSA-05/58). The same amount of illegal take was assumed for 2005 and 2006 as for 2004 (WG-FSA-06/58). Note that CCAMLR records indicated only one reported IUU vessel in this area during 2004, whereas other intelligence reports indicated that at least three IUU vessels were seen within the South African EEZ (WG-FSA-05/58).

1.3 Size distribution of catches (time series)

7. Annual estimated catch length frequencies are presented in Figure 2.

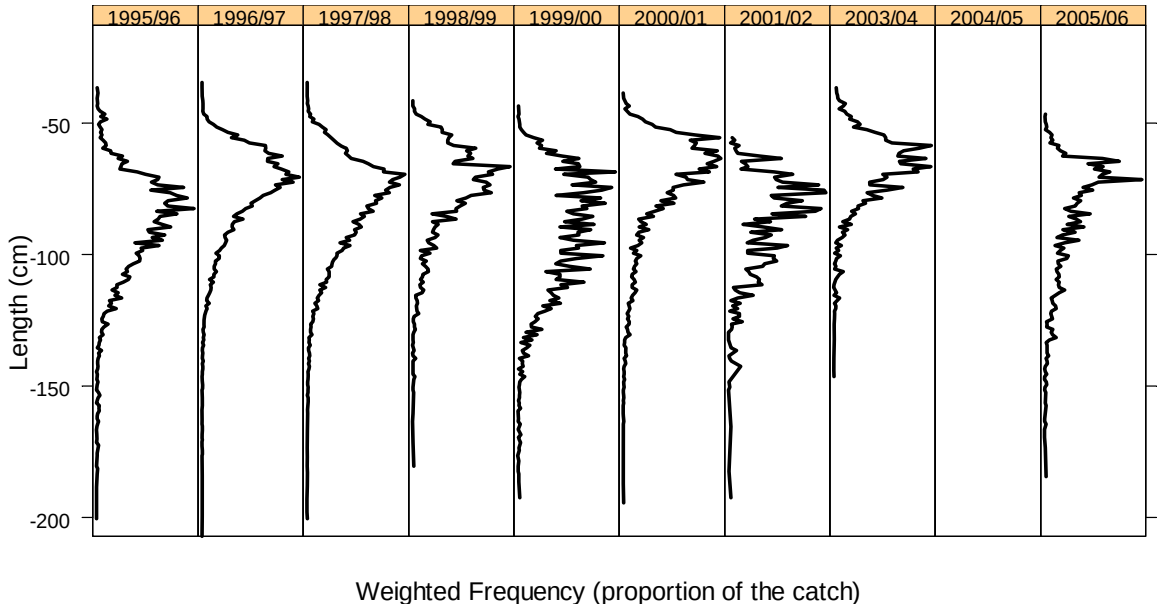

Figure 2: Catch-weighted length frequencies for *Dissostichus eleginoides* in Subarea 58.7 derived from observer, fine-scale and STATLANT data reported by 5 October 2006 (WG-FSA-06/4). There were no fine-scale data available for the 2004/05 season.

2. Stocks and areas

8. The South African EEZ around the Prince Edward Islands is mainly in Subarea 58.7 but extends east into Subarea 58.6, south into Division 58.4.4, and north of the Convention Area in to Area 51 (Figure 1). However, there are currently no fishing grounds in the south of the South African EEZ. The majority of the fishery occurs down to about 1 500 m, but fishing depths in excess of 2 000 m have been recorded.

3. Parameter estimation

3.1 Biological parameters

9. None of the parameters used in the assessment were derived specifically from this fishery, rather they have been assumed from work on toothfish in other areas within the CAMLR Convention Area. The parameter values now used in the assessment reflect those used in Subarea 48.3 and indicate a stock of lower productivity.

Table 3: Parameter values used in the assessment of the toothfish stock in the South African EEZ at the Prince Edward Islands (source: WG-FSA-06/58).

Component	Parameter	Value	Units
Natural mortality	M	0.13	y^{-1}
VBGF	K	0.067	y^{-1}
VBGF	t_0	–1.49	y
VBGF	L_∞	152.0	cm
Length to mass	'a'	2.54E-05	cm, kg
Length to mass	'b'	2.8	
Age-at-maturity	t_m	13	y
Age-at-recruitment	a_m	6	y
Steepness	h	0.75	

Standardised CPUE

10. Longline CPUE was standardised by applying both log-linear and log-linear mixed model approaches described in Appendix 2 of WG-FSA-06/58.

Table 4: Standardised longline CPUE by season for *Dissostichus eleginoides* in the South African EEZ at the Prince Edward Islands (source: WG-FSA-06/58). The indices for the 2005/06 season are based on data for part of a year only.

Fishing season	Log-linear CPUE	Log-linear mixed model CPUE (standard error)
1996/97	4.202	3.129 (0.745)
1997/98	1.157	1.117 (0.241)
1998/99	1.013	1.086 (0.228)
1999/00	0.618	0.854 (0.180)
2000/01	0.375	0.524 (0.113)
2001/02	0.390	0.597 (0.137)
2002/03	0.487	0.628 (0.146)
2003/04	0.276	0.479 (0.106)
2004/05	0.483	0.585 (0.146)
2005/06	0.140	0.470 (0.151)

4. Stock assessment

4.1 Model structure and assumptions

11. A two-fleet ASPM was used to assess the status of the *D. eleginoides* resource in the South African EEZ at the Prince Edward Islands (WG-FSA-06/58). The methodology is presented in detail in Appendix 1 of that paper. The Working Group noted that refinements have been added since WG-FSA-05/58. The model now uses biological parameters currently used in Subarea 48.3, which leads to less optimistic results relative to that found in WG-FSA-05/58.

4.2 Model estimates

12. Estimated exploited biomass and projections under three levels of future catches for the base-case ASPMs from WG-FSA-06/58 are presented in Figure 3. Further model estimates are available in WG-FSA-06/58.

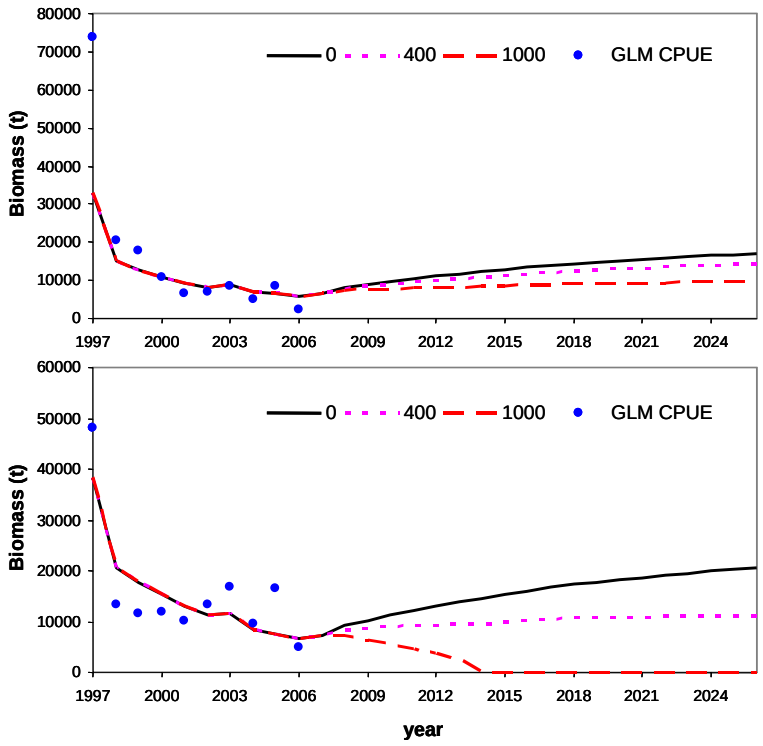

Figure 3: Log-linear standardised CPUE indices to which the ASPM was fitted (divided by the estimated catchability q to express them in biomass units) and estimated longline exploitable biomass, together with projections under future annual catches of 0, 400 and 1 000 tonnes (source: WG-FSA-06/58). The upper panel is the 2005/06 base-case assessment and the lower panel is the same assessment with the inclusion of a maximum of 66% marine mammal depredation of catches. The base-case was fitted to CPUE and catch-at-length data (with a weight of 1.0 on the latter) with stochastic recruitment and a change in selectivity from 2003 onwards.

4.3 Sensitivity analyses

13. Several sensitivity tests were explored in WG-FSA-06/58. With respect to the estimate of current spawning biomass relative to unfished spawning biomass the inclusion of cetacean predation decreased the estimate by about 2% while the inclusion of year-specific weights for the CPUE indices increased the estimate by about 5%.

4.4 Discussion of model results

14. The ASPM now shows reasonable fits to both the CPUE (except the initial high value) and the catch-at-length data. The two data sources no longer appear to suggest different degrees of stock depletion. The inclusion of year-specific weights on the CPUE indices improved the quality of fit to the CPUE and suggested a slightly better status for the resource, but the effect is only small. However, because of the sensitivity of last year's assessment to the relative weights attributed to the different data streams, the Working Group encouraged further exploration of these sensitivities in future assessments.

15. As requested by WG-FSA-SAM-06, the relationship between observations of smaller toothfish and years of predicted high recruitments levels was explored. Evidence was found that, as expected, between six and eight years following a strong recruitment event there were higher proportions of smaller toothfish observed in the catch-at-length data that could not be fitted well if the high recruitment years in 1996 and 1997 were artificially flattened. This match between the model predictions and observations can act as a diagnostic tool of internal consistency in the model. With respect to the predicted recruitment series in the assessment report, the Working Group suggested that the high average recruitment level and the first two spikes of recruitment in 1984 and 1990 are possibly related more to the dynamics of fishing than to any underlying dynamics of the stock. The Working Group recommended that consideration be given to using only the more recent recruitment levels, from 1992 onwards, to inform the forward projections.

16. The Working Group also noted that the advice on appropriate levels of future catch yield provided in the paper was not based on the CCAMLR decision rules.

4.5 Future research requirements

17. While making some suggestions for further investigations related to the assessment, the Working Group noted that the limited data available for such analyses meant that considerable uncertainty would remain associated with the results for some time. For this reason the Working Group encouraged continued development of the feedback control management procedure approach of which an account was given in WG-FSA-SAM-06/12, particularly as this might also prove informative for other toothfish fisheries.

18. The Working Group encouraged South Africa to consider:

(i) requesting the scientific observers on board its vessels to report on the extent of cetacean activity and to collect data on toothfish remains on longline hooks evidencing cetacean predation;

(ii) in the absence of research surveys to consider a 'commercial survey' conducted as a component of commercial operations whereby certain locations are fished in a systematic manner each year to provide an index that is comparable over time.

5. By-catch of fish and invertebrates

5.1 Estimation of by-catch removals

19. Estimated annual by-catch removals for the South African EEZ in Subareas 58.6 and 58.7, but excluding Area 51, are reported in Table 5. The Working Group noted that the voluntary submission of fine-scale data has been poor in some recent years and continued to encourage South Africa to submit more fine-scale data in the future.

Table 5: Reported by-catch landings from toothfish directed longline fishing by South African vessels fishing in Subareas 58.6 and 58.7. Source: fine-scale and STATLANT data.

Fishing season	*Macrourus* spp.	Rajids	Other species
1995/96	0	0	0
1996/97	0	0	0
1997/98	0	1	1
1998/99	0	0	0
1999/00	203	18	54
2000/01	72	2	7
2001/02	8	0	0
2002/03	no fine-scale data submitted		
2003/04	1	0	0
2004/05	no fine-scale data submitted		
2005/06	no fine-scale data submitted		

5.2 Assessments of impact on affected populations

20. It was not possible to assess the impacts on affected populations.

5.3 Mitigation measures

21. There are no mitigation measures in force.

6. By-catch of birds and mammals

6.1 Estimation of longline by-catch removals

22. Details of seabird by-catch (Appendix D, Table 3) are summarised in Table 6. Estimated potential seabird removals in the IUU fishery are summarised in SC-CAMLR-XXV/BG/27.

Table 6: Estimated by-catch of seabirds in the South African EEZ in Subareas 58.6 and 58.7.

Fishing season	By-catch rate (birds/thousand hooks)	Estimated by-catch
1996/97	0.52	834
1997/98	0.194	528
1998/99	0.034	156
1999/00	0.046	516
2000/01	0.018	199
2001/02	0	0
2002/03	0.003	7
2003/04	0.025	39
2004/05	0.149	76
2005/06	-	-

23. Ad hoc WG-IMAF assessed the level of risk of incidental mortality of seabirds in the fishery in the South African EEZ at the Prince Edward Islands (in both Subareas 58.6 and 58.7) as category 5 (SC-CAMLR-XXV/BG/26). For new and exploratory fisheries in areas of this risk level category, WG-IMAF recommendations are set out in Appendix D, Table 18.

6.2 Pot fishery by-catch

24. No by-catch of seabirds or mammals has been observed in this fishery (main report, paragraphs 7.11 and 7.15).

6.3 Mitigation measures

25. South Africa has consistently required the application in this area of the mitigation measures recommended by CCAMLR with the exception of a closed season.

6.4 Interactions involving marine mammals with longline fishing operations

26. On one vessel, some limited observations by the industry in the 2004/05 season indicated a loss of two toothfish to toothed cetaceans for each whole toothfish landed when longlines were hauled. Longline operations are now concentrated in shallower waters to attempt to minimise such losses. The Working Group noted that this level of cetacean predation is much greater than suspected for other toothfish fisheries, and encouraged the deployment of a scientific observer by South Africa to gather further data on this (see also paragraph 18).

27. No marine mammal injuries or deaths were reported during the 2005/06 season (WG-FSA-06/36 Rev. 2, paragraph 6).

7. Harvest controls for the 2005/06 season and advice for 2006/07

7.1 Management advice inside the EEZ

28. In 2005, the Scientific Committee noted that the advice on the appropriate levels of future catch provided in WG-FSA-06/58 was not based on the CCAMLR decision rules. Therefore it was unable to provide management advice for the fishery in the South African EEZ at the Prince Edward Islands. The Scientific Committee recommended that CCAMLR decision rules also be used in estimating yields for this fishery and that the concerns of WG-FSA over the sensitivity of the ASPM to weightings used for different data sources and the estimation of recruitment levels for forward projections be noted.

29. The Scientific Committee also noted the recommendations by ad hoc WG-IMAF with respect to mitigation of seabird mortalities (SC-CAMLR-XXIII, Annex 5, paragraphs 5.289 and 5.290).

7.2 Management advice outside the EEZ

30. No new information was available on the state of fish stocks in Subareas 58.6 and 58.7 and Division 58.4.4 outside areas of national jurisdiction. The Scientific Committee therefore recommended that the prohibition of directed fishing for *D. eleginoides*, described in Conservation Measures 32-10, 32-11 and 32-12, remain in force.

Reference

Brandão, A., D.S. Butterworth, B.P. Watkins and D.G.M. Miller. 2002. A first attempt at an assessment of the Patagonian toothfish (*Dissostichus eleginoides*) resource in the Prince Edward Islands EEZ. *CCAMLR Science*, 9: 11–32.