APPENDIX H

FISHERY REPORT: *DISSOSTICHUS ELEGINOIDES* KERGUELEN ISLANDS (DIVISION 58.5.1)

CONTENTS

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1. Details of the fishery

1.1 Reported catch

The catch limit of *Dissostichus eleginoides* set by France in its EEZ in Division 58.5.1 for the 2004/05 season (defined by France, 1 September 2004 to 31 August 2005) was 4 832 tonnes, and was allocated to seven longliners. The season's catch reported for this division as of 31 August 2005 was 3 186 tonnes. Reported historical catches in the fishery are shown in Table 1. The fishery began in 1984/85 as a trawl fishery targeting *D. eleginoides* and trawling continued to the 2000/01 season; a longline fishery began in 1991/92 and continues to the present. For the last four seasons the fishery has been prosecuted only by longliners. The fishery was active throughout the year except during February for the last two seasons.

Table 1: Catch history for *Dissostichus eleginoides* in Division 58.5.1 by CCAMLR season. Source: STATLANT data and SCIC reports.

Season	Reported catch (tonnes)			Estimated IUU catch (tonnes)	Total removals (tonnes)
	Longline	Trawl	Total		
1987/88	0	892	892	0	892
1988/89	0	1311	1311	0	1311
1989/90	0	1243	1243	0	1243
1990/91	26	2982	3008	0	3008
1991/92	679	7079	7758	0	7758
1992/93	243	3354	3597	0	3597
1993/94	749	4632	5381	0	5381
1994/95	1467	4129	5596	0	5596
1995/96	1233	3478	4710	833	5543
1996/97	1048	4012	5059	6094	11153
1997/98	1747	2967	4714	7156	11870
1998/99	2062	2669	4730	1237	5967
1999/00	3046	3093	6139	2600	8739
2000/01	2593	2153	4747	4550	9297
2001/02	3976	178	4154	6300	10454
2002/03	5291	0	5291	7825	13116
2003/04	5171	0	5171	643	5814
2004/05*	3186	0	3186	321	3507

* To 31/08/2005

1.2 IUU catch

2. Details of the IUU catches attributed to Division 58.5.1 are given in Table 1. IUU fishing began at the end of 1996 and in some years IUU catches exceeded legal catches, resulting in a high level of total removals (>10 000 tonnes per season). There has been a sharp decline in IUU catches since 2002/03 as a result of increased surveillance within the EEZ.

1.3 Size distribution of catches

3. Catch-weighted length frequencies were not available but could be prepared for next year.

2. Stocks and areas

4. *Dissostichus eleginoides* occurs throughout the Kerguelen Islands Shelf, from shallow waters (<10 m) to at least 2 000 m depth. As fish grow, they move to deeper waters, and are recruited to the trawl fishery on the slopes of the shelf and subsequently to the longline fishery in deeper waters. A general east–west deep-sea movement of adult fish occurs and spawning is restricted to the westerly zone early in winter each year (WG-FSA-05/27). Tagging experiments at Heard Island (Division 58.5.2) (Williams et al., 2002) show long-distance movements of sub-adult/adult fish between zones (Heard to Kerguelen and also Crozet) but the proportion of exchange between stocks is unknown.

3. Parameter estimations

3.1 CPUE standardisation

5. The CPUE series in the French EEZ was standardised for both the trawl and longline fisheries (WG-FSA-05/27) using GLM.

6. The trawl fishery for *D. eleginoides* occurred from 1984 to 2001. The trawl CPUE series is not used in the assessment as the trawl fishery was confined to relatively small proportions of the area occupied by the stock (three fishing grounds: the western ground was exploited mainly from 1984 to 1993, the northern and northeastern grounds from 1993 to 2001). Trends in commercial CPUE are not expected to reflect trends in the status of the whole stock. However, trends show an increase in CPUE from 1994 to 1997 followed by a steady decline (to the closure of the trawl fishery in 2001). As the level of legal catches has not changed during the period, it could be suggested that the stock has been depleted as a result of the cumulative effect of IUU fishing which began at the end of 1996.

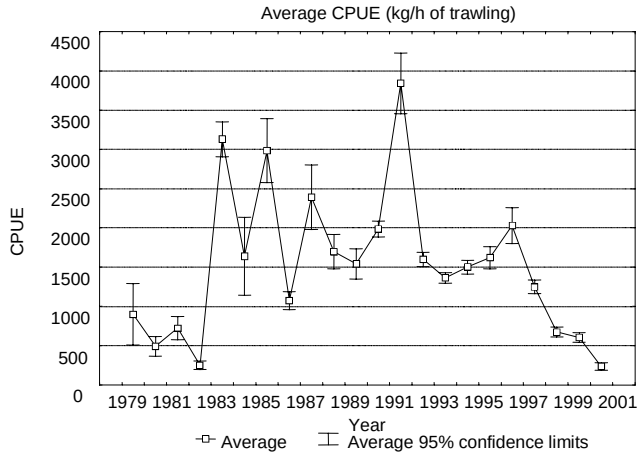

Figure 1: Time series (1979/80 to 2001/02) of trawl CPUE (solid line) in the Kerguelen Islands EEZ based on the GLM (year: 1 July–30 June).

7. Historical CPUE data for the longline fishery (1991–2004) were analysed using the GLM. Before 1998/99 only Ukrainian-flagged longliners operated in the western sector in a limited depth range. The series is highly variable, although the last five years indicate a decline in CPUE.

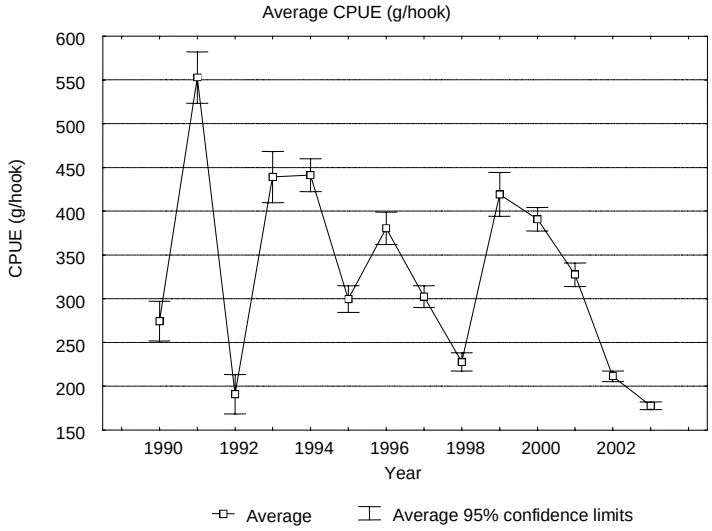

Figure 2: Time series (1990/91–2003/04) of longline CPUE (solid line) in the Kerguelen Islands EEZ based on the GLM (year: 1 July–30 June).

8. Haul-by-haul catch and effort data for the French longline fishery in Division 58.5.1 (fine-scale data) for the 1999/2000 to 2004/05 fishing seasons were examined. A total of 11 398 hauls were used in the standardisation with 1 288 and 1 942 hauls added for the 2003/04 and 2004/05 seasons respectively. The standardised CPUE series was derived using the same GLMMs and LMMs that were described in SC-CAMLR-XXIII, Annex 5, paragraphs 5.177 to 5.180. In addition, a CPUE standardisation was carried out using a similar model to that described in WG-FSA-05/27 using most of the predictor variables in that

paper and only excluding those predictors for which the data were not available to the meeting. These models were used to investigate trends in CPUE (kg/hook), average weight of fish caught (kg), and fishing depth (m).

CPUE

9. Two GLMMs were fitted, the first of which used fishing season and calendar month as the only fixed predictors and vessels as the only random effect. The Tweedie distribution parameter was revised down from 1.7 to 1.5. The standardisation uses the month of January to set the general level for the series. Figure 3 shows the estimated series while Table 2 compares the current estimates with those from last year. The alternative standardisation used most of the predictors reported in WG-FSA-05/27. These predictors were bait species, fishing method ('autoliner' vs 'Spanish'), season (summer, autumn, winter, spring), with linear and quadratic terms for fishing depth and soak time. Removing missing values of bait species and restricting soak time to between 4 and 72 hours gave a dataset of 10 753 hauls. Figure 4 gives the standardised CPUE series with the general level of the series set for 'autoliners', 'summer', bait species = 'CHP', fishing depth of 1 028 m and soak time of 20.3 hours. Note that there were no data after the above restrictions were applied to estimate the CPUE value for 1999.

Table 2: Standardised series of CPUEs (kg/hook) for *Dissostichus eleginoides* in Division 58.5.1, estimated using haul-by-haul data for seasons up to either 2004 or 2005.

Year	2004 CPUE estimate (lower 95% CI, upper 95% CI)	2005 CPUE estimate (lower 95% CI, upper 95% CI)
1999	0.561 (0.412, 0.762)	0.465 (0.385, 0.562)
2000	0.361 (0.293, 0.445)	0.336 (0.292, 0.388)
2001	0.311 (0.255, 0.363)	0.289 (0.253, 0.330)
2002	0.305 (0.256, 0.363)	0.301 (0.286, 0.338)
2003	0.220 (0.186, 0.259)	0.225 (0.201, 0.252)
2004	0.180 (0.151, 0.214)	0.209 (0.186, 0.235)
2005		0.212 (0.188, 0.239)

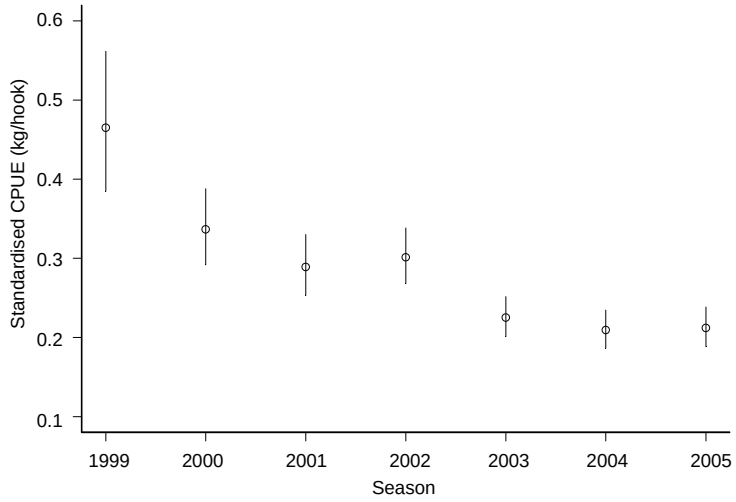

Figure 3: Time series of standardised CPUE (kg/hook) based on the GLMM fitted to catch (kg) and adjusted for effort (number of hooks) using a loglink function and the Tweedie distribution with variance power parameter of 1.5 with fixed-model terms for fishing season and calendar month and random terms for vessel and haul (error bars represent approximate 95% confidence bounds on the estimates).

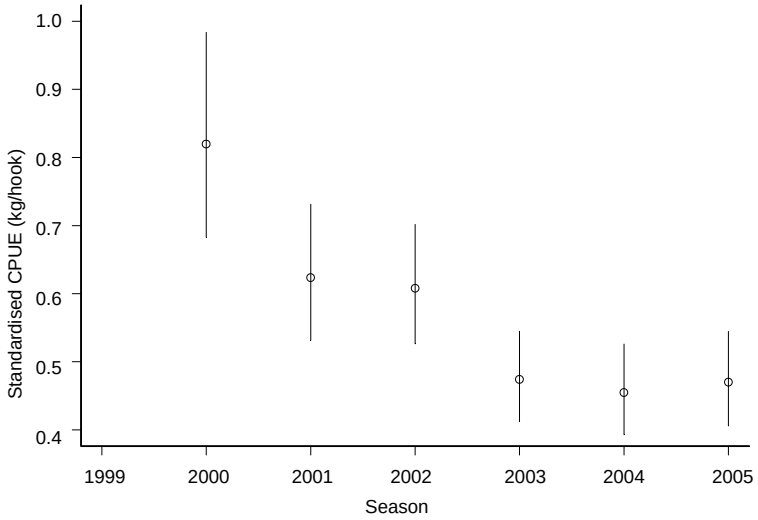

Figure 4: Time series of standardised CPUE (kg/hook). As above, but with fixed-model terms for season, fishing method, bait type, and linear and quadratic terms for each of fishing depth and soak time (error bars represent approximate 95% confidence bounds on the estimates).

Average weight

10. The same analyses were carried out for average weight (= haul weight/number caught). Depth of fishing was also found to be significant in the LMM. Figure 5 shows the

time series and Figure 6 shows the trend of average weight versus depth of fishing. These estimated trends were obtained using the LMM fitted to log(average weight) using smoothing splines as described in Candy (2004).

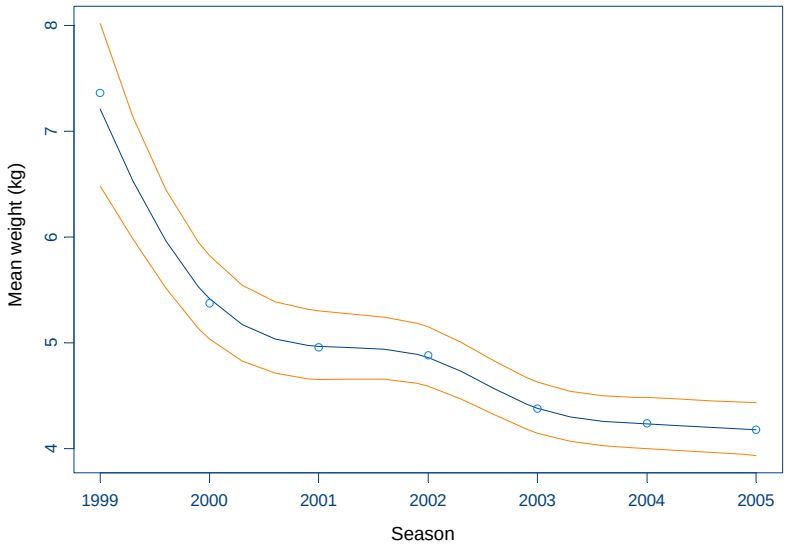

Figure 5: Time series of standardised average weight (kg) obtained using the LMM fitted to log(average weight) using a cubic smoothing spline (error bounds represent approximate 95% confidence bounds on the estimates).

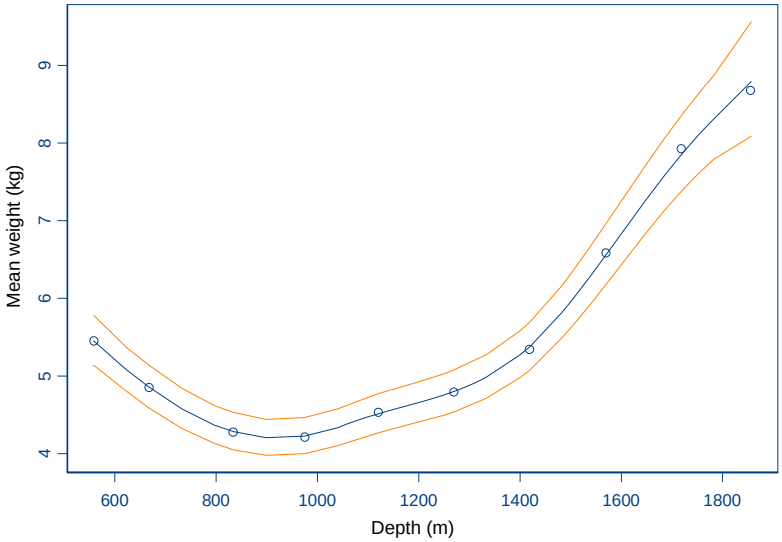

Figure 6: Standardised average weight (kg) obtained using the LMM fitted to log(average weight) using a cubic smoothing spline (error bounds represent approximate 95% confidence bounds on the estimates).

Fishing depth

11. The same analyses were carried out for fishing depth with the obvious exception that fishing depth class was not included in the GLMM or LMM. Figure 7 shows the trend in average depth of fishing by season.

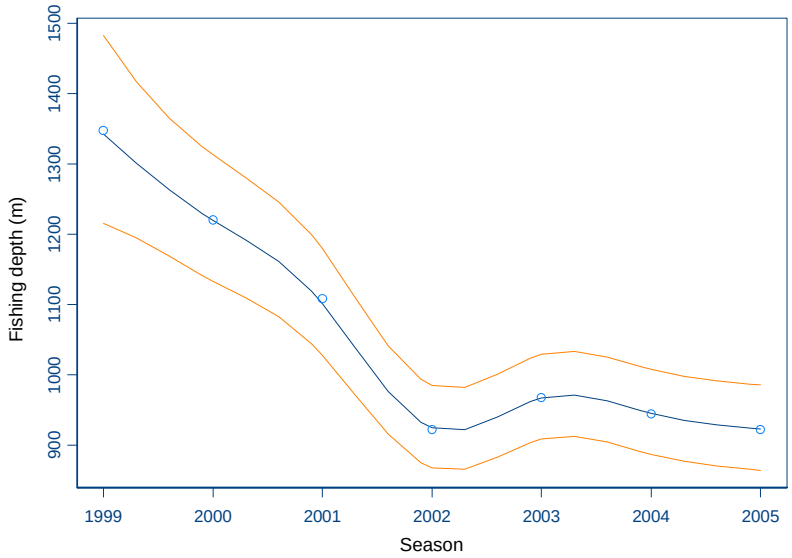

Figure 7: Time series of standardised depth of fishing (m) obtained using the LMM fitted to log(depth) using a cubic smoothing spline (error bounds represent approximate 95% confidence bounds on the estimates).

12. These analyses show a general decreasing trend in the standardised CPUE with two steps (i.e. 1999–2000 and 2002–2005). Note that in the 2005 series the estimates in Table 2 differ for the seasons prior to 2004/2005 from those for the series estimated at WG-FSA-04. This is possible because all parameters in the standardisation GLMM are re-estimated when new data are added and the differences in estimates are likely to be substantial when a large amount of new data are added as is the case here. The decrease in the standardised average weight probably indicates that the older age classes are less numerous in the exploited stock. The average weight generally increased with fishing depth. The average depth of fishing decreased steadily from 1999 to 2002 and has remained steady at that level over the last three fishing seasons.

3.2 Biological parameters

13. No biological parameters (except size-at-first-maturity) are available for Division 58.5.1. It is likely that the parameters used in the stock assessment for Heard Island will be valid for the Kerguelen stock (growth curve, natural mortality).

4. Stock assessment

14. No stock assessment has been carried out for Division 58.5.1.

4.1 Research requirements

15. The Working Group encouraged the estimation of biological parameters for Kerguelen. The Working Group also noted that a preliminary stock assessment could be carried out if CPUE, catch-weighted length frequencies and biological parameters were available.

16. As for other toothfish fisheries in the Convention Area, the Working Group recommended that tag–recapture experiments be conducted. It also noted that a recruitment survey in the Kerguelen area was planned for 2006 and that this would be very beneficial for an assessment of toothfish stocks on the Kerguelen Plateau.

5. By-catch

5.1 By-catch removals

17. By-catch removals for the toothfish longline fishery are detailed in Table 3. In order of importance, grenadiers (*Macrourus carinatus*), rajids (*Bathyraja eatonii* and *B. irrasa*) and morids (*Antimora rostrata*) form the bulk of the by-catch. Only the latter species is fully discarded, the others are partly or totally processed. Local geographic distributions differ from one species to another (Figure 8).

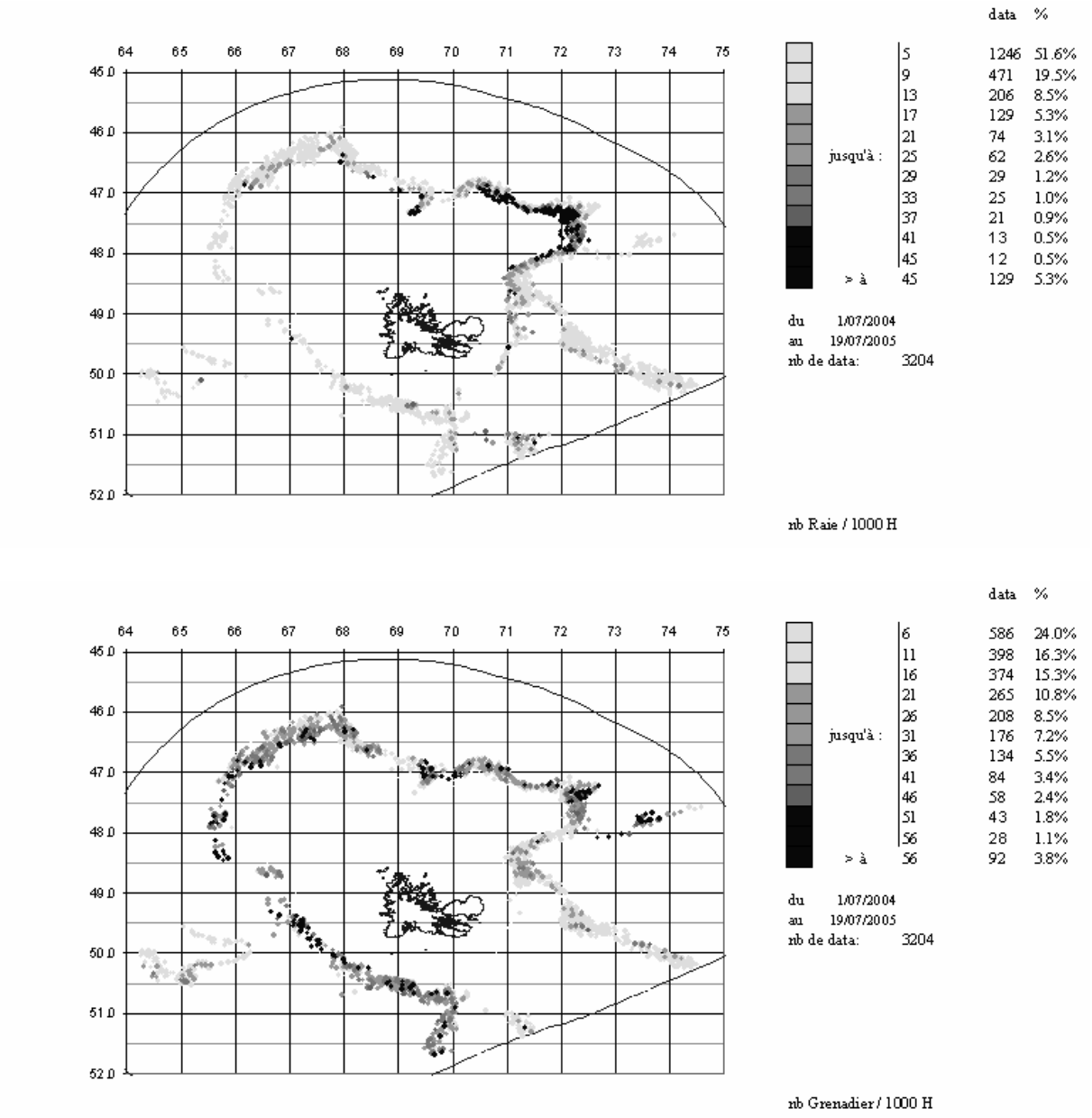

Figure 8: CPUE index for two by-catch species groups in the Kerguelen EEZ for the 2004/05 season: (a) *Bathyraja* spp. 2004/05 CPUE (number/thousand hooks); (b) *Macrourus carinatus* 2004/05 CPUE (number/thousand hooks).

Table 3: Historical by-catch in the Kerguelen EEZ (Division 58.5.1) by CCAMLR season.

Season	*Macrourus carinatus*		*Bathyraja irrasa* and *B. eatonii*		Other	
	Trawl	Longline	Trawl	Longline	Trawl	Longline
1991/92					11	
1992/93					16	
1993/94			2			
1994/95					62	
1995/96					15	
1996/97			2		5	
1997/98		12	6	14	1	
1998/99		31	4	25	2	
1999/00	2	89	12	66		
2000/01		89	3	103		
2001/02		449		558		
2002/03		677		776		
2003/04		741		428		
2004/05*		485		724		11

* To 31/08/2005

5.2 Assessments of impact on affected populations

18. No stock assessments of individual by-catch species were undertaken.

5.3 Mitigation measures

19. The Working Group recommended that, where possible, all rajids should be cut from the line while still in the water, except on the request of the observer. Areas with high by-catch rates should be avoided.

6. By-catch of birds and mammals

20. Seabird mortality of white-chinned (*Procellaria aequinoctialis*) and grey (*P. cinerea*) petrels has been reported (Appendix O). CCAMLR mitigation measures are in force.

21. Details of seabird by-catches in 2004/05 are reported in paragraphs O21 to O34 and Tables O7 to O11. Detailed data for 2000/01 are reported in paragraphs O19 and O20 and Tables O5 and O6. Details for 2001/02, 2002/03 and 2003/04 are reported in SC-CAMLR-XXIII, Annex 5, paragraphs 7.16 to 7.34.

Table 4: Total extrapolated incidental mortality of seabirds and observed mortality rates (birds/thousand hooks) in longline fisheries in the French EEZ at Kerguelen (Division 58.5.1). Data for 1998/99, 1999/2000, and for the period 2001/02 to 2003/04 are from SC-CAMLR-XXIII, Annex 5, Table 7.11. Data for 2000/01 are from Table O5 and data for 2004/05 are from Table O9.

Subarea	CCAMLR season							
	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04		2004/05
Extrapolated mortality	4 967*	1 897*	1 917*	10 814*	13 926*	3 485 2 069*	1 416†	4 387
Mortality rate	2.95*	0.308*	0.092*	0.936*	0.518*	0.128*†	0.123†	0.161

* Reported by captains
† Corrected data

Table 5: Comparison of similar periods for extrapolated incidental mortality of seabirds and mortality rates (birds/thousand hooks) in longline fisheries in the French EEZ at Kerguelen (Division 58.5.1), as reported by vessel captains and by observers.

Period	Fishing season	No. of hooks observed (thousands) (% observed)	Mortality rate	Extrapolated mortality
September–February	2003/04	14 566.7 (100.0)	0.1261*	1 837*
	2004/05	14 900.5 (100.0)	0.0546*	814*
April–August	2003/04	1 908.9 (23.3)	0.0581	477
	2004/05	1 494.5 (25.1)	0.0703	419

* Reported by captains

22. No mammals have been reported as by-catch in Division 58.5.1.

6.1 Mitigation measures

23. Details of mitigation measures applied this year are reported in paragraphs O36 and O37. Details of mitigation measures implemented last year are reported in SC-CAMLR-XXIII, Annex 5, paragraphs 7.35 to 7.45.

(i) line-weighting regimes as specified in Conservation Measure 25-02 are now applicable to autoliners, with fishers having to comply fully by 1 January 2006;

(ii) at least two streamer lines meeting the CCAMLR specifications are compulsory. Some vessels use up to seven streamer lines;

(iii) in 2004/05 all vessels had observers on board who observed 25% of hooks set. This level of observer effort will be continued in 2005/06;

(iv) continued closure of Division 58.5.1 (outside the French EEZ), with the division classified as a high-risk area in February during the main seabird breeding season;

(v) the discarding of hooks and the use of black lines are prohibited.

7. Conservation measures

24. Various national conservation and fisheries enforcement measures are in force in addition to those agreed by CCAMLR. The national measures include:

- annual fishing season closure (February)
- annual catch limit and limitation of number of longliners (seven)
- compulsory logbooks
- allocation of fishing effort (not more than one longliner per 0.5° latitude x 1° longitude rectangle)
- one French observer on board each licensed vessel
- minimum fishing depth limit (500 m)
- minimum legal size for toothfish (60 cm)
- mitigation measures for the reduction of bird mortality
- landings occur at one place (Réunion Island)
- port inspection.

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Williams, R., G.N. Tuck, A.J. Constable and T. Lamb. 2002. Movement, growth and available abundance to the fishery of *Dissostichus eleginoides* Smitt, 1898 at Heard Island, derived from tagging experiments. *CCAMLR Science*, 9: 33–48.