

**FISHERY REPORT: EXPLORATORY FISHERY
FOR *DISSOSTICHUS* SPP. IN DIVISION 58.4.2**

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1. Details of the fishery

The exploratory fishery for *Dissostichus* spp. in Division 58.4.2 was first agreed by the Commission in 1999/2000. This was a trawl fishery which was permitted in association with a new fishery for *Chaenodraco wilsoni*, *Lepidonotothen kempfi*, *Trematomus eulepidotus* and *Pleuragramma antarcticum* (CM 186/XVIII). The exploratory trawl fishery was also permitted in 2000/01, and in 2001/02 in association with a new fishery for *Macrourus* spp. In 2002/03, the fishery for *Dissostichus* spp. in Division 58.4.2 changed to an exploratory longline fishery.

2. In 2009/10, the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 was limited to Japanese, Korean, New Zealand, Spanish and Uruguayan vessels using longlines only (CM 41-05). The precautionary catch limit for *Dissostichus* spp. was 70 tonnes, of which no more than 30 tonnes could be taken in SSRU A and no more than 40 tonnes could be taken in SSRU E (see Figure 1). The other SSRUs (B, C and D) were closed to fishing. The catch limits for by-catch species were defined in CM 33-03. The fishing season was from 1 December 2009 to 30 November 2010. Environmental protection in this fishery is regulated by CMs 26-01, 22-06, 22-07 and 22-08.

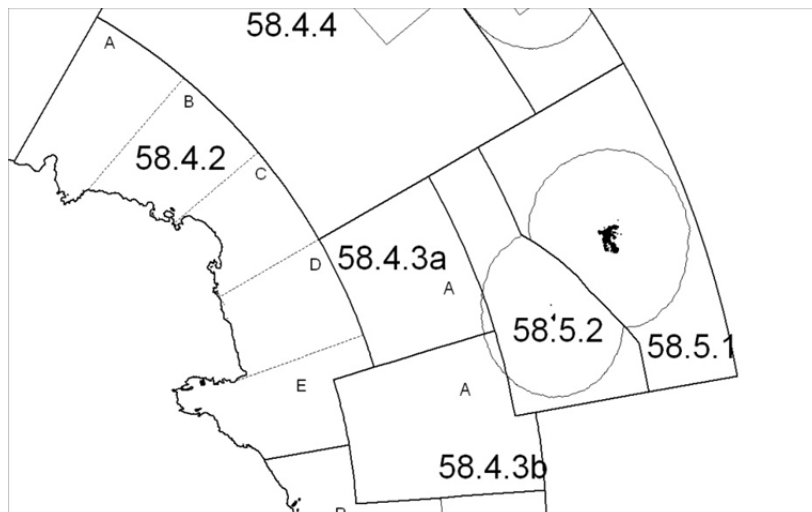


Figure 1: General map of Division 58.4.2 and location of SSRUs (A–E in that division).

1.1 Reported catch

3. Licensed longline vessels have fished the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 since 2003/04, and the target species is *D. mawsoni* (Tables 1(a) and 1(b)). In 2009/10, one vessel fished in SSRUs A and E and reported a total catch of 93 tonnes of *Dissostichus* spp. (Table 1(b), Figure 1).

4. SSRU E was closed on 17 February 2010 (catch limit for *Dissostichus* spp.: 40 tonnes; final reported catch: 40 tonnes), and SSRU A, and consequently the fishery, was closed on 24 February 2010 (SSRU A catch limit for *Dissostichus* spp.: 30 tonnes; final reported catch: 53 tonnes – whole fishery catch limit for *Dissostichus* spp.: 70 tonnes; final reported catch: 93 tonnes).

Table 1(a): Catch history for *Dissostichus* spp. in Division 58.4.2 (source: STATLANT data for past seasons, and catch and effort reports for current season, WG-FSA-10/6 Rev. 1 and past reports for IUU catch).

Season	Regulated fishery						Estimated IUU catch (tonnes)	Total removals (tonnes)
	Effort (number of vessels)		Catch limit (tonnes)	<i>Dissostichus</i> spp.				
	Limit	Reported		Reported catch (tonnes)				
				<i>D. eleginoides</i>	<i>D. mawsoni</i>	Total		
2002/03	1	1	500	0	117	117	98	215
2003/04	-	1	500	0	20	20	197	217
2004/05	8	4	780	1	125	126	86	212
2005/06	7	3	780	0	163	164	192	356
2006/07	8	3	780	0	124	124	288	412
2007/08	14	3	780	0	216	217	0	217
2008/09	14	2	70	0	66	66	176	242
2009/10	8	1	70	0	93	93	432	525

Table 1(b): Catch of *Dissostichus* spp. in Division 58.4.2 reported by SSRU (source: fine-scale data pro-rated by total reported catch in Table 1(a)).

Season	<i>D. eleginoides</i>					<i>D. mawsoni</i>				
	A	B	C	D	E	A	B	C	D	E
2002/03			<1		<1			17	16	84
2003/04					<1				5	14
2004/05			1		<1	62		15		48
2005/06					<1	4		4		156
2006/07	<1				<1	58				65
2007/08					<1	54		37		125
2008/09	<1				<1	5				61
2009/10						53				40

1.2 IUU catch

5. Information on IUU fishing indicated that over 1 400 tonnes of *Dissostichus* spp. had been taken during IUU fishing in Division 58.4.2 since 2002/03 (Table 1(a)). The total removal of *Dissostichus* spp. in 2009/10 was estimated at 525 tonnes and well in excess of the catch limit.

1.3 Size distribution of catches

6. Most *D. mawsoni* caught in the fishery ranged from 50 to 170 cm in length (Figure 2). A bimodal distribution was observed from 2002/03 to 2004/05, with broad modes at

approximately 60–80 and 130–160 cm, while the distributions in following seasons have a mode at 125–160 cm. The detailed distribution of catches will have to be investigated in order to understand these changes.

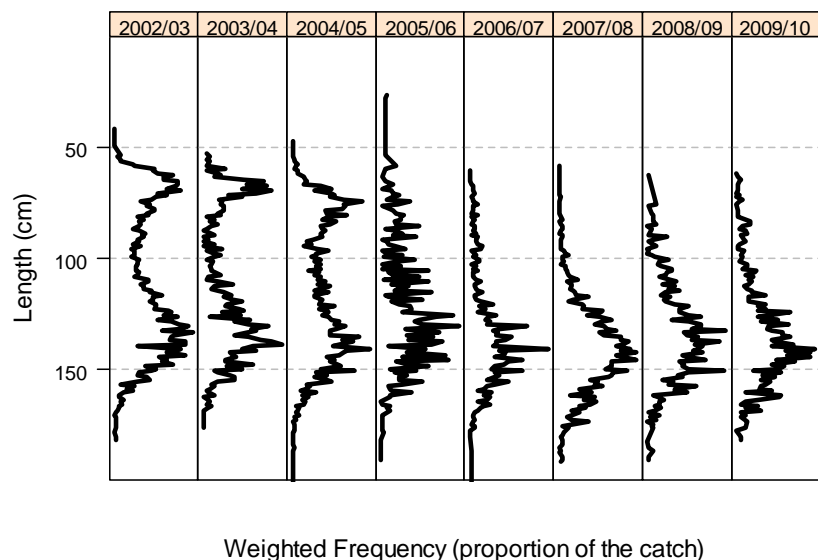


Figure 2: Catch-weighted length frequencies for *Dissostichus mawsoni* in Division 58.4.2 (source: observer, fine-scale and STATLANT data, and the length–weight relationship was taken from observations on *D. mawsoni* in Subarea 88.1).

2. Stocks and areas

7. The Working Group noted that the two-stock ‘east and west’ hypothesis presented in WG-FSA-08/43 could also be simply a differential immature/mature distribution of animals of one stock, as is seen in the Ross Sea. It was agreed that even though the (very low) number of tag returns might support a two-stock hypothesis, the sample size is currently so low that both hypotheses are equally plausible.

8. The most likely areas where *D. mawsoni* spawn are the Pacific Antarctic Ridge north of the Ross Sea and the Amundsen Ridge in the Amundsen Sea. In the Cooperation Sea the most likely area of spawning is BANZARE Bank. Spawning occurs in winter and may extend into autumn or spring (WG-FSA-08/14).

9. The Working Group noted that the results in WG-FSA-08/43 and Figures 3 and 4 confirm the hypotheses that juvenile fish inhabit mostly the shelf, while larger fish live on the slope and pre-spawning fish are found either on their northward spawning migration or inhabit the deeper slope.

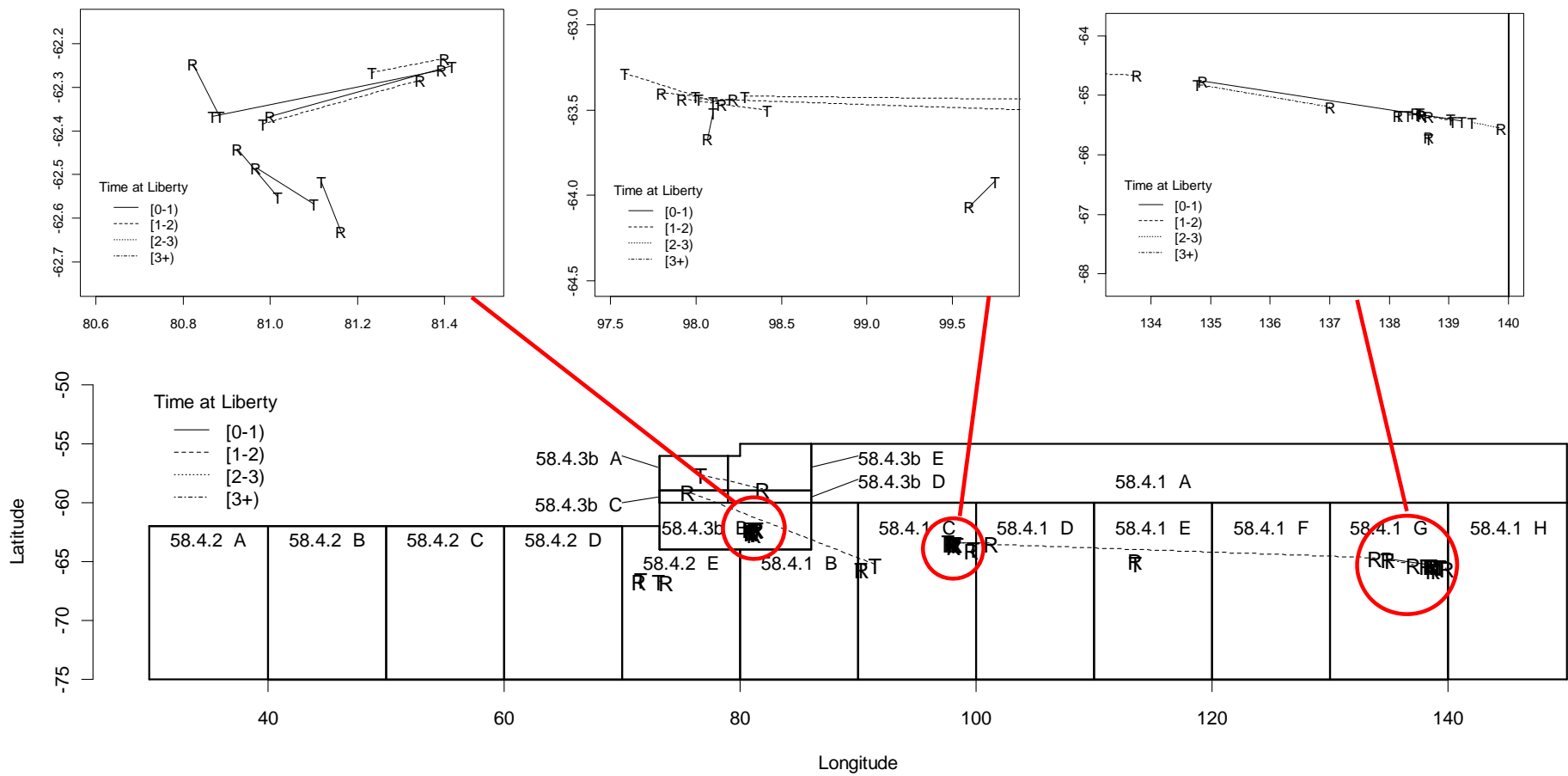


Figure 3: Plot of tag recaptures of *Dissostichus mawsoni* in Divisions 58.4.1, 58.4.2 and 58.4.3b recorded between 2003/04 and 2009/10. 'T' indicates the release location and 'R' indicates the recapture location.

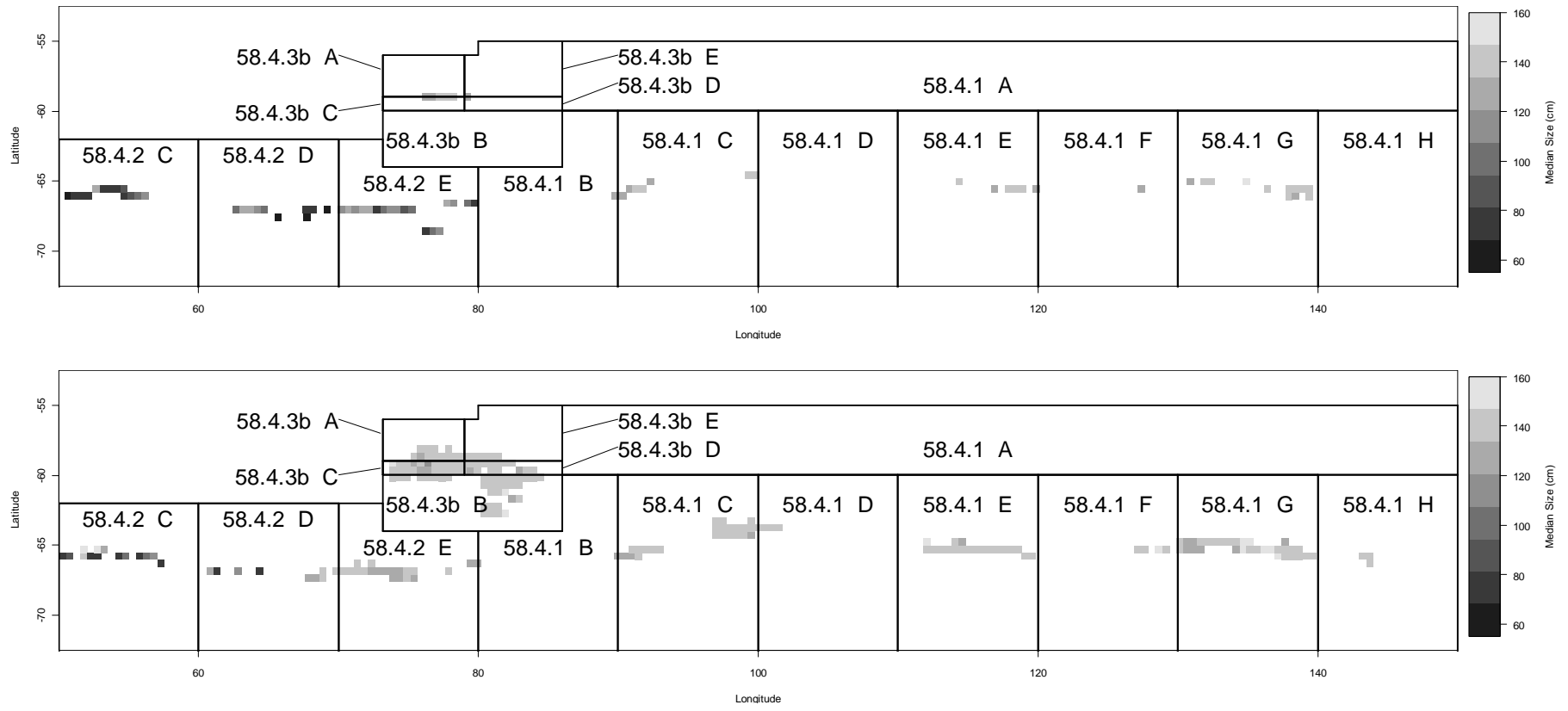


Figure 4: Plot of median lengths for longlines sampled in Divisions 58.4.1, 58.4.2 and 58.4.3b between 2003/04 and 2008/09, aggregated into 0.5° latitude × 0.5° longitude boxes. The upper panel shows data for fishing in depths shallower than 1 000 m, the lower panel for fishing in depths deeper than 1 000 m. Note darker squares indicate smaller median length; lighter squares indicate larger median length.

3. Parameter estimation

3.1 Observations

10. Vessels operating in this fishery are required to conduct fishery-based research in accordance with CM 41-01. This includes the collection of detailed catch, effort and biological data (Annex 41-01/A), the setting of research lines (Annex 41-01/B) and participation in the tagging program (Annex 41-01/C).

11. Vessels, on first entry into an SSRU, are required to make 10 research longline hauls. The requirement for a further 10 research hauls during the course of fishing was removed in 2008 and since 2008/09 the starting position of research hauls has been allocated by the Secretariat. The number of research hauls reported in fine-scale data are summarised in Table 2.

12. Vessels are also required to tag and release *Dissostichus* spp. at a rate of three fish per tonne of green weight caught, and a limit of 500 fish tagged per vessel applied until the end of 2006/07. A total of 1 643 *D. mawsoni* and 33 *D. eleginoides* (total 1 676 fish) have been tagged and released, and one recapture has been reported from that division (Table 3). Of the fish tagged and released, 575 were in SSRU A, 185 in SSRU C and 916 in SSRU E. No fish were tagged in SSRU D in the first two years of the fishery when that SSRU was open to fishing.

Table 2: Research (R) and commercial (C) longline hauls reported by vessels operating in the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 (source: fine-scale data).

Season	Flag State	Vessel name	SSRU	Number of hauls		
				R	C	Total
2002/03	Australia	<i>Eldfisk</i>	5842C	21	17	38
		<i>Eldfisk</i>	5842D	16	4	20
		<i>Eldfisk</i>	5842E	20	63	83
2003/04	Australia	<i>Eldfisk</i>	5842D	10	8	18
		<i>Eldfisk</i>	5842E	19	9	28
		<i>Eldfisk</i>	5842E	19	9	28
2004/05	Chile	<i>Globalpesca II</i>	5842A	20	2	22
		<i>Globalpesca II</i>	5842E	8		8
	Korea, Republic of	<i>Bonanza No. 707</i>	5842A	15	38	53
		<i>Bonanza No. 707</i>	5842C	-	18	18
	New Zealand	<i>Janas</i>	5842A	15	2	17
		<i>Janas</i>	5842E	20	7	27
Spain	<i>Arneta</i>	5842E	13	7	20	
2005/06	Chile	<i>Globalpesca I</i>	5842A	8		8
		<i>Globalpesca I</i>	5842C	4		4
		<i>Globalpesca I</i>	5842E	19	16	35
	Korea, Republic of	<i>Insung No. 2</i>	5842E	20	22	42
	Spain	<i>Galaecia</i>	5842E	19	2	21
2006/07	Korea, Republic of	<i>Insung No. 1</i>	5842A	10	9	19
		<i>Insung No. 1</i>	5842E	2		2
		<i>Jung Woo No. 2</i>	5842A	16	22	38
	Namibia	<i>Antillas Reefer</i>	5842E	19	36	55

(continued)

Table 2 (continued)

Season	Flag State	Vessel name	SSRU	Number of hauls		
				R	C	Total
2007/08	Korea, Republic of	<i>Insung No. 1</i>	5842A	20	7	27
		<i>Insung No. 1</i>	5842C	10	5	15
2008/09	Namibia	<i>Antillas Reefer</i>	5842A	20	2	22
		<i>Paloma V</i>	5842E	20	26	46
	Japan	<i>Shinsei Maru No. 3</i>	5842A	5*		5
		<i>Shinsei Maru No. 3</i>	5842B	10	5	15
2009/10	Korea, Republic of	<i>Insung No. 22</i>	5842B	10	11	21
	Korea, Republic of	<i>Insung No. 2</i>	5842A	10		10
		<i>Insung No. 2</i>	5842E	10	37	47

* SSRU closed while vessel undertaking research hauls.

Table 3: Number of individuals of *Dissostichus* spp. tagged and released (a) and tagging rates (b) reported by vessels operating in the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 since 2005/06, and total number of tagged fish released and recaptured (c) (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				
		2005/06	2006/07	2007/08	2008/09	2009/10
Chile	<i>Globalpesca I</i>	24 (1)				
Japan	<i>Shinsei Maru No. 3</i>				60 (1)	
Korea, Republic of	<i>Insung No. 1</i>		88 (0)	248 (0)		
	<i>Insung No. 2</i>	101 (0)				291 (0)
	<i>Insung No. 22</i>				217 (7)	
Namibia	<i>Jung Woo No. 2</i>		74 (0)			
	<i>Antillas Reefer</i>		86 (0)	48 (1)		
	<i>Paloma V</i>			377 (9)		
Spain	<i>Galaecia</i>	11 (0)				

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

Flag State	Vessel name	Season				
		2005/06	2006/07	2007/08	2008/09	2009/10
Chile	<i>Globalpesca I</i>	0.91				
Japan	<i>Shinsei Maru No. 3</i>				3.12	
Korea, Republic of	<i>Insung No. 1</i>		4.36	3.01		
	<i>Insung No. 2</i>	0.80				3.14
	<i>Insung No. 22</i>				4.61	
Namibia	<i>Jung Woo No. 2</i>		1.94			
	<i>Antillas Reefer</i>		1.32	5.44		
	<i>Paloma V</i>			3.01		
Spain	<i>Galaecia</i>	1.03				
Required rate		1	3	3	3	3

(c) Total number of tagged *Dissostichus* spp. released and recaptured in Division 58.4.2.

Season	Number tagged and released			Number recaptured		
	<i>D. eleginoides</i>	<i>D. mawsoni</i>	Total	<i>D. eleginoides</i>	<i>D. mawsoni</i>	Total
2004/05	14	328	342			
2005/06	1	135	136			
2006/07	0	248	248			
2007/08	10	663	673			
2008/09	8	269	277	0	1	1
2009/10	0	291	291	0	1	1
Total	33	1934	1967	0	2	2

3.2 Fixed parameter values

13. None available for this fishery.

4. Stock assessment

14. WG-FSA-08/63 examined expected tag-recapture rates in new and exploratory *Dissostichus* spp. fisheries in the southern Indian Ocean sector. In particular, the paper considered the potential for tagging programs in new and exploratory fisheries to yield sufficient data to be of use in determining catch limits in the early stages of fishery development. Scenarios were developed using a range of tag-release rates, tag-detection rates, natural mortality, fish movement out of the fishery, and IUU removals in order to estimate the expected numbers of tag-returns. Even under 'worst-case' assumptions (e.g. lower detection rates, higher tag mortality, high levels of emigration and high IUU) tag-recaptures were still expected to be considerably higher than currently observed in Divisions 58.4.1 and 58.4.2. The paper concluded that if current tag-recapture rates continue, then tag-based assessments of stock status in Divisions 58.4.1 and 58.4.2 are likely to remain uncertain in the short to medium term, and fishing should remain focused in areas where tag-releases have been concentrated until these uncertainties can be addressed.

15. Progress on assessing the exploratory fishery in Divisions 58.4.1 and 58.4.2 was presented in WG-SAM-08/4 and a summary was provided in SC-CAMLR-XXVII, Annex 7, paragraphs 3.1 to 3.5. WG-SAM recommended that WG-FSA use the methods described in this paper to provide management advice for the *Dissostichus* spp. fishery in this division, once a number of modifications had been made (SC-CAMLR-XXVII, Annex 7, paragraph 4.3). WG-SAM also recommended that tagging be continued at the current rate in these divisions.

16. An updated assessment of the exploratory fisheries in Divisions 58.4.1 and 58.4.2, including the minor modifications requested by WG-SAM, was provided in WG-FSA-08/43. The authors compared estimates of abundance for these areas using four methods: comparative CPUE trends, local depletions, a constant recruitment model and mark-recapture data. Recapture rates were so low that a reliable stock assessment based on these data was not possible, and instead they presented estimates of the number of expected tag-returns given the estimated biomass. Estimates of biomass by SSRU were moderately consistent between

CPUE comparisons and local depletion methods. However, the predicted estimates of tag-recaptures were much higher than those observed. The paper provided tentative estimates of precautionary yield from Divisions 58.4.1 and 58.4.2, noting that these are substantially lower than the existing catch limits.

17. The Working Group noted that the full uncertainty in the longline CPUE in the two areas had not been incorporated into the assessment. For the purposes of providing advice on potential catch limits for the open SSRUs in Divisions 58.4.1 and 58.4.2, a further analysis was carried out which incorporated the uncertainty in CPUE into the biomass estimates for the SSRUs obtained using the comparative CPUE method detailed in WG-FSA-08/43. SSRU-specific yield calculations were calculated assuming an exploitation rate of 0.05 (which appears to be a sustainable exploitation rate for the assessed *Dissostichus* spp.) multiplied by the biomass estimate. Estimates of yield were also made for SSRUs 5841C, 5842A and 5842E based on depletion-derived biomass estimates. These are the only SSRUs for which depletion estimates were available over several years, from which the most recent best-fit depletion was selected. Yields were calculated separately for the median, 25 percentile and 75 percentile biomass values for each SSRU. The results of the analysis are presented in Table 4.

Table 4: Yield estimates (tonnes) assuming a 5% exploitation rate by SSRU using the median, 25 percentile (25%) and 75 percentile (75%) biomass levels calculated using the comparative CPUE and depletion-derived methods. Estimates are relative to the 2006/07 fishing season.

	SSRU				
	5842A		5842C	5842E	
Method	CPUE	Depletion	CPUE	CPUE	Depletion
Median	24	10	9	37	42
25%	1	9	0	24	36
75%	47	12	18	50	48
Current catch limit	260		260	260	
2007/08 catch	54		37	125	
Range in catches	4–62		4–37	14–156	

18. Dr L. Pshenichnov (Ukraine) noted that the estimation of fished areas of Divisions 58.4.1 and 58.4.2 has not been corrected for the closed SSRUs of Divisions 58.4.1 and 58.4.2. He noted that the assumption that CPUE is proportional to toothfish density is not correct for a longline fishery, and that this leads to an increase in the uncertainty of the analysis. He further noted that the biomass of toothfish was estimated by means of an unknown constant (the catchability) (WG-FSA-08/43). Catchability of longline as a whole, and longlining of toothfish in particular, is unknown and should not be used for biomass estimation. He also considered that catches of immature (1–4 years old) fish in Division 58.4.2 (WG-FSA-08/23) using bottom trawls are similar to those found in other subareas which suggests that recruitment and biomass of fish in this division is also similar to those subareas. This is inconsistent with the summary of WG-FSA-08/43.

19. The Working Group considered that although the estimates of yield from the analysis were uncertain, the results suggested that the size of the *Dissostichus* spp. population in these two divisions was likely to be small and that the current catch limits were unlikely to be sustainable. The Working Group therefore recommended that the catch limits be reduced in each of the open SSRUs in Divisions 58.4.1 and 58.4.2 to the estimates of yield based on the

median biomass estimates provided in Table 4. The Working Group also recalled the work of WG-SAM which considered that catches of 10 tonnes were unable to provide useful information to enable the assessment of a stock except in circumstances of well-designed research programs testing clear hypotheses (SC-CAMLR-XXVII, Annex 7, paragraph 4.6). Therefore, the Working Group further recommended that SSRUs with a yield of less than 20 tonnes be closed to fishing.

5. By-catch of fish and invertebrates

5.1 By-catch removals

20. 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 5. The by-catch in this fishery consists predominantly of macrourids (up to 28 tonnes per season). Catches of rajids of up to 3 tonnes per season have been reported.

21. The Working Group noted that the reported catch of macrourids in the fishery in 2004/05 was relatively higher (22% of the catch of *Dissostichus* spp.) when fishing was concentrated in SSRU A, than in other seasons (2–10% of the catch of *Dissostichus* spp.) when fishing was concentrated in SSRU E.

Table 5: Catch history for by-catch species (macrourids, rajids and other species), catch limits and number of rajids released alive in Division 58.4.2. Catch limits are for the whole fishery (see CM 33-03 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)
2002/03	250	12	250	0	-	100	1
2003/04	80	1	50	0	-	100	0
2004/05	124	28	50	3	3	60	2
2005/06	124	4	50	0	-	60	1
2006/07	124	7	50	0	-	60	0
2007/08	124	12	50	0	-	60	1
2008/09	20	1	50	0	-	40	0
2009/10	20	4	50	0	7	40	0

5.2 Assessment of impacts on affected populations

22. None available for this fishery.

5.3 Identification of levels of risk

23. None available for this fishery.

5.4 Mitigation measures

24. In 2008, the Commission agreed to the Year-of-the-Skate, and the protocol in CCAMLR-XXVII, paragraph 4.55, was implemented.

25. In 2009, the Commission agreed that the Year-of-the-Skate should be extended to 2009/10 in order to allow for sufficient data to be collected for preliminary assessments to be made in the future (see main report, paragraphs 6.14 to 6.21).

26. During WG-FSA-10 it was concluded that the Year-of-the-Skate had been a success overall and had met its objectives to enhance data collection and improve tagging in order to develop assessments (SC-CAMLR-XXVI, Annex 5, paragraphs 6.34 and 6.35). Based on conclusions reported in WG-FSA-10/25 for data in Subareas 88.1 and 88.2 and review of data across all exploratory areas and divisions during the meeting, the Working Group concluded that data collection rates for skates could return to standard levels for these species in 2010/11 until further notice, and the mandatory skate tagging requirements could be removed from the relevant conservation measures. However, the requirement for all skates to be brought on board or alongside the hauler to be correctly identified, scanned for tags and for their condition to be assessed should be made mandatory, and the Working Group recommended that CM 33-03 be revised accordingly. Continued scanning for tags by crew and observers is imperative to enable updates to be made to preliminary assessments of skates in the future.

6. By-catch of birds and mammals

6.1 By-catch removals

27. There have been no observed seabird mortalities in Division 58.4.2 (Table 6).

Table 6: Seabird by-catch limit, observed mortality rate and total estimated mortality of seabird by-catch in Subarea 58.4, including Division 58.4.2.

Season	By-catch limit (number of birds)	Mortality rate (birds/thousand hooks)	Total estimated mortality (number of birds)
2002/03	3*	-	-
2003/04	3*	-	-
2004/05	3*	0	0
2005/06	3*	0	0
2006/07	3*	0	0
2007/08	3*	0	0
2008/09	3*	0	0
2009/10	3*	0	0

* Per vessel during daytime setting.

28. No marine mammal interactions or mortalities were observed in 2009/10.

29. WG-IMAF did not meet in 2010, however, in 2009 it assessed the risk level of seabirds in this fishery in Division 58.4.2 as category 2 (average to low) (SC-CAMLR-XXVIII, Annex 7, Table 14 and Figure 2).

6.2 Mitigation measures

30. CM 25-02 applies to this fishery and in recent years has been linked to an exemption for night setting in CM 24-02 and subject to a seabird by-catch limit. Offal and other discharges are regulated under CM 26-01.

7. Ecosystem implications/effects

31. No evaluation available for this fishery.

8. Harvest controls and management advice

8.1 Conservation measures

32. The limits on the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 are defined in CM 41-05. The limits in force and the Working Group's advice to the Scientific Committee for the forthcoming season are summarised in Table 7.

Table 7: Limits on the exploratory fishery for *Dissostichus* spp. in Division 58.4.2 in 2009/10 (CM 41-05) and advice to the Scientific Committee for 2010/11.

Element	Limit in force	Advice for 2010/11
Catch limit	Precautionary catch limit for <i>Dissostichus</i> spp. was 70 tonnes, and catch limits for each SSRU was as follows: A – 30 tonnes; B – 0 tonnes; C – 0 tonnes; D – 0 tonnes; E – 40 tonnes.	Carry forward
Season	1 December to 30 November	Same period
By-catch	Regulated by CM 33-03	Carry forward
Mitigation	In accordance with CM 25-02, except paragraph 5 if requirements of CM 24-02 are met.	Carry forward
	Limit of three (3) seabirds per vessel during daytime setting.	Carry forward
Observers	At least two (2) scientific observers, one of whom shall be appointed in accordance with the CCAMLR Scheme of International Scientific Observation.	Carry forward
Data	Five-day catch and effort reporting	Carry forward
	Haul-by-haul catch and effort data	Carry forward
	Biological data reported by the CCAMLR scientific observer.	Carry forward
Research	Fishery-based research in accordance with CM 41-01, including the collection of detailed catch, effort and biological data (Annex 41-01/A), setting of research hauls (Annex 41-01/B) and tagging (Annex 41-01/C).	Carry forward
	Toothfish tagged at a rate of at least three fish per tonne green weight caught.	Carry forward
	Skates tagged at a rate of at least one skate per five skates caught, up to a maximum of 500 skates per vessel.	Remove requirement
Environmental protection	Regulated by CMs 26-01, 22-06, 22-07 and 22-08.	Carry forward

8.2 Management advice

33. The Working Group agreed that measures in the research and data collection plans, including the requirement to tag toothfish at the rate of three toothfish per tonne and the requirement for research hauls as used in 2009/10, be retained for the exploratory fisheries in Division 58.4.2.

34. The Working Group agreed that it could provide no new advice on catch limits for this division. It noted that a research plan was being developed which could provide advice in the future (main report, paragraphs 5.1 to 5.12).

35. In progressing a research plan to develop *D. mawsoni* assessments for Division 58.4.2, the Working Group encouraged Members to collaborate in the intersessional period to progress elements of the generalised work plan (main report, paragraphs 5.1 to 5.12).