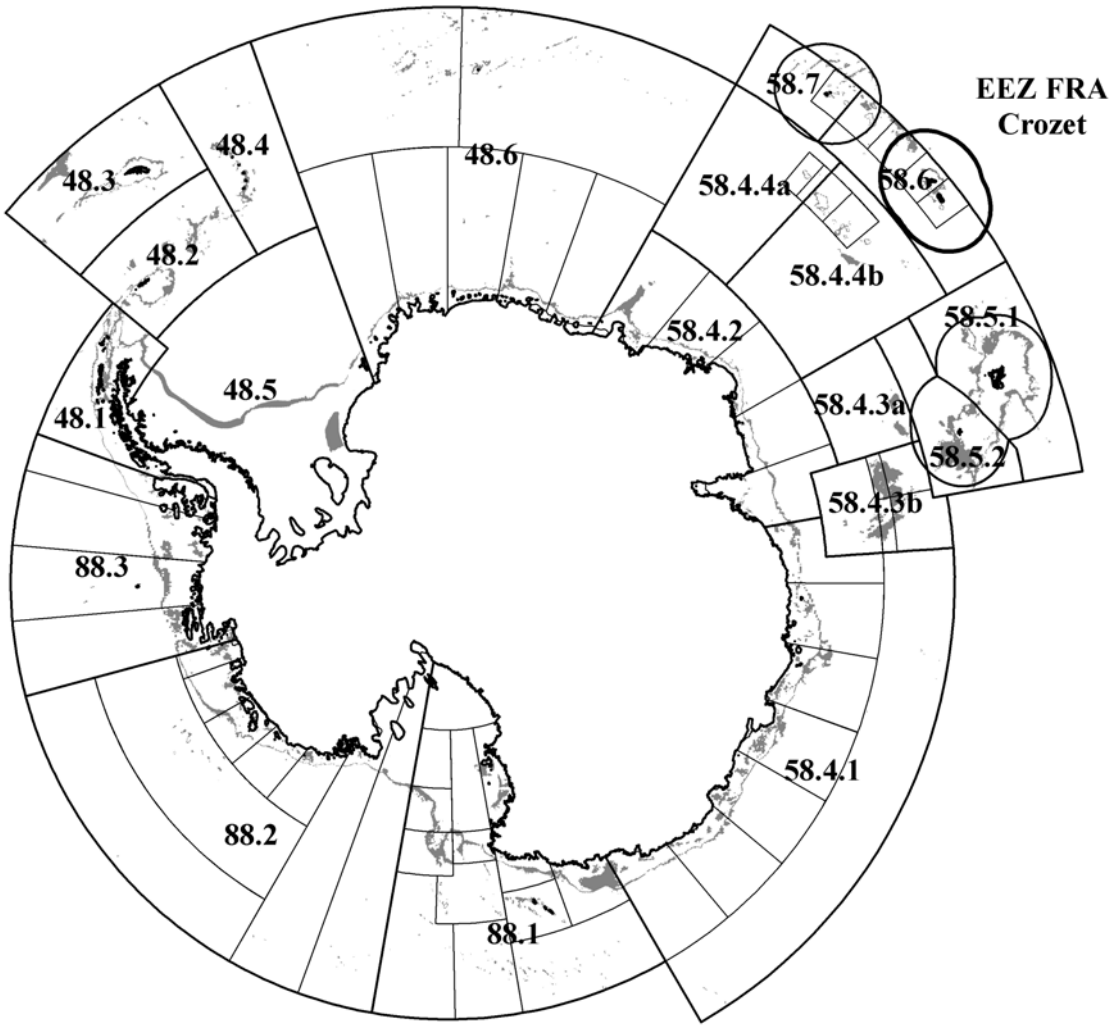
Fishery Report 2013: *Dissostichus eleginoides* Crozet Island
French EEZ (Subarea 58.6)



CONTENTS

The map on the cover page shows the management areas within the CAMLR Convention Area, the specific region related to this report is outlined in bold. Depths between 600 and 1 800 m (the 'fishable depths' for *Dissostichus* spp.) are shaded.

Throughout this report the CCAMLR fishing season is represented by the year in which that season ended, e.g. 2013 represents the 2012/13 CCAMLR fishing season (from 1 December 2012 to 30 November 2013).

FISHERY REPORT 2013: *DISSOSTICHUS ELEGINOIDES*
CROZET ISLAND, FRENCH EEZ (SUBAREA 58.6)

Introduction to the fishery

1. This report describes the licensed longline fishery for Patagonian toothfish (*Dissostichus eleginoides*) in the French Exclusive Economic Zone (EEZ) around the Crozet Islands, which includes a portion of Subarea 58.6, including small-scale research units (SSRUs) B, C and D, and extends into FAO Area 51, outside the CAMLR Convention Area.

2. Trials of trawl fishing, which were conducted by Japanese vessels prior to 1979 and by French vessels from 1983 to 1996 and in 2000, have since been discontinued. A joint survey between France and Japan first conducted longline fishing in Subarea 58.6 in 1997, the method currently used in the fishery.

3. The fishery is open year-round but most fishing effort takes place in February and March when the fishery in the French EEZ at the Kerguelen Islands (Division 58.5.1) is closed. A high level of catch depredation (Tixier et al., 2010) by killer whales (*Orcinus orca*) is the main reason why fishers avoid fishing in Subarea 58.6. Fishing effort in this area concentrates on the Crozet shelf slope and on the eastern part of the del Cano Rise.

4. Within the South African and French EEZs, catch limits for target and by-catch species, as well as vessel licensing, are allocated by the country of national jurisdiction. French conservation measures, specific to the EEZ at Crozet Island, have restricted the longline fishery to waters outside 12 n miles and no shallower than 500 m. A size limit has been set at 60 cm total length and every vessel must carry a scientific observer and must offload its catch only at Réunion Island. In 2013, a catch limit set by France of 700 tonnes was allocated to seven longline vessels.

5. An analysis presented in WG-IMAF-09/12 estimated that the depredation of *D. eleginoides* by killer whales and sperm whales (*Physeter macrocephalus*) over the period 2003 to 2008 was 1 200 tonnes; this implies a depredation rate of 41% of all fish caught. Such a high level of depredation is of concern for the viability of the fishery.

6. A pot-trial cruise was conducted in February 2010 (WG-FSA-10/10) to try to find solutions to the depredation problem (and to reduce seabird mortality). However, while whale depredation and seabird by-catch is eliminated using pot gear, the catch rates of the target species were reduced and the by-catch of king crabs (*Lithodes murrayi* and *Paralomis aculeata*) was considerable.

Reported catches

7. Reported catches of *Dissostichus eleginoides* over the past 10 seasons are presented in Table 1. The majority of the catch taken within the French EEZ is obtained from Subarea 58.6, the highest reported catch, of 885 tonnes, being recorded in 2009. In 2013, the catch for the French EEZ in Subarea 58.6 was 504 tonnes (Table 1).

Table 1: Catch history of *Dissostichus eleginoides* in the French EEZ at Crozet Islands (Subareas 58.6). The IUU estimate is for all of Subarea 58.6, including the South African EEZ. (Source: STATLANT data for past seasons, fine-scale data for current season.) Reported catch (tonnes)

Season	Reported Catch (t)	Estimated IUU Catch (t)	Total Removal (t)
1977	6	0	6
1978	370	0	370
1983	17	0	17
1987	488	0	488
1988	21	0	21
1994	56	0	56
1995	115	0	115
1996	3	7875	7878
1997	413	11760	12173
1998	787	1758	2545
1999	877	1845	2722
2000	1017	1430	2447
2001	1091	685	1776
2002	1158	720	1878
2003	531	302	833
2004	537	380	917
2005	559	12	571
2006	775	55	830
2007	410	0	410
2008	823	224	1047
2009	885	0	885
2010	663	0	663
2011	703	0	703
2012	673	*	673
2013	504	*	504

* Not estimated.

8. Fishing effort in the French EEZ in Subarea 58.6 is concentrated around the islands, with the highest catches of *D. eleginoides* (>1 000 tonnes) being recorded from SSRUs C and D.

Illegal, unreported and unregulated (IUU) fishing

9. Illegal, unreported and unregulated (IUU) fishing was first detected in Subarea 58.6 in 1996 and peaked the following year at an estimated 11 760 tonnes.

10. Estimates of IUU catch in Subarea 58.6 are presented in Table 1. Due to increased surveillance, IUU fishing has virtually been eliminated inside the French EEZ at Crozet Island. However, IUU fishing is still believed to persist outside the EEZ in Subarea 58.6 and in 2008 was estimated to be 224 tonnes.

11. There have been no official reports of IUU fishing in Subarea 58.6 since 2009 and, following the recognition of methodological issues in its assessment, no estimates of the IUU catch of *Dissostichus* spp. have been provided since 2010 (SC-CAMLR-XXIX, paragraph 6.5).

Data collection

12. CCAMLR has developed a framework for designing and undertaking research fishing designed to lead to an assessment of these toothfish stocks in the short to medium term, established under the provisions of CM 41-01. This research planning framework has three phases: prospecting phase, biomass estimation phase and assessment development phase, with a set of decisions and review for the progression between stages.

13. In order to obtain the data necessary for a stock assessment, catch limits for research fishing by commercial vessels are set at a level intended to provide sufficient information (including sufficient recaptures of tagged fish) to achieve a stock assessment within a time period of 3–5 years. These catch limits are also set so that they provide reasonable certainty that exploitation rates at the scale of the stock, or research unit, will not negatively impact the stock. Appropriate exploitation rates are based on estimates from areas with assessed fisheries and are not more than 3–4% of the estimated stock size. In 2012 and 2013, CCAMLR put in place a more structured approach to setting catch limits, and spatially constraining research, in fisheries with little data. This process attempts to use all available information combined with a regular review process to make progress while recognising the inherent uncertainties and data limitations in data-poor fisheries.

Biological data

14. The collection of biological data is conducted as part of the CCAMLR Scheme of International Scientific Observation. In longline fisheries targeting *D. eleginoides*, biological data collection includes representative samples of length, weight, sex and maturity stage, as well as collection of otoliths for age determination of the target and most frequently taken by-catch species.

Length distributions of catches

15. The length-frequency distributions of *D. eleginoides* caught in this fishery from 2004 to 2013 are presented in Figure 1. The majority of *D. eleginoides* caught ranged from 50 to 120 cm in length, with a single mode for all seasons at approximately 60–80 cm. These length-frequency distributions are unweighted (i.e. they have not been adjusted for factors such as the size of the catches from which they were collected). The interannual variability exhibited in the figure may reflect differences in the fished population but is also likely to reflect changes in the gear used, the number of vessels in the fishery and the spatial and temporal distribution of fishing.

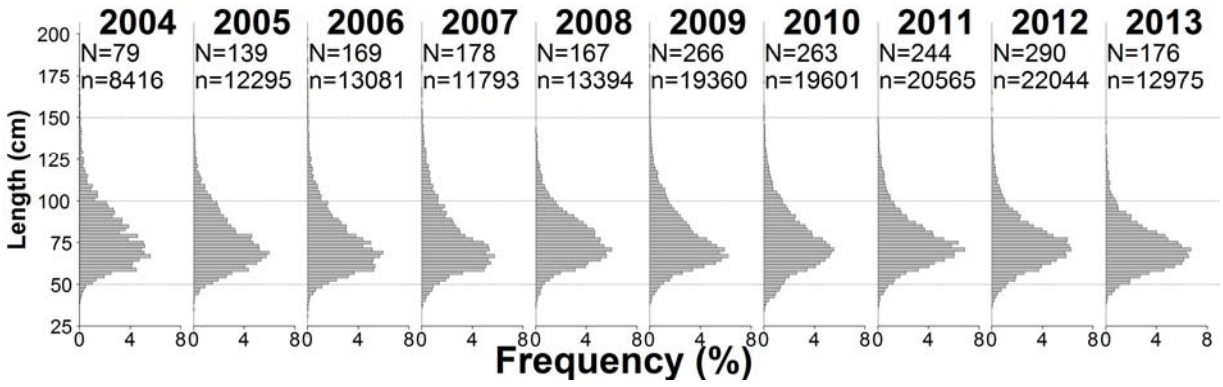


Figure 1: Annual length-frequency distributions of *Dissostichus eleginoides* caught in the French EEZ at the Crozet Islands, Subarea 58.6 from 2004 - 2013. The number of hauls from which fish were measured (N) and the number of fish measured (n) in each year are provided. Note: length-frequency distributions are only presented for those years/SSRUs in which the number of fish measured was >150.

Tagging

16. Within the French EEZ vessels are required to tag and release toothfish at a rate of one fish per tonne of green weight caught throughout the season.

17. Tagging commenced in 2005, and to date 5 561 fish have been tagged, of which 272 have been recaptured (Table 2).

Table 2: The number of individuals of *Dissostichus eleginoides* tagged and recaptured in each year in the French EEZ in Subarea 58.6.

Year	Tagged	Recaptured							
		2006	2007	2008	2009	2010	2011	2012	2013
2005	91	1	0	0	0	1	0	0	0
2006	1 186	13	8	6	18	12	8	13	1
2007	502		3	13	7	5	4	1	0
2008	550			4	21	7	8	4	7
2009	690				10	17	11	9	9
2010	618					0	5	10	0
2011	727						4	13	4
2012	814							3	11
2013	383								1
Total	5 561								272

18. One fish which was tagged in Subarea 58.6 was recaptured in Subarea 58.7. Despite these long-distance movements of sub-adult/adult fish, the proportion of exchange between stocks is still unknown and no fish from Crozet Island have been recovered on the Kerguelen Plateau.

Life-history parameters

Data collection

19. The life histories of *D. mawsoni* and *D. eleginoides* are characterised by slow growth, low fecundity and late maturity. Both *D. mawsoni* and *D. eleginoides* appear to have protracted spawning periods, taking place mainly in winter, but which may start as early as late autumn and extend into spring. However, as this is the period least accessible to fishing, and thus the collection of biological data, specific life-history traits for these species are limited (WG-FSA-08/14). The areas that are considered to be the most likely spawning grounds for *D. mawsoni* include the north of the Ross Sea associated with the Pacific–Antarctic Ridge (SSRUs 881B–C), and the Amundsen Ridge (SSRU 881E) in the Amundsen Sea. In the Cooperation Sea, *D. mawsoni* most likely spawn on BANZARE Bank (Division 58.4.3b). *Dissostichus eleginoides* are thought to spawn in deep water around South Georgia Island (Division 48.3), Bouvet Island (Division 48.6) and on the Kerguelen Plateau (Divisions 58.5.1 and 58.5.2).

Parameter estimates

20. There are no specific life-history parameters for *D. eleginoides* in the French EEZ. However, for the purposes of stock assessment, the parameters estimated by Agnew et al. (WG-FSA-06/53) for this species in Subarea 48.3 have been adopted.

Stock assessment status

21. A preliminary stock assessment using CASAL was conducted in 2013 and presented to WG-FSA for review (WG-FSA-13/05). This stock assessment model included commercial catches, commercial catch-at-length and tag-release and recapture data and takes in account the killer whale depredation and estimated rates of IUU fishing. The impact of data weighting was revised and a more stable model was obtained (WG-FSA-13/51). This scenario gave an initial biomass estimate of 68 323 tonnes and a spawning stock biomass of 51 246 tonnes. MCMCs were carried out and the potential yield that would satisfy the CCAMLR decision rules (to maintain the median spawning biomass at no less than 50% of the pre-exploitation spawning biomass) was calculated as 2 500 tonnes. As a precautionary approach, the current catch limit was set at 700 tonnes.

22. Future work is needed to refine the current stock assessment model, including:

(i) continuation of France’s tagging program in Subarea 58.6

(ii) comparison of the results from the model with a calculation of biomass through CPUE by seabed area

(iii) integration of sensitivity runs, including trawl length-frequency data, IUU catches and orca depredation

(iv) derivation of age estimates such that annual age–length keys and age frequencies, spanning the period of the fishery, can be incorporated into the model.

By-catch of fish and invertebrates

Fish by-catch

23. Catch limits for by-catch (macrourids, rajids and other species) inside the French EEZ are set by France.

24. The by-catch in the French EEZ at Crozet Islands consists predominantly of macrourids. The maximum catch over the past 10 years of 193 tonnes (Table 3), was reported in 2009 and amounts to 22% of the target catch in that year.

25. Primary by-catch species from the longline fishery at Crozet Islands are the macrourid *Macrourus carinatus*, rajid skate (*Amblyraja taaf*) and blue antimora (*Antimora rostrata*). The latter species is fully discarded, while the others being partly or totally retained.

Table 3: Catch history for by-catch species (macrourids, rajids and *Antimora rostrata*) taken in the longline fishery for *Dissostichus eleginoides* in the French EEZ in Subarea 58.6 and Area 51. (Source: fine-scale data.) Data for 2013 is incomplete.

Season	Macrourids	Rajids	Number released alive	*Antimora rostrata*
	Reported catch (tonnes)	Reported catch (tonnes)		Reported catch (tonnes)
2004	116	73	-	56
2005	132	93	-	67
2006	149	121	-	53
2007	117	83	2 118	43
2008	135	46	11 397	64
2009	193	46	17 730	79
2010	113	56	6 836	78
2011	93	29	2 484	23
2012	96	75	2 448	21
2013	46	29	273	14

Invertebrate by-catch including VME taxa

26. There are no VMEs or VME Risk Areas designated in the French EEZ.

Mitigation measures

27. WG-FSA recommended that areas with high by-catch rates should be avoided and noted that from 2012 vessels have received a recommendation to avoid the areas of high by-catch.

Incidental mortality of birds and mammals

Incidental mortality

28. A summary of the historic seabird mortality by longline in the French EEZ at Crozet Island since 2007 is presented in Table 4. The three most common species injured or killed in the fishery were white-chinned petrel (*Procellaria aequinoctialis*), northern giant petrel (*Macronectes halli*) and grey petrel (*P. cinerea*).

29. In 2013, there were 13 seabird mortalities observed inside the French EEZ in Subarea 58.6 (WG-IMAF-13/06), all of which were *P. aequinoctialis* (Table 4).

Table 4: Incidental mortality of seabirds in the French EEZ in Subarea 58.6 since 2007.

Season	*Procellaria aequinoctialis*	*Macronectes halli*	*Procellaria cinerea*
2007		1	
2008	32		
2009	19	3	1
2010	27		
2011	7	1	
2012	17		
2013	13		
Total	115	5	1

30. The level of risk of incidental mortality of seabirds in the French EEZ at Crozet Island in Subarea 58.6 is considered to be high (category 5) (SC-CAMLR-XXX, Annex 8, paragraph 8.1).

31. There have been no reports of incidental mortalities of marine mammals since 2007.

Mitigation measures

32. The requirements of CM 25-02 'Minimisation of the incidental mortality of seabirds in the course of longline fishing or longline fishing research in the CAMLR Convention Area' apply to this fishery. There is an exemption to the requirement for night setting by achieving the sink rates described in CM 24-02 and subject to a seabird by-catch limit. France has applied the CCAMLR mitigation measures for the last three seasons and these will continue for the upcoming fishing season.

33. Additional measures for the upcoming season new measures will also be applied (WG-IMAF-11/10 Rev. 1), including:

(i) changes to the bird exclusion device to ensure it is effective in all weather conditions

(ii) closure of fishing areas and quota allocation reduction to vessels that have high by-catch rates

(iii) education and training will be strengthened by regular meetings between TAAF and masters of fishing vessels with high by-catch

(iv) a new population survey of at-risk seabird species, conducted in the Crozet archipelago during November 2011, will be compared to the results of a similar survey conducted in 2005.

Ecosystem implications and effects

34. There is no formal evaluation available for this fishery.

Current management advice and conservation measures

35. In addition to those CCAMLR conservation measures that are applied in this fishery, various national conservation and fisheries enforcement measures are applicable, such as:

- annual catch limit and limitation on the number of longline vessels allowed to operate in the fishery (seven)
- allocation of fishing effort permitting not more than two longliners simultaneously per 0.5° latitude × 1° longitude rectangle
- obligatory observer and vessel logbooks
- one French observer on board each licensed vessel
- minimum fishing depth limit of 500 m
- minimum legal size limit for *D. eleginoides* of 60 cm
- mitigation measures for the reduction of seabird mortality
- a single catch landings site at Réunion Island
- unless retained for commercial processing, all skates are to be released alive
- mandatory port inspection.

36. The limits in force and the advice of WG-FSA to the Scientific Committee for the forthcoming season:

(i) WG-FSA was unable to provide management advice for the fishery in the French EEZ at Crozet Island as no new information was available on the state of fish stocks and recommended that a prohibition of directed fishing for *D. eleginoides*, described in CM 32-11, remain in force

(ii) biological parameters for *D. eleginoides* in Subarea 58.6 (French EEZ) are to be estimated in order to aid the development of a stock assessment for this area

(iii) France is to continue its tagging program in Subarea 58.6

(iv) zones of specific high by-catch should also be avoided

(v) monitoring of two boats responsible for the majority of the bird by-catch, including the use of spatial closure, is recommended.

Reference

Tixier, P., N. Gasco, G. Duhamel, M. Viviant, M. Authier and C. Guinet. 2010. Interactions of Patagonian toothfish fisheries with killer and sperm whales in the Crozet Islands Exclusive Economic Zone: an assessment of depredation levels and insights on possible mitigation strategies. *CCAMLR Science*, 17: 179–195.