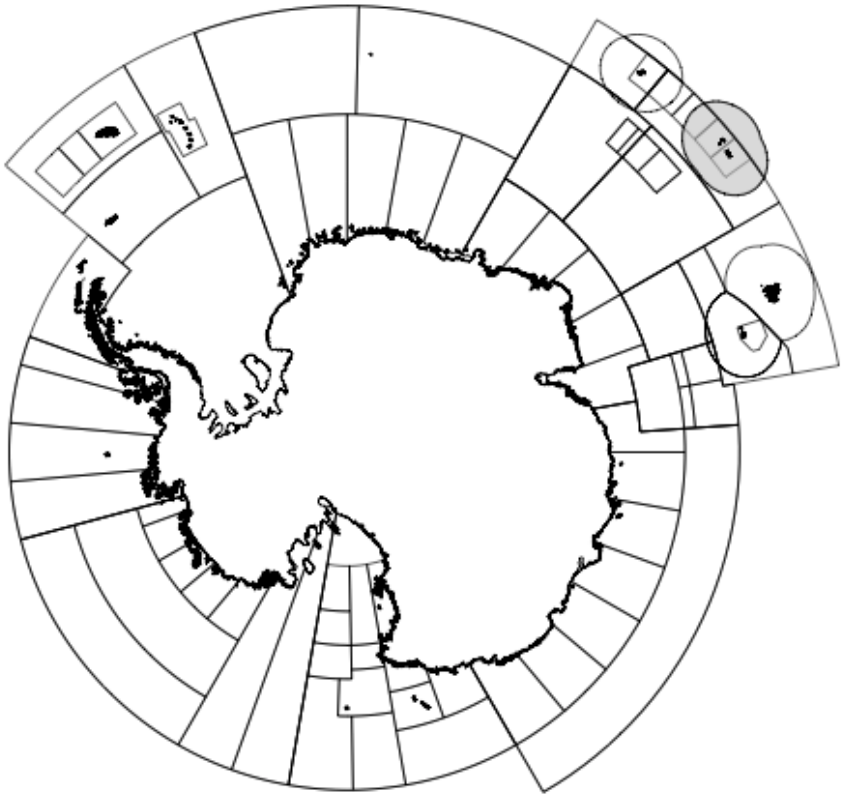
CCAMLR

Commission for the Conservation of Antarctic Marine Living Resources
Commission pour la conservation de la faune et la flore marines de l'Antarctique
Комиссия по сохранению морских живых ресурсов Антарктики
Comisión para la Conservación de los Recursos Vivos Marinos Antárticos

FISHERY REPORT

Fishery Report 2015: *Dissostichus eleginoides* Crozet Island French EEZ (Subarea 58.6)



The map above shows the management areas within the CAMLR Convention Area, the specific region related to this report is shaded.
Throughout this report the CCAMLR fishing season is represented by the year in which that season ended, e.g. 2015 represents the 2014/15 CCAMLR fishing season (from 1 December 2014 to 30 November 2015).

Fishery Report 2015: *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) established in 1978 around the Crozet Islands, which includes a portion of Subarea 58.6, small-scale research units (SSRUs) B, C and D, and extends into FAO Area 51 (north of 45°S), 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, and this has been used in the fishery since then.

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 French EEZs, catch limits for target and by-catch species, as well as vessel licensing, are allocated by France. French management measures (TAAF annual decrees), specific to the EEZ at Crozet Island, have restricted the longline fishery to waters outside the 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 2015, a catch limit set by France of 850 tonnes was allocated to seven longliners.

5. An analysis presented in WG-FSA-14/10 estimated that the depredation of *D. eleginoides* by killer whales and sperm whales (*Physeter macrocephalus*) over the period 2003 to 2013 was 2 568 tonnes; this implies a depredation rate of 28% of all fish caught for this decade.

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 bird mortality). However, while whale depredation and bird 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 *D. eleginoides* 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 1 158 tonnes being recorded in 2002. In 2015, the catch to the end of July 2015 for the French EEZ in Subarea 58.6 was 433 tonnes (Table 1).

Table 1: Catch history of *Dissostichus eleginoides* in the French EEZ at Crozet Islands (Subarea 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 the current season.)

Season	Reported catch (tonnes)	Estimated IUU catch (tonnes)	Total removal (tonnes)
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	840	*	840
2014	778	*	778
2015**	433	*	433

* Not estimated.
** Data to July 2015.

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 still persists outside the EEZ in Subarea 58.6.

11. There is one official report (2013) of IUU fishing inside the French EEZ of Subarea 58.6 since 2009 (CCAMLR-XXXII/21 Rev. 1) and, following the recognition of methodological issues in its assessment, no estimates of IUU catch of *Dissostichus* spp. have been provided since 2011 (SC-CAMLR-XXIX, paragraph 6.5).

Data collection

Biological data

12. 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

13. The length-frequency distributions of *D. eleginoides* caught in this fishery from 2006 to 2015 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.

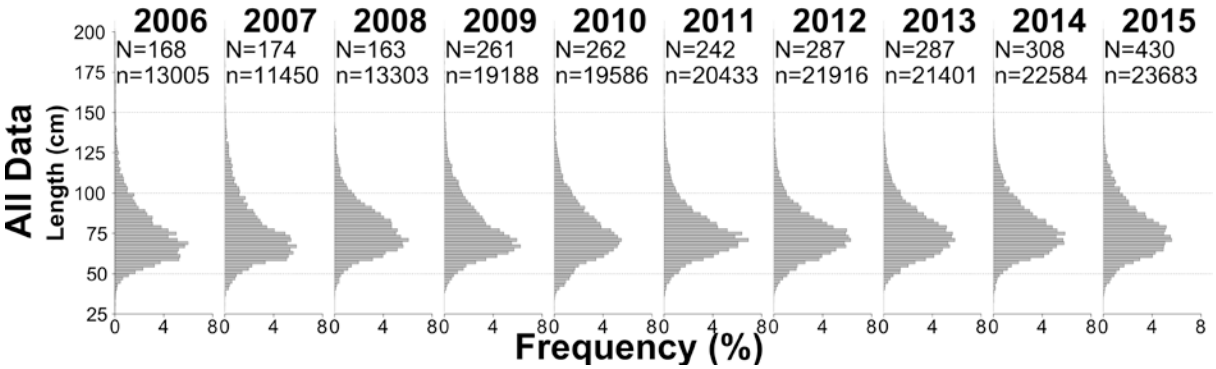


Figure 1: Annual length-frequency distributions of *Dissostichus eleginoides* caught in the French EEZ at the Crozet Islands, Subarea 58.6, from 2006 to 2015. The number of hauls from which fish were measured (N) and the number of fish measured (n) in each year are provided.

Tagging

14. Within the French EEZ, vessels are required to tag and release toothfish at a rate of 1 fish per tonne of green weight caught throughout the season.

15. Tagging commenced in 2005 and to date, 7 206 fish have been tagged, of which 396 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 (*: incomplete data).

Year	Tagged	Recaptured										
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015*	Total
2005	90	1	0	0	0	1	0	0	0	0	0	2
2006	1162	12	9	5	18	12	7	12	2	1	1	79
2007	527		3	13	7	5	4	1	0	3	0	36
2008	550			4	21	7	8	3	9	3	1	56
2009	679				8	19	11	7	10	7	6	68
2010	629					0	5	10	2	4	2	23
2011	727						4	12	5	6	3	30
2012	693							1	24	20	4	49
2013	852								8	18	10	36
2014	839									4	12	16
2015*	458										1	1
Total	7206											396

16. One fish which was tagged in Subarea 58.6 was recaptured in Subarea 58.7 and another in the SIOFA zone. Again, tagged fish from the Kerguelen Plateau (nine from Division 58.5.1 – Kerguelen and 26 from Division 58.5.2 – Heard Island) have been recovered in the Crozet EEZ. 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 eastward on the Kerguelen Plateau.

Life-history parameters

Data collection

17. The life history of *D. eleginoides* is characterised by slow growth, low fecundity and late maturity. *Dissostichus 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. *Dissostichus eleginoides* are thought to spawn in deep water around South Georgia Island (Subarea 48.3), Bouvet Island (Subarea 48.6) and on the Kerguelen Plateau (Divisions 58.5.1 and 58.5.2), but data in Subarea 58.6 (Crozet) are still not available.

Parameter estimates

18. There are no specific life-history parameters for *D. eleginoides* in the French EEZ. However, the metapopulation of the Indian Ocean sector has been validated by Appleyard et al. (2004) and thus it is likely that the parameters used in the stock assessment for Heard Island, such as growth rate and natural mortality, would be valid for the stock in Subarea 58.6. Age-specific data from Crozet otolith sampling are available since 2015.

Stock assessment status

19. A preliminary stock assessment using CASAL was first presented during the 2013 meeting of the Working Group on Fish Stock Assessment (WG-FSA) (WG-FSA-13/05).

20. WG-FSA-15/69 presented an updated stock assessment of *D. eleginoides* at Crozet Islands (Subarea 58.6 inside the French EEZ). The model included estimated levels of depredation by killer whales from generalised additive model (GAM) analyses of the fishery data and 10% of total catch depredation by killer whale in the predictions.

21. WG-FSA-15 recommended that the annual depredation calculations be presented in future stock assessment papers and further work on growth estimation with inter-laboratory comparisons of fish age estimates from otoliths. It recommended also to investigate the use of a uniform-log prior for B_0, the use of a lognormal prior for year-class strength (YCS), double-normal plateau selectivity ogives, and the application of YCS variability in stock projections.

By-catch of fish and invertebrates

Fish by-catch

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

23. Catch limits for by-catch (macrourids, rajids and other species) inside the French EEZ are set by France. Avoidance of high level by-catch areas has been promoted and the cut-off protocol is in force to follow the CCAMLR recommendations.

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

Invertebrate by-catch including VME taxa

25. There are no vulnerable marine ecosystems (VME) or VME Risk Areas designated in the French EEZ. Fishery observers have protocols to collect information about benthos taxa, including VME taxa.

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.) (2015: partial data, to July 2015.)

Season	Macrourids	Rajids		*Antimora rostrata*
	Reported catch (tonnes)	Reported catch (tonnes)	Number released alive	Reported catch (tonnes)
2005	132	93	-	67
2006	149	121	-	53
2007	117	83	2118	43
2008	135	46	11397	64
2009	193	46	17730	79
2010	113	56	6836	78
2011	93	29	2484	23
2012	96	75	2457	21
2013	64	33	1242	17
2014	92	53	10182	36
2015	65	2	10823	34

Mitigation measures

26. 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 seabirds and marine mammals

Incidental mortality

27. A summary of the bird mortality by longline fisheries in the French EEZ at Crozet Islands 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*). Night-setting requirements have been highly effective in removing the previously high levels of albatross mortality.

28. In 2015, there were 10 bird mortalities observed inside the French EEZ in Subarea 58.6, all of which were *P. aequinoctialis* (Table 4).

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

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

Table 4: Incidental mortality of birds 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		
2014	6		
2015	10		

Mitigation measures

31. The requirements of CM 25-02 'Minimisation of the incidental mortality of birds in the course of longline fishing or longline fishing research in the Convention Area' apply to this fishery. France has applied the CCAMLR mitigation measures for the last seasons and these will continue for the upcoming fishing seasons.

32. Additional 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 bird 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

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

Current management advice and conservation measures

34. 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 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 bird mortality
- a single catch landings site at Réunion Island
- unless retained for commercial processing, all skates are to be released alive
- mandatory port inspection.

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

(i) WG-FSA-15 agreed that model R1 with fixed YCS, as described in WG-FSA-15/69, could be used to provide management advice for the fishery in the French EEZ in Subarea 58.6 for 2016. The Working Group noted that a catch limit of 1 780 tonnes would satisfy the CCAMLR decision rules. It noted that France had set a catch limit of 1 000 tonnes for 2016

(ii) no new information was available on the state of fish stocks in Subarea 58.6 outside areas of national jurisdiction. The Working Group therefore recommended that the prohibition of directed fishing for *D. eleginoides*, described in CM 32-02, remain in force in 2016

(iii) further work on growth estimation and other biological parameters for *D. eleginoides* in Subarea 58.6 (French EEZ) are to be estimated to improve the stock assessment for this area

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

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

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

References

Appleyard, S.A., R. Williams and R.D. Ward. 2004. Population genetic structure of Patagonian toothfish in the West Indian Ocean sector of the Southern Ocean. *CCAMLR Science*, 11: 21–32.

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.