

A BRIEF HISTORY OF FISHING IN THE KERGUELEN ISLANDS, FRANCE¹

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ABSTRACT

Catch statistics from around the (uninhabited) Kerguelen Islands, which are part of the French Antarctic and sub-Antarctic Territories, and where distant-water fisheries began in 1970, were obtained from the CCAMLR (Commission for the Conservation of Antarctic Marine Living Resources) Statistical Bulletin (Area 58.5.1) and complemented by statistics reported through the French KERPECHE program. Catches originally expressed by fishing seasons were re-expressed as calendar years, which results in a slight between-season smoothing. These catches show a general decline over a 30 year-period and an expansion of the longline fishery to deeper waters in the last 10 years.

INTRODUCTION

The Kerguelen Islands

The Kerguelen Islands (49°30'S, 69°30'E) are part of the French Antarctic and sub-Antarctic Territories, which also include the islands of Crozet, Amsterdam and St. Paul, and the Antarctic district of Terre Adélie (www.taaf.fr). They consist of a main island called 'La Grande Terre' (6,700 km²) and a number of smaller surrounding islets. Kerguelen Island sits in the middle of the combined shelf of the Kerguelen and Heard Islands (Australia), known as the Kerguelen Plateau, which covers an area of 100,500 km² above 500 m depth (Pruvost *et al.*, 2005; see Figure 1). The islands are uninhabited both because of their isolated locations and the extreme climate prevailing in the area.

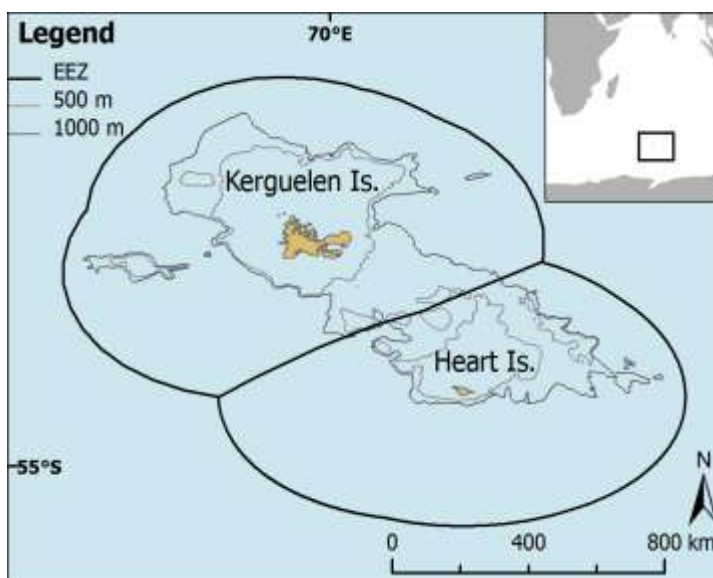


Figure 1. Map of Kerguelen Islands, CCAMLR areas 58.5.1, showing French (Kerguelen Islands) and Australian (Heard Island) Exclusive Economic Zones, as well as 500 m and 1000 m depth contour.

Fisheries and their resource species

Fishery prospecting cruises (mostly by the USSR, i.e., the Ukraine; Zeller and Rizzo 2007) in the 1960s led to the development of a modern fishery in the Kerguelen Islands starting in 1970 with about 10 Ukrainian bottom trawlers operating during 6-month fishing seasons without management or control. They targeted marbled rockcod (*Notothenia rossii*), mackerel icefish (*Champsocephalus gunnari*) and gray rockcod (*Lepidonotothen squamifrons*), and also caught unspecified by-catch species of the plateau, at 200-500 m depths in what is now known as CCAMLR area 58.5.1 (Pruvost *et al.*, 2005). This unmanaged fishery continued until France declared an Exclusive Economic Zone (EEZ) around the islands as well as the

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other 'Terres Australes et Antarctiques Françaises' in 1978 (TAAF; see Duhamel, 1995). Since the implementation of the French management scheme in 1980, foreign fleets could access the Kerguelen Islands' EEZ only through access agreements for which the French government granted quotas, limiting to 7 the number of trawlers operating at any one time (Pruvost *et al.*, 2005; Duhamel, 1995).

The discovery of a large stock of Patagonian toothfish, *Dissostichus eleginoides*, by USSR bottom trawlers in the 1984-1985 fishing season on the slopes of the Kerguelen shelf led to the development of this high-value trawl fishery. In 1996, the former USSR stopped trawling in Kerguelen waters and only 2 Ukrainian longliners and 2 French bottom trawlers remained (Pruvost *et al.*, 2005). In the same year, a joint French and Japanese prospecting cruise aboard the M/V *Anyo Maru* established that longlining was an effective method for catching Patagonian toothfish (Duhamel and Hautecoeur, 2009), which led to the development of this fishery, completely replacing the bottom trawl fishery in the 2000-2001 fishing season (Lord *et al.*, 2006). The high initial abundance of this stock encouraged a rapid expansion of the longline fisheries and the subsequent proliferation of non-licensed longliners from non CCAMLR member states (Kock, 2001). The illegal fishery catch peaked between 1996 and 2004, with catches reaching four times that of the regulated catch in 1997 (Agnew, 2000). In 2005, illegal fishing was curtailed and the fishery was limited to 7 French longliners (Pruvost *et al.*, 2005).

Overall, both trawl and longline fisheries in the Kerguelen Islands increased their effort throughout the period considered here, i.e., 1970-2005. Their catch per unit of effort has consequently strongly diminished, in spite of the expansion of the longline fishery from an average fishing depth of 500 m to 1,000 m (Lord *et al.*, 2006). This suggests massive declines in the target fish biomass; the mean individual size of Patagonian toothfish has also declined (Duhamel and Hautecoeur, 2009).

MATERIAL AND METHODS

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) catch statistics for CCAMLR area 58.5.1 were used as a basis of this catch reconstruction for the period 1970-2010. These statistics were missing data for the period 1979-1987. Lord (2005) provided statistics for: (i) catches of Ukrainian and French trawlers for Patagonian toothfish, marbled rockcod, mackerel icefish and grey rockcod fisheries for the period 1979-2001; (ii) longline catches for the Patagonian toothfish fishery and its by-catch (mainly rays and grenadiers) for the period 1990-2003 using the French KERPECHE database (see Lord *et al.*, 2006 and Pruvost *et al.*, 2005); and (iii) catch estimates from illegal fishing operations based on recorded arrests for the period 1996-2003. In those cases where the CCAMLR and KERPECHE statistics overlapped, the KERPECHE catches ranged from 73% (marbled rockcod trawl fishery) to 204% (rays as by-catch of the longline fishery) of the CCAMLR statistics. We used the KERPECHE statistics *in lieu* of the CCAMLR statistics for: (a) trawlers for the period 1979-1989 for mackerel icefish, marbled and gray rockcod, and 1979-1991 for Patagonian toothfish; and (b) longliners, notably during the period of expansion for Patagonian toothfish, in order to be able to include some of the unreported catches.

Catches reported by the USSR to the CCAMLR were all assigned to the Ukraine because this part of the world's ocean was exploited by USSR vessels from the Ukrainian SSR during the Soviet era (see Romanov, 2003; Zeller and Rizzo 2007). Also, it is only Ukrainian vessels which exploited the Kerguelen following the breakup of the USSR (see Pruvost *et al.*, 2005).

RESULTS AND DISCUSSION

Appendix Table A1 and A2 present a summary of the catch statistics available from the Kerguelen Islands extracted from the CCAMLR (2010) and completed with data from Lord (2005, Annex 3). The catches originally presented by CCAMLR 'season', from the 1st of July of a particular year to the 30th of June of the next year, were converted to calendar years by assuming that the catch in the first half of the season (in a given year) is equal to that of the second half of the season (in the next year). This does not affect cumulative catches and, in fact, corresponds to a slight between-season smoothing.

This brief account of the fisheries in the Kerguelen Islands is meant to present the Kerguelen Island fisheries statistics in such a way that they can be included in the *Sea Around Us* project's (www.seararoundus.org) catch mapping procedure (see Watson *et al.*, 2004). This is the reason why the catch is reported by calendar years and not as done in the original literature, which account for fishing 'seasons'. Moreover, we include estimates of illegal catches, which although highly tentative, are likely to be more correct than the statistically very precise but inaccurate estimate of zero commonly used as a replacement for difficult to estimate quantities such as illegal catches (see Zeller *et al.*, 2011).

The resulting catch statistics for the Ukraine (see Appendix Table A2 and Figure 2a), i.e., the fishery which heavily exploited mackerel icefish over three decades, show peaks and troughs similar to patterns reported for South Georgia, South Orkney Islands, Elephant Island and South Shetland Islands (Kock, 1991). Heavy fishing pressure on the strong 1973-1974 year classes may have reduced the stock size to a level that prevented adequate recruitment and thus recovery (Anon., 2001). The trend of the peaks shows a steady decline in the catch, and Kock and Everson (2003) concluded that this decline is the result of a combination of factors, including heavy fishing pressure, changes in the abundance of icefish predators (Antarctic fur seals and penguins) and prey (krill), and warming in the northern parts of the distributional range of icefish. Commercial fishing for mackerel icefish was banned at the end of the 1980s (Kock, 1991) resulting in the tapering off of statistics reported by the Ukraine.

The increasing French catch trend (see Appendix Table A1 and Figure 2b), on the other hand, reflects an exploratory fishery tending towards expansion to deeper waters. Duhamel *et al.* (1997) speculated that the level of longline bycatch (mainly of rays and rattails or grenadiers, Family Macrouridae) have the potential to replace the Patagonian toothfish fishery. Although smaller and subjected to management and monitoring, this expanding fishery has effectively 'counterbalanced' its decreasing catch per unit of effort.

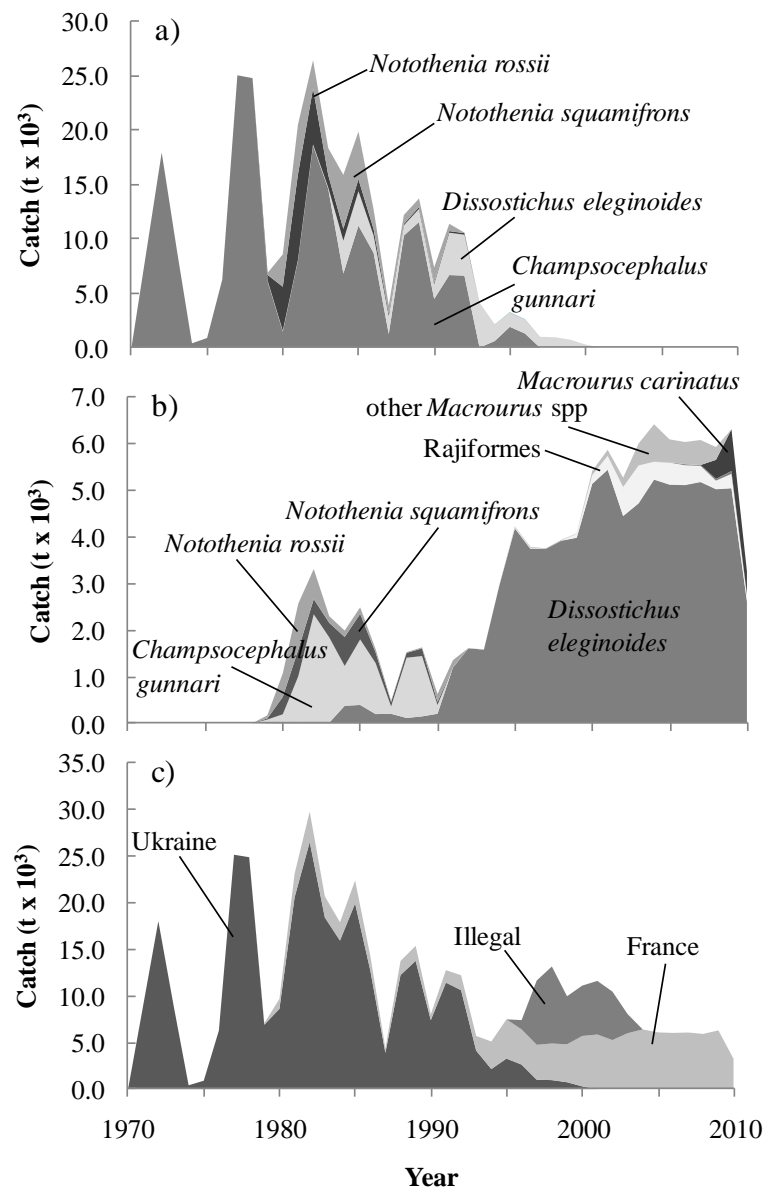


Figure 2. Reconstructed fisheries catches (in metric tonnes) for the Kerguelen Islands (CCAMLR Area 58.5.1) with statistics adapted from CCAMLR (2010) and complemented with data from Lord (2005) for (a) Ukrainian (i.e., former USSR and Russian Federation statistics); (b) French trawlers and long-liners; and (c) total catch by country including some estimates of illegal fishing during the period 1996-2003 from Lord (2005).

Overall, it is masking the fact that no new fishing grounds have been found since all accessible shallow shelf stocks have been over exploited (Lord *et al.*, 2006).

The illegal catch estimates shown in Figure (2c) that were reported both by the CCAMLR (2010) and by Lord (2005) may well be underestimates, i.e., catches may be twice (or more) of those reported to the CCAMLR.

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Appendix Table A1: Kerguelen Islands, CCAMLR area 58.5.1, fisheries catch statistics (t) by French trawlers and longliners from 1970-2010 adjusted from fishing season to calendar year (see text and Figure 2).

Year	France								
	Blue antimora	Mackerel icefish	Unicorn icefish	Patagonian toothfish	Ridge scaled rattail	Rattails ^a	Marbled rockcod	Gray rockcod	Rays ^b
1970-1978	–	–	–	–	–	–	–	–	–
1979	–	75	–	9	–	–	65	247	–
1980	–	136	–	11	–	–	506	597	–
1981	–	952	–	9	–	–	984	574	–
1982	–	2328	–	14	–	–	645	326	–
1983	–	1832	–	15	–	–	143	312	–
1984	–	855	–	379	–	–	136	622	–
1985	–	1407	–	396	–	–	139	548	–
1986	–	1093	–	201	–	–	71	228	–
1987	–	158	–	207	–	–	28	93	–
1988	–	1292	–	118	–	–	16	104	–
1989	–	1295	–	152	–	–	24	163	–
1990	–	188	–	208	–	–	170	67	–
1991	–	8	–	1199	–	–	148	5	0
1992	–	7	–	1611	–	–	0	0	0
1993	–	6	–	1582	–	–	0	0	0
1994	–	6	–	2960	–	–	0	0	1
1995	–	42	1	4178	–	–	0	1	1
1996	–	45	1	3742	–	–	0	1	0
1997	–	3	2	3744	–	0	0	0	6
1998	–	0	3	3919	–	6	0	0	11
1999	–	0	1	3984	–	7	1	0	87
2000	–	0	0	5139	–	87	1	0	189
2001	–	–	–	5443	–	132	0	0	298
2002	–	–	–	4450	–	201	–	–	623
2003	–	–	–	4722	–	472	–	–	815
2004	–	–	–	5231	–	805	–	–	383
2005	7	–	–	5123	–	489	–	–	477
2006	21	–	–	5115	–	476	–	–	428
2007	15	–	–	5179	–	537	–	–	351
2008	35	–	–	5026	409	276	–	–	186
2009	58	–	–	5045	896	–	–	–	313
2010	23	–	–	2620	488	–	–	–	136
Totals	157	11,826	6	81,727	1,792	3,487	3,077	3,443	4,302

^a *Macrourus* spp.; ^b *Raja* spp. and unidentified Rajiformes, most probably *Bathyraja eatonii* and *Bathyraja irrasa* (Lord, 2005; Lord *et al.*, 2006).

Appendix Table A2: Kerguelen Islands, CCAMLR area 58.5.1, fisheries catch statistics (t) for the Ukrainian (i.e., former USSR and Russian Federation statistics) from 1970-2010 adjusted from fishing season to calendar year and estimates of illegal fishing during the period 1996-2003 (see text and Figure 2).

Year	Ukraine					Illegal Fisheries ^b
	Mackerel icefish	Patagonian toothfish	Marbled rockcod	Gray rockcod	Other finfish ^a	
1970	3	-	-	-	-	-
1971	8982	-	-	-	-	-
1972	17995	-	-	-	-	-
1973	9018	-	-	-	-	-
1974	410	-	-	-	-	-
1975	900	-	-	-	-	-
1976	6275	-	-	-	-	-
1977	25110	-	-	-	-	-
1978	24847	-	-	-	-	-
1979	6118	71	522	1978	-	-
1980	1485	90	4045	4772	-	-
1981	8019	74	7875	4595	-	-
1982	18622	113	5162	2607	-	-
1983	14657	123	1141	2493	-	-
1984	6841	3031	1088	4979	-	-
1985	11253	3170	1113	4388	-	-
1986	8747	1609	571	1824	-	-
1987	1261	1655	225	748	-	-
1988	10338	946	126	829	-	-
1989	11585	1212	172	777	13	-
1990	4494	1354	143	1397	13	-
1991	6699	3902	150	674	-	-
1992	6647	3772	144	51	5	-
1993	16	4096	1	0	12	-
1994	614	1530	1	0	7	-
1995	1926	1311	-	9	31	-
1996	1312	1279	-	8	31	1000
1997	-	1008	-	-	-	6913
1998	-	966	-	-	-	8275
1999	-	739	-	-	-	5163
2000	-	297	-	-	-	5410
2001	-	-	-	-	-	5760
2002	-	-	-	-	-	5213
2003	-	-	-	-	-	2063
2004	-	-	-	-	-	-
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-
2009	-	-	-	-	-	-
2010	-	-	-	-	-	-
Totals	214,171	32,345	22,478	28,567	111	39,795

^aOsteichthyes reported in the CCAMLR statistics, most probably including incidental bycatch of southern lantern shark (*Etmopterus granulosus*), porbeagle (*Lamna nasus*), Greenland shark (*Somniosus microcephalus*), moray cod (*Muraenolepis marmoratus*) and gray rockcod (*Notothenia squamifrons*) (see Lord *et al.*, 2006); ^bConsisting only of longlines targeting Patagonian toothfish; their bycatch consisting mainly of rays and rattails. Note that the blue antimora (*Antimora rostrata*), unicorn icefish (*Channichthys rhinoceratus*), ridge scaled rattail (*Macrourus carinatus*) and other rattail species and rays are also bycatch of the longline fishery which are sometimes legally reported.