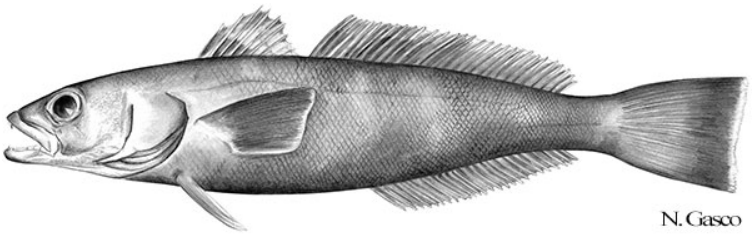
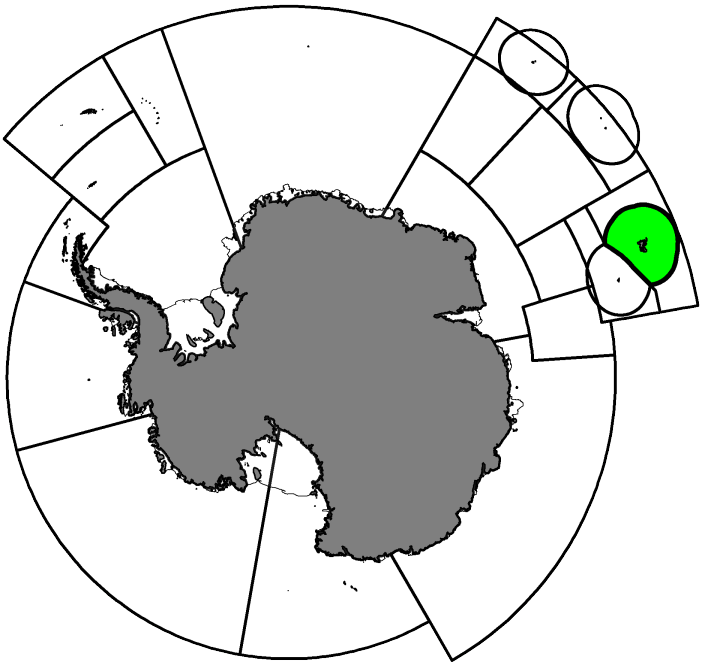
Fishery Report 2024: *Dissostichus eleginoides* at Kerguelen Islands French EEZ (Division 58.5.1)

CCAMLR Secretariat

14 April 2025



Patagonian Toothfish, *Dissostichus eleginoides* Smitt, 1898.



Map of the management areas within the CAMLR Convention Area. The region discussed in this report is shaded in green. Throughout this report, "2024" refers to the 2023/24 CCAMLR fishing season (from 1 December 2023 to 30 November 2024). Coastlines and ice shelves: UK Polar Data Centre/BAS and Natural Earth. Projection: EPSG 6932.

Contents

1. Introduction to the fishery

1.1. History

This report describes the licensed longline fishery for Patagonian toothfish (*Dissostichus eleginoides*) in the French Exclusive Economic Zone (EEZ) established in 1978 around the Kerguelen Islands in Division 58.5.1.

The fishery, targeting *D. eleginoides*, began as a trawl fishery in 1985 but targeting other species between 1979 and 1984 and caught small amounts of toothfish as by-catch. Trawling continued to 2001 and intermittently in 2006 and 2010; a longline fishery began in 1992 (Duhamel et al., 2011). The fishery is active throughout the year with the exception of a summer closure period (1 February to either 1 or 15 March) which has been in place since 2004.

Within the French EEZs, fishing seasons, catch limits for target species, as well as vessel licensing, are allocated by France. Since 2019, catch limits are set for a period of 3 years. The season extends from 1 September to 31 August. French management measures, annually established by TAAF, specific to the EEZ, have restricted the longline fishery to waters outside the 12 nautical mile zone and no shallower than 500m. Fishing is also prohibited within the strict protection areas of the Marine Reserve since 2006.

1.2. Conservation Measures currently in force

No new information was available on the state of fish stocks in Division 58.5.1 outside areas of national jurisdiction and thus the prohibition of directed fishing for *D. eleginoides*, described in Conservation Measure 32-13, shall remain in force.

Within the French EEZs, catch limits for target species, as well as vessel licensing, are allocated by France. A six-year management plan was adopted in July 2019 with the overall objective of ensuring conditions for a sustainable and optimal exploitation of Patagonian toothfish. It also sets catch limits for a period of 3 years. The 2020-2022 seasonal catch limit was set at 5200 tonnes, and the 2023-2025 seasonal catch limit was set at 5020 tonnes.

In the EEZ of Kerguelen, various national conservation and fisheries enforcement measures are applicable, such as:

- Annual catch limit set triennially since September 2019
- Demersal longlines and pots are the only authorized fishing gears
- Fishing season extends from 1 September to 31 August of the following year with an annual closure from 1 February to mid-March, which differs from the CCAMLR fishing season
- One vessel at a time fishing per 0.5° latitude x 1° longitude rectangle for a maximum period of 10 days
- Fishing is prohibited within the strict protection areas of the Marine Reserve which include areas not exceeding 500m in depth
- Move-on rule to limit catches of *D. eleginoides* of 60cm and less
- Cut-off procedure and move-on rules for skates to reduce fishing mortality
- Mitigation measures to reduce bird mortality
- Move-on rule on VME
- One French scientific observer on board each licensed vessel
- Mandatory vessel logbooks
- A single catch landings site at Réunion Island
- Mandatory port inspection

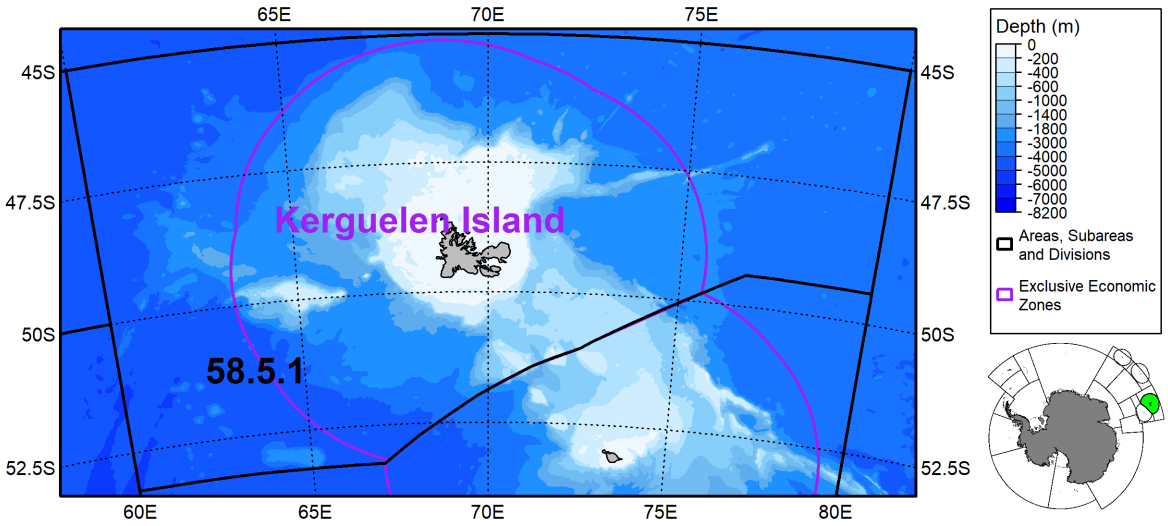


Figure 1: Map of the region discussed in this report. Coastlines and ice shelves: UK Polar Data Centre/BAS and Natural Earth. Bathymetry: GEBCO. Projection: EPSG 6932 (rotated).

1.3. Active vessels

In 2024, 9 vessels participated in this fishery.

2. Reported catch

Since the CCAMLR fishing season (1 December to 30 November of the following year, UTC time) and the TAAF fishing season (1 September to 31 August of the following year) do not match, data pooled at the annual scale and shown in this document may not match data reported by TAAF. This distinction is particularly relevant if readers wish to compare annual catch in the Convention Area to annual catch limits as set by TAAF.

2.1. Latest reports and limits

Reported catches of *Dissostichus eleginoides* are shown in Table 1. In this fishery, the catch of *D. eleginoides* reached a maximum of 9126 tonnes in 2000. In 2024, 4856 tonnes of *D. eleginoides* were caught.

Table 1. Catch and effort history for *Dissostichus eleginoides* in this fishery. Source: Fine scale data and past estimates for IUU catch (-: no fishing, or no IUU estimate available).

Season	Longline Catch (tonnes)	Trawl Catch (tonnes)	Pot Catch (tonnes)	Total Catch (tonnes)	Number of vessels	Estimated IUU catch (tonnes)
1992	-	1588	-	1588	1	-
1993	-	1570	-	1570	1	-
1994	-	4348	-	4348	1	-
1995	-	3997	-	3997	1	-
1996	-	3304	-	3304	1	833
1997	-	4011	-	4011	1	6094
1998	121	3525	-	3645	1	7156
1999	504	3617	-	4121	5	1237
2000	2999	6127	-	9126	8	2600
2001	2589	4348	-	6937	8	4550
2002	4075	346	-	4421	11	6300
2003	5452	-	-	5452	7	5518
2004	5099	0	-	5099	9	536
2005	5034	-	-	5034	7	268
2006	4698	254	-	4952	8	144
2007	5345	-	-	5345	7	451
2008	4859	-	-	4859	7	720
2009	5238	-	-	5238	8	0
2010	4915	235	-	5151	8	22
2011	5236	-	-	5236	7	-
2012	4904	-	-	4904	7	-
2013	5377	-	-	5377	7	-
2014	5326	-	-	5326	7	-
2015	4392	-	-	4392	8	-
2016	5553	-	-	5553	8	-
2017	5098	-	-	5098	9	-
2018	4878	-	-	4878	7	-
2019	5270	-	-	5270	7	-
2020	5157	-	-	5157	7	-
2021	5038	-	1	5039	7	-
2022	5196	-	0	5196	7	-
2023	5115	-	-	5115	9	-
2024	4856	-	-	4856	9	-

2.2. By-catch

Primary by-catch species from the longline fishery in the French EEZ in Division 58.5.1 are the macrourid *Macrourus carinatus*, rajid skates (*Bathyraja irrasa* and *B. eatonii*) and blue antimora (*Antimora rostrata*). The latter species is fully discarded, while the others are partly or totally retained. The spatial distribution of by-catch indicates specific areas of higher catch rates that differed between species (WG-FSA-10/34).

The catch histories for by-catch species are provided in Table 2.

Table 2. Reported catch for by-catch species (*Macrourus* spp., skates and *Antimora rostrata*) in this longline fishery. Source: fine-scale data.

Season	*Macrourus* spp.	Skates		*Antimora rostrata*
	Reported Catch (tonnes)	Reported Catch (tonnes)	Number Released	Reported Catch (tonnes)
1998	12	12	0	<1
1999	37	42	0	1
2000	162	120	0	1
2001	97	116	0	<1
2002	448	530	0	2
2003	772	929	0	10
2004	938	1133	0	12
2005	779	975	0	47
2006	686	596	0	54
2007	779	546	1954	56
2008	821	376	3593	68
2009	956	415	3432	45
2010	884	455	2	59
2011	861	438	535	52
2012	691	433	15878	26
2013	727	308	12423	67
2014	752	68	32808	72
2015	605	9	33641	69
2016	696	13	53270	56
2017	642	22	44273	49
2018	665	22	44225	38
2019	523	15	52044	43
2020	445	24	62187	60
2021	716	26	60386	94
2022	693	16	50380	88
2023	710	16	57074	90
2024	558	14	50127	76

No stock assessments of individual by-catch species are presently undertaken, but biomass of a part of the stocks is now available from the biomass surveys (POKER 2006, 2010, 2013, 2017; Duhamel *et al.*, 2019) and could help in the future. The Working Group on Fish Stock Assessment (WG-FSA) recommended that, where possible, areas with high by-catch rates should be avoided, particularly those shown in WG-FSA-09/43. The requirement for rajids to be 'cut-off' at the surface has been in force since 2014.

2.3. Vulnerable marine ecosystems (VMEs)

All Members are required to submit, within their general fisheries notifications requirements, information on the known and anticipated impacts of their gear on vulnerable marine ecosystems (VMEs), including benthic communities and benthos such as seamounts, hydrothermal vents and cold-water corals. All of the VMEs in CCAMLR's VME Registry are currently afforded protection through specific area closures.

In this fishery, fishery observers collect information about benthic taxa, including those considered as VME taxa.

As Conservation Measure 22-06 does not apply to this area, there are no VMEs or VME Risk Areas designated in Division 58.5.1.

2.4. Incidental mortality of seabirds and marine mammals

CCAMLR mitigation measures are applied in the French EEZ. A summary of the historic bird mortality by longline in the French EEZ in Division 58.5.1 is shown in Table 3. The most common species injured or killed in the fishery was white-chinned petrel (*Procellaria aequinoctialis*). Night-setting requirements have been highly effective in removing the previously high levels of albatross mortality.

Table 3. Number of reported birds caught (killed or with injuries likely to substantially reduce long-term survival) in this fishery in each fishing season.

Season	*Macronectes halli*	*Procellaria aequinoctialis*	*Procellaria cinerea*	Other
2007	3	57	10	1
2008	5	271	14	
2009	2	111	6	
2010	5	63	15	1
2011	9	49	8	1
2012		41	5	1
2013	6	18	2	
2014		4		2
2015	1	9	3	
2016		12	7	
2017		13	1	
2018		9		
2019		22		
2020		7		
2021		27	4	
2022		1		
2023	1	34	1	
2024		13	2	

The level of risk of incidental mortality of birds in Division 58.5.1 is category 5 (high) (SC-CAMLR-XXX, Annex 8, paragraph 8.1).

France applies the requirements of Conservation Measure 25-02 'Minimisation of the incidental mortality of seabirds in the course of longline fishing or longline fishing research in the Convention Area' to this fishery.

Additional measures are also 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 for vessels that have high by-catch rates,

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

(iv) data will continue to be collected and submitted using CCAMLR standard methods and forms,

(v) a demographic study on the white-chinned petrel will be undertaken at Kerguelen Islands, as well as the continued population counts of white-chinned petrels on the Kerguelen archipelago.

To date, most mammal IMAF incidents reported in this fishery involved Southern elephant seals (*Mirounga leonina*; Table 4).

Table 4. Number of reported mammals killed or with injuries likely to substantially reduce long-term survival in this fishery in each fishing season. *N.B.* Data prior to 2021 were collected but not reported (reporting of number started in September 2020).

Season	*Arctocephalus gazella*	*Mirounga leonina*
2022		4
2023		3
2024	1	4

3. Illegal, Unreported and Unregulated (IUU) fishing

Illegal, unreported and unregulated (IUU) fishing was first detected in this region in 1996 and in some years IUU catches have exceeded legal catches, resulting in total removals exceeding 10,000 tonnes in some seasons.

IUU fishing activity was detected in Division 58.5.1 (Kerguelen EEZ) during 2006, with one IUU-listed fishing vessel observed in the division. Two IUU-listed vessels were sighted during 2007 and three IUU-listed vessels were sighted during 2008. One IUU fishing vessel was observed on the boundary of the Kerguelen EEZ during winter 2007, and reports from France indicate that IUU activities sometimes occurred here during each year from 2008 to 2012. One IUU-listed fishing vessel was sighted in Division 58.5.1 during 2010, two during 2012 and one during the 2013. No IUU-listed vessels were observed during 2014, 2015 and 2016, however, IUU fishing gear was recovered from the region during all three years. Following the recognition of methodological issues in its assessment, no estimates of the IUU catch of *Dissostichus* spp. have been provided since 2011 (SC-CAMLR-XXIX, paragraph 6.5).

4. Data collection

4.1. Data collection requirements

The collection of biological data as part of the CCAMLR Scheme of International Scientific Observation (SISO) 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.

4.2. Summary of available data

Both the vessel's crew and observers collect fishing effort, catch, and by-catch information.

The vessel's crew report total catch of by-catch by coarse taxonomic groups given the taxonomic expertise required to discriminate similar species. Observers collect biological information on toothfish and by-catch specimens at a finer taxonomic resolution, and report toothfish length measurements to CCAMLR.

Summaries of data reported to CCAMLR for the past five years are given in Tables 5 and 6.

Table 5. Summary of by-catch and biological data reported by vessels crew and observers in each of the last five seasons in this longline fishery. By-catch records correspond to the number of observations of total weight and count of individuals for each taxon identified. Taxonomic identification may occur at different levels. *N.B.* Data prior to 2021 were collected but not reported (reporting of weight, sex, maturity, gonad weight and otolith samples started in September 2021).

Data source	Data class	Variable	2020	2021	2022	2023	2024
Vessel crew	by-catch	taxa identified	9	9	13	13	14
		records	8943	10271	9249	11460	10403
Observer	toothfish	specimens examined	119084	130880	136678	155609	158364
		length measurements	119084	130880	136629	155607	158340
		weight measurements	0	499	2604	1943	5322
		sex identifications	0	18886	96772	111366	98596
		maturity stage identifications	0	18886	96671	104395	97849
		gonad weight measurements	0	0	62	36	72
		otolith samples	0	514	2398	1847	702

Table 6. Summary of biological data for predominant by-catch groups reported by observers (from random subsets of lines) in each of the last five seasons. Taxonomic identification may occur at different levels. *N.B.* Data prior to 2021 were collected but not reported (reporting started in September 2021).

By-catch group	Variable	2020	2021	2022	2023	2024
Macrourus spp.	specimens examined	0	2218	7306	8537	8583
	taxa identified	0	1	3	2	1
	length measurements	0	2218	7296	8468	7903
	weight measurements**	0	24	221	81	70
	snout to anus measurements*	0	2135	5743	7362	8166
	sex identifications**	0	461	760	2679	3950
	maturity stage identifications**	0	79	469	1292	1527
	gonad weight measurements**	0	0	0	0	0
	otolith samples**	0	24	107	88	22
Skates and rays	specimens examined	0	934	2074	1273	1274
	taxa identified	0	2	2	3	4
	length measurements	0	934	2073	1267	1273
	weight measurements**	0	41	671	448	349
	wingspan measurements*	0	214	1016	1033	820
	pelvic length measurements*	0	0	489	162	342
	sex identifications**	0	933	1926	1269	1270
	maturity stage identifications**	0	197	1043	707	568
	gonad weight measurements**	0	0	0	0	0
Other fish	specimens examined	0	1249	2721	3731	3354
	taxa identified	0	3	5	10	10
	length measurements	0	1249	2696	3716	3345
	weight measurements**	0	37	128	177	150
	standard length measurements*	0	22	66	276	129
	sex identifications**	0	311	191	422	139
	maturity stage identifications**	0	52	57	258	11
	gonad weight measurements**	0	0	0	0	0
	otolith samples**	0	36	104	64	37

*: Species-dependent records

**: Voluntary records

The counts of by-catch taxa reported above (Table 6) correspond to specimens that have been individually sampled by observers. These are a subset of all the specimens counted by observers and are generally identified at a more precise taxonomic level. The figures below (Figs. 2 and 3) display the distribution of the most frequently examined by-catch taxa in time and space. It is important to note that observers sample a random subset of lines and do not individually examine all taxa; as such these figures are more representative of the distribution of biological observations than the catch of these taxa or their spatial distribution. At a coarse taxonomic level, the total catch of by-catch species groups is provided in section 2.2 above.

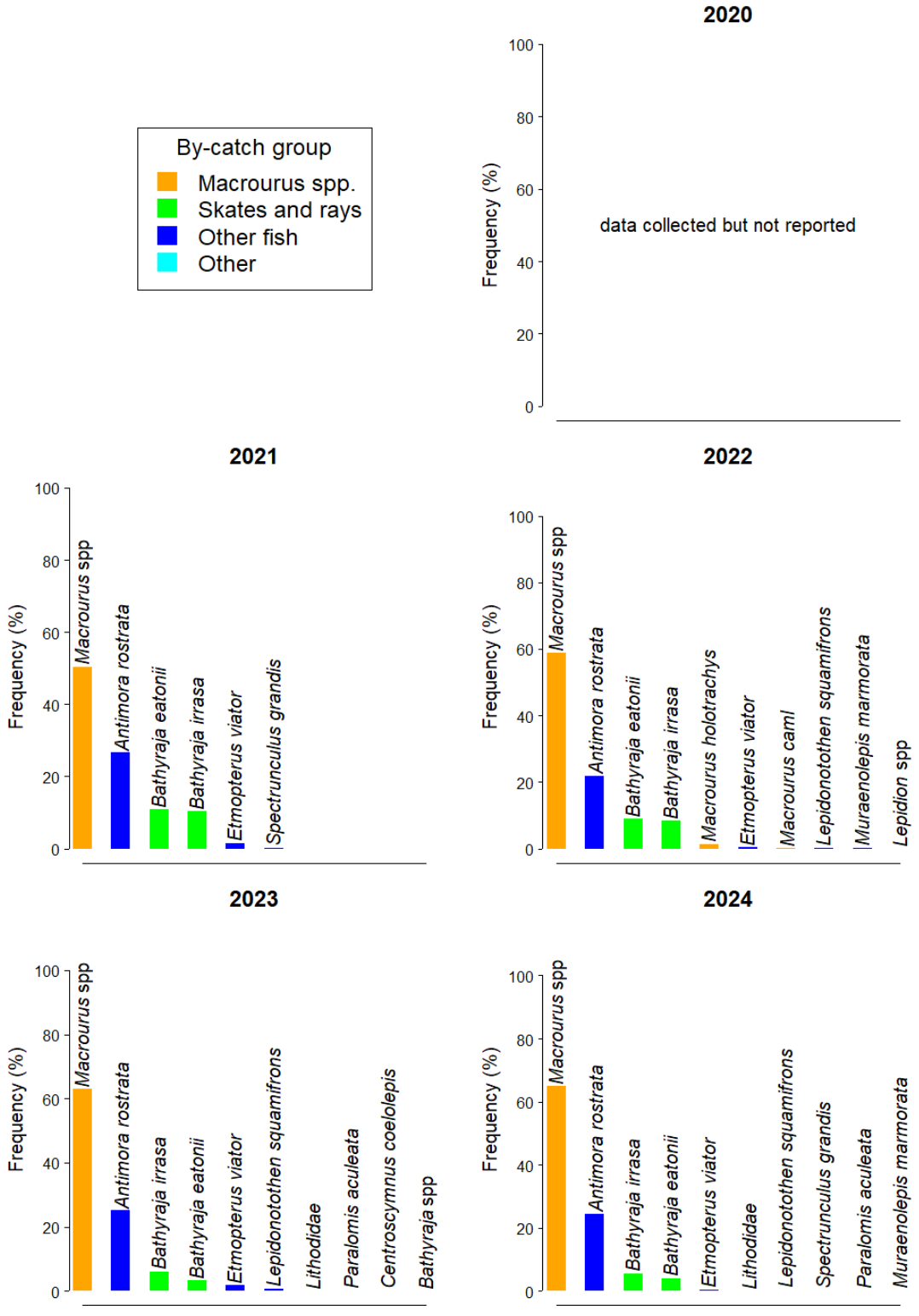


Figure 2. Relative frequencies of the most commonly examined by-catch taxa in each of the last five seasons, from the observer data (unweighted raw counts of individually examined specimens). Taxonomic identification may occur at different levels. *N.B.* Data prior to 2021 were collected but not reported (reporting started in September 2021).

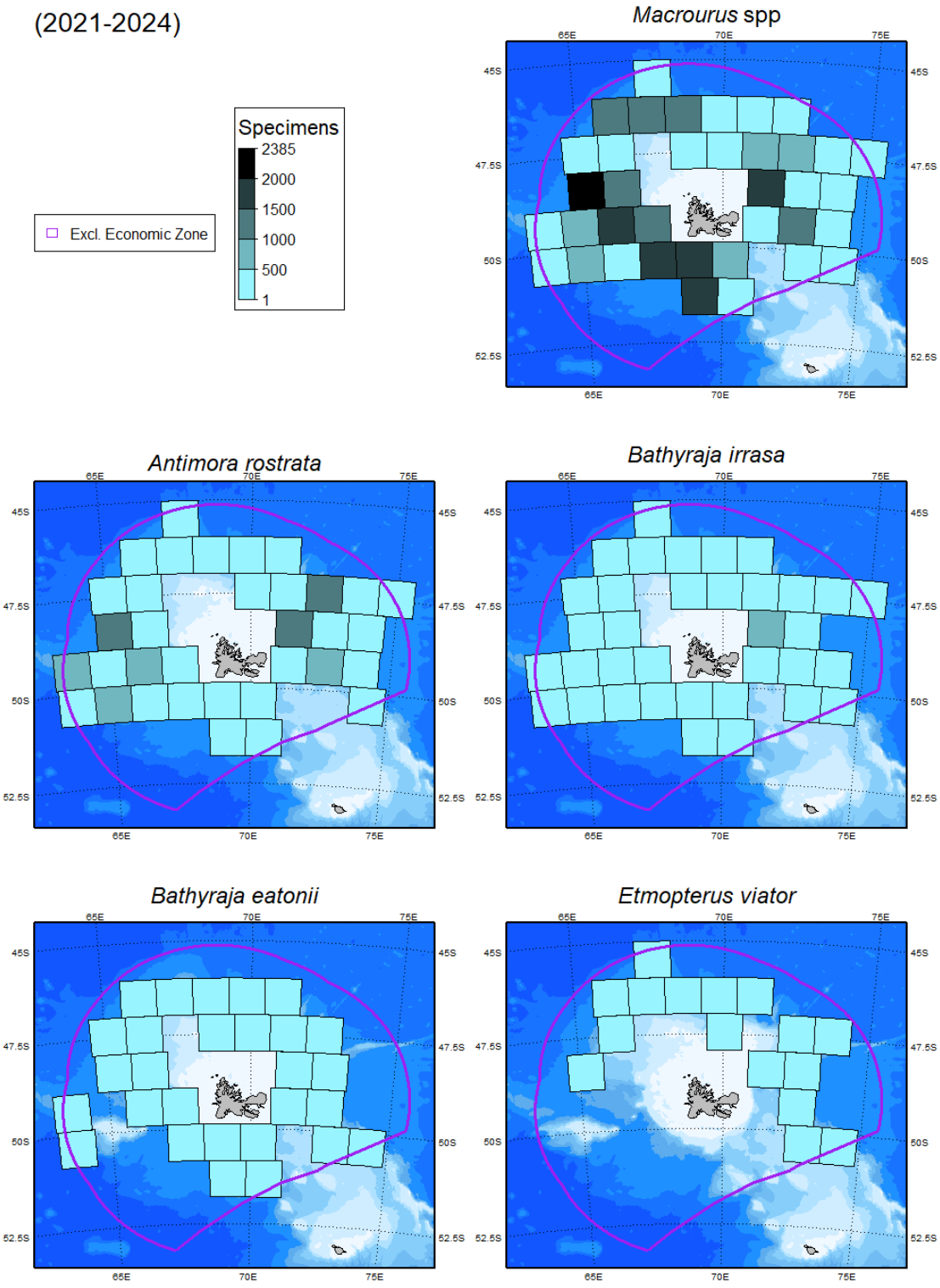


Figure 3. Spatial distribution of the most commonly examined by-catch taxa across the last five seasons, from the observer data (unweighted raw counts of individually examined specimens in each cell). The data were aggregated using equal area (100 km x 100 km) cells. Taxonomic identification may occur at different levels. Refer to Figure 1 for more details on the boundaries shown. Coastlines and ice shelves: UK Polar Data Centre/BAS and Natural Earth. Bathymetry: GEBCO. Projection: EPSG 6932 (rotated). *N.B.* Data prior to 2021 was collected but not reported (reporting started in September 2021).

4.3. Length frequency distributions

The recent length frequency distributions of *D. eleginoides* caught in this fishery are presented in Figure 4 (only commercial longline considered). The majority of *D. eleginoides* caught by longline range from 50 to 125cm in length, with a single strong mode for all seasons at approximately 70cm. These length frequency distributions are unweighted; 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 changes in the gear used, the number of vessels in the fishery and the spatial and temporal distributions of fishing.

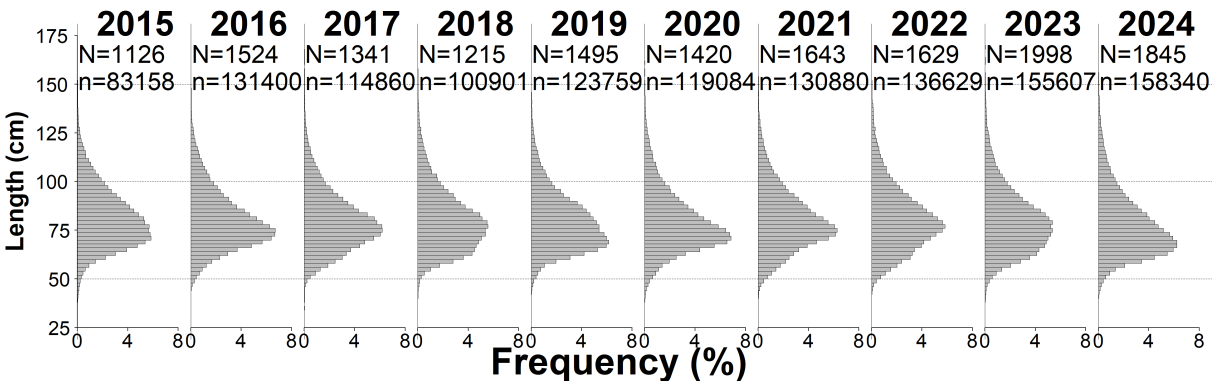


Figure 4. Annual length frequency distributions of *D. eleginoides* caught by longline in this fishery. The number of hauls from which fish were measured (N) and the number of fish measured (n) in each year are indicated. Note: length frequency distributions are only shown where more than 150 fish were measured.

4.4. Tagging

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.

To date in this area, 86936 *D. eleginoides* have been tagged and released (14514 have been recaptured, 14255 of which were released in this area; Table 7).

Table 7. Number of *Dissostichus eleginoides* tagged and recaptured in the area for each fishing Season.

		Recaptured																			
Season	Tagged	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
2006	636																				
2007	2258	12	58	62	52	37	26	16	11	12	7	6	3	3	1		1		2		**309**
2008	2479		18	87	77	52	46	36	16	12	6	7	9	4	5	2	1	2			**380**
2009	4367			42	116	118	107	93	48	26	23	19	13	4	8	4	3				**624**
2010	4880				27	122	132	121	79	45	49	33	21	12	15	9	6	8	1		**680**
2011	5378					42	243	236	154	107	98	54	46	40	17	18	14	18	1	1	**1089**
2012	4987						55	209	180	145	131	72	52	46	25	23	20	21	6	1	**986**
2013	5445							72	211	171	161	120	86	60	44	41	21	14	8	1	**1010**
2014	5400								44	181	203	135	100	87	50	45	42	21	11	3	**922**
2015	4503									60	194	197	112	95	69	57	36	23	9		**852**
2016	5631										80	199	265	186	121	92	58	43	28	3	**1075**
2017	5194											73	250	257	219	126	81	61	33	3	**1103**
2018	4760												43	301	256	159	104	80	50	5	**998**
2019	5399													85	339	231	183	147	92	16	**1093**
2020	5236														94	326	205	194	134	14	**967**
2021	5136															92	291	324	199	17	**923**
2022	4882																99	295	186	31	**611**
2023	5307																	134	290	48	**472**
2024	5058																		109	52	**161**
Total	**86936**																				**14255**

The tagging program undertaken by France in its EEZ in Division 58.5.1 has achieved a similar tag-recapture rate to the tagging program undertaken by Australia in Division 58.5.2, which indicates that tagged fish move mainly short distances, but some fish make longer forays around the slope, as well as long-distance movements outside the Division. Fish from the tagging program at Heard Island (Division 58.5.2) have also shown movement of sub adult/adult fish between zones (Heard to Kerguelen and also Crozet), but the proportion of exchange between stocks is relatively small (Williams et al., 2002; WG-FSA-07/48 Rev. 1).

5. Research

Four biomass survey cruises (named POKER 1, 2, 3 and 4) have been conducted in 2006 (Duhamel and Hautecoeur, 2009), 2010 and 2013 (see WG-FSA-14/07) and 2017 respectively to estimate biomass and recruitment of *D. eleginoides* on the whole shelf and surrounding banks (100-1,000m). Such surveys are planned to be conducted every 3 to 4 years.

Collaborative work between France and Australia on analyses of catch, effort and other data (survey, tagging) to be used to progress understanding of fish stocks and fishery dynamics for Divisions 58.5.1 and 58.5.2 is ongoing (see WG-SAM-11/20, WG-SAM-15/37).

In 2019, catch removals due to killer and sperm whale interactions across subantarctic fisheries were estimated (WG-FSA-2019/33). These estimates are routinely updated as part of the stock assessment (WG-FSA-2021/46).

In 2022, WG-FSA-2022/19 presented an analysis of skate handling practices and condition assessment methods in the longline toothfish fisheries operating in the southern Indian Ocean. Results provided clear guidelines for crew members operating on longline vessels to maximise the survival of released skates. WG-FSA-2022/20 presented a preliminary study on the use of the vertebrae centrum in the age determination of skates (*Amblyraja taaf* in Crozet, and, *Bathyraja eatonii* and *B. irrasa* in Kerguelen waters).

In 2023, WG-FSA-2023/11 presented results from an aging study using the centrum of 285 vertebrae for the three skate species caught as by-catch in the Kerguelen and Crozet Patagonian toothfish fisheries in Division 58.5.1 and Subarea 58.6. WG-FSA-2023/35 further presented length-at-maturity estimates for *B. eatonii* and *B. irrasa* in Kerguelen and *A. taaf* in Crozet. WG-FSA-2023/28 explored how different recruitment projections under potential regime shifts in Patagonian toothfish stocks might influence associated SSB calculations, and, an investigation into whether re-estimation of SSB0 according to stock productivity (dynamic SSB0) might impact historical, current and future stock status.

In 2024, WG-FSA-IMAF-2024 considered a large work program for integrated toothfish stock assessments, with a focus on the performance of the decision rules, the effects of spatial bias in tagging data, approaches to select recruitment data for stock status projections, and management strategy evaluations (WG-FSA-IMAF-2024, paragraphs 4.30–4.50). Papers summarising this work included WG-SAM-2024/17, WG-SAM-2024/22, WG-SAM-2024/23, WG-SAM-2024/24, WG-SAM-2024/25 and WG-FSA-IMAF-2024/47. The stock assessment for this fishery was updated a part of the stock assessment workplan (SC-CAMLR-43, paragraphs 3.7–3.8).

6. Stock status

6.1. Summary of current status

According to the 2024 assessment (WG-FSA-IMAF-2024/67), SSB0 is estimated at 188,460 tonnes (95% CI: 175,690–203,010 tonnes). The estimate of the current SSB status of the stock is 56.4% (95% CI: 54.2–60.2%).

6.2. Assessment method

The stock in this fishery was assessed using a fully integrated single-sex Casal2 model.

6.3. Year of last assessment, year of next assessment

Assessments are reviewed biennially during WG-FSA, the last assessment was in 2024.

7. Climate Change and environmental variability

In 2022, the Commission recognised that climate change is already having effects in the Convention Area (CCAMLR-41, paragraph 6.3) and agreed that it needed to act urgently to prepare for, and adapt to, the effects of climate change on the marine ecosystems within the Convention Area (CCAMLR-41, paragraph 6.5). The Commission noted (CCAMLR-41, paragraph 6.4) that the Scientific Committee had incorporated climate change into its advice (SC-CAMLR-41, paragraph 7.8) and through discussions at the SC-Symposium (SC-CAMLR-41, Annex 11) had also added climate change to the work plans and terms of reference of its Working Groups (SC-CAMLR-41, paragraph 7.14). The Commission adopted (CCAMLR-41, paragraph 6.28) Resolution 36/41.

In 2023, the Scientific Committee held a workshop on Climate Change (WS-CC-2023) which made recommendations regarding monitoring and management actions CCAMLR could progress to document and track the effects of climate change in the Convention Area. The recommendations were incorporated into the workplan of the Scientific Committee. Further, the Scientific Committee recommended that summaries of evidence for changes in stock assessment parameters or processes that could be due to the effects of environmental variability or climate change be developed for all fisheries (SC-CAMLR-42, paragraph 2.149).

In 2024, Members developed such summaries, in the form of tables, for fisheries in Subarea 48.3, Divisions 58.5.1 and 58.5.2 and in the Ross Sea region (Table 8).

Table 8. Table summarising evidence for changes in stock assessment and population parameters or processes that could be due to the effects of environmental variability or climate change in the Patagonian toothfish fishery in Division 58.5.1 (WG-FSA-IMAF-2024/63).

Parameter or process	Evidence for trends and potential drivers
Recruitment	The assessment model shows decreasing trends of recruitment since 2007 (Massiot-granier et al., 2024a). This trend could be a sign of a regime shift and a change of productivity. Further investigation is needed to confirm this hypothesis and assess the causes of this decrease (fishing; climate change; etc).
Age at maturity (2024 stock assessment values: a50 = 9.25; ato95 = 8.07)	Patterns of age at maturity from 2007 to 2023 show no evidence of trends over time (WG-FSA-IMAF-2024/63; Figure 3 and 4). However estimations of a50 for females and males separately indicate that females become mature long after the males. In the stock assessment models maturity is common to males and females. Therefore maturity parameters might change over time due to changes in sex ratio.
Stock-recruit relationship	Recruitment is assumed to follow a Beverton-Holt relationship whereby the stock recruitment (SR) is a function of the spawning stock biomass (SSB) the pre-exploitation equilibrium unfished spawning stock biomass (B0) and the parameter steepness h defined as h=SR(0,2B0) and SR=(SSB/B0) / (1-((5h-1)/4h)(1-SSB/B0)). Series of recruitment is too short to analyse potential changes of the stock-recruitment relationship due to climate change. Furthermore comparing recruitment estimates with a recruitment series obtained with surveys (fishery-independent) would help to investigate variations of the stock-recruitment relationship.
Natural mortality	Not known.
Growth rates (2024 stock assessment values: k = 0.0662; t0 = -1.12; Linf = 170)	Except for years 2013; 2014 and 2015 for which estimated values of t0 are lower there is no temporal trend of growth (WG-FSA-IMAF-2024/63; Figures 7 and 8).
Length-weight	Patterns of length-weight relationship show that females tend to have a higher condition (higher weight/length ratio) in the most recent years. This pattern may result from increased sampling of mature females during the reproductive period and will be investigated further. No evidence or variability over time of length-weight relationship is showed for the males (WG-FSA-IMAF-2024/63; Figure 11).
Sex ratio changes	Since 2016 inter-annual changes of sex-ratio can be observed with males-biased catches in the most recent years (2020-2022) Figure 12. However the proportion of males in the catch does not exceed 57% during the period 2007-2022 and 54.8% in the last three years.
Spatial distribution	Recent analysis of fishing effort data was conducted (Le Clech 2024; Masere et al. 2024). Further investigation is needed to assess if the spatial distribution itself has changed.
Stock structure	There is no evidence to suggest that the stock structure for Patagonian toothfish in Kerguelen has changed.
Locations of spawning and site fidelity	Ongoing work is conducted to assess spawning locations. Data are too poor to estimate a site fidelity among the years.
Depredation mortality	No significant trend has been observed, with the depredation rate fluctuating around 4.5%.

Additional Resources

- Fishery Summary: pdf, html
- Species Description: pdf, html
- Stock Annex: pdf
- Fisheries Documents Browser

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