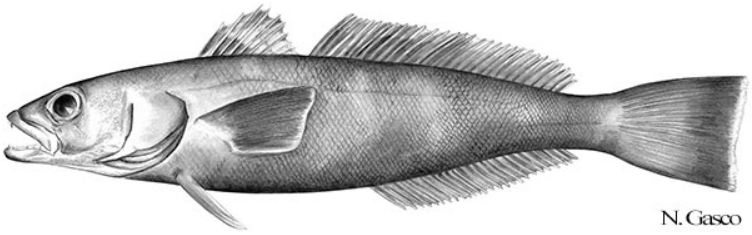
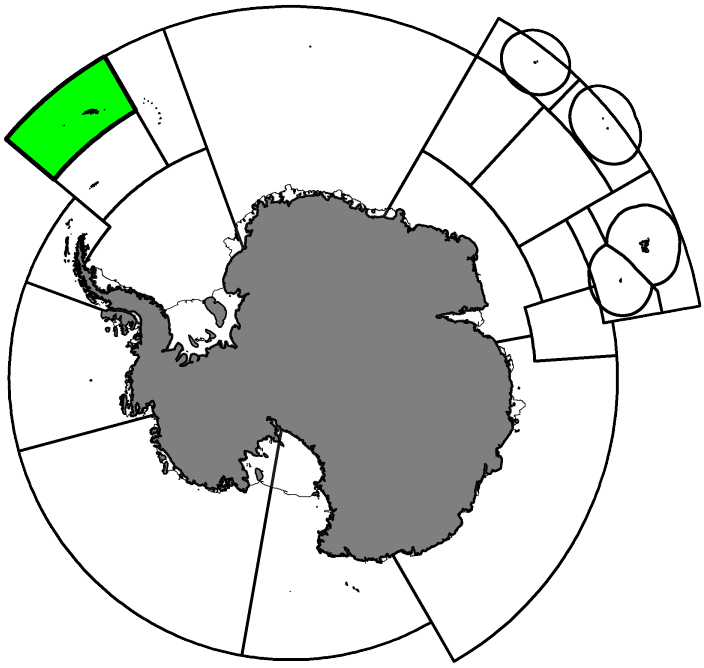
Fishery Report 2024: *Dissostichus eleginoides* in Subarea 48.3

CCAMLR Secretariat

28 April 2025



Patagonian Toothfish, *Dissostichus eleginoides* Smitt, 1898.



Map of the management areas within the CAMLR Convention Area. Subarea 48.3, 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

The fishery for Patagonian toothfish (*Dissostichus eleginoides*) in Subarea 48.3 began in the 1980s and expanded rapidly during the early 1990s, when considerable illegal, unreported and unregulated (IUU) catches were also taken (Table 1). The initial fishery also caused high rates of incidental bird mortality, with relatively large numbers of albatrosses and petrels attracted to the baited hooks and being caught and drowned. In response to these issues, CCAMLR introduced strict regulations designed to reduce bird by-catch. These regulations, including seasonal closures, streamer lines, line-weighting regimes and night setting requirements, greatly reduced bird by-catch in this fishery (Collins et al., 2021). The fishery uses demersal longlines in which lines of baited hooks are deployed on the sea floor at depths down to 2,250 m.

1.2. Conservation Measures currently in force

The limits on the fishery for *D. eleginoides* in Subarea 48.3 for the 2020 and 2021 seasons were defined in Conservation Measure 41-02.

Due to the lack of consensus on catch limits for this fishery in 2021 (CCAMLR-40, paragraphs 6.18–6.36) and subsequently (CCAMLR-41, paragraphs 4.23–4.38; CCAMLR-42, paragraphs 4.44–4.60, 4.75–4.77; CCAMLR-43, paragraphs 4.66–4.73), Conservation Measure 41-02 has not been in force since the 2021/22 fishing season.

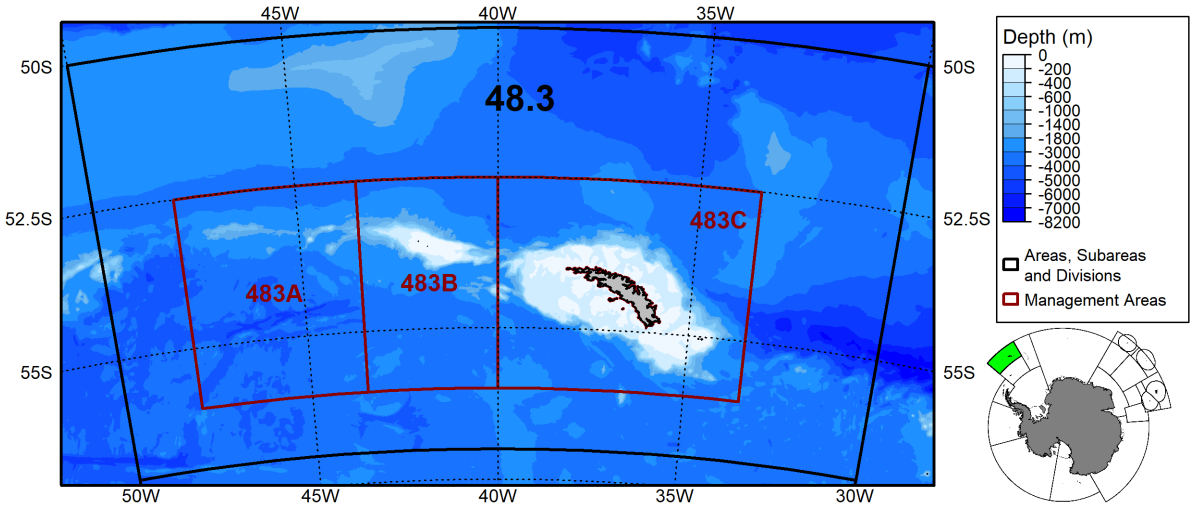


Figure 1: Location of the Management Areas in Subarea 48.3. Coastlines and ice shelves: UK Polar Data Centre/BAS and Natural Earth. Bathymetry: GEBCO. Projection: EPSG 6932 (rotated).

1.3. Active vessels

In 2024, 3 vessels fished for toothfish in Subarea 48.3. On 22 July 2024, the Fishing Vessel *Argos Georgia* sunk and thirteen lives were tragically lost at sea (SC-CAMLR-43, paragraph 1.4).

1.4. Timeline of spatial management

In 1998, the fishery was restricted to the winter months (1 May to 31 August) to minimise interactions with foraging birds during their breeding season. Since 2010, CCAMLR has applied a gradual expansion to the

season, accompanied by a number of seabird by-catch limits in those extension periods. Under Conservation Measure 41-02 (no longer in force) the season was restricted to the period from 16 April to 14 September.

In 2004, CCAMLR agreed to subdivide Subarea 48.3 into three Management Areas (A, B and C; Fig. 1) defined in Conservation Measure 41-02, Annex 41-02/A.

2. Reported catch

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 7493 tonnes in 2003. In 2024, 1435 tonnes of *D. eleginoides* were caught.

Table 1. Catch (tonnes) 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	Number of vessels	Catch limit (tonnes)	Catch	Estimated IUU catch (tonnes)
1980	1		64	-
1981	1		7	-
1982	-		-	-
1983	-		-	-
1984	1		3	-
1985	-		-	-
1986	1		7	-
1987	1		130	-
1988	3		537	-
1989	3		3580	-
1990	2		5023	-
1991	1		270	-
1992	19	3500	3975	3066
1993	19	3350	4028	4019
1994	4	1300	639	4780
1995	13	2800	3082	1674
1996	13	4000	3297	0
1997	10	5000	3724	0
1998	9	3300	2848	146
1999	12	3500	3660	667
2000	16	5310	5067	1015
2001	16	4500	3916	196
2002	17	5820	5448	3
2003	19	7810	7493	0
2004	16	4420	4460	0
2005	8	3050	3030	23
2006	10	3556	3545	0
2007	10	3554	3536	0
2008	11	3920	3862	0
2009	11	3920	3382	0
2010	9	3000	2518	0
2011	6	3000	1732	0
2012	6	2600	1836	0
2013	6	2600	2094	0
2014	6	2400	2180	0
2015	6	2400	2195	0
2016	6	2750	2196	0
2017	6	2750	2195	0
2018	6	2600	1950	0
2019	6	2600	2124	0
2020	5	2327	1884	0
2021	5	2327	1813	0
2022	4		1578	0
2023	3		1615	0
2024	3		1435	0

Catch and effort data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

2.2. By-catch

Annual catch limits for by-catch species groups were defined in Conservation Measures 41-02 and 33-01. If the by-catch of skates or macrourids exceeds 1 tonne in any one haul or set, then the fishing vessel must move at least 5 nautical miles away for a period of at least five days. Catches of by-catch species groups (*Macrourus* spp., skates and rays, and other species), their respective catch limits and number of skates released alive are summarised in Table 2.

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

Season	*Macrourus* spp.		Skates and rays			Other catch	
	Catch Limit (tonnes)	Reported Catch (tonnes)	Catch Limit (tonnes)	Reported Catch (tonnes)	Number Released	Catch Limit (tonnes)	Reported Catch (tonnes)
1985		0		4	0		<1
1986		<1		9	0		<1
1987		<1		3	0		152
1988		<1		<1	0		<1
1989		<1		11	0		<1
1990		<1		<1	0		<1
1991		1		4	0		<1
1992		<1		2	0		<1
1993		2		<1	0		<1
1994		<1		12	0		<1
1995		12		90	0		11
1996		32		54	0		<1
1997		33		43	0		4
1998		21		13	0		2
1999		21		19	0		<1
2000		18		12	0		5
2001		21		27	0		3
2002		50		25	0		12
2003		74		37	0		19
2004	221	30	221	6	0		4
2005	152	121	152	8	0		20
2006	177	136	177	7	21056		37
2007	177	129	177	4	9265		27
2008	196	161	196	12	19558		36
2009	196	110	196	22	23709		34
2010	150	70	150	7	15810		16
2011	150	74	150	4	12832		9
2012	130	54	130	2	13503		9
2013	130	59	130	2	14005		11
2014	120	61	120	3	12969		15
2015	120	56	120	2	10937		10
2016	138	64	138	2	14960		15
2017	138	54	138	3	12916		16
2018	130	107	130	4	21235		29
2019	130	107	130	3	23817		41
2020	116	87	116	3	23610		47
2021	116	97	116	3	26113		56
2022		75		2	22492		47
2023		69		<1	21258		43
2024		74		<1	23383		31

By-catch data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

A preliminary assessment of skate populations in Subarea 48.3 using a surplus production model implemented in a Bayesian framework was presented in 2007 (WG-SAM-07/11), at which time it was considered that there were insufficient data to inform the assessment. Nevertheless, these preliminary results suggested that the by-catch limit in Subarea 48.3 for rajids were sustainable.

A skate tagging program has been under way since 2006 in Subarea 48.3 and a preliminary assessment of skates in Subarea 48.3 using tagging data was presented in 2014 (WG-FSA-14/48). This assessment indicated a stable biomass. Using the same skate tagging programme, a stock status and population assessment of the Antarctic starry skate (*Amblyraja georgiana*) in Subarea 48.3 was presented in 2018 (WG-FSA-18/27). These results indicated that the longline fishery for toothfish does not appear to have resulted in a decline in the population of *A. georgiana* and at present has low by-catch rates of exploitation.

Recent genetic analysis of skates (*Amblyraja* spp.) (WG-FSA-18/73) suggests that skates caught as by-catch from CCAMLR subareas 48.3 and 48.4 that were identified as *A. georgiana*, *A. georgiana* sp. anon and *A. taaf* do not represent distinct, reproductively isolated species. Rather, these different morphological forms of *Amblyraja* appear to be interbreeding members from two geographically differentiated stocks, one occurring around the main island of Subarea 48.3 and the other around the islands of Subarea 48.4.

2.3. Vulnerable marine ecosystems (VMEs)

As Conservation Measure 22-06 does not apply to this Subarea there are no CCAMLR VMEs or VME Risk Areas designated in Subarea 48.3. There are fishery-specific restrictions in place to mitigate the impact of the fishery on VMEs, including benthic communities, such as seamount communities, and benthos such as cold water corals.

2.4. Incidental mortality of seabirds and marine mammals

A summary of seabird mortality in the longline fishery in Subarea 48.3 in recent years is shown in Table 3. The three most common species injured or killed in the fishery since 2005 were southern giant petrel (*Macronectes giganteus*), white-chinned petrel (*Procellaria aequinoctialis*) and black-browed albatross (*Thalassarche melanophris*).

The requirements of Conservation Measure 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 in addition to the seasonal closure and the night-setting requirements that were defined in Conservation Measure 41-02.

The risk level in this fishery in Subarea 48.3 is category 5 (high) (SC-CAMLR-XXX, Annex 8, paragraph 8.1).

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 giganteus*	*Procellaria aequinoctialis*	*Thalassarche melanophris*	Other
1992				4
1995	122	597	39	176
1996	5	102	297	291
1997	13	198	253	122
1998		37	8	6
1999	1	42	62	5
2000	1		1	
2001				1
2003		2	1	1
2004				1
2005				1
2009			1	1
2010				2
2011		1		
2012	1		1	
2013		1		1
2014		77		
2015		1		
2016		30		
2017		19		1
2018	1	22	1	1
2019	1			
2020		1		

A summary of mammal mortalities associated with longline fishing in Subarea 48.3 is given in Table 4.

Table 4. Number of reported mammals killed in this fishery in each fishing season.

Season	*Arctocephalus gazella*	*Hydrurga leptonyx*	*Leptonychotes weddellii*	*Mirounga leonina*	Otariidae, Phocidae	*Physeter macrocephalus*
1995				1		
1996		1	1			
1997					3	
1998					1	
2004					1	
2007				2		
2009	1				1	
2012						1
2014				1		

3. Illegal, Unreported and Unregulated (IUU) fishing

On 8 June 2019, sightings of the vessel Nika were reported in Subarea 48.3. There has been no other reported evidence of IUU fishing activities in Subarea 48.3 since 2006 (Table 1).

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 non-VME by-catch (mostly fishes) 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, as well as data on individual specimens such as size and maturity.

Conservation Measures 22-06 and 22-07 do not apply to this fishery.

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. By-catch records correspond to the number of observations of total weight and count of individuals for each taxon identified. Observers may take further biological measurements on toothfish and by-catch taxa. Taxonomic identification may occur at different levels.

Data source	Data class	Variable	2020	2021	2022	2023	2024
Vessel crew	by-catch	taxa identified	8	11	7	5	9
		records	4215	4070	3384	3563	3170
Observer	toothfish	specimens examined	31022	32516	20057	20651	22238
		length measurements	30984	32492	20023	20651	22233
		weight measurements	13245	14846	16204	20642	14864
		sex identifications	14442	14778	16258	8477	7971
		maturity stage identifications	10354	14764	16100	8469	7965
		gonad weight measurements	10240	9709	14398	5951	7402
		otolith samples	3210	3677	2871	1332	2673
	by-catch	specimens examined	6067	8011	4729	4247	4513
		taxa identified	12	11	9	10	10
		length measurements	3783	8010	4714	4246	4490
		weight measurements**	6057	7998	4676	4247	4426
		standard length measurements*	688	827	16	551	853
		wingspan measurements*	300	348	200	31	93
		pelvic length measurements*	300	348	200	31	91
		snout to anus measurements*	3725	5237	2759	2837	3211
		sex identifications**	4379	6306	3087	2954	4476
		maturity stage identifications**	3477	6273	3078	2932	4349
		gonad weight measurements**	41	3214	800	1015	3803
		otolith samples**	677	195	0	11	390

*: Species-dependent records
**: Voluntary records
By-catch and biological data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

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.

By-catch group	Variable	2020	2021	2022	2023	2024
Macrourus spp.	specimens examined	3725	5238	2784	2837	3216
	taxa identified	4	5	4	5	4
	length measurements	1443	5238	2784	2837	3206
	weight measurements**	3725	5230	2777	2837	3203
	snout to anus measurements*	3725	5235	2758	2837	3210
	sex identifications**	2806	5088	2043	2766	3192
	maturity stage identifications**	2164	5081	2026	2745	3156
	gonad weight measurements**	0	2409	505	858	3019
	otolith samples**	533	194	0	11	390
Skates and rays	specimens examined	301	348	201	31	104
	taxa identified	2	2	4	2	2
	length measurements	300	348	186	31	92
	weight measurements**	296	345	155	31	36
	wingspan measurements*	300	348	200	31	93
	pelvic length measurements*	300	348	200	31	91
	sex identifications**	300	347	185	30	101
	maturity stage identifications**	298	326	196	29	88
	gonad weight measurements**	41	1	0	0	0
Other fish	specimens examined	2040	2425	1744	1379	1193
	taxa identified	5	4	1	3	4
	length measurements	2039	2424	1744	1378	1192
	weight measurements**	2035	2423	1744	1379	1187
	standard length measurements*	688	827	1	547	853
	sex identifications**	1272	871	859	158	1183
	maturity stage identifications**	1015	866	856	158	1105
	gonad weight measurements**	0	804	295	157	784
	otolith samples**	144	0	0	0	0

*: Species-dependent records

**: Voluntary records

By-catch biological data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

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.

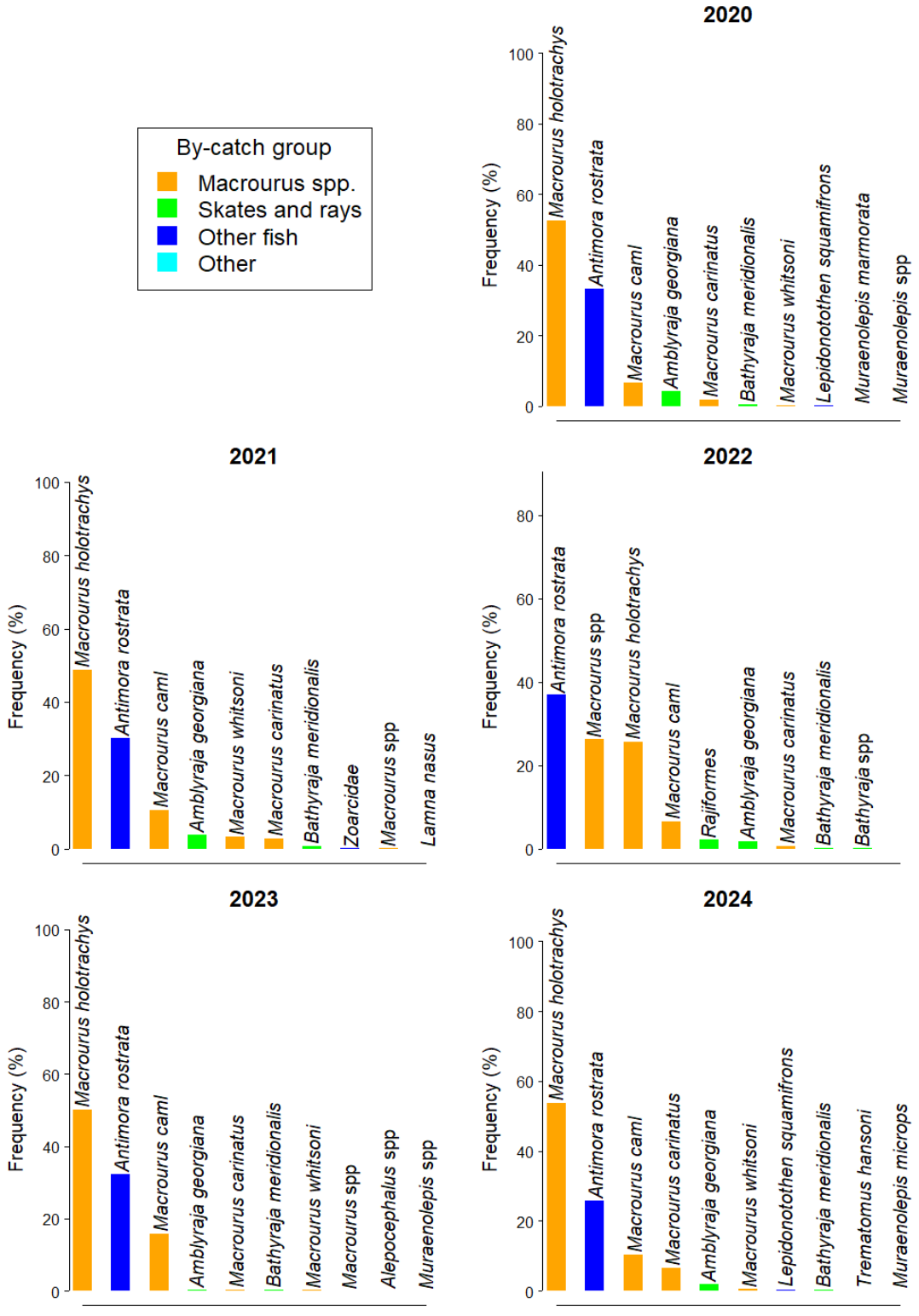


Figure 2. Relative frequencies of the most commonly examined by-catch taxa in each of the last five seasons, from the observer data (unweighted raw counts of individually examined specimens). Taxonomic identification may occur at different levels. By-catch data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

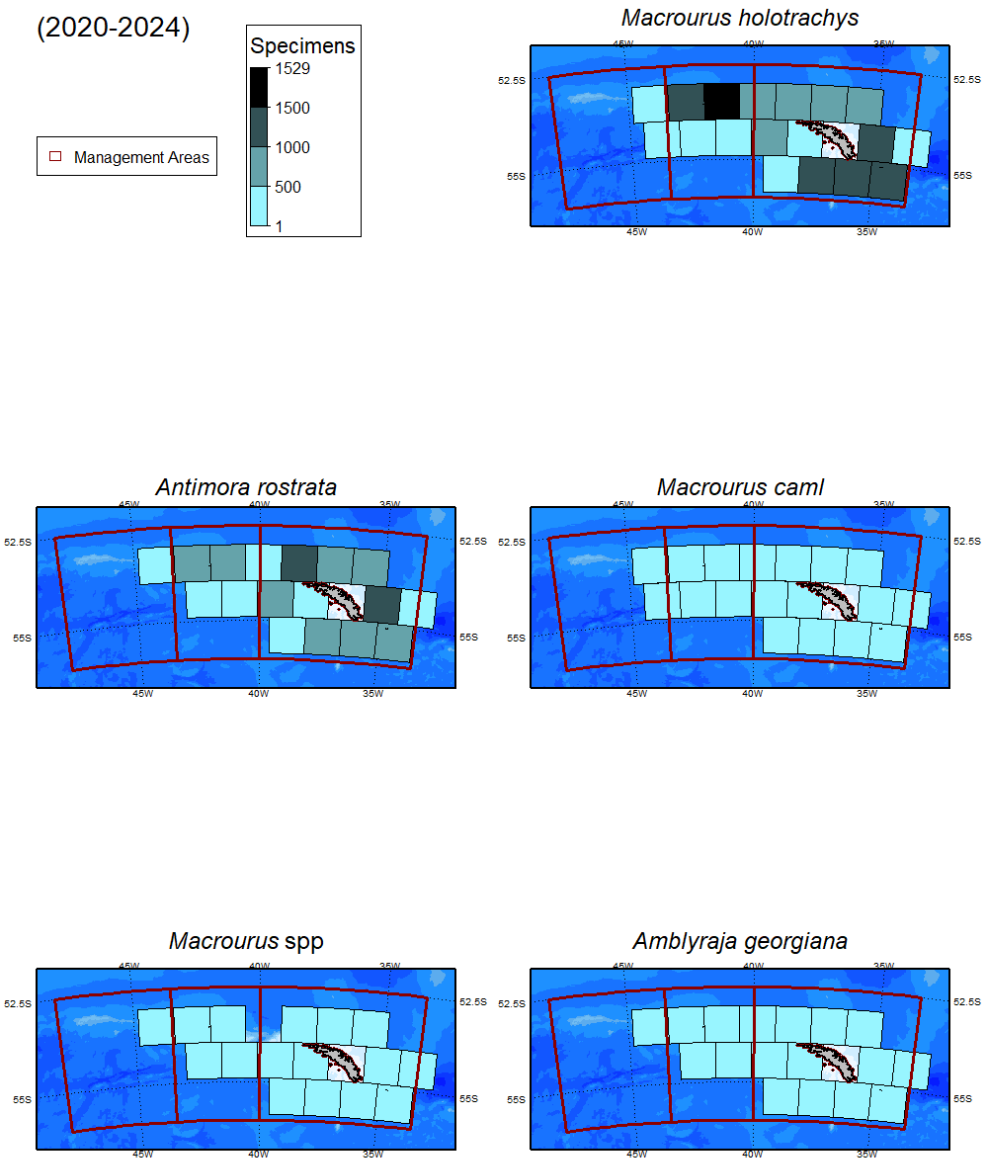


Figure 3. Spatial distribution of the most commonly examined by-catch taxa across the last five seasons, from the observer data (unweighted raw counts of individually examined specimens in each cell). The data were aggregated using equal area (100 km x 100 km) cells. Taxonomic identification may occur 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). By-catch data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

4.3. Length frequency distributions

Recent length frequency distributions for catches of *D. eleginoides* in Subarea 48.3 are shown in Figure 4. 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 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 distributions of fishing. A clear bimodal distribution is observed in 2024 with recruits of around 60cm in length that were first detected in 2023.

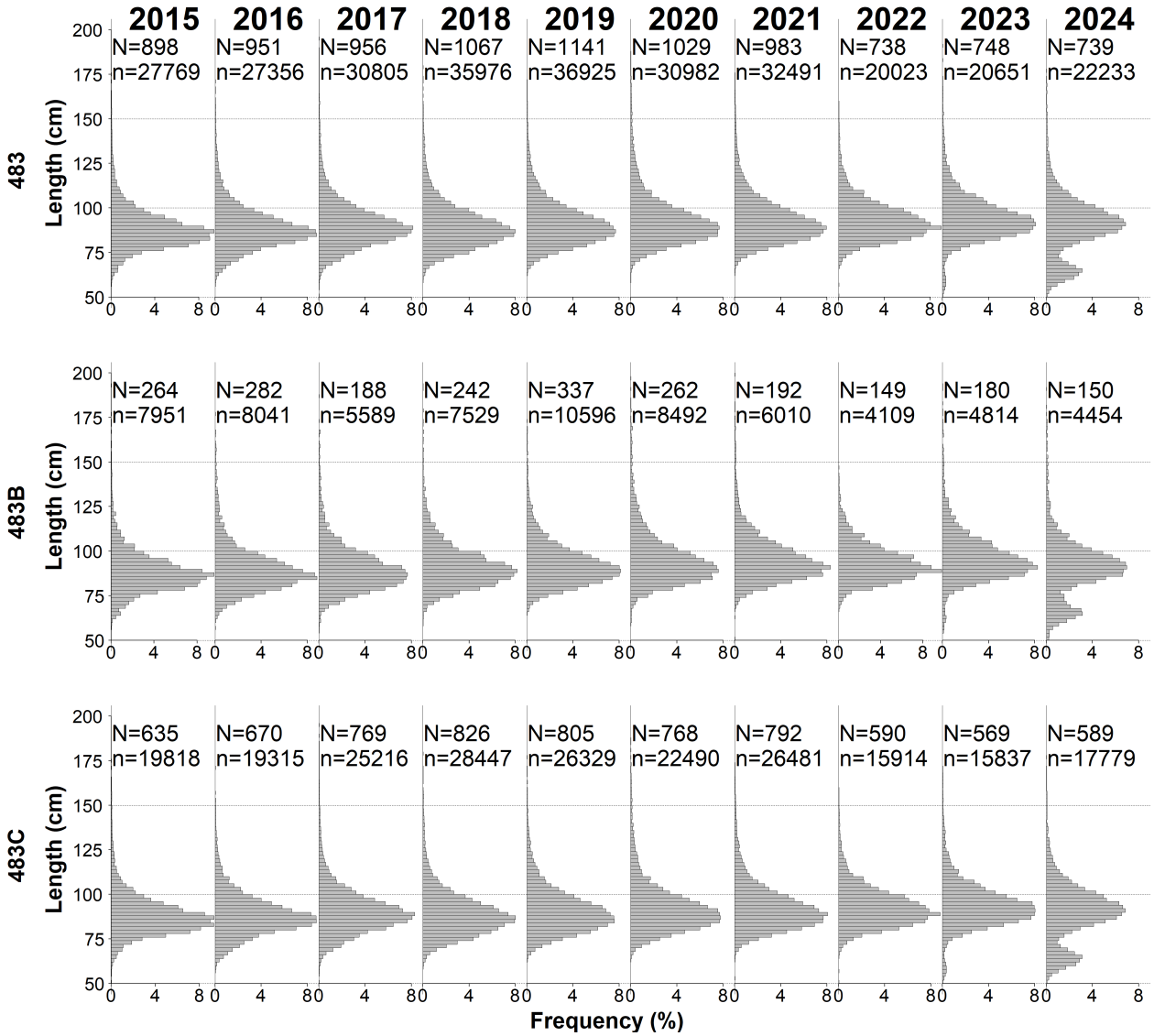


Figure 4. Annual length frequency distributions of *D. eleginoides* caught in Subarea 48.3. The number of hauls from which fish were measured (N) and the number of fish measured (n) in each year are indicated. Letters to the left of the panel (B and C) refer to the management areas shown in Figure 1. Length data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

4.4. Tagging

Tagging of *D. eleginoides* is conducted at a rate of 1.3 fish per tonne in this fishery; a total of 73463 *D. eleginoides* have been tagged and released and 14359 have been recaptured, 13460 were identified as released in the area (Table 7).

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

		Recaptured																					
Season	Tagged	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
2004	3218	19	70	82	66	64	45	35	25	16	4	16	9	9	6	6	2	3	1		2	1	**481**
2005	3949		23	194	155	148	121	86	45	24	39	26	17	19	25	11	10	5	7	7	5	2	**969**
2006	4889			31	223	194	144	132	71	51	52	43	20	13	22	16	12	12	6	8	12	6	**1068**
2007	4782				41	238	170	139	82	64	56	50	36	21	30	17	16	14	15	16	10	9	**1024**
2008	4632					61	230	150	107	81	79	69	48	49	43	35	38	14	16	16	10	5	**1051**
2009	3506						19	138	71	67	66	60	52	32	40	22	29	16	21	9	14	4	**660**
2010	2966							12	72	62	48	55	39	40	32	19	17	17	13	10	7	8	**451**
2011	2909								18	98	89	81	64	59	48	32	42	25	32	24	22	9	**643**
2012	3027									19	118	98	79	72	53	37	33	36	19	17	21	13	**615**
2013	3356										17	126	89	93	90	53	63	37	32	19	19	13	**651**
2014	3563											34	126	129	106	72	70	48	39	29	25	17	**695**
2015	3718												15	170	143	98	119	83	69	39	44	28	**808**
2016	3515													35	193	111	107	110	80	60	51	22	**769**
2017	3486														41	173	146	130	85	71	67	34	**747**
2018	3381															27	154	119	98	80	61	50	**589**
2019	3328																28	190	158	121	108	78	**683**
2020	2915																	43	186	114	104	74	**521**
2021	2862																		27	177	149	96	**449**
2022	2749																			37	162	106	**305**
2023	3777																				38	216	**254**
2024	2935																					27	**27**
Total	**73463**																						**13460**

Tagging data from fishing for *Dissostichus eleginoides* in Subarea 48.3 for 2022, 2023 and 2024 were received by the Secretariat. Said fishing was carried out in the absence of a CCAMLR Conservation Measure for 48.3, since CM 41-02 was not readopted for the 2021/22, 2022/23 and 2023/24 fishing seasons.

5. Research

All toothfish vessels in Subarea 48.3 carry a SISO observer who collects data on toothfish and common by-catch, including conversion factors, length frequencies, weights and maturity. Toothfish otoliths are collected by observers for an ageing program that provides length-at-age data for stock assessments. Observers also record whale occurrence at the vessel during hauling; data which are then used to model depredation rates which are included in the stock assessment. Observers work with vessels to tag toothfish and skates and collate recapture data.

Dissostichus eleginoides in Subarea 48.3 are genetically distinct from those found on the Patagonian shelf (FAO Area 41). The stock, occurring within Management Areas A, B and C, is genetically separate from fish taken in the extreme north and west of Subarea 48.3 and the assessments consider only the stock within Management Areas A, B and C (see Stock Assessment Report).

In January-February 2019, the UK undertook a random stratified groundfish survey of the islands in Subarea 48.3 (WG-FSA-2019/20). The survey used the same trawl gear and survey design as previous UK surveys in Subarea 48.3 (WG-FSA-15/26, WG-FSA-17/44). The 2019 survey covered the whole shelf area, covering depths of 100-350m. The primary aim of the survey was to estimate stocks of mackerel icefish (*Champsocephalus gunnari*) but juvenile *D. eleginoides* were also captured. Numbers and lengths of *D. eleginoides* provide an index of recruitment for stock assessments. *Dissostichus eleginoides* were caught in 28 of the 73 hauls in the 2019 survey and were, as in previous surveys, present in greatest numbers around the eastern and western ends of the Management Area 483B shelf. Toothfish ranged in length from 18 to 117 cm, with evidence of a 1+ cohort with a mode at 18-26 cm.

In May 2021, the UK undertook a groundfish survey of CCAMLR Subarea 48.3 on the *FV Robin M Lee* (WG-FSA-2021/12). Seventy-seven random trawls were completed covering depths of 105 to 354 m, including 20 in Management Area 483B, 27 in the NW, 14 in the SW, 6 in the SE and 10 in the NE. The primary aim of the survey was to estimate stocks of mackerel icefish (*Champsocephalus gunnari*) but almost 500kg of juvenile *D. eleginoides* were also captured. Catches were dominated by fish of 40-50 cm in length, but some smaller fish were also caught.

In 2022, several research papers were submitted to CCAMLR Working Groups providing information on the status of this fishery, its stock and its ecosystem, to address the issues that led to the absence of CM 41-02 for the 2022 fishing season. These included:

- Estimates of tag loss rates for Patagonian toothfish (*Dissostichus eleginoides*) in Subarea 48.3 tagged between 2004 to 2020 (WG-SAM-2022/17).
- The utility of surface plots in the development of the CCAMLR Decision Rule, its interpretation, and the rationalisation of current management and fishery metrics (WG-SAM-2022/18).
- A comparison of fishing mortality estimates derived using data-rich and data-limited approaches (WG-SAM-2022/23).
- A comparison of estimates of Patagonian toothfish (*Dissostichus eleginoides*) maturity and growth in Subarea 48.3 using different otolith selection procedures (WG-SAM-2022/24).
- Fishery characterisation for Patagonian toothfish around the main island in Subarea 48.3 (WG-FSA-2022/56 Rev. 1).
- Maturity and growth estimates of Patagonian toothfish in Subarea 48.3 between 2009 to 2021 (WG-FSA-2022/59).
- Whale depredation in the Subarea 48.3 Patagonian toothfish (*Dissostichus eleginoides*) fishery in the South Atlantic: a comparison of estimation methods (WG-FSA-2022/P05).

In 2023, Additional work comparing growth estimation methods (WG-SAM-2023/15) along with papers characterising the fishery (WG-FSA-2023/31), and supporting an updated stock assessment in CASAL and in Casal2 were submitted ([WG-FSA-2023/45 Rev 1], WG-FSA-2023/16).

Also in 2023, both the UK and Argentina conducted groundfish surveys in Subarea 48.3.

In WG-FSA-2023/44 and WG-FSA-2023/46, Argentina presented results from a survey conducted on the *BIPO Víctor Angelescu* between 27 February and 3 April. The papers covered a range of research undertaken in the survey, including oceanography, acoustic and zooplankton sampling, biogeochemistry, and fish sampling. WG-FSA-2023/61 presented analyses of reproductive potential of three icefish species (*C. gunnari*, *Pseudochaenichthys georgianus*, *Chaenocephalus aceratus*) and *Notothenia rossii* sampled during the survey, with results that were generally consistent with those of a previous Argentinian survey in this Subarea undertaken in 2013 (WG-FSA-13/59).

In WG-FSA-2023/45 Rev. 1, the UK presented results for a survey conducted on the *FV Robin M Lee* between the 1st and 10th of February 2023. Catches of juvenile toothfish (*Dissostichus eleginoides*) were the highest since 2011, with almost 1,340 kg caught in total. During the first two days of the survey, two Antarctic toothfish (*Dissostichus mawsoni*) were caught, representing the first time this species has been found in the history of the surveys (since 1988/89).

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). Specific to Subarea 48.3, WG-FSA-IMAF-2024/28 presented an update of the analysis of spatial changes in the Subarea 48.3 toothfish fishery, and, WG-FSA-IMAF-2024/29 and WG-FSA-IMAF-2024/30 presented the updated assessment and investigated methods to include Chapman abundance indicators, and various future recruitment scenarios (WG-FSA-IMAF-2024, paragraphs 4.51–4.63).

6. Stock status

6.1. Summary of current status

Assessment of the Patagonian toothfish (*D. eleginoides*) in Subarea 48.3 indicates that the current status of the stock is at 49% of B0 (see Stock Assessment Report).

6.2. Assessment method

The stock of *D. eleginoides* in Subarea 48.3 was assessed using a Bayesian age-structured statistical catch-at-age Casal2 integrated stock assessment model (see Stock Assessment Report).

6.3. Year of last assessment, year of next assessment

Assessments are reviewed biennially, 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).

WG-FSA-IMAF-2024/15 presented initial findings from a research project evaluating climate change risks to toothfish in Subarea 48.3. Initial findings indicate that over the 1986–2023 period, Sea Surface Temperatures (SSTs) have increased in Management Areas 483B and 483C, and that the long-term mean SST threshold of 1.8°C, which divides areas of high and low Patagonian toothfish abundance, aligns with the geographic division between the Management Areas 483B and 483C shelves.

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 Subarea 48.3 (WG-FSA-IMAF-2024/29).

Parameter or process		Evidence for trends and potential drivers
Recruitment	Mean recruitment	Results from the groundfish surveys indicate a negative relationship between juvenile toothfish density and summer maximum SST prior to spawning (Belchier and Collins, 2008). Survey data (e.g. Hollyman et al. 2023) suggest that a lower period of recruitment observed during the 2006-2019 surveys may now be coming to an end. Proportion of small (< 90 cm TL) individuals has remained relatively constant from 1997-2021 (Abreu et al. 2024).
	Recruitment variability	No information at present, however, the depletion rule (risk of falling below 20% of B0) is not a constraint in this assessment. Earl et al. (2024) explored estimating autocorrelation in recruitment estimates.
Age at maturity		Evidence of increased age at maturity with time from 2009-2021 in females, but not in males (Marsh et al. 2022). Changes cannot be attributed to climate change or environmental variability at present. Size at maturity has remained stable over the last 25 years (Abreu et al. 2024).
Stock-recruit relationship		No information at present.
Natural mortality	From direct predation	No information at present.
	Not from direct predation	No information at present.
Growth rates		Work is ongoing to evaluate changes in growth rate breakpoints with time and bottom temperature. Macleod et al. (2019) and Marsh et al. (2022) showed variability in estimates of growth rate, but no overall trend.
Length-weight		No trends in length-weight relationships (Macleod et al. 2019; Marsh et al. 2022).
Sex ratio changes		Increase in proportion of females over time likely an artefact of increased fishing depth and not related to climate change (Marsh and Earl, 2023; Abreu et al. 2024).
Spatial distribution		Preliminary analysis suggests most dissimilarity in spatial distribution of individuals caught is driven by changes in fishery distribution.
Stock structure		TOP at Subarea 48.3 are considered an isolated population, with little connectivity to other subareas (Soffker et al. 2022; Earl et al. 2023). There is currently no evidence of changing stock structure due to climate change or environmental variability.
Locations		Biennial groundfish surveys consistently catch the most TOP (largely juveniles) around Shag Rocks (Gregory et al. 2019; Collins et al. 2021 and Hollyman et al. 2023). Spawning hotspot analysis indicates any apparent changes in spawning location are likely driven by changes in fishery distribution rather than being true signals (Bamford et al. 2024).
Depredation mortality		Orca and sperm whale presence is recorded and used as a factor in the CPUE standardisation. Estimated orca depredation is included as additional catch in the assessment and projection. Estimated depredation has decreased overall since 2000 (Earl et al. 2024, Table 2), though it is unclear if this is related to climate change or environmental variability.

Additional Resources

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