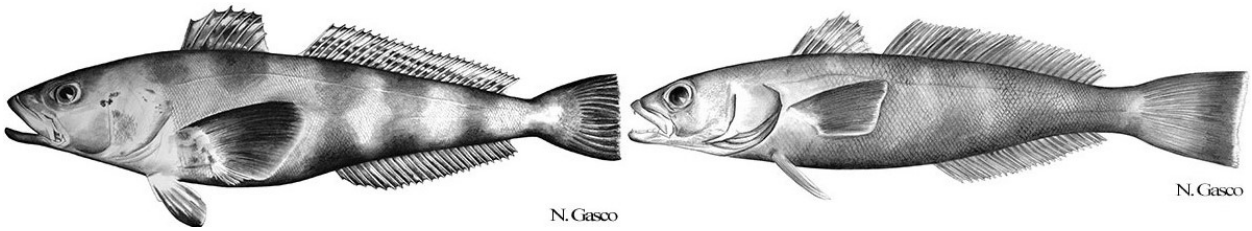
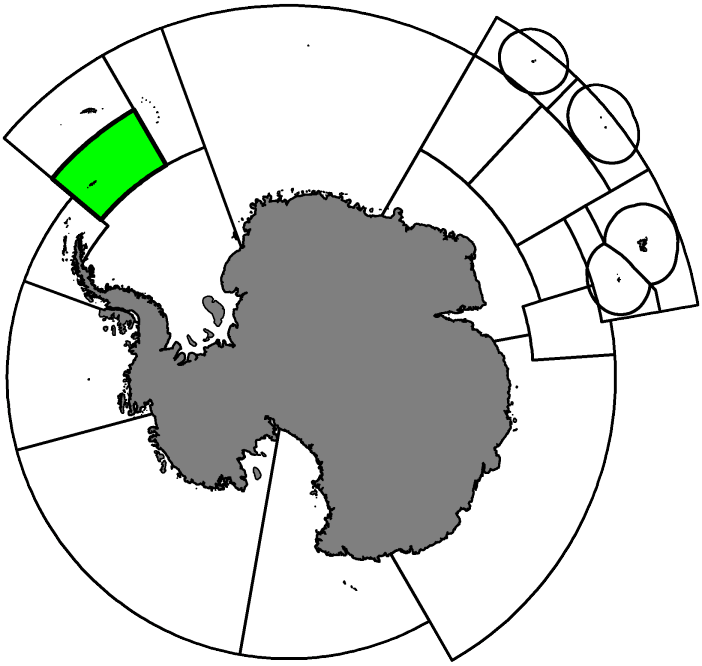
Fishery Report 2022: *Dissostichus eleginoides* and *Dissostichus mawsoni* in Subarea 48.2

CCAMLR Secretariat

17 March 2023



Antarctic toothfish, *Dissostichus mawsoni* Norman, 1937, and, Patagonian toothfish, *Dissostichus eleginoides* Smitt, 1898.



Map of the management areas within the CAMLR Convention Area. Subarea 48.2, the region discussed in this report is shaded in green. Throughout this report, "2022" refers to the 2021/22 CCAMLR fishing season (from 1 December 2021 to 30 November 2022).

Contents

1. Introduction to the fishery

1.1. History

Research fishing for *Dissostichus* spp. in Subarea 48.2 was first conducted by Chile in 1998, when seven hauls were conducted and 36kg of Patagonian toothfish (*Dissostichus eleginoides*) were caught.

In 2015, Ukraine began a multi-year research program and conducted 29 hauls with a total catch of 31 tonnes of Antarctic toothfish (*D. mawsoni*) and 4 tonnes of *D. eleginoides*. Research has continued since 2016 in two Research Blocks (Fig. 1) as part of a multi-year research program in the east of Subarea 48.2.

1.2. Conservation Measures currently in force

Directed fishing for *Dissostichus* spp. in Subarea 48.2 is prohibited under Conservation Measure 32-02 at least until further scientific information is gathered and reviewed by the Scientific Committee and the Working Group on Fish Stock Assessment (WG-FSA).

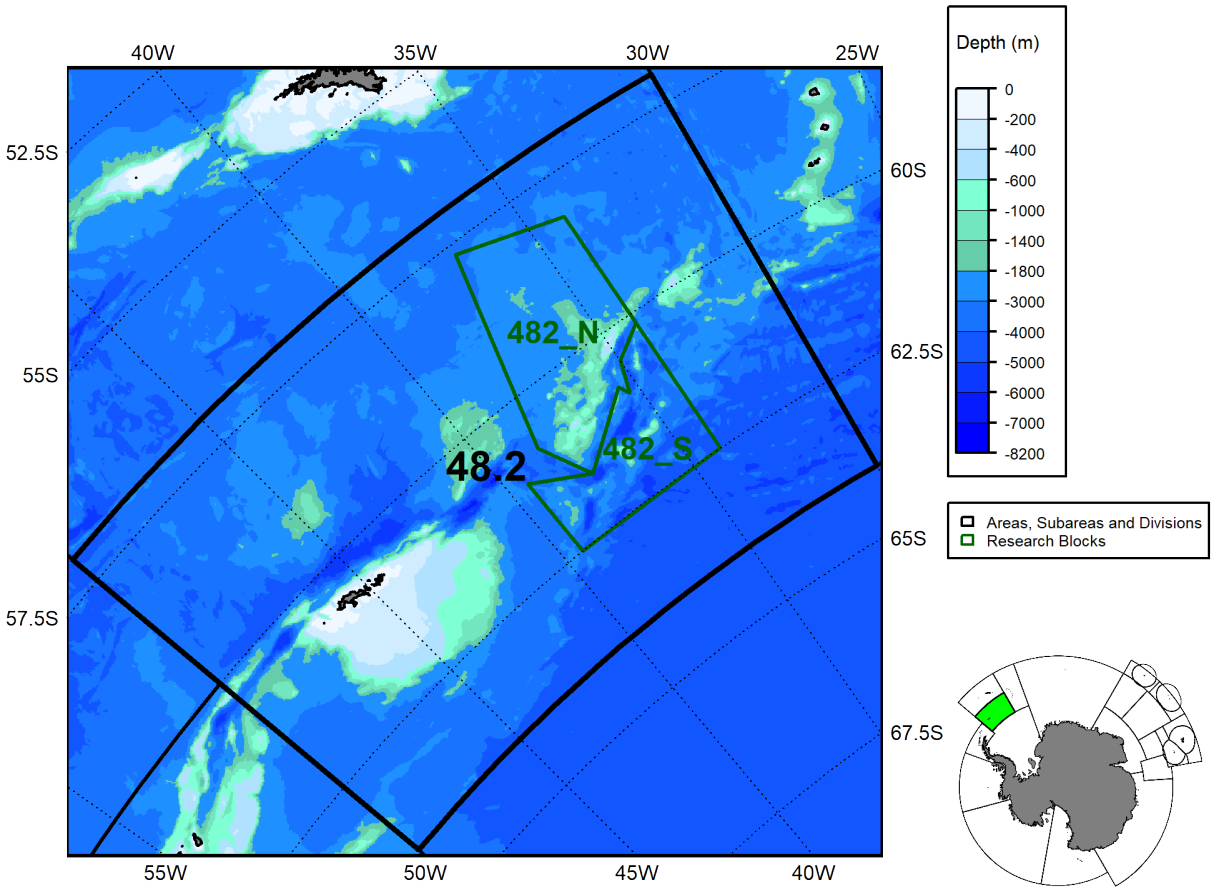


Figure 1: Location of the Research Blocks in Subarea 48.2. The fishable depth range (600m-1800m) is highlighted in shades of green.

1.3. Active vessels

In 2019, when fishing last occurred, 3 vessels participated in this fishery.

2. Reported catch

2.1. Latest reports and limits

The total catch reported from research surveys that have been conducted in Subarea 48.2 are shown in Table 1. In this fishery, the catch of *D. mawsoni* reached a maximum of 35 tonnes in 2019, when fishing last

occurred.

The catches reported in Subarea 48.2 include catch data that CCAMLR has agreed should be quarantined as there is no confidence in the amount and/or the location of those catches (SC-CAMLR-38, paragraph 3.56). All ancillary data associated with these vessels (*e.g.*, by-catch, tagging, observer data) are also quarantined and are not included in the data presented in this report.

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

Season	Number of vessels	*D. eleginoides*	*D. mawsoni*	Estimated IUU catch (tonnes)
1998	1	0	0	-
2015	1	0 (q: 4)	0 (q: 31)	-
2016	2	1 (q: 2)	6 (q: 66)	-
2017	3	0 (q: 7)	11 (q: 56)	-
2018	5	1 (q: 2)	8 (q: 56)	-
2019	3	1	35	-
2020	-	-	-	-
2021	-	-	-	-
2022	-	-	-	-

2.2. By-catch

Table 2. Reported catch for by-catch species (*Macrourus* spp., skates and rays, and other species) in this fishery. -: no fishing. 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)
1998		<1		<1	0		<1
2015	12	<1 q	3.75	<1 q	1 q	12	<1 q
2016	12	<1 q	3.75	<1	82	12	<1 q
2017	12	3 q	3.75	<1	452	12	<1 q
2018	12	3 q	3.75	<1	206	12	<1 q
2019	12	5	3.75	<1	371	12	<1
2020	12	-	3.75	-	-	12	-
2021	12	-	3.75	-	-	12	-
2022		-		-	-		-

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.

By the end of the 2019 fishing season, there were 16 VMEs and no VME Risk Areas designated in Subarea 48.2.

2.4. Incidental mortality of seabirds and marine mammals

The requirements of Conservation Measure 25-02, including the 'Minimisation of the incidental mortality of seabirds in the course of longline fishing or longline fishing research in the Convention Area' apply to this fishery. There is an exemption to the requirement for night setting by achieving the sink rates described in Conservation Measure 24-02 and subject to a bird by-catch limit.

There has been no observed seabird mortality reported by vessels from Subarea 48.2 in this fishery.

There has been no observed mammal mortality reported by vessels from Subarea 48.2 in this fishery.

3. Illegal, Unreported and Unregulated (IUU) fishing

Illegal, unreported and unregulated (IUU) fishing gear was recovered from Subarea 48.2 in March 2016 (CCAMLR-XXXV/10). There has been no other recorded evidence of IUU activities in this region since 2006.

4. Data collection

4.1. Data collection requirements

The collection of biological data under Conservation Measure 23-05 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.

Following Conservation Measure 22-07, vessels participating in this fishery must report the occurrence of VME indicator organisms on hauled lines. To do so, the vessel's crew observe lines in segments (1000-hook sections or 1200m sections, whichever is the shorter) and report the number of VME indicator units (either one litre of those VME indicator organisms that can be placed in a 10-litre container, or one kilogram of those VME indicator organisms that do not fit into a 10-litre container). Depending on the number of VME indicator units landed, vessels must immediately report and potentially cease fishing in the area (termed a Risk Area) until further review of the data is completed (see Conservation Measure 22-07). Based on the portion of the line monitored, observers further identify VME indicator organisms to the lowest taxonomic level possible.

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.

Summaries of data reported to CCAMLR for the past five years are given in Tables 3 and 4.

Table 3. Summary of VME indicator taxa by-catch, by-catch of other species 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. -: no fishing.

Data source	Data class	Variable	2018	2019	2020	2021	2022
Vessel crew	VME	line segments	54	380	-	-	-
		VME indicator units $>$ 5 and $<$ 10	0	0	-	-	-
		VME indicator units $>$ 10	0	0	-	-	-
	by-catch	taxa identified	8	8	-	-	-
		records	52	129	-	-	-
Observer	VME	line segments	56	212	-	-	-
		taxa identified	9	15	-	-	-
		weight or volume measurements	26	55	-	-	-
	toothfish	specimens examined	191	886	-	-	-
		length measurements	191	885	-	-	-
		weight measurements	190	758	-	-	-
		sex identifications	189	886	-	-	-
		maturity stage identifications	190	791	-	-	-
		gonad weight measurements	176	246	-	-	-
		otolith samples	80	543	-	-	-
	by-catch	specimens examined	213	752	-	-	-
		taxa identified	5	9	-	-	-
		length measurements	198	228	-	-	-
		weight measurements**	207	345	-	-	-
		standard length measurements*	0	15	-	-	-
		wingspan measurements*	35	25	-	-	-
		pelvic length measurements*	35	25	-	-	-
		snout to anus measurements*	130	631	-	-	-
		sex identifications**	167	712	-	-	-
		maturity stage identifications**	130	689	-	-	-
		gonad weight measurements**	8	0	-	-	-
		otolith samples**	0	185	-	-	-

*: Species-dependent records
**: Voluntary records

Table 4. 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. -: no fishing.

By-catch group	Variable	2018	2019	2020	2021	2022
Macrourus spp.	specimens examined	130	631	-	-	-
	taxa identified	2	3	-	-	-
	length measurements	115	110	-	-	-
	weight measurements**	130	254	-	-	-
	snout to anus measurements*	130	631	-	-	-
	sex identifications**	100	606	-	-	-
	maturity stage identifications**	100	606	-	-	-
	gonad weight measurements**	8	0	-	-	-
	otolith samples**	0	185	-	-	-
Skates and rays	specimens examined	35	25	-	-	-
	taxa identified	1	1	-	-	-
	length measurements	35	25	-	-	-
	weight measurements**	35	25	-	-	-
	wingspan measurements*	35	25	-	-	-
	pelvic length measurements*	35	25	-	-	-
	sex identifications**	35	25	-	-	-
	maturity stage identifications**	0	25	-	-	-
	gonad weight measurements**	0	0	-	-	-
Other fish	specimens examined	48	96	-	-	-
	taxa identified	2	5	-	-	-
	length measurements	48	93	-	-	-
	weight measurements**	42	66	-	-	-
	standard length measurements*	0	15	-	-	-
	sex identifications**	32	81	-	-	-
	maturity stage identifications**	30	58	-	-	-
	gonad weight measurements**	0	0	-	-	-
	otolith samples**	0	0	-	-	-

*: Species-dependent records
**: Voluntary records

The counts of by-catch taxa reported above (Table 4) 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.

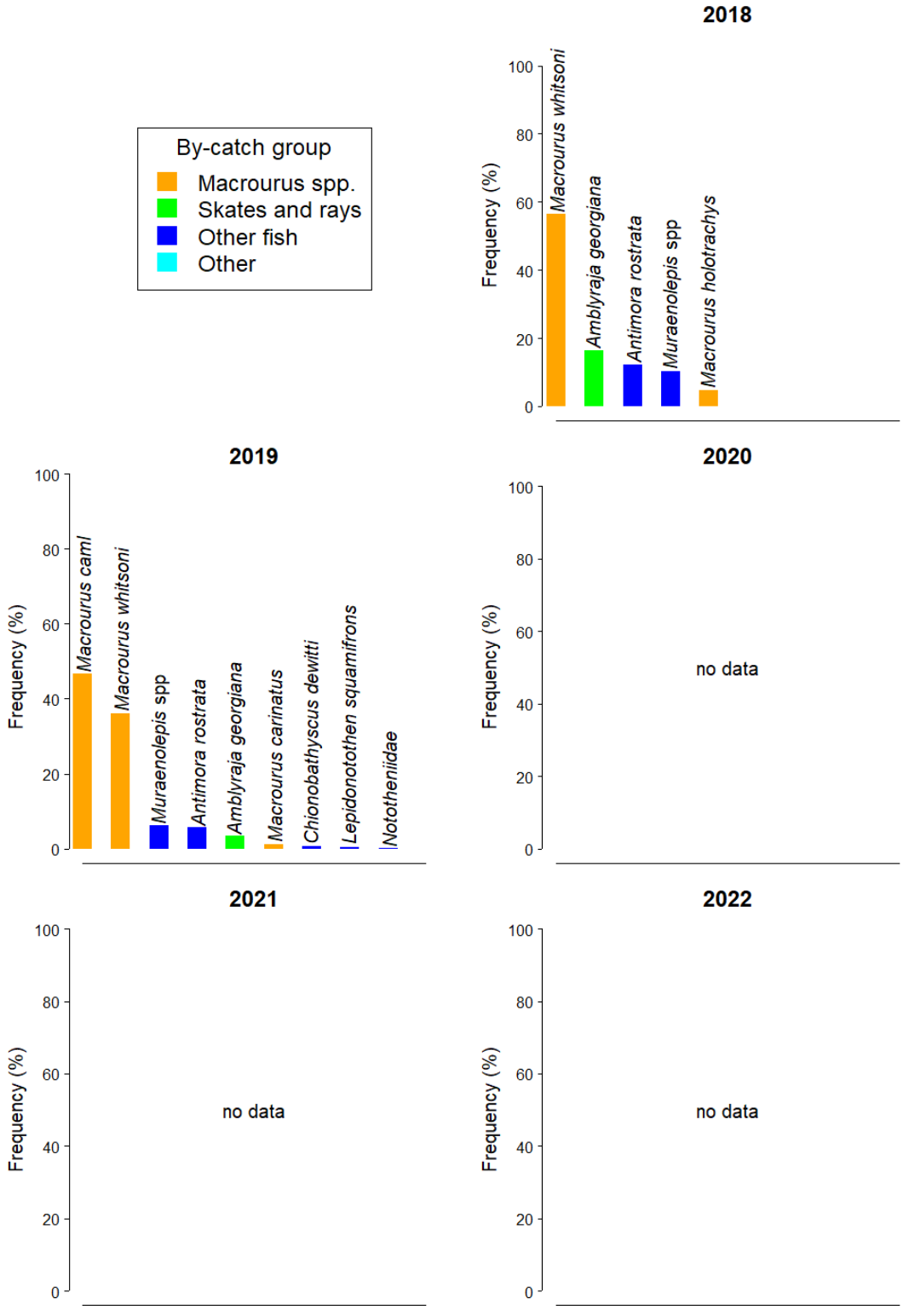


Figure 2. Relative frequencies of the most commonly examined by-catch taxa in each of the last five seasons, from the observer data (unweighted raw counts of individually examined specimens). Taxonomic identification may occur at different levels.

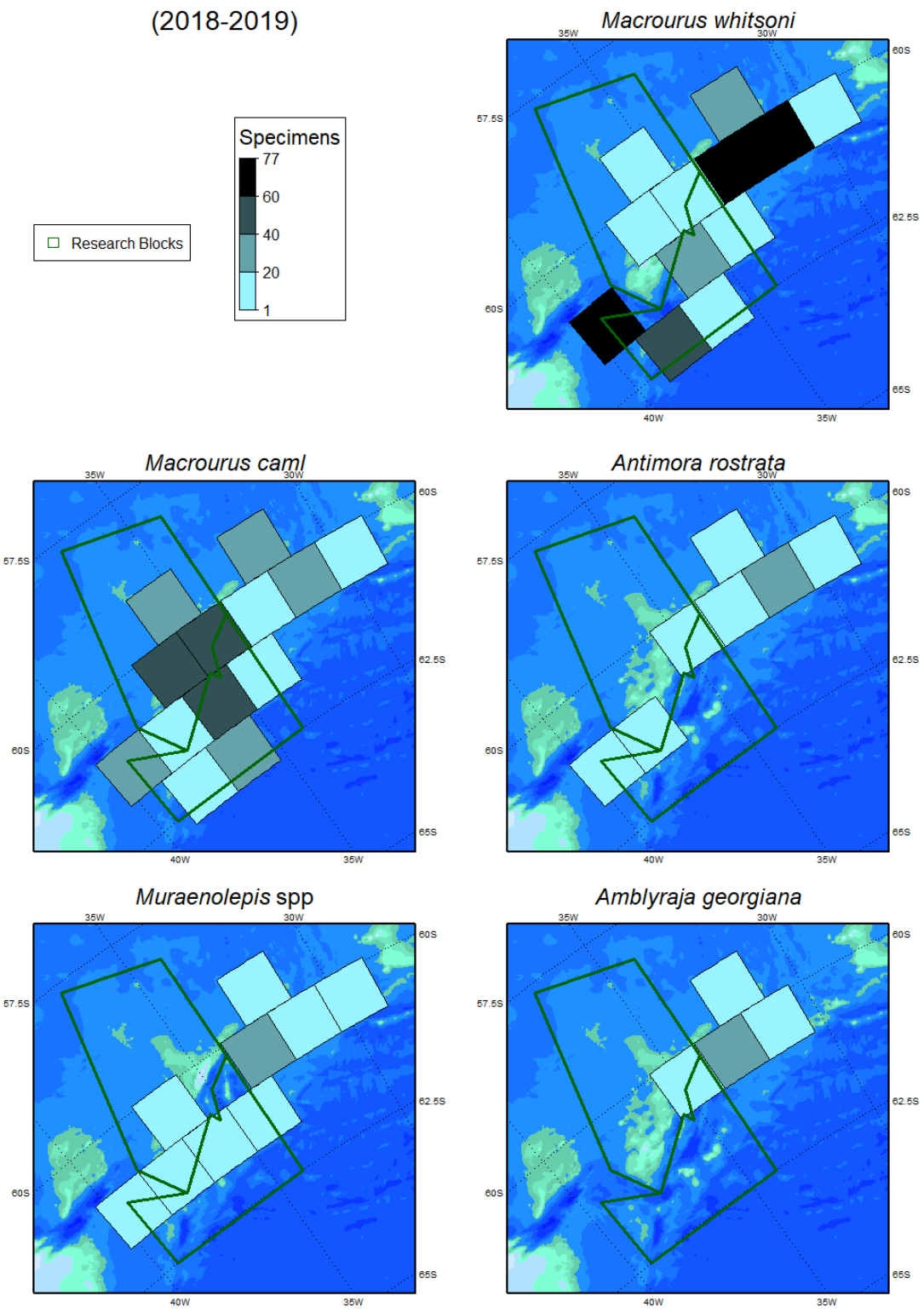


Figure 3. Spatial distribution of the most commonly examined by-catch taxa across the last five seasons, from the observer data (unweighted raw counts of individually examined specimens in each cell). The data were aggregated using equal area (100 km x 100 km) cells. Taxonomic identification may occur at different levels. Refer to Figure 1 for more details on the boundaries shown.

4.3. Length frequency distributions

The length frequency distributions of *D. mawsoni* caught during research 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.

The majority of *D. mawsoni* caught during research fishing ranged from 125 to 175cm.

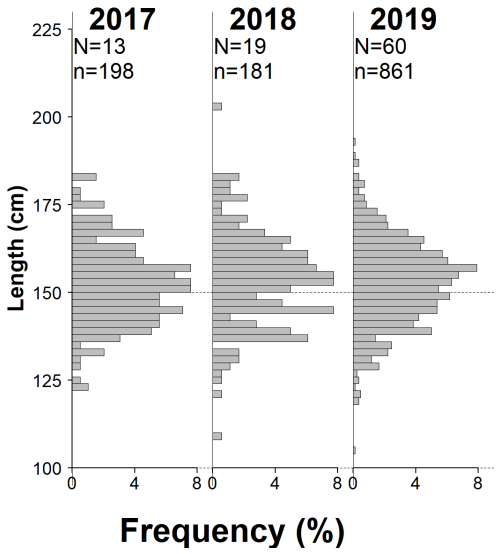


Figure 4. Annual length frequency distributions of *D. mawsoni* caught in Subarea 48.2. The number of hauls from which fish were measured (N) and the number of fish measured (n) in each year are indicated. Note: length frequency distributions are only shown where more than 150 fish were measured in a given season.

4.4. Tagging

To date in this area, 1359 *D. mawsoni* have been tagged and released (17 have been recaptured, 15 of which were released in this area; Table 5), and, 88 *D. eleginoides* have been tagged and released (0 have been recaptured).

Table 5. Number of *Dissostichus mawsoni* tagged and recaptured in the area for each fishing Season.

		Recaptured				
Season	Tagged	2016	2017	2018	2019	Total
2015	156	1				**1**
2016	346		4			**4**
2017	349		2	1	1	**4**
2018	323			3	3	**6**
2019	185					
Total	**1359**					**15**

5. Research

5.1. Status of the science

Ukraine initiated a three year (2015-2017) research plan using longline gear (trotline) to sample the toothfish populations in Subarea 48.2 (WG-FSA-14/08). The purpose of the research was to characterise the toothfish populations found in that region to better understand stock structure, movement patterns and improve estimates of population characteristics in the northern Weddell/Scotia Sea. The distributions of the two species of *Dissostichus* overlap in this area. Additional outcomes of the research related to mapping of the fishable area, documenting relative abundance of *D. eleginoides* and *D. mawsoni*, tagging toothfish for biomass estimation and for stock linkage studies, input into spatial population models and collecting information on distribution, relative abundance and life history of by-catch species. The Ukrainian research was continued after 2017 by the vessel Simeiz.

In 2019, Ukraine reported on its research progress, including data on the distribution of Antarctic toothfish and by-catch, and, biological characteristics (length, weight and age) of Antarctic and Patagonian toothfish (WG-FSA-19/51).

In 2016, the United Kingdom proposed to undertake a 3-year research survey in the eastern part of Subarea 48.2 (also extending into Subarea 48.4; WG-FSA-16/40 Rev. 1). The aim of the UK study was to understand the connectivity of toothfish stocks between Subareas 48.2 and 48.4.

The results (WG-FSA-2021/22) provided evidence linking *D. mawsoni* with the Antarctic continental shelf and indicated a potential *D. mawsoni* spawning region in Subarea 48.2. The movements of recaptured tagged fish indicated potential connections with the Lazarev Sea (Subarea 48.6) as well as the southern South Sandwich Islands (Subarea 48.4).

5.2. Research plans

Objectives

In 2014, the Scientific Committee endorsed the advice of the Working Group on Fish Stock Assessment (WG-FSA) (SC-CAMLR-XXXIII, Annex 7, paragraph 5.48) that the research plan of Ukraine in Subarea 48.2 proceed in 2015 with an effort limit of 30 lines and catch limit of 75 tonnes of *Dissostichus* spp. and a tagging rate of 5 toothfish per tonne. This research program was continued in 2016 with the following specific objectives:

(i) to utilise the expertise and experience of crew aboard vessels to explore and locate fishable habitat and sample toothfish in Subarea 48.2

(ii) to document the spatial distribution of toothfish species in the area to east of the South Orkney Islands, thus providing catch and biological observations to test and develop the functionality of spatial population models of the north Weddell Sea region

(iii) to tag toothfish and collect biological samples to further understand toothfish movement, migration, spawning and stock linkages within Area 48 and adjacent waters.

In 2016, the Scientific Committee endorsed the UK survey and recommended research catch limits of 23 tonnes in the eastern area of Subarea 48.2 and 18 tonnes in the southern area of Subarea 48.4 (SC-CAMLR-XXXV, paragraph 3.231). The specific objectives of the UK survey were:

(i) determine population connectivity of *D. eleginoides* and *D. mawsoni* between Subareas 48.2 and 48.4 adjacent to the established fishery in Subarea 48.4,

(ii) expand information on population structures of *D. eleginoides* and *D. mawsoni* in Subareas 48.2 and 48.4 adjacent to established fishery in Subarea 48.4,

(iii) improve data on bathymetry and associated distributions of target and benthic by-catch species, improve data available to CCAMLR on bathymetric features.

The UK vessel Argos Froyanes and the New Zealand vessel San Aspiring undertook research fishing in 2018 for the UK research survey.

5.3. Advice by the Scientific Committee

Research fishing in Subarea 48.2 was conducted under Conservation Measure 24-01.

6. Stock status

6.1. Summary of current status

As a data-limited fishery, this fishery does not have such estimates.

6.2. Year of last assessment, year of next assessment

Research plans for data-limited fisheries are reviewed annually.

7. Climate Change and environmental variability

In 2018, a summary of the potential impacts of climate change on Southern Ocean fisheries (FAO 2018) highlighted the following key points:

The Antarctic region is characterized by complex interaction of natural climate variability and anthropogenic climate change that produce high levels of variability in both physical and biological systems, including impacts on key fishery taxa such as Antarctic krill. The impact of anthropogenic climate change in the short-term could be expected to be related to changes in sea ice and physical access to fishing grounds, whereas longer-term implications are likely to include changes in ecosystem productivity affecting target stocks. There are no resident human populations or fishery-dependent livelihoods in the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Area, therefore climate change will have limited direct implications for regional food security. However, as an "under-exploited" fishery, there is potential for krill to play a role in global food security in the longer term. The institutional and management approach taken by CCAMLR, including the ecosystem-based approach, the establishment of large marine protected areas, and scientific monitoring programmes, provides measures of resilience to climate change.

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 also welcomed (CCAMLR-41, paragraph 6.8) the Scientific Committee's agreement to hold a workshop on climate change in the first half of 2023 (SC-CAMLR-41, paragraph 7.10) and encouraged the inclusion of a range of scientific experts as well as policy makers to foster integration of the best available science into management actions. The Commission adopted (CCAMLR-41, paragraph 6.28) Resolution 36/41.

Additional Resources

- Fishery Summary: pdf, html
- Species Description for Patagonian Toothfish: pdf, html
- Species Description for Antarctic Toothfish: pdf, html
- Fisheries Documents Browser