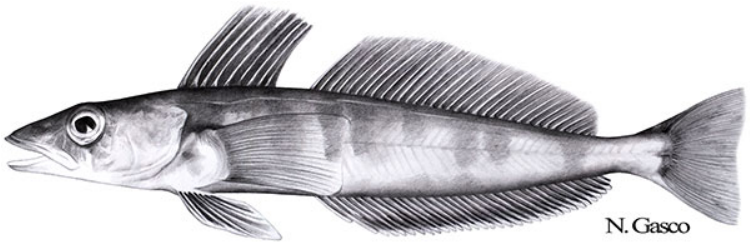
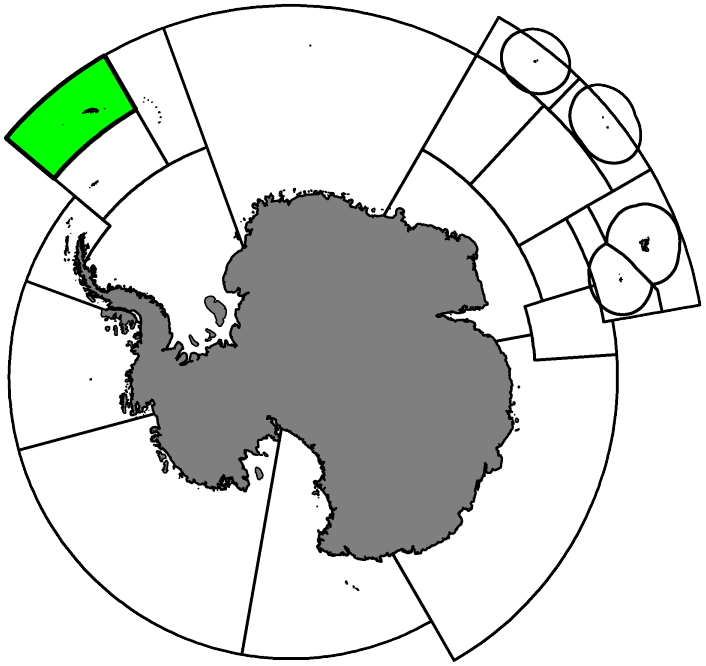
Fishery Report 2020: *Champsocephalus gunnari* in Subarea 48.3

CCAMLR Secretariat

16 March 2021



Mackerel icefish, *Champsocephalus gunnari* Lönnberg, 1905.



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, "2020" refers to the 2019/20 CCAMLR fishing season (from 1 December 2019 to 30 November 2020).

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1. Introduction to the fishery

1.1. History

Fishing for *C. gunnari* began in Subarea 48.3 in the late 1970s, with large catches taken by Eastern European vessels. Catches peaked in 1983 at a reported 178,824 tonnes. Following concerns about the depletion of stocks, CCAMLR closed the fishery in the early 1990s. The fishery was reopened in 1995, but with a highly conservative catch limit, and was restricted to pelagic trawling to avoid impacts on non-target species. Conservation measures, including requirements to clean nets and ensure that they sink quickly, also reduced incidental mortality of birds. By-catch and incidental mortality is now low.

Currently, the fishing activity in Subarea 48.3 focuses on an area to the northwest of South Georgia. Vessels use pelagic trawls with a minimum mesh size of 90mm. In recent years, the catch limit for this fishery has been between 1,500 and 5,000 tonnes, with up to four or five vessels operating.

1.2. Conservation Measures currently in force

The annual catch limit for this fishery (Table 1) is described in Conservation Measure 42-01.

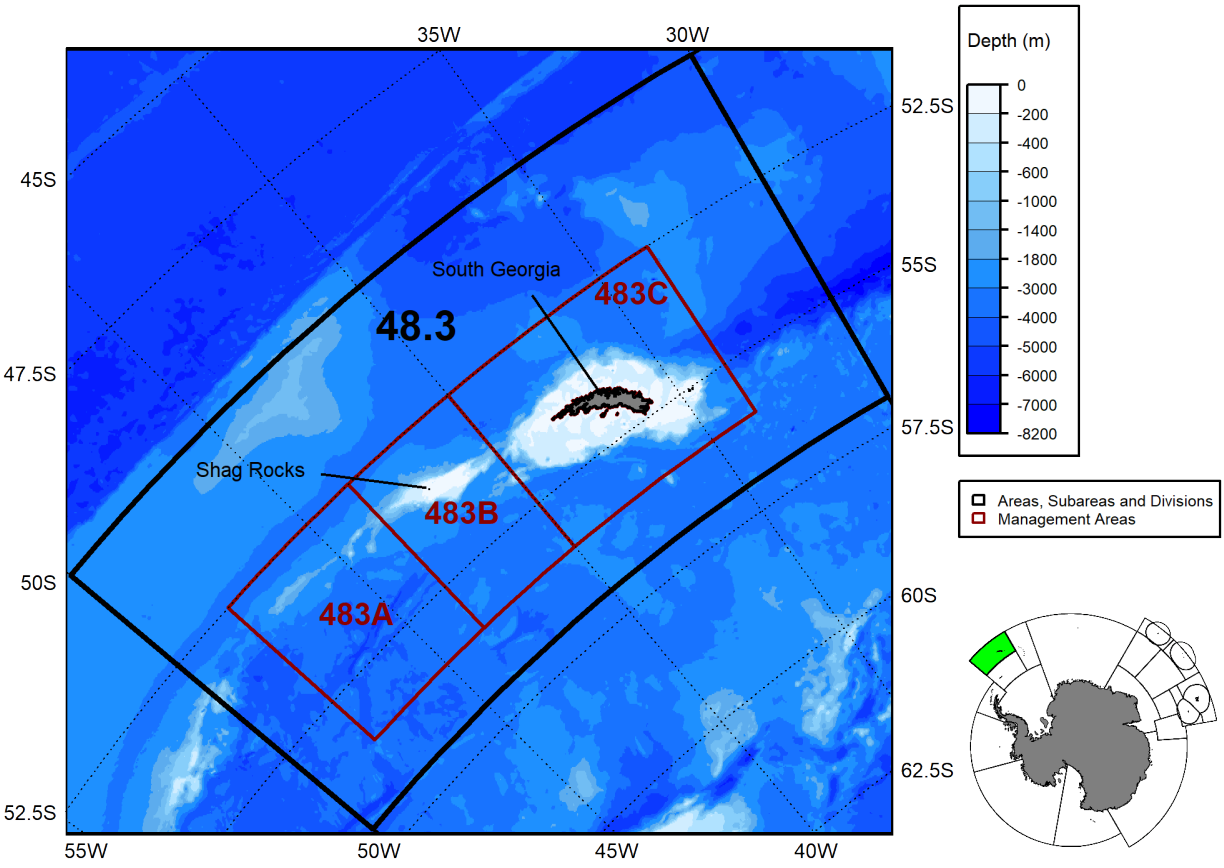

Figure 1: Location of the Management Areas in Subarea 48.3.

1.3. Active vessels

In 2018, 1 vessel participated in this fishery.

1.4. Timeline of spatial management

Catch limits for this fishery have been set biennially since 2012. Catch limits are based on a precautionary harvest control rule, assuming there is no recruitment in the second year of the assessment period. Catch limits for the second year of an assessment period are therefore always lower than those for the first year. Annual catches, relative to the catch limit, are variable depending on the extent of participation in the fishery. They are also influenced by both interannual variation in the icefish population abundance and the

availability of fish to the fishery (*i.e.*, changes in the location and depth of fish). Specific size-based move-on rules apply in this fishery so that a vessel must move at least 5 nautical miles from a location where >10% of *C. gunnari* are less than 240mm, are detailed in Conservation Measure 42-01, paragraph 4.

The location of management areas in this subarea is shown in Figure 1.

2. Reported catch

2.1. Latest reports and limits

Reported catches of *C. gunnari* are presented in Table 1. In this fishery, since 1980, the catch of *C. gunnari* reached a maximum of 178824 tonnes in 1983. In 2018, 1 tonne of *C. gunnari* was caught.

Table 1. Catch and effort history in tonnnes for *C. gunnari* in this fishery. Source: Fine scale data.

Season	Number of vessels	Catch limit (tonnes)	Catch
1980	1		8795
1981	1		27903
1982	1		54040
1983	1		178824
1984	1		35743
1985	1		628
1986	1		21008
1987	1		80586
1988	2		11473
1990	1		8030
1991	1		41
1998	1	4520	6
1999	1	4840	265
2000	2	4036	4041
2001	5	6760	1433
2002	5	5557	2663
2003	4	2181	1972
2004	5	2887	2758
2005	7	3574	201
2006	5	2244	2177
2007	5	4337	4339
2008	5	2462	2479
2009	5	3834	1827
2010	2	1548	1
2011	2	2305	2
2012	3	3072	984
2013	3	2933	1326
2014	3	4635	33
2015	1	2695	270
2016	1	3461	2
2017	2	2074	110
2018	1	4733	1

Total catches <5t reflect catches from research surveys only

2.2. By-catch

Catch limits for the most common by-catch species; humped rockcod (*Gobionotothen gibberifrons*), marbled rockcod (*Notothenia rossii*), grey rockcod (*Lepidonotothen squamifrons*), South Georgia icefish (*Pseudochaenichthys georgianus*) and blackfin icefish (*Chaenocephalus aceratus*) are defined in Conservation Measure 33-01 and shown for each fishing season in Table 2. Conservation Measure 33-01 sets bycatch limits for all fisheries in Subarea 48.3, for this reason the catch limtis for by-cath species can be greater than the catch limits for individual targets species. By-catch is consistently low in this pelagic fishery.

Specific by-catch related move-on rules (whereby a vessel must move at least 5 nautical miles from a location where significant amounts of by-catch were hauled) are detailed in Conservation Measure 42-01, paragraph 6.

Table 2. Reported catch and catch limits for by-catch species (*Gobionotothen gibberifrons*, *Notothenia rossii*, *Lepidonotothen squamifrons*, *Pseudochaenichthys georgianus* and *Chaenocephalus aceratus*) in the fishery for *Champsocephalus gunnari* in Subarea 48.3 (see Conservation Measure 33-01 for details). Source: fine-scale data.

Season	*Gobionotothen gibberifrons*		*Notothenia rossii*		*Lepidonotothen squamifrons*		*Pseudochaenichthys georgianus*		*Chaenocephalus aceratus*	
	Catch Limit (tonnes)	Reported Catch (tonnes)	Catch Limit (tonnes)	Reported Catch (tonnes)	Catch Limit (tonnes)	Reported Catch (tonnes)	Catch Limit (tonnes)	Reported Catch (tonnes)	Catch Limit (tonnes)	Reported Catch (tonnes)
2004	1470	0	300	0	300	0	300	2	2200	<1
2005	1470	<1	300	<1	300	<1	300	25	2200	1
2006	1470	0	300	1	300	0	300	6	2200	<1
2007	1470	<1	300	0	300	0	300	<1	2200	0
2008	1470	<1	300	<1	300	0	300	<1	2200	<1
2009	1470	<1	300	<1	300	0	300	<1	2200	<1
2010	1470	<1	300	<1	300	0	300	<1	2200	0
2011	1470	0	300	0	300	0	300	<1	2200	0
2012	1470	<1	300	<1	300	24	300	<1	2200	<1
2013	1470	<1	300	<1	300	<1	300	<1	2200	<1
2014	1470	<1	300	<1	300	0	300	2	2200	1
2015	1470	<1	300	<1	300	0	300	<1	2200	<1
2017	1470	<1	300	<1	300	0	300	<1	2200	<1
2018	1470	0	300	0	300	0	300	<1	2200	0

2.3. Incidental mortality of seabirds and marine mammals

A summary of seabird mortality in this fishery in recent years is presented in Table 3. The three most common species injured or killed in this fishery were white-chinned petrel (*Procellaria aequinoctialis*), grey-headed albatross (*Thalassarche chrysostoma*) and black-browed albatross (*Thalassarche melanophris*).

The level of risk of incidental mortality of birds in Subarea 48.3 remains at category 5 (high) (SC-CAMLR-XXX, Annex 8, paragraph 8.1).

Conservation Measure 25-03 applies to this fishery. It sets out technical measures to minimise bird by-catch and relates to: net monitoring cables, vessel lighting, discarding of offal, net cleaning, net sinking (nets are most likely to trap birds when they are on the surface of the water) and streamer lines (bird scarers).

Conservation Measure 42-01 has a further mitigation measure whereby, should any vessel catch a total of 20 birds, it shall cease fishing and shall be excluded from further participation in the fishery in that year.

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	*Procellaria aequinoctialis*	*Thalassarche chrysostoma*	*Thalassarche melanophris*	Other
2001	6	1	10	
2003	14		3	
2004	34	1	6	
2005	1		6	1
2006	18	1	18	2
2007	3	1		
2008	3			2
2009	3	2	4	2
2010	1			1
2013	1			
2017	3			

There were no observations of mammal mortalities reported by vessels in this fishery.

3. Illegal, Unreported and Unregulated (IUU) fishing

There has been no evidence of illegal, unreported and unregulated IUU fishing activity in this fishery.

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. Length frequency distributions

Recent length frequency distributions of the catches of *C. gunnari* across the entire subarea and in Management Areas 483B and 483C are shown in Figure 2. 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.

Differences in length distribution have been noted between Shag Rocks and South Georgia, although these differences are not thought to represent separate stocks for stock assessment purposes.

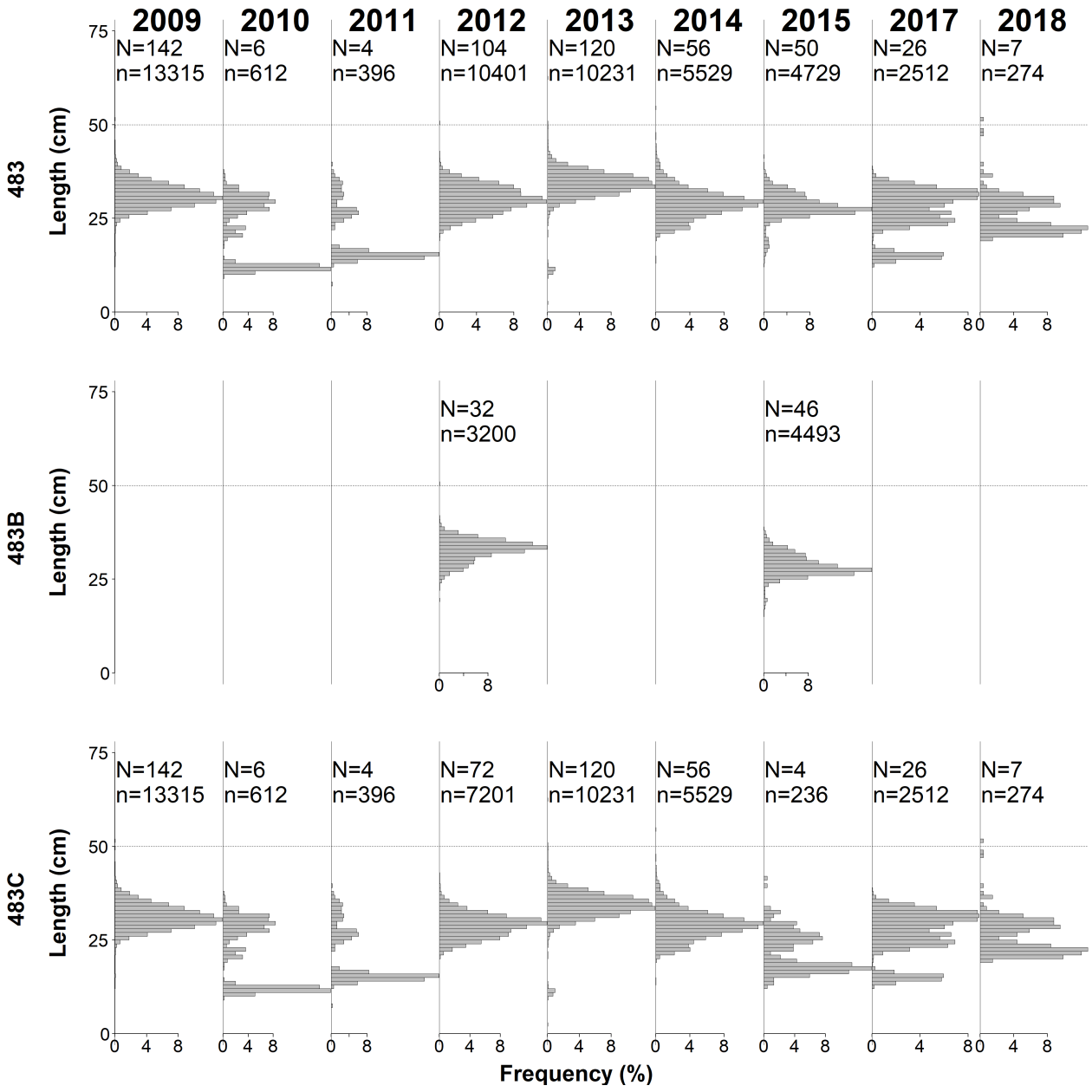

Figure 2. Annual length frequency distributions of *Champsocephalus gunnari* caught in Subarea 48.3. The number of hauls from which fish were measured (N) and the number of fish measured (n) in each year are indicated. Note: length frequency distributions are only shown where more than 150 fish were measured.

5. Research

5.1. Status of the science

Champsocephalus gunnari play an important role in the ecosystem of the South Georgia shelf as predators of krill (*Euphausia superba*), other euphausiids and the hyperiid amphipod (*Themisto gaudichaudii*) and as prey species of fur seals and gentoo penguins. *Champsocephalus gunnari* may also be consumed by juvenile toothfish in years of high *C. gunnari* abundance at Shag Rocks.

Estimates of *C. gunnari* standing stock have been shown to vary in relation to krill abundance at South Georgia, and in years of poor krill availability, *C. gunnari* condition is poorer and larger quantities are likely to be consumed by both fur seals and gentoo penguins, which are normally krill-dependent predators.

Preliminary analysis of long-term data series from UK trawl surveys (since 1986) indicates that abundance of previously overexploited fish (*C. gunnari* and *N. rossi*) may now be slowly increasing (WG-FSA-17/44). Time-series analysis of length-frequency data of *C. gunnari* from five Argentine surveys between 1993 and 2013 also indicates a steady increase in densities of adult fish (WG-FSA-13/65).

The UK undertook a bottom trawl survey of CCAMLR Subarea 48.3 on the FV Sil between the 27th January and 5th February 2019 (WG-FSA-2019/20). A total of 73 random and representative hauls were completed covering depths of between 108 and 352m. Overall biomass of mackerel icefish, *Chamsocephalus gunnari*, was calculated at 50,897 tonnes with a lower 1-sided 95% interval estimate of 30,288 tonnes. This is lower than in 2017, but is comparable with the long term average. The highest catches were on the moraine banks of the two northern strata and at the western end of Shag Rocks, with one high catch recorded in the South West stratum. Clear regional differences in *C. gunnari* diet composition were observed. At Shag Rocks *Euphausid* spp. made the largest contribution to icefish diet, however the amphipod *Themisto* sp. dominated the diet around South Georgia. Based on the Index of Relative Importance, the importance of *E. superba* as a prey species varied across the four regions at South Georgia, ranging from 10.48% IRI in the South West to 33.49% IRI in the South East.

5.2. Advice by the Scientific Committee

The limits on the fishery for *C. gunnari* in Subarea 48.3 for the forthcoming season are defined in Conservation Measure 42-01.

6. Stock status

6.1. Summary of current status

A stratified bootstrap of icefish catch density based on the UK 2019 demersal fish survey catch rate data indicated a biomass of 53,124 tonnes (lower one sided 5th percentile: 32,399 tonnes) within Subarea 48.3 (WG-FSA-2019/30). Projections for the 2019/20 and 2020/21 seasons applying the CCAMLR harvest control rule lead to catch limits (TAC) of 3,225 tonnes for 2019/20 and 2,132 tonnes for 2020/21.

6.2. Assessment method

The use of a length-based model to set catch limits for *C. gunnari* in Subarea 48.3 was endorsed at the 2010 meeting of the Working Group on Fish Stock Assessment (WG-FSA-10) (SC-CAMLR-XXIX, Annex 8, paragraph 5.164). The assessment used survey data on length densities and biomass density without the need to identify age-specific cohorts. Methods of aggregating the length distributions from multiple hauls using a mean of positive values (as previous assessments in this subarea), or a sum (equivalent to a mean of all values) were considered by WG-FSA-17 (WG-FSA-17/51). It was agreed that the assessment should

change to using the sum, which reduces the likelihood of over-representing young fish in the population length distribution when small fish are clustered in particular survey strata.

The CCAMLR harvest control rule, using a length-based approach, has been demonstrated to provide robust precautionary estimates of catch limits and exploitation rates for *C. gunnari* in Subarea 48.3 (WG-SAM-13/31 Rev. 1).

6.3. Year of last assessment, year of next assessment

Assessments are reviewed biennially, the last assessment was in 2019.

7. Climate Change and environmental variability

A recent summary of the potential impacts of climate change on Southern Ocean fisheries (FAO 2018) highlights 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.

There is no formal evaluation of the impacts of climate change and environmental variability available for this particular fishery.

Additional Resources

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