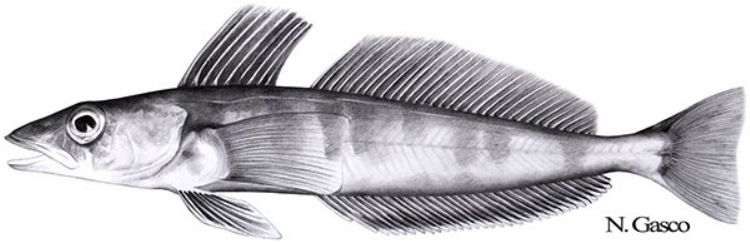
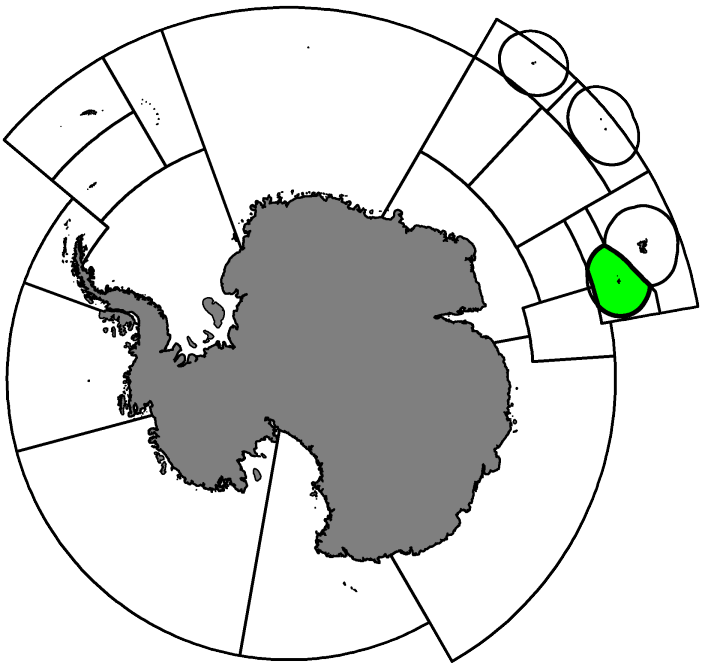
Stock Assessment Report 2021: *Champsocephalus gunnari* at Heard Island (Division 58.5.2)

CCAMLR Secretariat

26 April 2022



Mackerel icefish, *Champsocephalus gunnari* Lönnberg, 1905.



Map of the management areas within the CAMLR Convention Area. The region discussed in this report is shaded in green.

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Heard Island, Australian EEZ (Division 58.5.2)

1. Model configuration

The Heard Island and McDonald Islands fishery for mackerel icefish (*Champsocephalus gunnari*) in Division 58.5.2 was assessed in 2021 using the Generalised Yield Model (WG-FSA-2021/20).

The specification for the assessment model used for management advice are provided in the Stock Annex.

2. Population structure and biomass

Using the data from the random stratified trawl survey (RSTS) and the input parameters in Table 1 for the CMIX analysis, the distribution of densities at age consisted of four year classes from 1+ to 4+ (Figure 1, Table 2).

Table 1: Input parameters for the CMIX analysis of *Champsocephalus gunnari* length density in Division 58.5.2 for 2021.

Parameter	Value
Size range included	140–460 mm
Bounds	Age 1+: 140–200 mm Age 2+: 240–300 mm Age 3+: 310–400 mm
SDs related linearly to the mean	Yes
Bounds on intercept (start, step)	1, 10 (3, 1.0)
Bounds on slope (start, step)	0.0, 0.1 (0.01, 0.001)
No. of function calls	10 000
Stopping criteria	1E-10
Frequency for convergence testing	5
Simplex expansion coefficient	1

Table 2: Results generated from CMIX analyses for *Champsocephalus gunnari* from the 2021 random stratified trawl survey in Division 58.5.2.

	Mixture Components			
	1 (1+)	2 (2+)	3 (3+)	4 (4+)
Mean length (mm)	161	259	338	390
SD (mm)	13	15	18	19
Intercept of CV	8			
Slope of CV	0.03			
Total density (n.km^{-2})	14	831	8654	170
SD (n.km^{-2})	8	214	2111	72
Sum of observed densities	9344			
Sum of expected densities	9668			

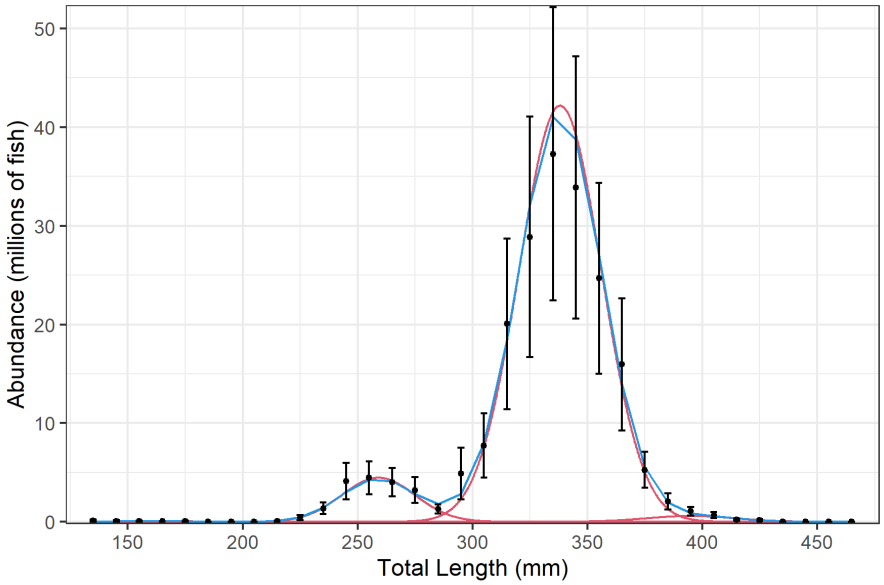

Figure 1: Size distribution of *Champsocephalus gunnari* from the 2021 random stratified trawl survey in Division 58.5.2 with standard errors. Cohorts were present in ages 1+ to 4+.

The biomass estimates with bootstrapped uncertainty for each icefish survey stratum and overall are shown in Table 3.

Few fish in the mackerel icefish population in Division 58.5.2 survive beyond age 4, with a drop in abundance between 3+ and 4+ cohorts observed in consecutive surveys (Welsford 2011, Welsford 2015). Consequently, the assessment scenarios only included the biomass estimated from the 1+ to 3+ cohorts, which means that 11 351 t of the overall 11 692 t lower 95% CI was used in the projection.

Table 3. Abundance (tonnes) of mackerel icefish in Division 58.5.2 estimated by bootstrapping hauls from the 2021 random stratified trawl survey. SE = standard error; Lower CI & Upper CI = lower and upper confidence intervals respectively; LOS 95% CI = lower one-sided 95% confidence interval.

Stratum	Mean	SE	Lower CI	Upper CI	LOS 95% CI
Gunnari Ridge	8,148	3,739	1,965	15,891	2,630
Plateau SE	7,643	2,560	3,219	13,007	3,803
Plateau W	3,142	1,300	1,257	5,878	1,431
Pooled	18,933	4,677	10,557	28,678	11,692

3. Yield estimates

These stock projections using the GYM indicated that catches of 1 528 t in the 2021/22 season and 1 138 t in the 2022/23 season satisfy the CCAMLR decision rules (Table 4).

Table 4. Target fishing mortality rate and annual yields of mackerel icefish in Division 58.5.2, estimated to ensure 75% escapement over a 2-year projection period for the 1+, 2+ and 3+ cohorts in the Generalised Yield Model, using the parameters shown in the Stock Annex.

Scenario	**Initial biomass estimate (t)**	**Target fishing mortality rate (yr^{-1})**	**Catch after RSTS**	**Yield (tonnes)**	
				2021/22	**2021/23**
2021	11351	0.1442	0	1528	1138

Additional Resources

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