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European Union's report on its toothfish exploratory fishery (CMM 14e-2024)

European Union



Georgia Seafoods Ltd

Exploratory Patagonian toothfish
demersal longline fishery:
George V Fracture Zone,
SPRFMO Convention Area

2024-26 Fishing Campaign:
First Annual Report



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Data Access

All data is stored in the SAERI Environmental Data Centre (<https://www.south-atlantic-research.org/>) and can be accessed by request and subject to permission from the data owner.

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1. Introduction

The exploratory fishery campaign 2024-2026 for Patagonian toothfish / Antarctic toothfish (*Dissostichus eleginoides*, *D. mawsoni* respectively) has completed its first year under CMM14e-2024. Fishing was undertaken in an area known as the George V Fracture Zone Research Block (GVFZ) adjacent to the NE of CCAMLR Convention Sub-area 58.4.1 (Figure 1). This follows up from the first campaign in the area (CMM14e-2021) that finished in October 2023. In this second campaign, exploration effort is distributed among the original Research Blocks A and now extending to an adjacent Research Block B.

The objectives of this exploratory fishery were;

- a) to further explore the presence and distribution of toothfish in the SPRFMO Convention Area.
- b) to collect and provide information and data contributing towards the sustainable management of potential toothfish stocks in specific, data-poor zones of the Convention Area.
- c) to assess the potential for a future sustainable toothfish fishery in specific zones of the Convention Area.
- d) to provide occurrence information on marine mammals, seabirds, sharks, skates and rays and other species of concern.
- e) to better understand patterns of seabirds and marine mammals and their potential for interactions with fishing vessels.
- f) to evaluate the potential impacts of longlines on non-target associated or dependent species, and vulnerable marine ecosystems.
- g) to undertake tagging activities on toothfish to enable future studies on the migration of toothfish as well as a preliminary stock assessment.

This report summarises all data collected in 2024 and provides an updated biomass assessment after 4 years of fishing in Research Block A (as there is only one season of tagging in Research Block B). These data will directly inform integration of this region into the current toothfish stock hypotheses and connectivity analyses with other regions where appropriate.

The fishing area straddles the Southeast Indian Ridge at approximately 139°E / 53°S, at a position roughly surrounding the George V Fracture Zone (Sempéré et al. 1996). The area is characterised by short chains of seamounts and spreading ridges (Harris et al., 2014) generally rising to approximately 1000m depth (500m depth for the highest seamount) and surrounded in abyssal hills of approximately 2500m – 3500m depth.

2. Methods

2.1 Data collection

All fishing was conducted on the *FV Tronio* using 'Spanish' double line bottom longline fishing gear (CCAMLR Gear Catalogue, specifically WG-FSA-11/53). Two scientific personnel were on board in each year: one scientific observer from the Instituto Español de Oceanografía (IEO), Spain, and a second from Capricorn Marine Environmental (Pty) Ltd, South Africa. All line setting metadata were collected by the vessel as well as total catch of target and main bycatch species. Biological data were collected for target and bycatch species according to the CCAMLR Scheme of International Scientific Observation, Scientific Observer's Manual Finfish Fisheries (2023) including green weight, total length,

sex, and maturity. Conversion factors for toothfish were monitored throughout the campaign. Otoliths were collected for all target species. Tagging of toothfish was conducted by Scientific Observers at a rate of 5 fish tagged per tonne green weight catch. Tissue samples of toothfish and *Macrourus holotrachys* were collected for DNA analysis. Additional data were also recorded, including all seabird and marine mammal interactions, benthic video footage, benthic invertebrate sample collection, and the collection of oceanographic data. Further details are found in the proposed fishing plan (SC11-DW04 EU FOP for an exploratory Patagonian and Antarctic toothfish fishery in the SPRFMO Area).

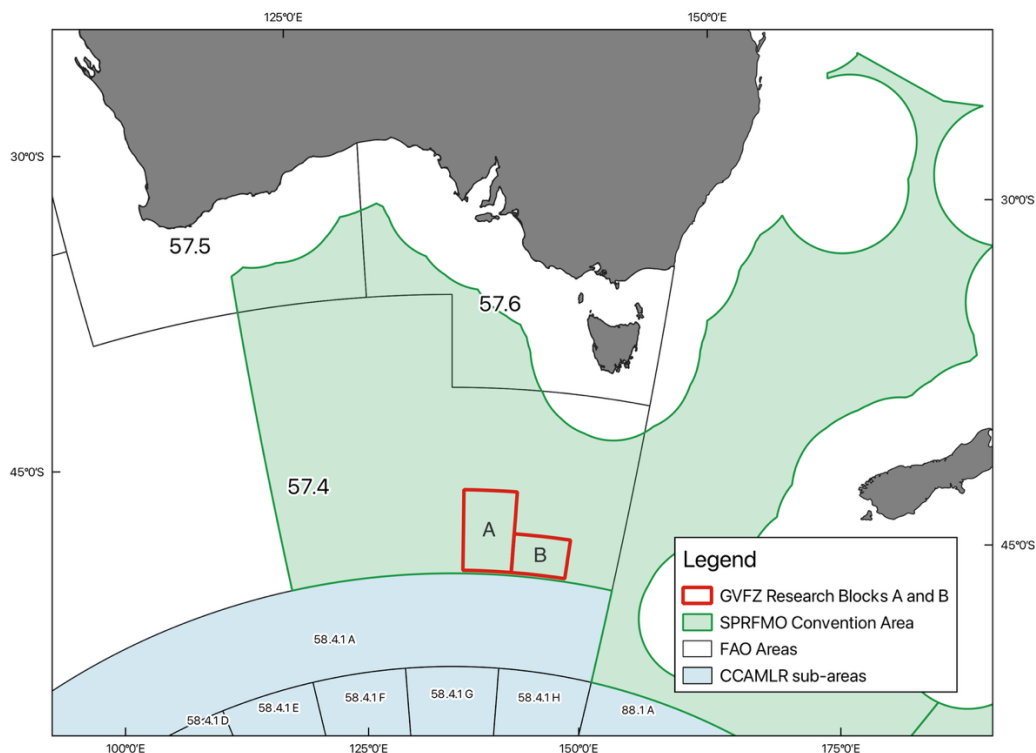


Figure 1 George V Fracture Zone research area within SPRFMO Convention Area. Also shown are FAO Area and CCAMLR Convention Area.

3. Results

3.1 Catch and effort

3.1.1 Toothfish

With respect to toothfish, only Patagonian toothfish (TOP) was caught; no Antarctic toothfish (TOA) were caught in 2024. The TAC (Block A – 129t; Block B - 33t) was not achieved after fishing for approximately 5 weeks (Table 1). Fishing in Block A was carried out on seamounts previously fished, and new seamounts were fished in Block B (Figure 2). Line setting depths ranged between 892m and 2310m depth. Number of lines set and numbers of hooks per line were below limits set out in CMM14e 2024. No lines were reported lost. A total of 289 hooks were lost, representing 0.1% of the total number of hooks deployed.

Table 1 Summary of TOP catch and effort.

Year	Research Block	Fishing period	Days fishing	Number of lines set	Mean line length (m)	Mean hooks set per line	Mean Line set depth (m)	Toothfish green weight (kg)
2024	A	10 Oct – 6 Nov	28	45	8,910	4861	1,769	118,744
2024	B	7 Nov – 15 Nov	9	16	7.94	4489	2,005	30,930

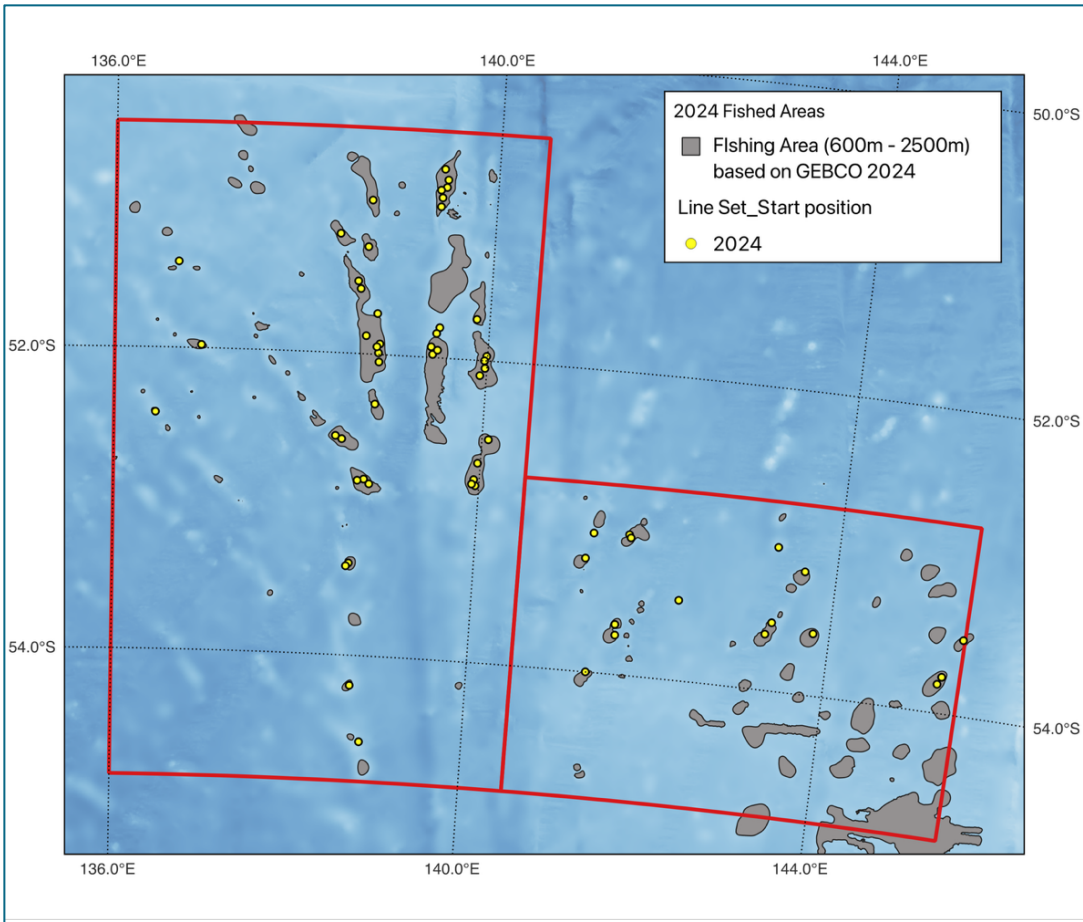


Figure 2 Location of lines set (set_start) in 2024. Highlighted are fishable seamounts defined by bathymetry ranging between 600m – 2500m depth (GEBCO 2024).

CPUE (kg/km of line) varied around an average of 283 kg/km line in Block A and B (Figure 3). Mean CPUE in Block A was 287 kg/km line, while mean CPUE in Block B was slightly lower (245 kg/km line).

3.1.2 Fish Bycatch

All bycatch was discarded; none was retained. *Macrourus* spp. was the primary bycatch species in all years, amounting to approximately 1% of the total toothfish catch (Table 2) each year. Secondary bycatch species include *Antimora rostrata* that was consistently caught in small amounts each year. *Lepidion* spp., *Spectrunculus grandis* (pudgy/giant cusk-eel), and *Muraenolepis* spp. (eel cod) were infrequently caught. Two species were caught in 2024 (Block A) that were not seen in previous years; *Lepidion microcephalus* and *Parastromateus niger*.

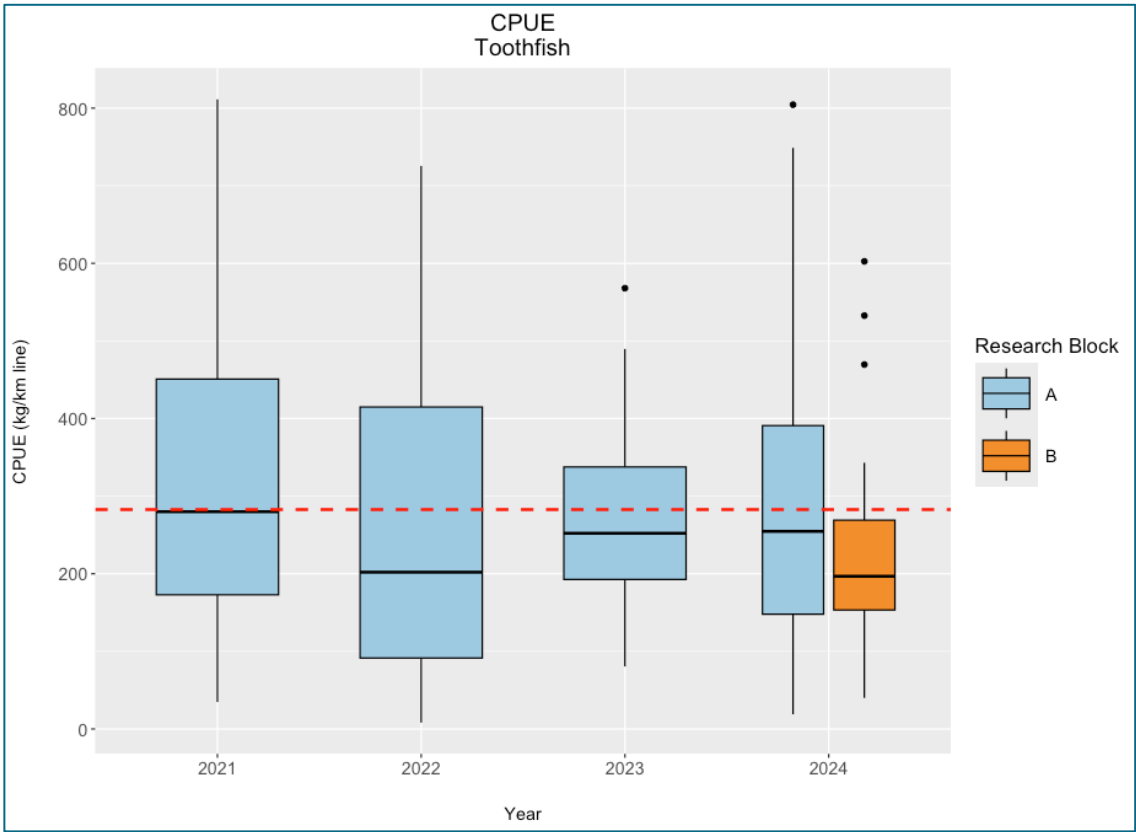


Figure 3 Box and whisker plot of CPUE (kg/km of line) of TOP from all lines in 2021-2024, representing medians, upper and lower quartiles and statistical max and min values. Overall mean CPUE per line (283 kg/km line) is shown by the dashed red line.

Table 2 Total bycatch species weight (kg) as recorded on the bridge.

	Code	Season				
		2021	2022	2023	2024 (A)	2024 (B)
<i>Antimora rostrata</i>	ANT	130	137	27	170	138
<i>Macrourus</i> spp.	GRV	783	983	466	886	313
<i>Lepidion</i> spp.	LEV	-	4	3	-	-
<i>Spectrunculus grandis</i>	OSG	-	-	6	-	-
<i>Muraenolepis</i> spp.	MRL	85	10	-	-	-
<i>Muraenolepis microps</i>	MOY	-	21	-	117	20
<i>Lepidion microcephalus</i>	LMF	-	-	-	14	-
<i>Parastromateus niger</i>	POB	-	-	-	3	-

3.2 Biological data and analysis

All biological data were recorded in standard Scientific Observer spreadsheets. A total of 271 otolith pairs from TOP were collected in 2024. These will be processed for production of an age-length key. Observers followed protocols for collection of 65 tissue samples of *Macrourus holotrachys* (MCH) for DNA analysis. Results of otolith and DNA analyses will be presented/published in due course.

3.2.1 Length/Frequency - TOP

The length-frequency of TOP from Research Block A and B in 2024 is shown in Figure 4. Median and mean fish lengths were slightly larger in Block A compared to Block B, with overall size distribution similar in both areas.

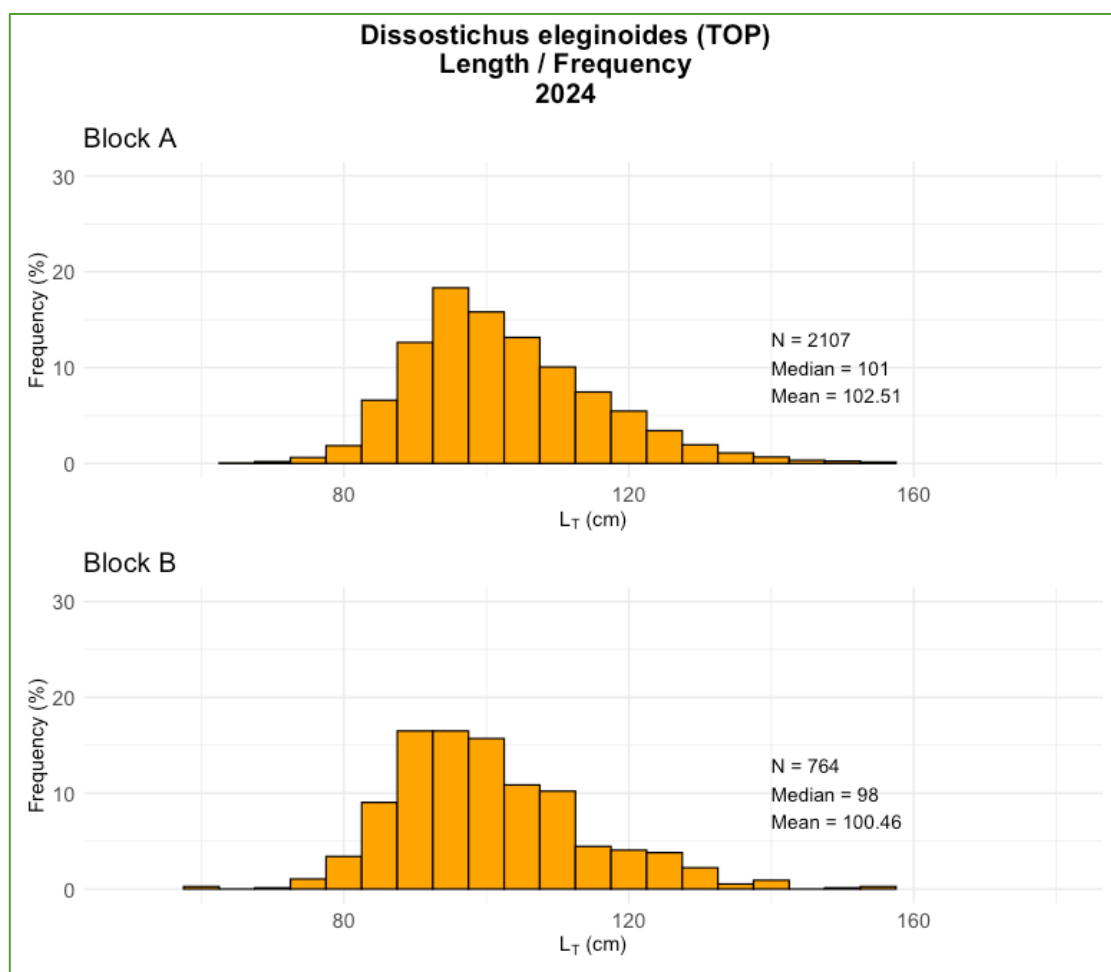


Figure 4 Length-frequency of TOP in 2024.

3.2.2 Sex and Maturity - TOP

Male and female length frequency of TOP in Block A and B is shown in Figure 5. In both Blocks, males were generally smaller than females. The sex ratio (M:F=70:30) between Blocks was also similar.

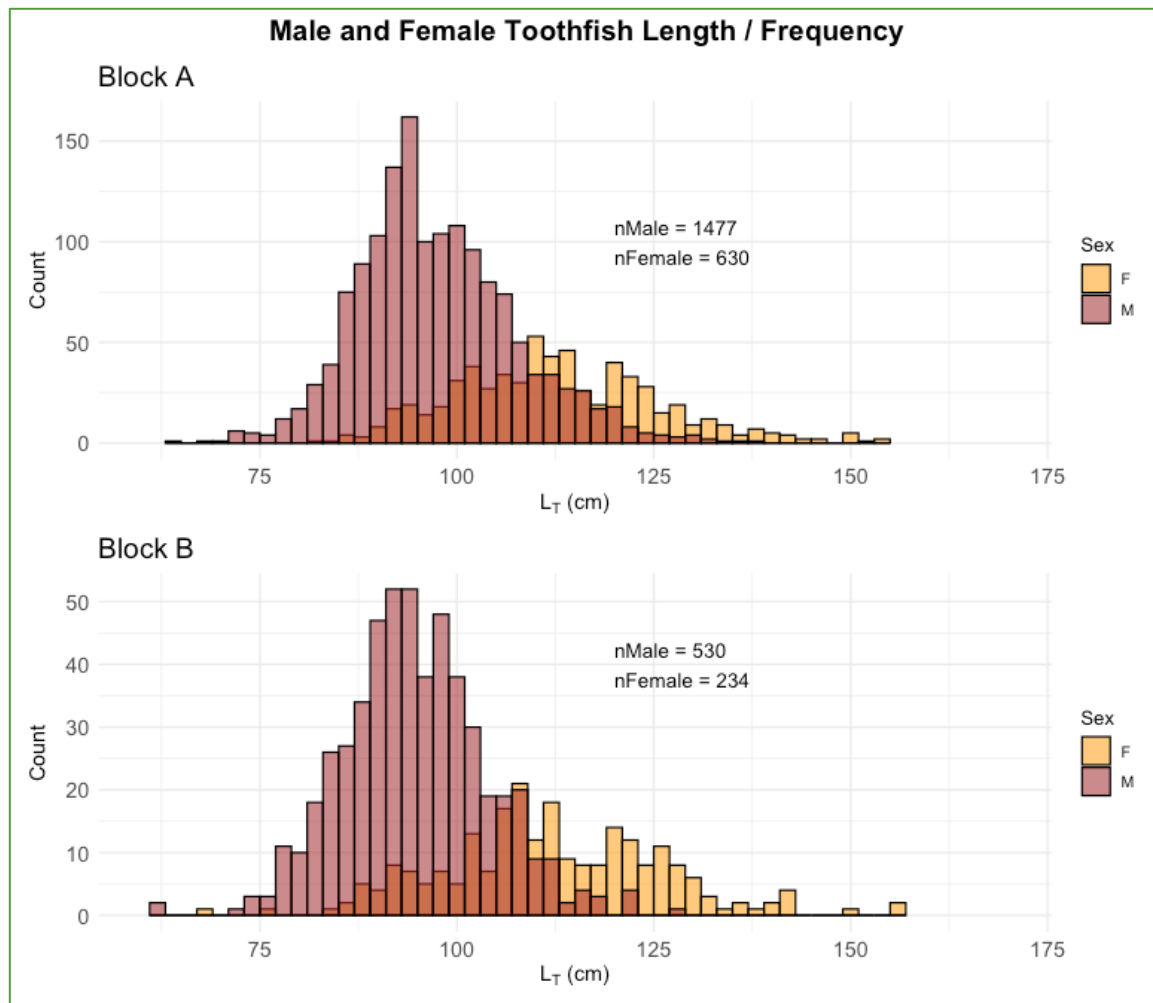


Figure 5 Length-frequency of males and females of TOP in 2024

Maturity stages (of males and females caught in 2021, 2022, and 2023 are shown in Figure 6. Maturity stages 1-5 were found in all years. In 2021, the majority of fish were in the Stage III (Developed), whilst in 2022 Stage II (Developing) were more common among both males and females. In 2023, 40% of males and 22% of females were in Stage V (Spent). Such inter-annual variability in maturity stages may, in part, account for variability in size-frequency distributions observed.

3.2.3 Bycatch

Scientific Observers collected biological data from all bycatch species. Minimum data collected was Total weight and Total length (with preanal length taken for some Macrourids on occasion), summarised in Table 3. Sex and maturity were collected by non-random sub-sampling, with some tissue sampling. Details are found in Observer Data collections spreadsheets.

There was no chondrichthyan bycatch recorded.

Macrourus holotrachys (MCH) was the most commonly caught bycatch species. Length-frequency of MCH for caught between 2024 is shown in Figure 7. Size distribution was similar between Blocks A and B.

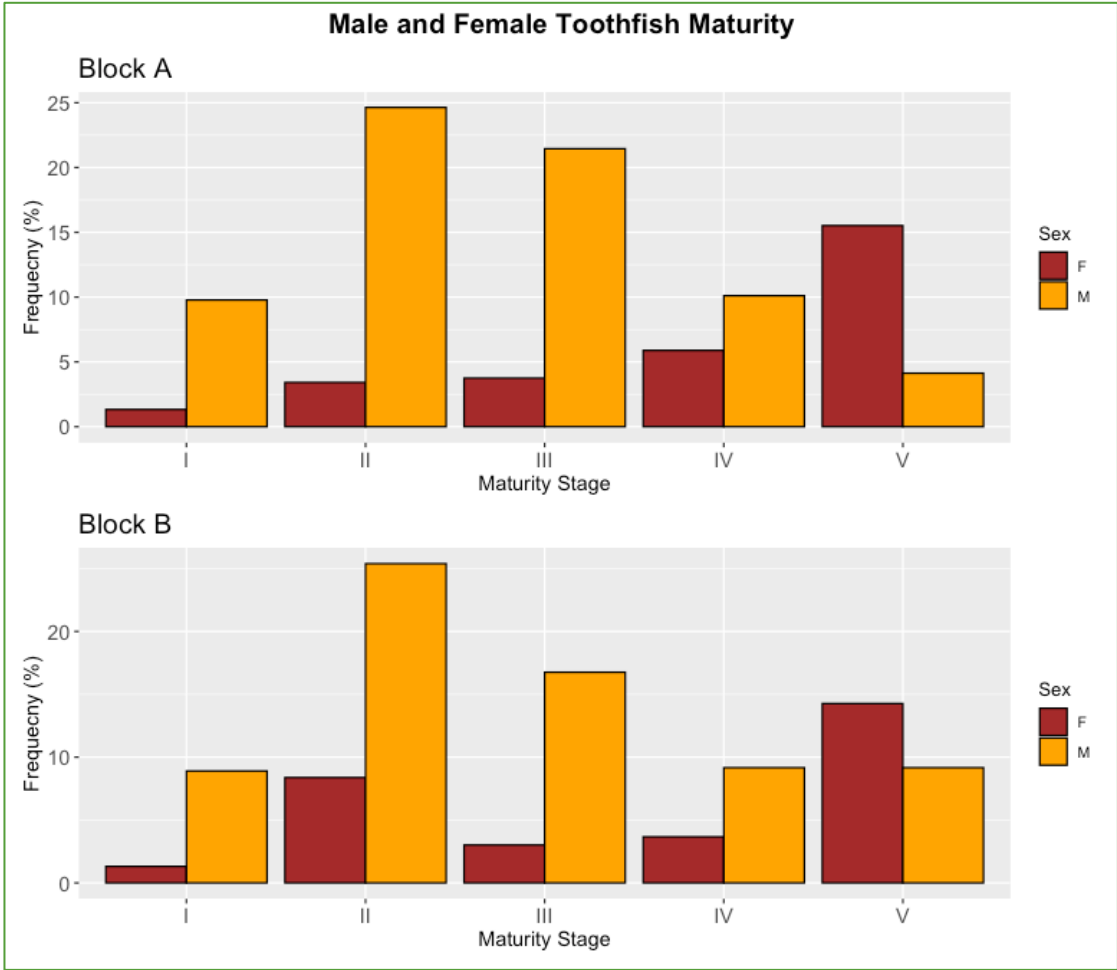


Figure 6 Frequency of maturity of male and female TOP from 2024.

Table 3 Length (cm) and weight (kg) of bycatch catch species as measured by Scientific Observers.

Bycatch species	Number measured	Total Weight (kg)	Length max (cm)	Length min (cm)	Length mean (cm)
<i>Antimora rostrata</i> (ANT)	160	291.9	760	410	603.1
<i>Coryphaenoides armatus</i> (CKH)	6	6	730	450	613.3
<i>Lepidion microcephalus</i> (LMF)	1	14	910	910	910
<i>Macrourus holotrachys</i> (MCH)	774	1387.2	870	420	648.8
<i>Muraenolepis microps</i> (MOY)	36	145	980	680	827.2
<i>Parastromateus niger</i> (POB)	1	2.9	610	610	610
<i>Macrourus whitsoni</i> (WGR)	2	0.9	510	490	500

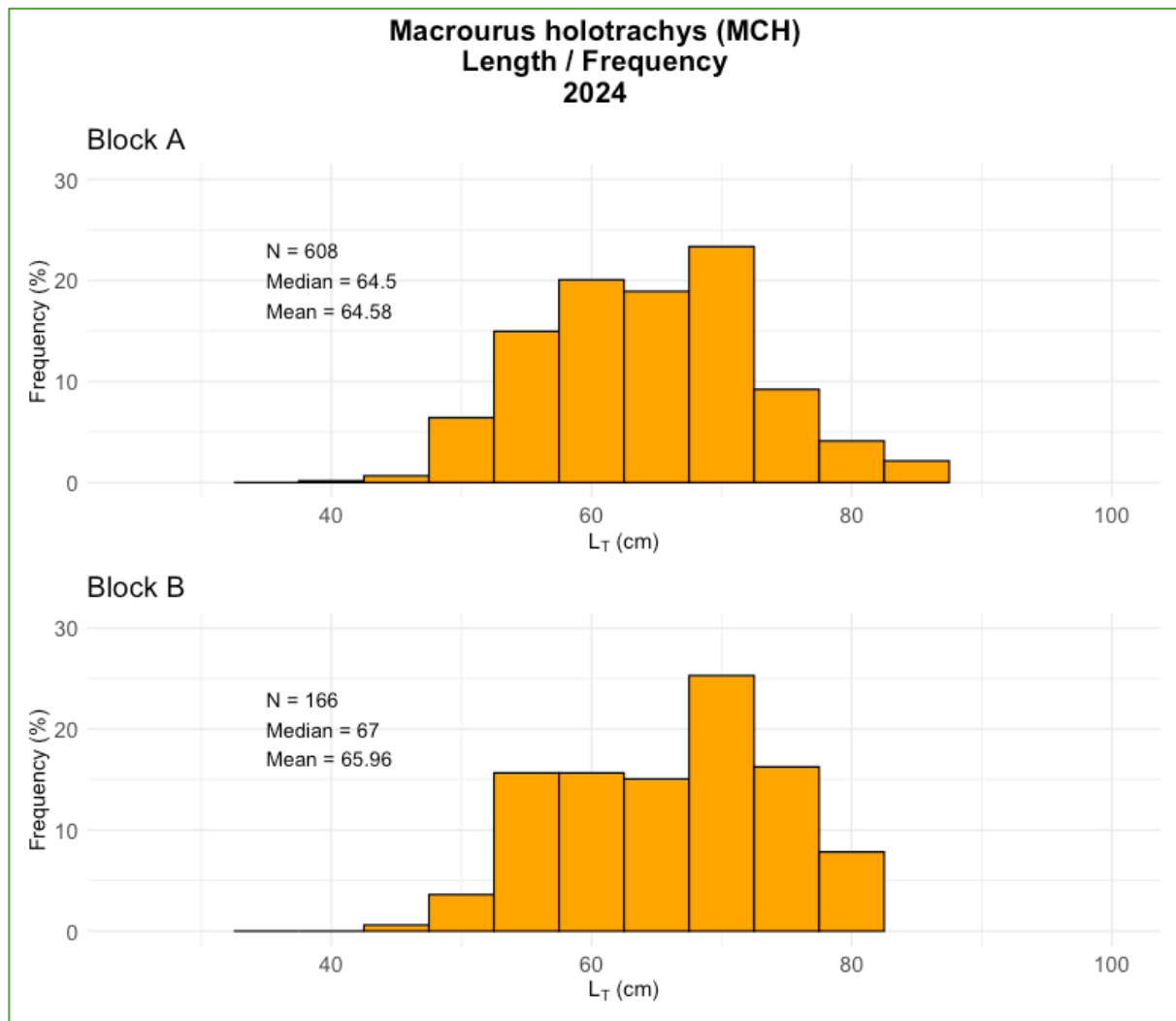


Figure 7 *Macrourus holotrachys* (MCH) length-frequency distribution from 2024.

3.2.4 Tagging – TOP

Tagging of TOP was carried out at a rate of 5 fish/tonne, using standard tagging methods. In 2024, 596 were tagged in Block A and 160 in Block B, and overlap statistics in Blocks A and B were 77.67% and 74.98% respectively, meeting requirements under CMM 14e-2024. No tagged and released fish were re-captured in season. Previous tag overlap statistics achieved on Block A were 66.20% (2021), 69.77% (2022), and 83.43% (2023).

There were two tag recaptures in 2024. One had been originally released in the Macquarie Ridge fishery in 2017. Data have been sent to the Australian Antarctic Division in Hobart. The second tag was released in the GVFZ in 2023 and recovered on the same seamount as it was released, similar to other tag /releases in the previous campaign. The release and recapture positions are shown in Figure 8.

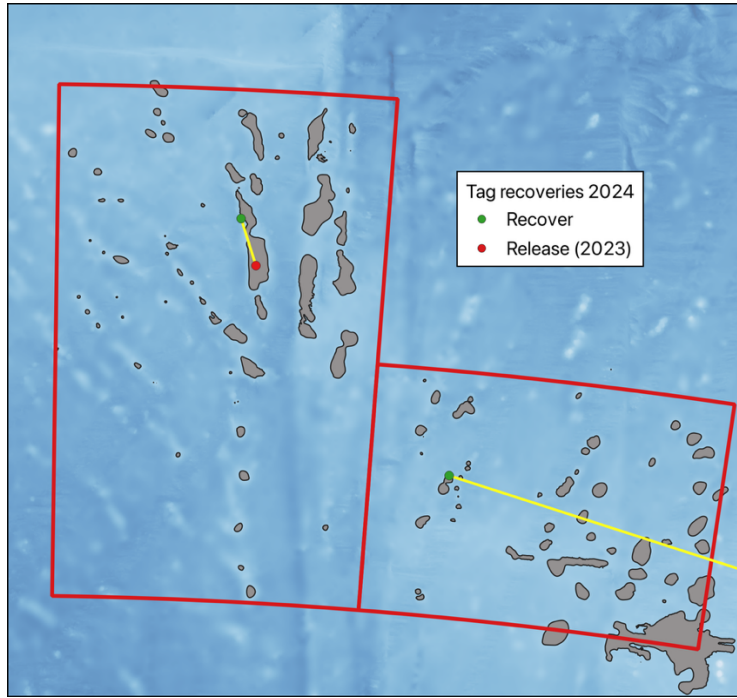


Figure 8 Recoveries on the GVFZ in 2024 with original release locations.

3.3 Biomass estimates

3.3.1 Method

Analysis of tagging data was done using the Chapman method as detailed in CCAMLR SC-XXXV Appendix 5. Biomass is calculated as:

$$B_j = \frac{c(n_{j-1} + 1)}{mx_j + 1}$$

where n_{j-1} is the number of tagged fish available for recapture at the end of the season prior to season j , c_j is the catch in season j (including those that were tagged and release) and mx_j is the number of tagged fish recaptured in season j (excluding within-season recaptures).

The number of tags available is calculated as;

$$n_j \begin{cases} j = 1, & r_j(1 - t)e^{-(f+M)} - m_j \\ j > 1, & n_{j-1}e^{-(f+M)} + r_j(1 - t)e^{-(f+M)} - m_j \end{cases}$$

Where r_j is the total number of fish released in CCAMLR fishing season j , m_j is the total number of tagged fish recaptured in CCAMLR fishing season j , and n_{j-1} is the number of tagged fish available for recapture at the end of the season prior to season j . t is the post-tagging mortality rate of 0.1 (Agnew et al., 2009). f is the annual tag loss rate which is 0.0084 (WG-SAM-11/18). M is natural mortality: 0.155 for Patagonian toothfish (*D. eleginoides*) (Candy et al., 2011).

Calculations of biomass using the Chapman tag-recapture method was implemented in R (4.4.0) using modified scripts provided by CCAMLR (https://github.com/CCAMLR-Science/Trend_Analysis).

Fishing effort for the years 2021-2024 is shown in Figure 9. Fishing effort in 2024 consisted of re-visiting several areas previously fished in 2021-2023 in Area A. This preliminary assessment is carried out on Area A only as no fishing (i.e. no tagging) was carried out in Area B prior to 2024. In addition, several new areas were fished in Area A. In 2024, Area B was fished for the first time.

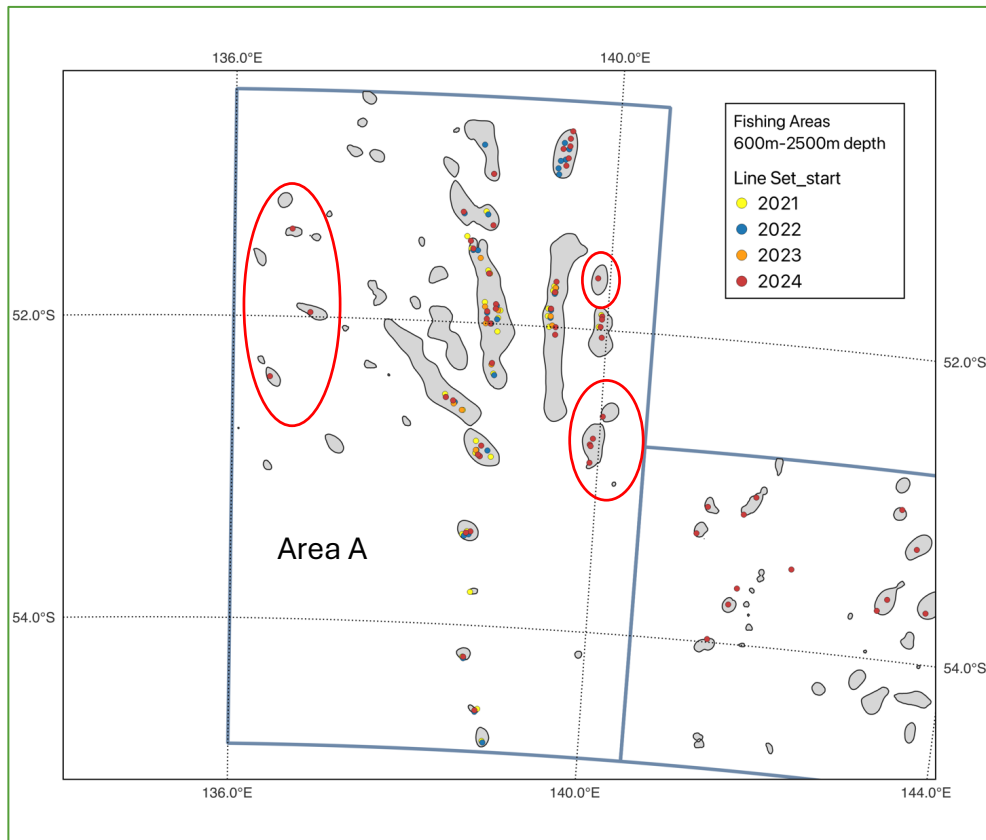


Figure 9. GFVZ Area A. Circled in red - fished areas omitted from the current biomass estimate.

3.3.2 Results

A length-weight relationship (Figure 10) was calculated for fish captured in 2021-2023 as:

$$W = 7.375e-06 L^{3.08}; R^2 = 0.933$$

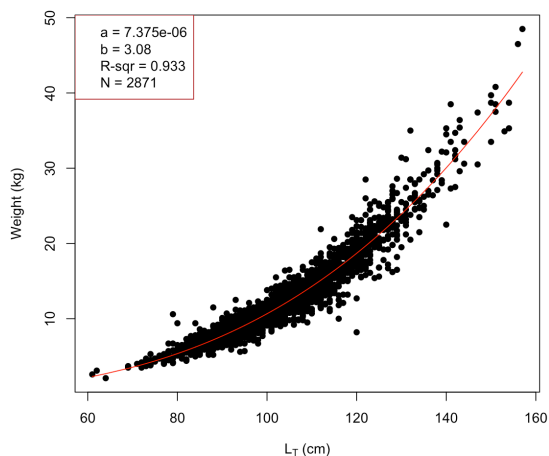


Figure 10 Length-weight relationship for Patagonian toothfish 2024.

Table 4 gives results of biomass estimates from Chapman tag-recapture method. Biomass estimates after 2024 recaptures was 31,810t (CI_{lower} – 13,484; CI_{upper} – 37,618). This is a significant increase from the 2022-23 estimates. Coincident CI intervals have also increased significantly. Over-inflated estimates are likely to be caused by the large number of lines set in 2024 in Area A (45 lines) compared to previous years, and only one fish tag return in 2024.

Table 4 Biomass estimates (tonnes) for TOP in research block GVFZ A.

Region	Species	Season	Biomass Est	CI_lower	CI_upper	N_recaptures	N_Hauls
GVFZ	TOP	2022	5950	2962	13369	3	32
GVFZ	TOP	2023	6297	3539	13230	3	17
GVFZ	TOP	2024	31810	13484	37618	1	45

3.4 Seabirds and Marine Mammals

There were no incidental mortalities of seabirds or marine mammals recorded during the 2024 season. There were no marine mammals observed. Table 5 summarises the seabirds observations made by scientific observers. Notably, the number of different species observed in 2023 (14 species) compared to 2022 (8 species), possibly due to Scientific Observer’s knowledge. Observations in 2023 included 3 species listed as Endangered (EN) under IUCN Red Listing.

Table 5 Seabird observations during line setting and hauling in 2024.

Species	Common Name	IUCN Status	2024	
			Observations during Line Setting	Observations during Line Hauling
<i>Daption capense</i>	Cape petrel	LC	377	253
<i>Macronectes halli</i>	Northern giant petrel	LC	453	810
<i>Diomedea epomophora</i>	Southern Royal albatross	VU	87	152
<i>Diomedea exulans</i>	Wandering albatross	VU	149	120
<i>Thalassarche melanophris</i>	Black-browed albatross	LC	228	163
Total			1294	1498

3.5 Benthic Habitats and VME

Very little bycatch of VME indicator taxa was recorded in 2024. VME bycatch recorded are shown in Table 6. Often, VME species recovered were dead fragments. VME move-on rules were not triggered at any time (CMM 03-2025). When physical samples were brought up on the line, observers collected representative photographs of living samples (Figure 11).

Table 6 VME indicator taxa bycatch recorded by scientific observers in 2024. Shown is total weight (kg) for all lines.

VME Group Code	VME Group Name	2024 Weight (kg)
CSS	Scleractinia	0.070
AQZ	Antipatharia	0.020
AXT	Stylasteridae	0.250
GGW	Gorgoniidae	4.447
NTW	Pennatulacea	0.160
OEQ	Euryalida	0.450
SSX	Ascidacea	0.070
Total		5.467

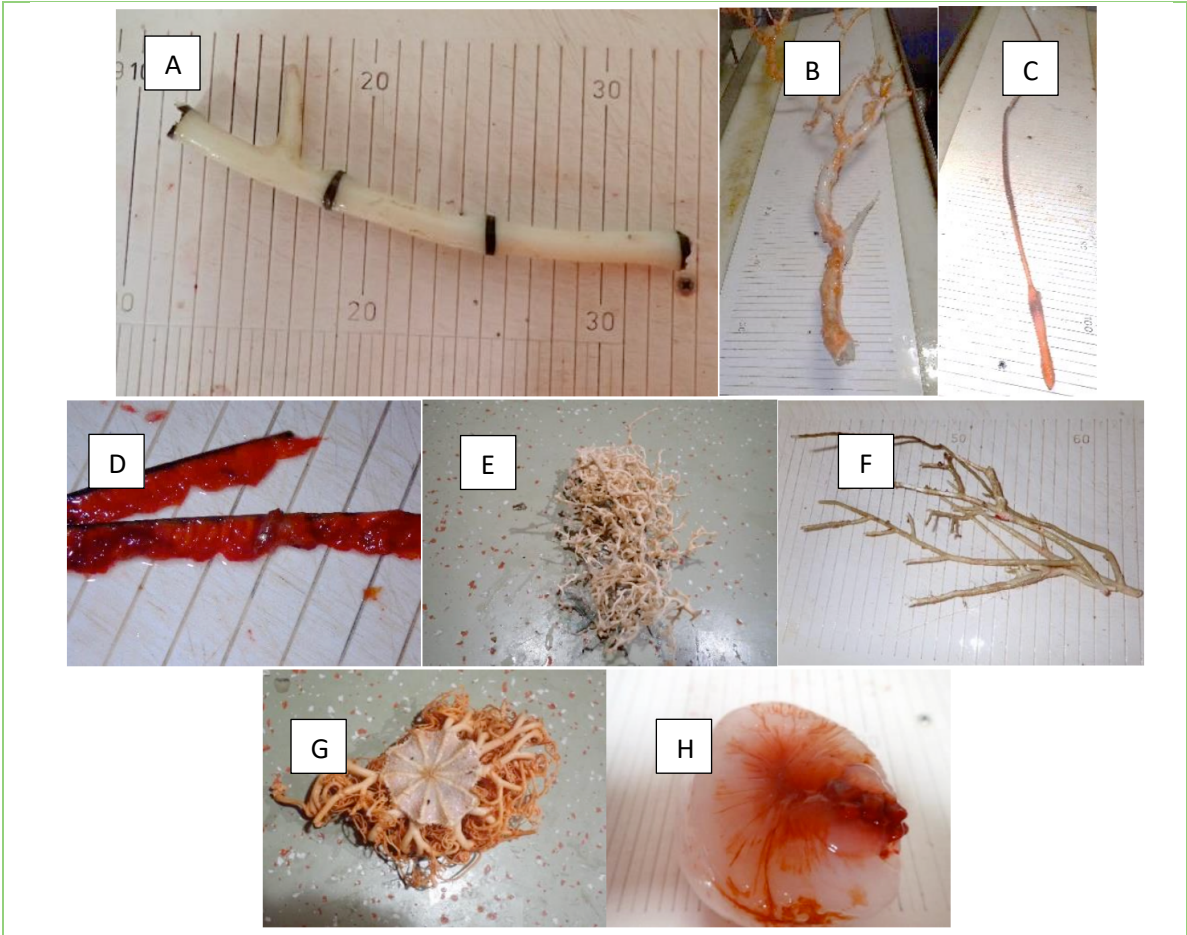


Figure 11: VME sample examples recovered in 2024. Photographs collected by Scientific Observers. Pictured are Isididae (A, B), Pennatulaceae (C, D), Scleractinia (E), Antipatharia (F), Euryalida (G), Actinaria (H).

A video camera was deployed on 8 lines, however unfortunately only one line produced usable results (Block A, line 43, 1702m depth). A screenshot is shown in Figure 12, indicating sand and bare rock with no VME taxa evident. This is similar to habitat captured in previous seasons.



Figure 12 Representative screenshot of video imagery taken at Line 43, Block A in 2024. Depth as 1705m.

3.6 Oceanography

Oceanographic data was collected at 33 stations in 2024 using Star-Oddi DST-CTD's (Figure 13).

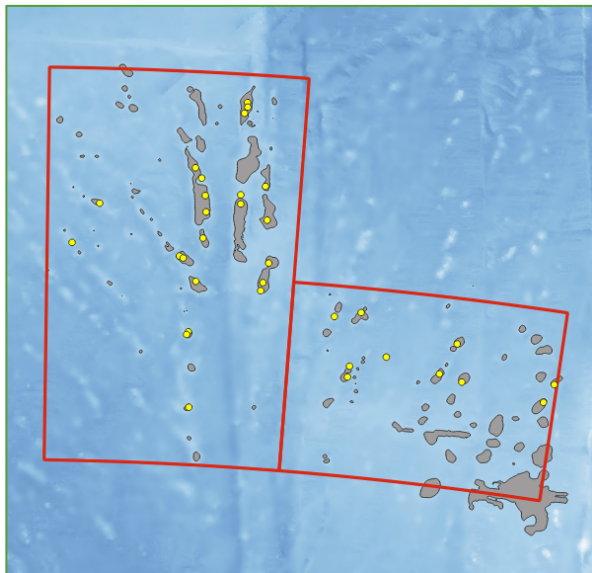


Figure 13 CTD Stations in 2024.

Similar to previous year, the water column is stratified, with a mixed layer down to approximately 250m depth, and a colder, saltier water laying underneath (Figure 14, Figure 15). Surface water in the north was warmer than in the southern area. At the seabed there was slight variability in temperature

during the 18hrs of line setting in the southern area, whilst the seabed temperature in northern area was relatively stable.

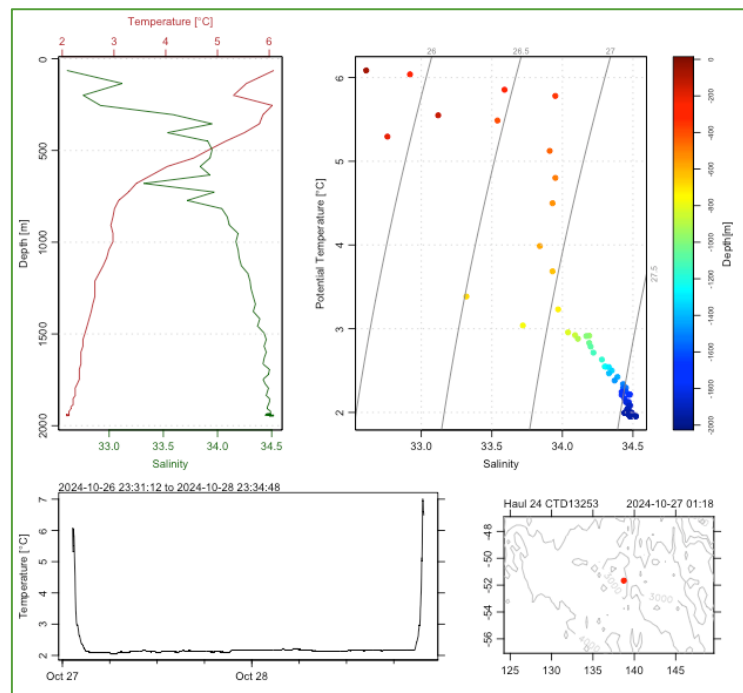


Figure 14 CTD profile at Line 24, 2024, showing temperature and salinity profiles (top left), TS plot (top right), bottom temperature (bottom left), and geographic position and bathymetry at the station (bottom right).

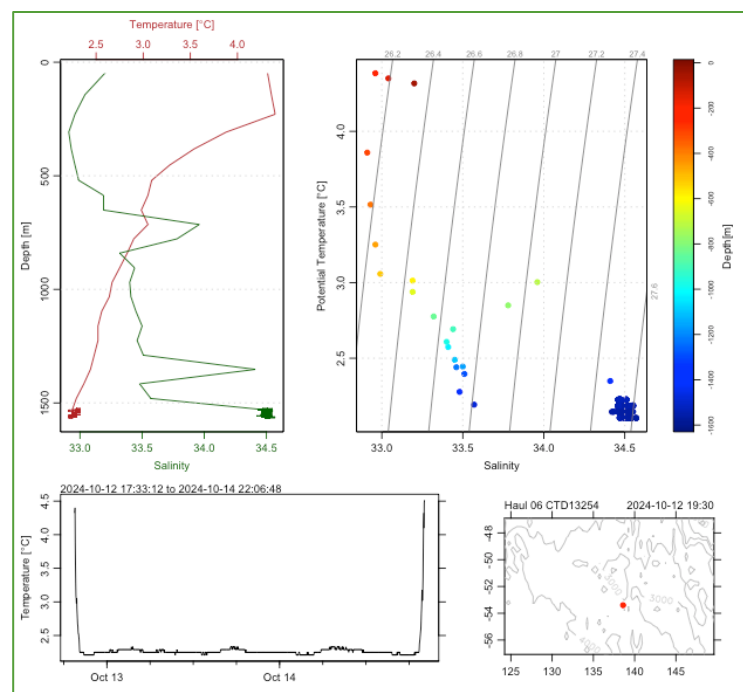


Figure 15 CTD profile at Line 5, 2024, showing temperature and salinity profiles (top left), TS plot (top right), bottom temperature (bottom left), and geographic position and bathymetry at the station (bottom right).

Contour plots of surface temperature throughout Block A and B illustrate an East – West increase in surface (100m) temperature (Figure 16). This gradient is also detected at 1000m depths (Figure 17). This gradient marks the transition from the Subantarctic Front in the north, to the Polar Front in the south. Bottom water at these locations is likely to be Antarctic Intermediate Water (AAIW) corresponding to a density surface of approximately 27.4 with overlaying Subantarctic Mode Water (SAMW) (Yaremchu et al 2001).

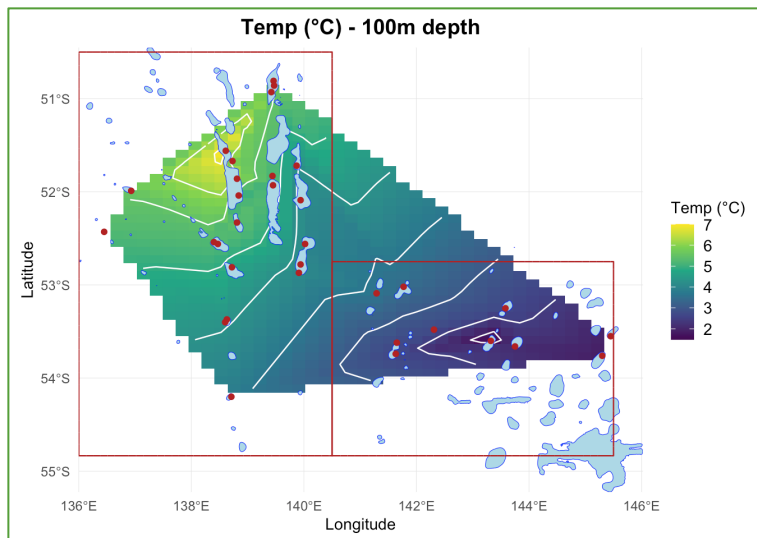


Figure 16 Surface (100m depth) contour plot of temperature throughout Blocks A and B.

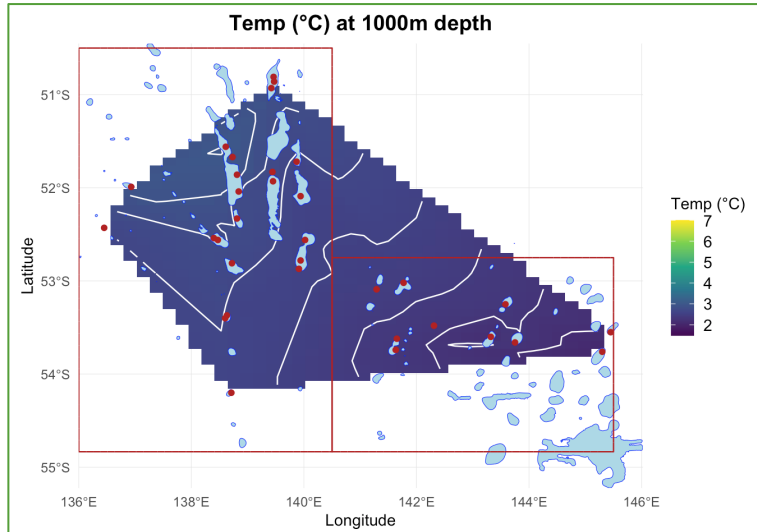


Figure 17 Surface (1000m depth) contour plot of temperature throughout Blocks A and B.

4. Discussion

There is a paucity of information on the toothfish stock and the biological / ecological character of the GVZF area. Prior to 2021, there were two records of Patagonian toothfish registered with OBIS and apparent records held by the Australian Government (L. Georgeson pers. com.). Other past observations made in the area include seabird observations made opportunistically from vessels that

frequently pass through, but little data collected systematically. There was no knowledge of seabed habitat or species.

The collection of data from the *FV Tronio*'s first exploratory fishing campaigns in 2021-23 and now its second campaign (2024-26) has provided much needed information on the toothfish stock in this area. The movement of toothfish may be constrained to ridge / seamount peaks, as indicated by tag release and recoveries, with continued evidence of connectivity to the wider region from as far as Macquarie Ridge 700nm to the east of the GVFZ. CPUE remains relatively stable in Block A. CPUE in Block B was slightly lower than in Block A, but is within the range of CPUEs in Block A and the historic variability. Patterns of length / frequency, sex ratio, and reproductive state of toothfish fish caught were similar between Blocks A and B. The combination of abundance and biological data tends to support the notion of managing Patagonian toothfish in the GVFZ as one stock. However, tag release/recapture rates remain variable, which translates to uncertainty in biomass estimate at this stage. Supplementary genetic and otolith analyses will provide indications of connectivity of Patagonian toothfish in the region's adjacent toothfish fisheries.

Data collected on fish bycatch, benthic species and habitats, seabird observations, and oceanography enhance our understanding of this poorly studied area of the Southern Ocean. There are relatively few species of bycaught fish, with their occurrence appearing relatively patchy. Only *Macrourus holotrachys* was caught consistently in significant numbers. The lack of VME species encountered has been a valuable observation, confirming the predictions of low VME suitability made for the region (Anderson et al. 2016; Tittensor et al. 2009; Davies and Guinotte 2011). Notably, the lack of elasmobranch bycatch suggests that sharks and skates are relatively rare; nevertheless, precautionary bycatch monitoring and move-on triggers should remain in place until further exploratory fishing can be conducted. These biological indicators can be explained by in part, the very cold, dense AAIW at these depths.

5. Future work

This exploratory fishery will continue from 2025-26, collecting similar data across the expanded fishing area.

- expanding the fishing area to new seamounts and ridges in the currently fished area as well as new areas to the east.
- toothfish tagging, and the fidelity of tagged fish to areas of seamounts and ridges
- toothfish population sex ratio, and how that relates to reproduction and maturity patterns
- collection of *Macrourus holotrachys* genetic samples for connectivity studies
- continued gathering of benthic imagery for habitat studies and VME species collection
- continued deployment of CTDs for oceanographic characterisation of the region.

Also in the coming years, toothfish otolith and genetic samples from 2021-23 will have been processed, and results from that analyses may inform additional studies to be undertaken in the 2024-26 fishing seasons.

6. References

- Agnew DJ, Edwards C, Hillary R, Mitchell R, and Abellán LJL (2009) Status of the coastal stocks of *Dissostichus* spp. in East Antarctica (Divisions 58.4.1 and 58.4.2). CCAMLR Science 16:71-100
- Anderson, OF et al. (2016) 'Field validation of habitat suitability models for vulnerable marine ecosystems in the South Pacific Ocean: Implications for the use of broad-scale models in fisheries management', Ocean and Coastal Management. Elsevier Ltd, 120, pp. 110–126. doi: 10.1016/j.ocecoaman.2015.11.025.
- Candy, S. G., Welsford, D. C., Lamb, T., Verdouw, J. J., & Hutchins, J. J. (2011). Estimation of natural mortality for the Patagonian toothfish at Heard and McDonald Islands using catch-at-age and aged mark-recapture data from the main trawl ground. CCAMLR Science, 18, 29–45
- CCAMLR WG-FSA-11/53. Description of fishing gear and procedures of setting / hauling of Spanish longline system for toothfish in CCAMLR area. <https://www.ccamlr.org/en/system/files/fsa-11-53.pdf>
- CCAMLR Scientific Observer's Manual – Finfish Fisheries – Version 2023.
<https://www.ccamlr.org/en/document/science/scientific-observers-manual---finfish-fisheries---version-2023>
- CCAMLR WG-SAM-11/18. Estimates of the tag loss rates for single and double tagged toothfish (*Dissostichus mawsoni*) fishery in the Ross Sea. <https://meetings.ccamlr.org/en/wg-sam-11/18>
- Davies, A. J. and Guinotte, J. M. (2011) 'Global habitat suitability for framework-forming cold-water corals', PLoS ONE, 6(4). doi: 10.1371/journal.pone.0018483.
- Harris PT et al. (2014) Geomorphology of the oceans. Marine Geology. Elsevier B.V., 352, pp. 4–24. doi: 10.1016/j.margeo.2014.01.011.
- Sempéré JC, West BP and Géli L (1996) The Southeast Indian Ridge between 127° and 132°40'E: Contrasts in segmentation characteristics and implications for crustal accretion.
- Tittensor, D. P. et al. (2009) Predicting global habitat suitability for stony corals on seamounts, Journal of Biogeography, 36(6), pp. 1111–1128. doi: 10.1111/j.1365-2699.2008.02062.x.
- Yaremchuk M, Bindoff NL, Schröter J, Nechaev D, and Rintoul SR (2001) On the zonal and meridional circulation and ocean transports between Tasmania and Antarctica. J of Geophysical Res. 106. 2795-2814.