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SC11 – DW14
European Union Exploratory Toothfish Year 2 Cruise Report

European Union

Georgia Seafoods Ltd

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

Year 2 Survey Report: *FV Tronio* (ECJF) 06/10/2022 - 21/10/2022

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Review table

Name	Reviewed by	Date
Version 1	P Brewin, P Brickle	9 May 2023
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Citation

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Data Access

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

Acknowledgements

We would like to thank the Captain and crew of *FV Tronio* for assistance on the vessel, and scientific observers from the Instituto Español de Oceanografía, Spain and Capricorn Marine Ltd.

Contents

1.   Introduction

An exploratory Patagonian toothfish (*Dissostichus* spp.) fishing program was proposed at the 9th Annual Meeting of the SPRFMO Commission (26 January- 05 February 2021) by the European Commission (COMM9-Prop16, SC8-DW05_Rev2), with work to be conducted by the Spanish flagged longline fishing vessel *FV Tronio*. The exploratory fishing activities were to be undertaken in 2021-2023 in the area known as the George V Fracture Zone Research Block, an area within the SPRFMO convention area and a southern border that is adjacent to the eastern end of CCAMLR Convention Sub-area 58.4.1 (Figure 1.1). The proposal highlighted the Fisheries Operation Plan, including specific proposed areas, target species, fishing methods, fishing period, data collection plan, sample and data management plan. The proposal identified the relevant elements of CMM 03-2020 on Bottom Fishing in the SPRFMO Convention Area, notably a risk assessment of bottom fishing activities within and outside the agreed footprint. The proposal was adopted by the Commission through CMM14e-2021 in accordance with Articles 8, 20 and 22 of the Convention.

To the best of our knowledge, there had not been any recorded toothfish fishing in the area prior to this campaign. There were two records found in OBIS (https://obis.org/) of Patagonian toothfish sampled in the target region, with records held at Museums Victoria, Australia.
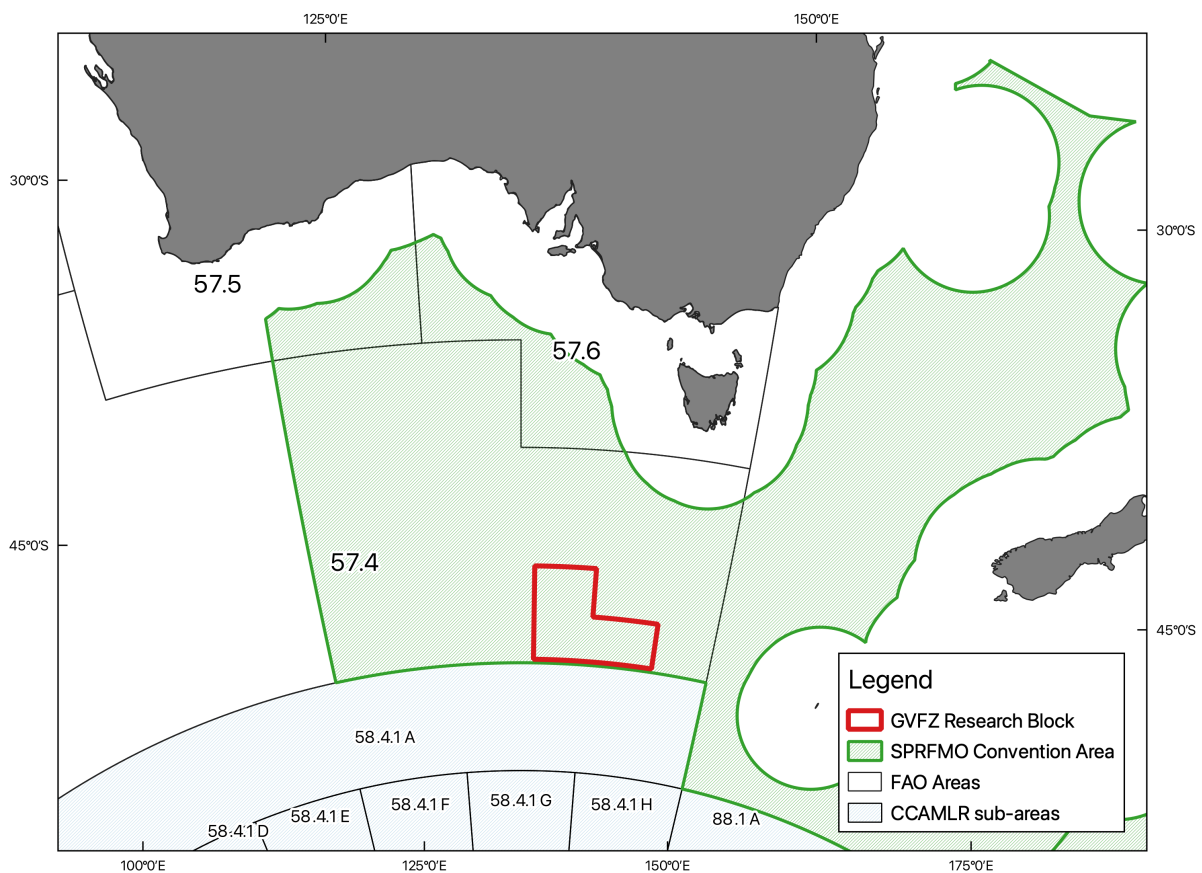

Figure 1.1 George V Fracture Zone research area within SPRFMO Convention Area. Also shown is adjacent CCAMLR Convention Area.

1.1.   Objectives

The objectives of this exploratory fishery are (CMM14e-2021);

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.

In this report we summarise results of Year 2 of the proposed 3-year exploratory fishing campaign. These data will directly inform integration of this region into current Patagonian toothfish stock hypotheses and connectivity analyses with other regions where appropriate.

2.   Methods

2.1   Proposed fishing plan
Detail of the proposed fishing plan are presented in COMM9-Prop16 and SC8-DW05_Rev2. Fishing methods, monitoring and data collection during the survey did not largely deviate from those proposed in the plan. Exceptions are noted below in section 3.

2.2   Fishing area
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.

2.3   Vessel
Vessel specific details as required under paragraphs 2 and 3 of Annex 1 of CMM 05-2002 (Record of Vessels) are shown in Table 2.1. Images of the *FV Tronio* are presented in Figure 2.1.

Table 2.1 Vessel details

CMM 05-2016 (Record of Vessels)	
Current vessel flag	EUROPEAN UNION (EU) (SPAIN)
Name of vessel	TRONIO
Registration number	3GC-1-2-05
International radio call sign	ECJF
UVI (Unique Vessel Identifier)/IMO number	9361603
Previous Names	N/A
Port of registry	CELEIRO (Spain)
Previous flag	UNITED KINGDOM (GBR)
Type of vessel	BOTTOM LONGLINER (LL)
Type of fishing method	LLS 09.3.0
Length	55 m LOA
Gross Tonnage	1058 GT
Power of main engine	1378.70Kw
Hold capacity	632,3 m^3
Freezer type	TUNNEL
Number of freezers units	3
Freezing capacity	30Mt
Vessel communication types and numbers	Inmarsat C :422462320 Inmarsat FBB: +870773184117
VMS system details	Satlink ELB 2014
Name of owner	PESQUERÍAS GEORGIA, S.L
Address of owner	Muelle Sur, Almacén 21- Celeiro – Spain
Ice classification	Ice Class 1C

2.4   Scientific personnel

There were two scientific personnel on board: one scientific observer from the Instituto Español de Oceanografía, Spain, and a second from Capricorn Marine Ltd.

2.5   Fishing gear

The 'Spanish' longline system of seabed longline fishing was used (Figure 2.2) (as specified in CCAMLR Gear Catalogue, specifically WG-FSA-11/53).
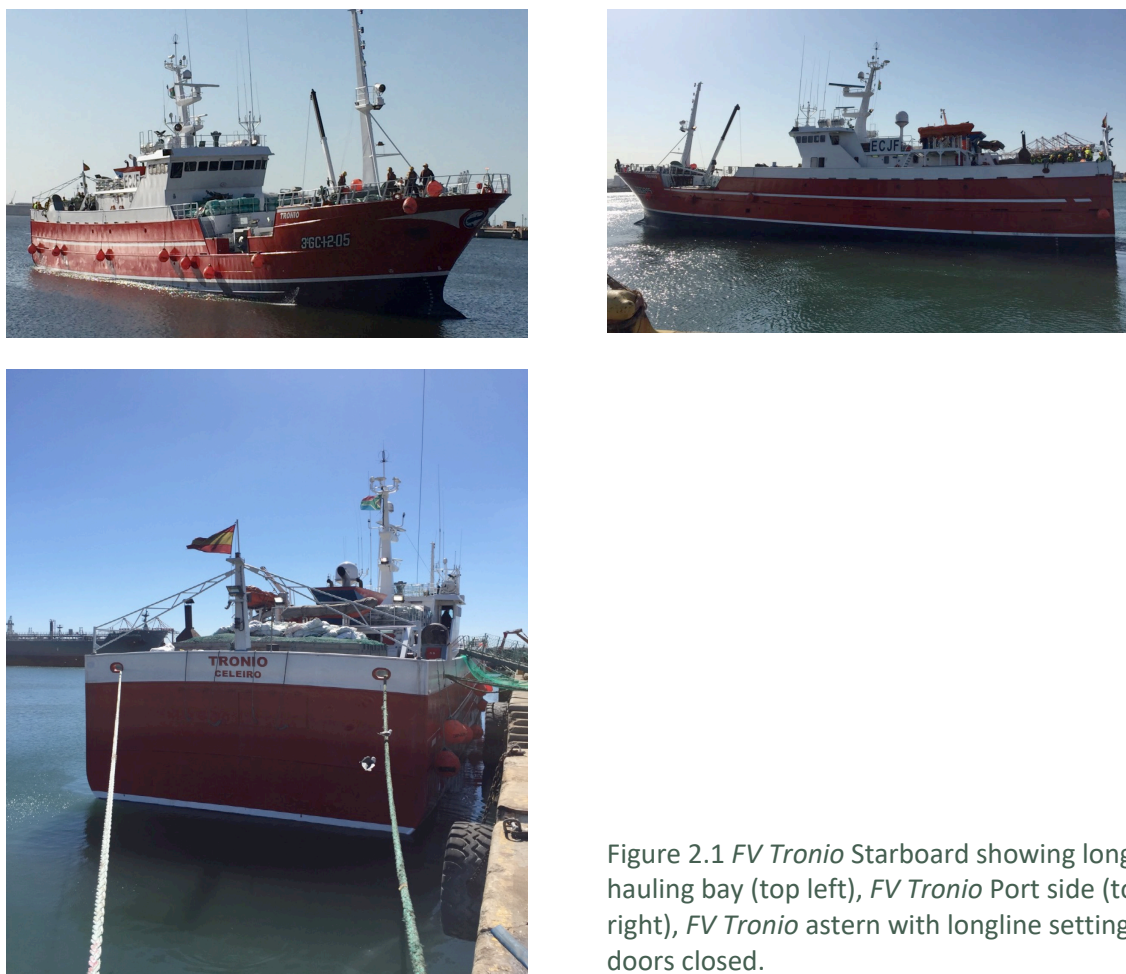
Figure 2.1 *FV Tronio* Starboard showing longline hauling bay (top left), *FV Tronio* Port side (top right), *FV Tronio* astern with longline setting doors closed.
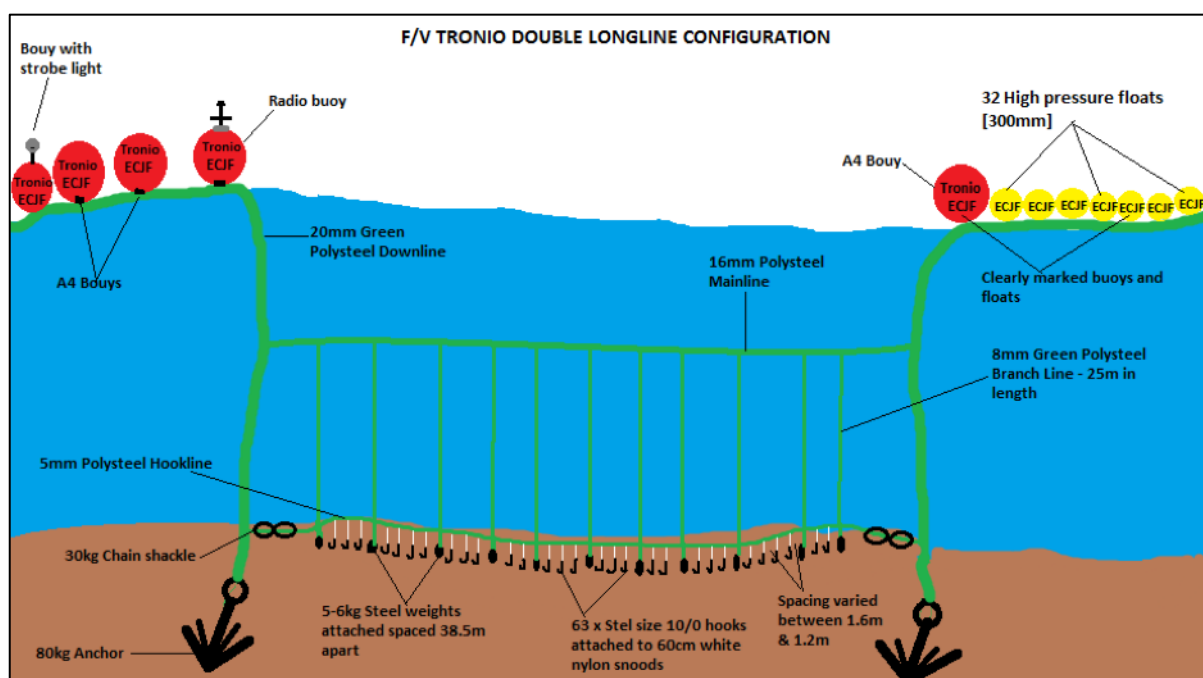

Figure 2.2 *FV Tronio* Spanish system. All steel weights were 6kg (not 5kg as shown in the figure).

2.6   Hooks

Hook size used was 'J' type, size 10 (A Poutada). All hooks were marked to identify the ship. Two types of makings were used; either a rectangle or double line on the shank near the eyelet (Figure 2.3).

Figure 2.3 Marked hooks used on *FV Tronio* during GVFZ exploratory fishing program.

2.7   Electronic monitoring

The vessel is equipped with AIS (FURUNO FA-150) and VMS (2 x Satlink ELB2004 and 1 x Zunibal V77) with a reporting frequency of 1 poll per hour as set by the Spanish authority (Centro Seguimiento Pesquero - CSP).   In addition, *FV Tronio* is equipped with an Electronic Monitoring (EM) system (Archipelago Marine Research Ltd) which record time/date and position, and tamper proof date/time/position stamped CCTV footage of the stern (during line setting), the setting room (during line setting), and the hauling bay (during line hauling). See COMM9-Prop16 & SC8-DW05_Rev2 for details. This footage can be analysed at any time upon request. Archipelago stores data for 5 years.

2.8   Conservation measures

Operations were carried out in compliance with CMM 14e-2021 (Conservation and Management Measure for Exploratory Fishing for Toothfish by the European Union in the SPRFMO Convention Area), CMM 09-2017 (Minimising Bycatch of Seabirds in the SPRFMO Convention Area), and paragraph 3 of CCAMLR CM 25-02 (2018) (Minimisation of the incidental mortality of seabirds in the course of longline fishing or longline fishing research in the Convention Area).   Additionally, vessel light emissions were kept to a minimum at night to avoid light-strike.

2.9   Data Collection

All required data was collected according to CMM02-2022 (Standards for the Collection, Reporting, Verification and Exchange of Data) and CMM03-2022 (Bottom Fishing in the SPRFMO Convention Area), as well as CCAMLR CM22-07 (2013) (VMEs).

2.10   Station, Catch and effort

All data was recorded by the bridge officers and/or scientific observer in standard SPRFMO forms (Data held by SPRFMO secretariat and Spain/EU).

2.11   Biological sampling

The length, weight, and sex and maturity for the target species were collected according to the CCAMLR Scheme of International Scientific Observation Scientific Observer's Manual Finfish Fisheries (2020). Pairs of otoliths were collected from the target species.

All discard was recorded as being discarded live or dead. All depredation was recorded in terms of hooks in head or in lips. All VME species were identified to the lowest taxonomic denominator and weighed.

2.12   Video sampling

A deep-water camera and strobe unit (GroupBInc.com, GPH-1750m + Hero4 GoPro) was deployed on four occasions (Figure 2.4). Unfortunately, the camera system was lost on the 5th deployment.
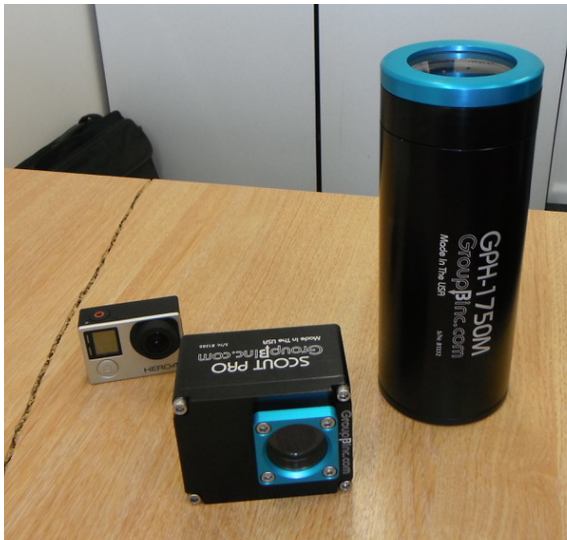

Figure 2.4 Deep-water camera system used for benthic video data collection.

2.13   Oceanography

In 2021 a Valeport FastCTD (https://www.valeport.co.uk/) was used for collection of oceanographic data. However, later in the year this machine was damaged from seawater ingress. To continue with

data collection, Starr-Oddi DST-CTD's were purchased (https://www.star-oddi.com). These units have been used elsewhere in toothfish fisheries, and are less likely to be damaged or lost when deployed. Unfortunately, software/hardware compatibility issues were encountered on the vessel and consequently no data was collected.

2.14 Software

All analyses and mapping were carried out in R (v. 4.3.0) (R Core 2023) and QGIS (v. 3.30).

3. Results

3.1 Fishing Effort

A total of 32 lines were set over 13 days in 2022 (06-21 October 2022), roughly on the same seamounts as in the 2021 campaign with the addition of two seamounts fished in the northern part of the research block (Figure 3.1).   A summary of toothfish fishing effort for 2022 is shown in Table 3.1. Detailed biological and catch data are available from the Spanish authorities and Owner/Operator of Tronio. Line setting depth ranged between 1,575m and 2,376m depth. No sections of line were lost.
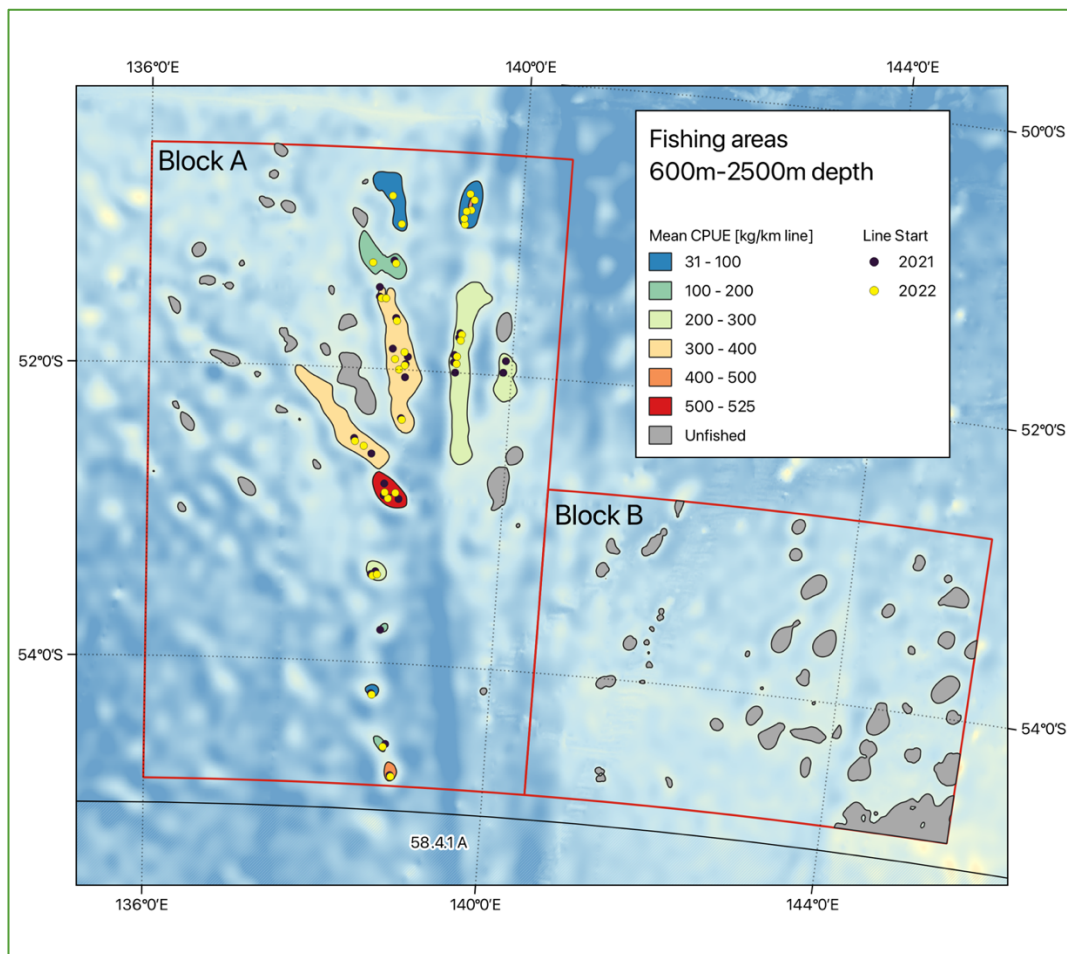

Figure 3.1 Location of lines set (set_start) in 2021 and 2022. Highlighted are fishable seamounts defined by bathymetry ranging between 600m – 2500m depth. Fished seamounts are coloured

according to mean CPUE (kg/km line) for all lines in both years. Unfished seamounts are shown in grey.

Table 3.1 Summary of lines set in 2022.

Line	Date/time (set start)	Date/time (haul start)	Latitude (set start)	Longitude (set Start)	Total line length (km)	Number of hooks set	Comments
1	06/10/2022 05:01	06/10/2022 15:57	-54.77	138.91	9.124	4977	Camera deployed
2	06/10/2022 07:21	06/10/2022 23:42	-54.57	138.8	7.5075	3465	
3	06/10/2022 10:45	07/10/2022 09:57	-54.22	138.64	7.5075	3465	
4	07/10/2022 22:12	08/10/2022 09:55	-53.41	138.58	9.124	4977	
5	07/10/2022 23:11	08/10/2022 17:31	-53.4	138.63	9.124	4977	Camera deployed
6	08/10/2022 02:58	09/10/2022 03:43	-52.88	138.71	9.124	4977	CTD deployed (no data)
7	08/10/2022 03:48	09/10/2022 11:09	-52.84	138.79	9.124	4977	
8	08/10/2022 04:33	10/10/2022 03:32	-52.84	138.67	9.124	4977	CTD deployed (no data)
9	09/10/2022 20:48	11/10/2022 10:11	-52.34	138.82	9.124	4977	
10	10/10/2022 00:17	10/10/2022 19:32	-52.5	138.31	9.124	4977	Camera deployed
11	10/10/2022 01:06	10/10/2022 13:02	-52.53	138.41	9.124	4977	
12	11/10/2022 04:47	12/10/2022 15:34	-51.93	138.71	9.124	4977	Camera deployed
13	11/10/2022 05:42	12/10/2022 01:49	-51.97	138.82	9.124	4977	
14	11/10/2022 06:34	11/10/2022 19:09	-52	138.76	9.124	4977	
15	12/10/2022 10:51	13/10/2022 20:34	-51.52	138.53	9.124	4977	
16	12/10/2022 12:08	13/10/2022 07:16	-51.67	138.71	9.124	4977	
17	12/10/2022 13:35	12/10/2022 22:58	-51.88	138.81	9.124	4977	
18	13/10/2022 13:49	14/10/2022 05:41	-51.52	138.58	9.124	4977	
19	13/10/2022 15:30	15/10/2022 03:22	-51.28	138.42	9.124	4977	Camera Lost
20	13/10/2022 17:20	14/10/2022 12:59	-51.28	138.67	9.124	4977	
21	14/10/2022 21:08	16/10/2022 10:26	-50.82	138.6	8.85	4410	
22	14/10/2022 22:48	15/10/2022 11:38	-51.01	138.71	9.124	4977	
23	16/10/2022 19:09	17/10/2022 05:07	-50.99	139.39	9.124	4977	

24	16/10/2022 20:15	17/10/2022 11:36	-50.95	139.38	9.124	4977	
25	16/10/2022 21:15	17/10/2022 18:03	-50.89	139.45	9.124	4977	
26	16/10/2022 22:33	18/10/2022 05:09	-50.9	139.4	9.124	4977	
27	18/10/2022 00:19	18/10/2022 11:03	-50.82	139.48	9.124	4977	
28	18/10/2022 01:27	18/10/2022 23:43	-50.78	139.43	9.124	4977	
29	19/10/2022 12:48	19/10/2022 22:26	-51.74	139.43	9.124	4977	
30	19/10/2022 13:46	20/10/2022 05:26	-51.78	139.42	9.124	4977	
31	19/10/2022 14:43	20/10/2022 12:59	-51.89	139.39	9.124	4977	
32	19/10/2022 15:48	20/10/2022 21:19	-51.94	139.39	9.124	4977	

Thirty one out of 32 lines were set at a minimum of 3nm apart (CMM 14e-2021 para 8) in 2022. Spatial analysis of AIS tracks provided through the on-board Archipelago system indicated that the distance between mid-points of lines 6 and 7 was 2.8nm.

Bait used on all lines was a combination of herring (*Clupea harengus*) on 4 hooks, and Humboldt squid (*Dosidicus gigas*) on 1 hook, with some variation.

3.2   Seabird observation times

Seabird monitoring was conducted on 31 out of 32 line setting events, and 32 out of 32 hauling events. Of the setting events, 10 lines were set at night (CCAMLR Nautical twilight calculator, UTC +9, between sunset and sunrise) and six lines were hauled at night where no birds were observed.   Seabird by-catch mitigation measures (tori-lines, bird scaring device, line weighting) were verified by the observer. A summary of observed seabirds is found in Table 3.2. There were no seabird mortalities reported.

All line setting was recorded on Archipelago Electronic Monitoring (EM) CCTV and position recording system.

Table 3.2 Summary of seabird observations in 2022.

Species	Common Name	Setting Observations	Hauling Observations
Daption capense	Cape petrel	157	122
Diomedea epomophora	Southern Royal albatross	0	13
Diomedea exulans	Wandering albatross	76	94
Fulmarus glacialoides	Southern Fulmar	1	2

Macronectes halli	Northern Giant petrel	193	388
Macronectes spp	Giant petrel	0	25
Pachyptila spp	Prion	3	14
Thalassarche melanophris	Black-browed albatross	272	114
Total		702	772

3.3   Total catch

Total catch in 2022 (as recorded on the FV Tronio bridge, excluding VMEs) for all hauls was 75,991 kg (Table 3.3). Catch largely included *Dissostichus eleginoides* (74,898kg), *Macrourus holotrachys* (581kg), and *Macrourus* spp. (342kg), and *Antimora rostrata* (136kg). Very minor catches of *Lepidion* spp*., Muraenolepis* spp. and *Muraenolepis microps* were also observed. Only TOP was retained, all other species were discarded.

No evidence of depredation was observed.

No elasmobranchs were caught.

Table 3.3 Total live weight (kgs) of catch as reported by the Tronio bridge officers in 2022. Only TOP was retained, all other species were discarded.

Line	TOP	ANT	GRV	LEV	MCC	MCH	MOY	MRL	Total
1	2285	4							2289
2	1293								1293
3	203								203
4	2875					65			2940
5	1006		25						1031
6	5588					32			5620
7	1664					53			1717
8	4856								4856
9	3911	3	18						3932
10	1466	13			1		21		1501
11	3852		15						3867
12	3348		25						3373
13	6620					62			6682
14	4254	11	7						4272
15	5581	3	72						5656
16	2498	20				22		7	2547
17	842	6	6						854
18	2022	6				24			2052

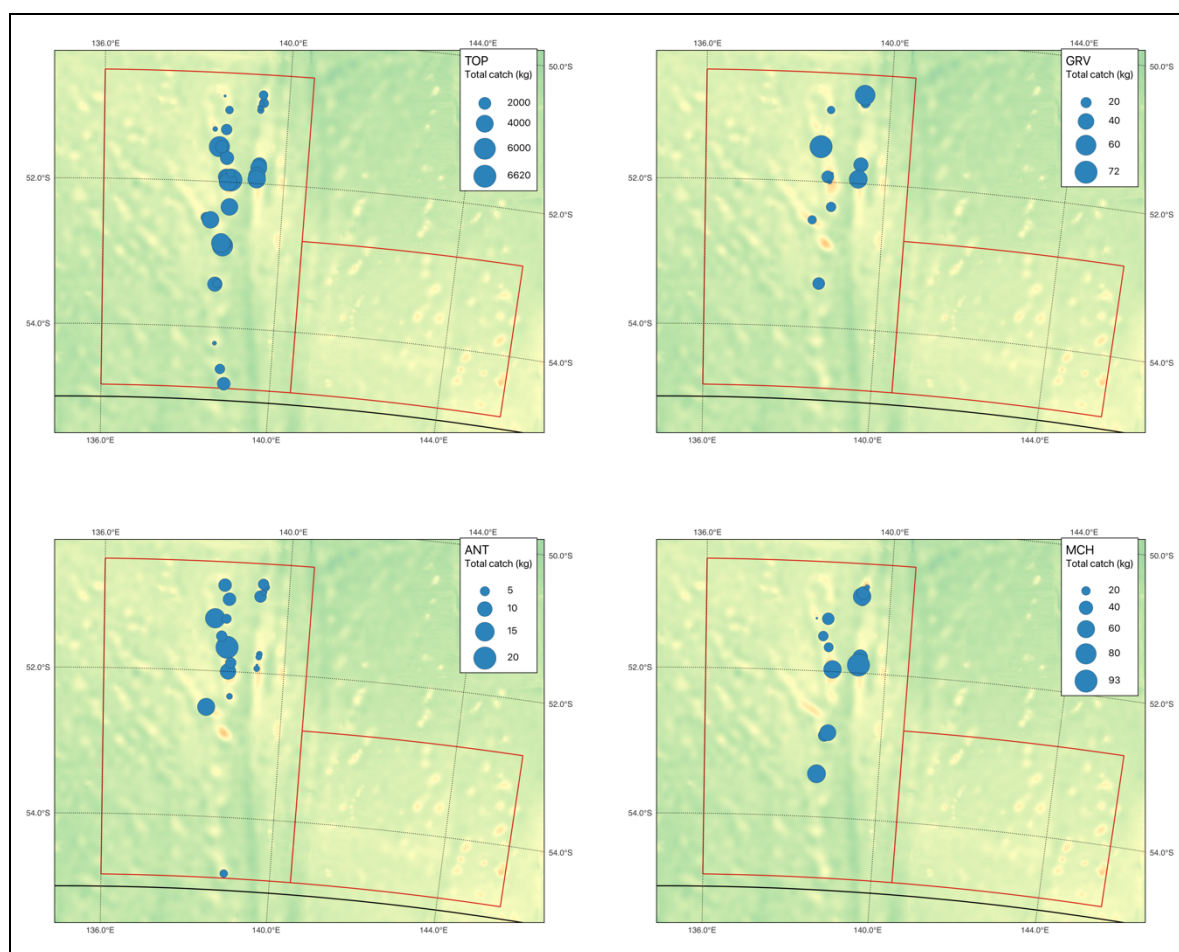|								
19	285	16				8		309
20	1561	5		3		32		1601
21	80	8						88
22	810	8	13					831
23	552	3				35		590
24	368	7		1		62		438
25	1154	3	18					1175
26	307					36		343
27	74	4				11		89
28	1028	6	59					1094
29	2902	3	34					2939
30	3594	3				46		3643
31	3763	2				93		3858
32	4256	3	50					4309
Total	**74898**	**136**	**342**	**5**	**1**	**581**	**21**	**7**	**75991**

Figure 3.2 Total catch as recorded on the *FV Tronio* bridge in 2022. Species codes are TOP – *Dissostichus eleginoides*; GRV - *Macrourus* spp; MCH - *M. holotrachys*; ANT- *Antimora rostrata*.

3.3.1 Seabirds, marine mammals, reptiles.

No seabird mortalities were observed throughout fishing activity by observers or by vessel crew. No marine mammals or reptiles were observed or caught.

3.3.2 VME

VME indicator taxa were recovered from 8 out of 32 lines (Table 3.4). A total of 4.3kg of VME indicator taxa were recovered, being comprised of small amounts of sea fans/bamboo corals (Gorgoniidae), stony corals (Scleractinia) and a small amount of black coral (Antipatharia). The most commonly caught VME was dead stony coral fragments. There are no VME threshold levels specified for longline fisheries, but if comparing to CMM03-2021 for towed fisheries, VME catch limits were not triggered. Two samples were retained frozen and will be sent to appropriate authorities for identification and curation.

Table 3.1 VME indicator taxa bycatch.

Line	VME Group code	VME Group Name	Weight (kg)
5	CSS	Scleractinia	0.71
7	GGW	Gorgoniidae	0.025
12	CSS	Scleractinia	0.165
15	AQZ	Antipatharia	0.08
28	GGW	Gorgoniidae	0.02
30	AXT	Stylasteridae	2.5
31	AQZ	Antipatharia	0.3
31	CSS	Scleractinia	0.5

3.4   TOP tagging

A total of 380 TOP were tagged (double tagged) in 2022, equating to a rate of just over 5 tagged fish per tonne. White T-Bar tags were used with wording "Rtn. CCAMLR PO Box 213 Hobart 7002 Australia". No tags deployed were re-captured in season. A tagging overlap statistic of 69.8% was achieved.

In 2022, three tagged TOP were recovered that were originally tagged in the GVFZ in 2021. All three fish were recovered on the same seamount from which they were released (Figure 3.3).

To date, 6 tags have been recovered in the GVFZ that were originally released in the Macquarie Ridge Fishery.

All tagging release and recovery data are available from the Spanish authorities and Owner/Operator of Tronio.
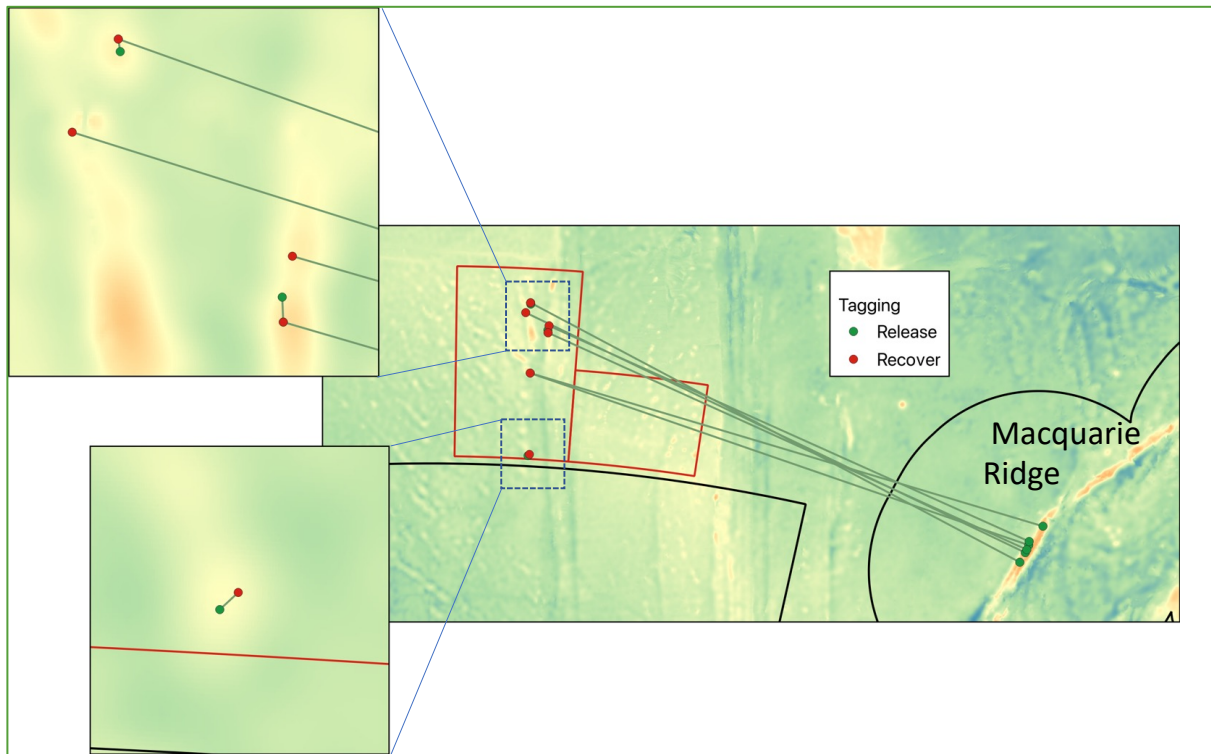
Figure 3.3 Tagging releases and recoveries on the GVFZ in 2021 and 2022 fishing campaigns.

3.5   Biological sampling

Details of all biological data collected are found held by Spain/EU and have been provided to the SPRFMO secretariat.

3.5.1 TOP

A total of 1,007 individuals were sampled by the scientific observers, comprising 286 females and 721 males. The median total length was 111cm for females and 97cm for males (5cm bins) (Figure 3.4). A total of 286 gonad weights were collected. All stages of maturity were found in males and females. The majority of individuals were in reproductive Stage II (Developing/Resting) with a large proportion of males in Stages III (Developed) and IV (Ripe). There was little variability around the length-weight curve (r^2 = 0.93).

A total of 318 sets of otoliths were collected, and 29 tissue samples for genetics.

Conversion factor analysis (HGT to live weight) was carried out on 101 fish from a range of lengths, sampled from 18 lines.   Mean conversion factor was 1.66.
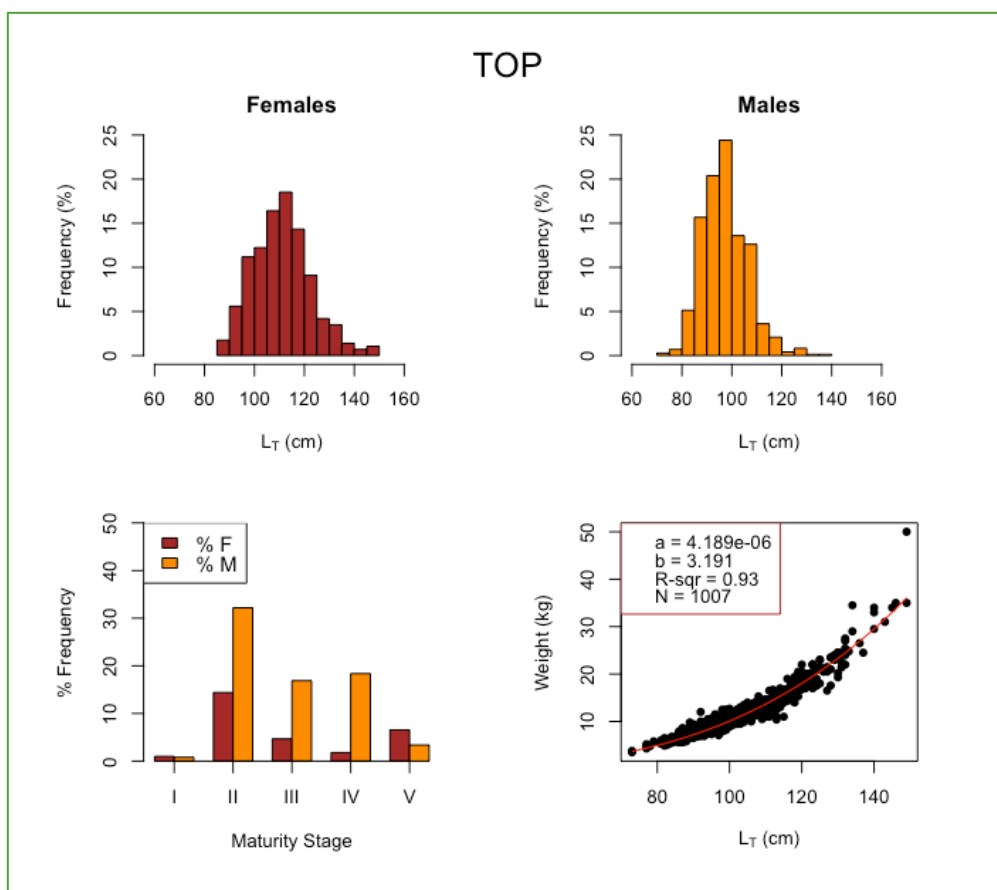
Figure 3.4 Summary of biological measurements for TOP (*D. eleginoides*).

3.5.2 MCH

A total of 157 individuals of *M. holotrachys* were sampled by the scientific observers. Sex was not recorded for sampled fish. The median total length was 68cm, with 60cm fish also found in relatively high numbers (Figure 3.5).   There was high variability around the length-weight curve (r^2 = 0.656). No other biological data was collected.
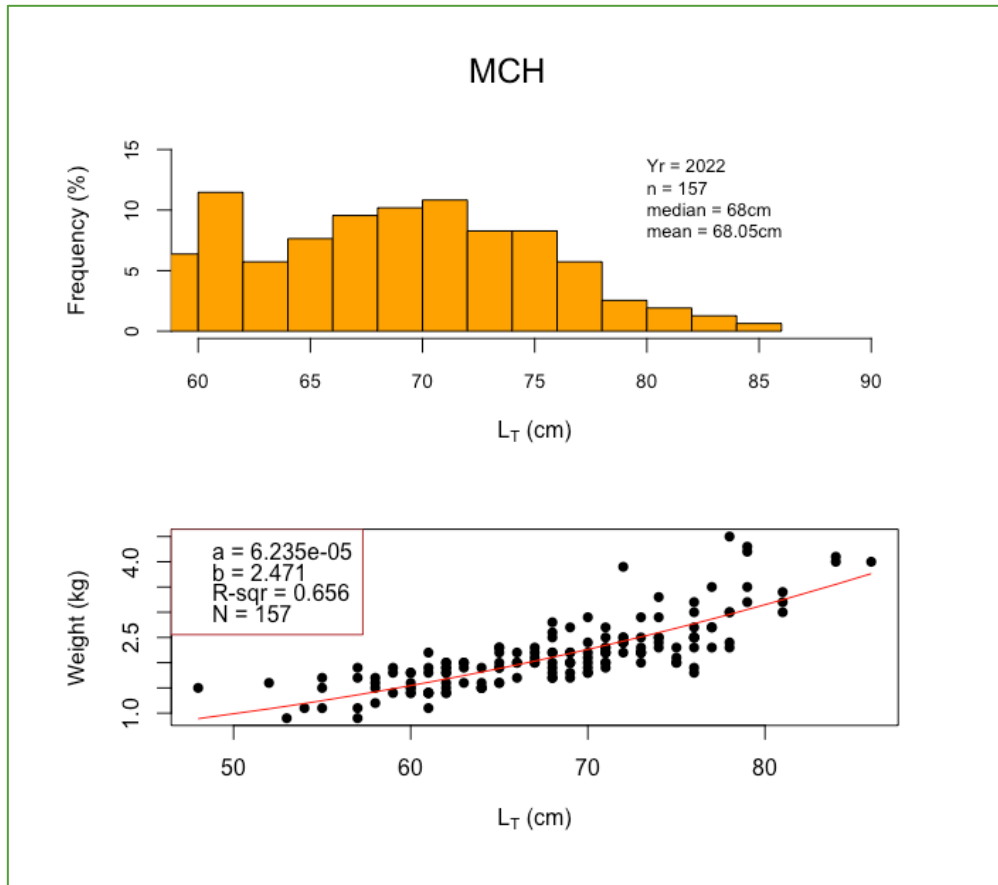
Figure 3.5 Summary of biological measurements for MCH (*Macrourus holotrachys*).

3.5.3 Other finfish

A total of 64 *Antimora rostrata* were sampled; 2 *Lepidion* spp.; 54 *Macrourus* spp.; 5 *Muraenolepis microps*; and 2 *Muraenolepis* spp. were sampled for length and weight.

3.6   Deep-water camera

The deep-water video camera images were obtained from lines 1 and 5. The camera was deployed on lines 10 and 12 but no useful images of the seabed were captured. The cameras system was lost on line 19.

Line 1. Footage of drop weight landing on seabed drop weight (Figure 3.6). The camera landed on its side with the duration very close up to rock. There was very little activity during this time. The seabed is made up of cobble, possibly exposed bedrock, and sand. Few invertebrates were seen on rock surfaces.

Figure 3.6 Seabed at Line 1.

Line 5. Footage of drop weight landing on sand patch similar to line 1. The camera collected 85 mins of video footage at the seabed with no activity on the seabed except for a single lithoid crab passing through the field of view. Caridean shrimps are seen crossing the image field periodically.

3.7   Data storage and analysis

All data and video is stored at the SAERI IMS-GIS Centre for long-term curation. DNA samples will be processed at in due course. All otoliths will most likely be processed at an aging facility in the Falkland Islands.

Table 3.2 Summary of samples, analyses and storage related institutions that are in progress.

Sample type	Taxa	Number	Location	Contact	Email
DNA	TOP	29	SAERI / U of Aberdeen	Dr Paul Brickle / Prof Stuart Piertney	pbrickle@saeri.ac.fk
Otoliths	TOP	318 sets	Falklands Aging Facility	Paul Brewin	pbrewin@saeri.ac.fk
VME		2	Georgia Seafoods	Joost Pompert	joostpompert@georgiaseafoods.com
Video		2	SAERI IMS-GIS Centre	Data manager	datamanager@saeri.ac.fk

4.   IUU Vessel Detection

No other vessels were detected fishing in the area.

5.   Discussion

A 75t TAC of *Dissostichus* sp. was set for this research area under CMM14e-2021 and this was reached in the current fishing campaign. A significant amount of biological data was collected on the target species, and a tagging rate of 5 fish per tonne was achieved.

Finfish bycatch was well under the trigger levels set in CMM14e-2021 paragraph 20.   Similarly, there was no seabird bycatch in the fishing period. Very little VME indicator species were bycaught, and seabed camera imagery collected (albeit limited to only two lines) indicates that abundance of VME indicator taxa may be low in this area. Further work needs to be done to confirm this.

The fished areas represent an under-studied region of the Southern Ocean. TOP catch/effort, tagging, and biological data collected in the upcoming fishing campaign will feed into improved understanding of the region's *Dissostichus eleginoides* stock and management, as well as benefiting wider environmental management of adjacent management convention areas of SPRFMO and CCAMLR.

5.1   Future fishery potential

In order to meet CMM14e-2021 paragraph 1, all TOP biological data will be examined immediately for assessment of the fishery potential in this area through SAERI. Otoliths will be processed for development of an age-length key. Other otolith-based stock identity tools will be explored e.g. otolith shape analysis and ICPMS. Tagging will be examined and reported separately as it relates to development of a preliminary stock assessment. By-catch of finfish, seabirds, and VME indicator taxa will continue to be monitored.

6.   References

CCAMLR Fishing Gear Library (https://www.ccamlr.org/en/publications/fishing-gear-library   ), specifically WG-FSA-11/53.

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