SPRFMO
South Pacific Regional Fisheries Management Organisation

8th MEETING OF THE SCIENTIFIC COMMITTEE

New Zealand, 3 to 8 October 2020

SC8-DW05_rev2

European Union proposal for exploratory fishing for Patagonian and Antarctic toothfish within the SPRFMO Convention area 2021-2023

New Zealand

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European Union proposal for exploratory fishing for Patagonian and Antarctic toothfish within the SPRFMO Convention area, 2021-2023

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1 Purpose

The current paper contains the preliminary elements established by *CMM 13-2020 on the Management of New and Exploratory Fisheries in the SPRFMO Convention Area* for the submission of an application for exploratory fisheries for Patagonian/Antarctic toothfish (*Dissostichus eleginoides* and *D. mawsoni*) by the European Union (EU) to the SPRFMO Commission. Notably, the current paper develops the Fisheries Operation Plan, including area, target species, proposed fishing methods, fishing gear, period and a preliminary data collection plan for the exploratory fishing activities to be undertaken during 2021-23 in FAO area 57.4 (Figure 1) better depicted in Figure 2, and which falls under the SPRFMO jurisdiction. The current paper also identifies the relevant elements of *CMM 03-2020 on Bottom Fishing in the SPRFMO Convention Area,* notably an assessment of bottom fishing activities outside the established footprint, and a risk assessment meeting the Bottom Fishery Impact Assessment Standard (BFIAS) (2011) (CMM 03-2020 paragraph 20(a)), as well as elements of the methodology proposed in the BFIAS (2019) (SC7-DW19) which was yet to be adopted into the CMMs at the time of writing (see section 4.5, Risk assessment on non-target by-catch – Methods below for details)

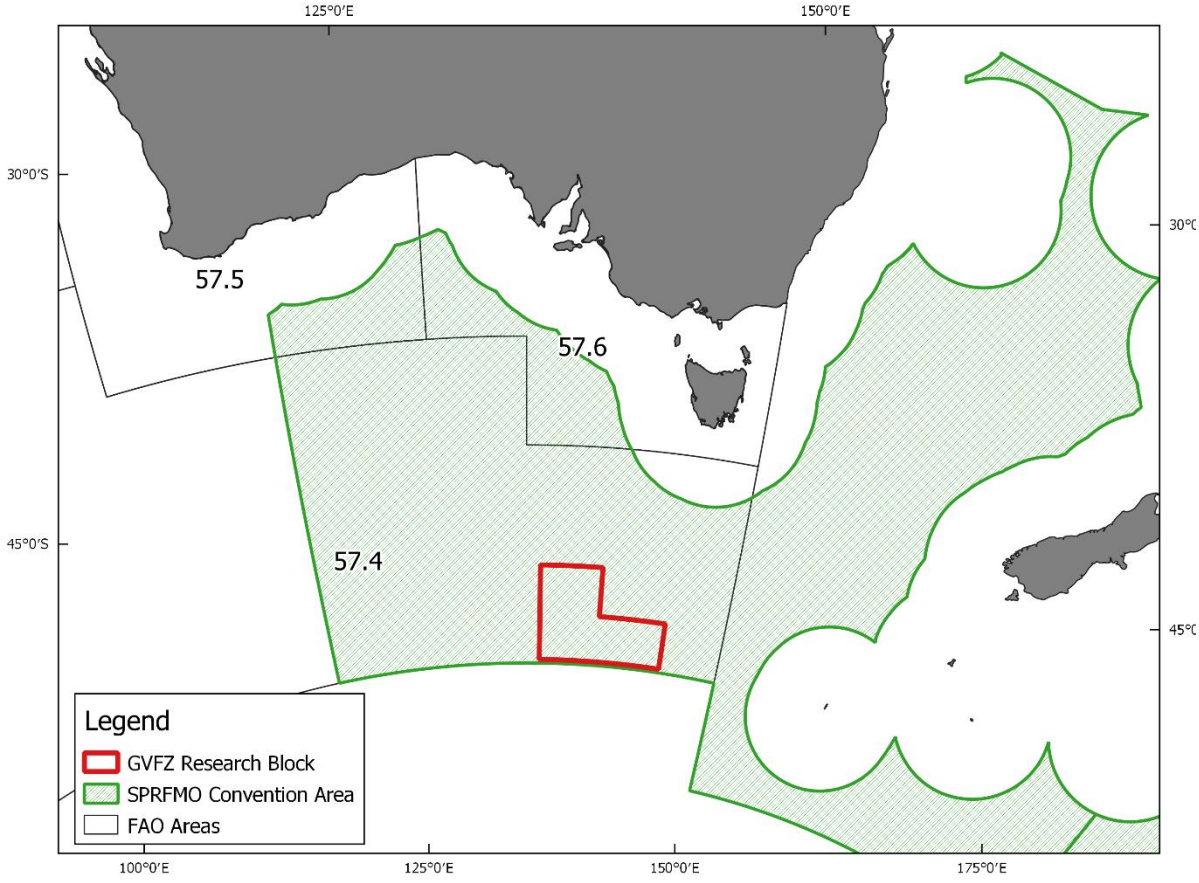

Figure 1: FAO area 57

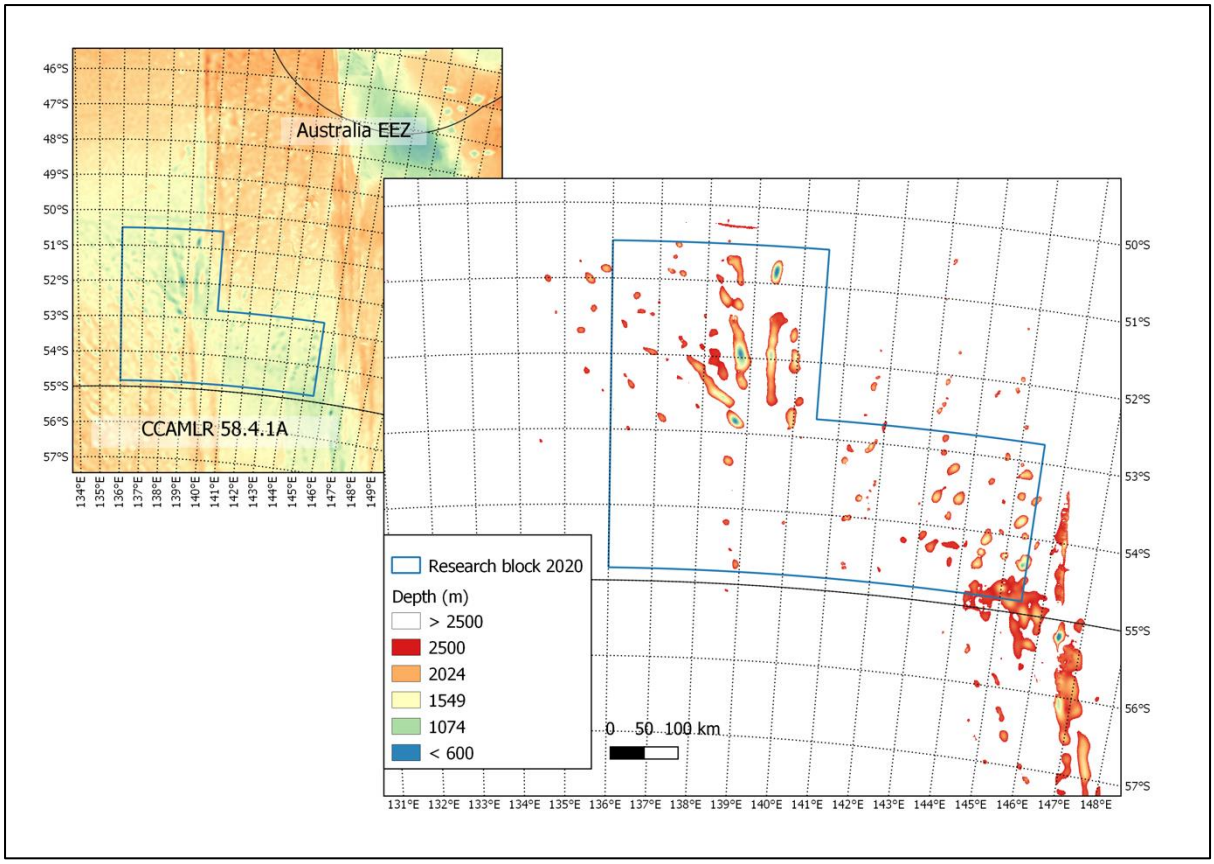

Figure 2: Area to the West of the George V Fracture Zone and henceforth named GVFZ Research Block or GVFZ RB– highlighting proposed fishing depths

Table 1: Proposed study location (corner coordinates) for the Research Block total area (around 222,142 km^2, area within the depth range 600-2500m = ~17,415-km^2).

Point	Latitude	Longitude	Distances
NW	50° 30’ S	136° E	318 km to NE
NE	50° 30’ S	140° 30’E	250 km to E-indent
E-indent	52° 45’ S	140° 30’E	336 km to E-corner
E-corner	52° 45’ S	145° 30’E	232 km to SE
SE	54° 50’ S	145° 30’E	608 km to SW
SW	54° 50’ S	136° E	482 km to NW

2 Introduction

This is the second proposal on Fisheries Operations Plans for exploratory fishing to date that EU has submitted to the SPRFMO Scientific Committee. The first proposal, for an exploratory research fishing survey targeting Patagonian toothfish (*Dissostichus eleginoides*) using the Spanish Bottom Longline System on the South Tasman Rise for a maximum period of 3 weeks on the fishing grounds, is detailed in COMM7-Prop14.1 "Exploratory fishing for Patagonian toothfish within the SPRFMO Convention Area". The proposal was accepted under CMM 14c 2019 for the Exploratory Fishing for Toothfish by EU Vessels in the SPRFMO Convention Area. Fishing was conducted in October-November 2019. The report of this survey will be submitted to the SPRFMO SC for consideration at its 2020 meeting.

The present proposal is to conduct exploratory fishing for toothfish (*Dissostichus spp.*) over three consecutive seasons, focussed on areas identified further South in a region that includes seamount features within the depth range 600-2500m that could provide a suitable habitat for either Patagonian *(D. eleginoides*) or Antarctic (*D. mawsoni*) toothfish, or a mixture of both. This new area of interest, and its proposed Research Block has been named the George V Fracture Zone Research Block or GVFZ RB.

To the best of our knowledge the available scientific literature (Science Direct and Google Scholar), FAO catch statistics and documents from SPRFMO, there has been no bottom longlining fishing in this area for Patagonian toothfish, or any other species.

Because the geographical latitude, oceanography, depth ranges and bathymetry of the area of interest is similar to that of toothfish fishing areas elsewhere, there is a likelihood that the proposed area is suitable habitat for toothfish. Despite searches through literature and Australian and New Zealand fisheries documents (such as http://www.environment.gov.au/system/files/resources/7a110303-f9c7-44e4-b337-00cb2e4b9fbf/files/south-east-marine-region-profile.pdf and https://data.gov.au/organization/australian-fisheries-management-authority) and the online databases, only two records of *Dissostichus eleginoides* have been recorded for the area of interest. These two records are registered in OBIS: www.obis.org. Other reports of Patagonian toothfish having been capture in the proposed area, as well as other fish and benthic invertebrate species (L. Georgeson pers com.) have been requested from the Australian authorities (as at 8 sept 2020).

3 Vessel specific details as required under paragraphs 2 and 3 of Annex 1 of CMM 05-2016 (Record of Vessels)

a) Current vessel flag (using the codes indicated in Annex 2);	EUROPEAN UNION (EU) (SPAIN)
b) Name of vessel;	FV TRONIO
c) Registration number;	3GC-1-2-05
d) International radio call sign (if any);	ECJF
e) UVI (Unique Vessel Identifier)/IMO number (if issued)[2];	9361603
f) Previous Names (if known);	N/A
g) Port of registry;	CELEIRO (Spain)
h) Previous flag (if any, and using the codes indicated in Annex 2);	UNITED KINGDOM (GBR)

i) Type of vessel (Use appropriate ISSCFV codes, Annex 10 of CMM 02-2018 (Data Standards));	BOTTOM LONGLINER (LL)
j) Type of fishing method(s) (Use appropriate ISSCFG codes, Annex 9 of CMM 02-2018 (Data Standards));	LLS 09.3.0
k) Length; l) Length type e.g. "LOA", "LBP";	55 m LOA
m) Gross Tonnage – GT (to be provided as the preferred unit of tonnage);	1058 GT
n) Gross Register Tonnage – GRT (to be provided if GT not available; may also be provided in addition to GT);	
o) Power of main engine(s) (kW);	1378.70Kw
p) Hold capacity (m3);	632,3 m^3
q) Freezer type (if applicable);	TUNNEL
r) Number of freezers units (if applicable);	3
s) Freezing capacity (if applicable);	30Mt
t) Vessel communication types and numbers (INMARSAT A, B and C numbers);	Inmarsat C :422462320 Inmarsat FBB: +870773184117
u) VMS system details (brand, model, features and identification);	Satlink ELB 2014
v) Name of owner(s);	PESQUERÍAS GEORGIA, S.L.
w) Address of owner(s);	Muelle Sur, Almacén 21- Celeiro – Spain
x) Date of inclusion into the SPRFMO Record;	
y) Vessel authorisation end date;	
z) Flag Authorisation Start Date;	
aa) Good quality high resolution photographs of the vessel of appropriate brightness and contrast, no older than 5 years, which shall consist of:	
• one photograph not smaller than 12 x 7 cm showing the starboard side of the vessel displaying its full overall length and complete structural features;	See below Figure 3
• one photograph not smaller than 12 x 7 cm showing the port side of the vessel displaying its full overall length and complete structural features;	See below Figure 4
• one photograph not smaller than 12 x 7 cm showing the stern taken directly from astern.	See below Figure 5

The FV Tronio has Ice Class 1C

Figure 3: Tronio Starboard

Figure 4: Tronio Port side

Figure 5: Tronio astern

4 Fisheries Operation Plan

4.1 Description of the exploratory fishery

The main objective of the exploratory fisheries survey will be to establish whether it is possible to 1) develop a long-term sustainable fishery of Patagonian and/or Antarctic toothfish in the area through collection of biological information and tagging data of the target species and, 2) to provide the SPRFMO SC with increased information about the area through data collection during fishing activity by implementing survey design for sampling by-catch species, accidental catches, Vulnerable Marine Ecosystems (VMEs), and oceanographic data. Following the survey, all data will be integrated into current Patagonian/Antarctic toothfish stock hypotheses and connectivity analyses with other regions where appropriate.

The proposed exploratory fisheries survey will maintain strict compliance with conservation measures regarding by-catch of mammals and VMEs (CMM 03-2020) and the protection of seabirds and marine mammals (CMM 09-2017).

The proposed study area has been named the *George V Fracture Zone Research Block* or GVFZ RB (with coordinates listed in Table 1), with fishing depths between 600 and 2500m. The total area is approximately 222,142 km^2, with the area within the fishable depth range 600-2500m = ~17,415 km^2. The fishable depth area is calculated from the bathymetric information provided by GEBCO 2014. However, it is suspected that there may well be inaccuracies, as survey activities in this region have been limited.

It is proposed to conduct a survey limited by both effort and TAC, with a maximum of 120 sets in the GVFZ RB per annum for the period 2021-23. For uniformity and to facilitate analyses, all sets will be lines of 5,000 hooks (~8,000m in length). The minimum distance between the centre point of each set is 3nm. It is expected that the maximum total catch of Patagonian/Antarctic toothfish will be lower than 75mt (green weight), and it is requested that this amount will be set as an annual TAC for this study. This amount, given the spatial extent of the proposed area is considered to be a precautionary amount given the spatial extent of the area. Although GVFZ RB is calculated to cover 222,142 km^2, the fishable area (750-2500m) is estimated to be 17,415km^2. Extracting a maximum of 75mt of Patagonian/Antarctic toothfish from a region of this size, would equate to 4.31kg/km^2.

An annual TAC of 75t is considered precautionary, compared to other fisheries. Results from the NZ exploratory fishery period (SPRFMO SC-04-DW-02) in their research blocks A (59,358km^2) and B (14,541km^2) suggest an extraction rate of 0.4kg/km^2, with the first year exploratory period yielding 80kg/100 hooks (28,961kg toothfish) on 35,994 hooks set. However, this rate is not based on fishable area only. In the Falkland Islands toothfish fishery, mean annual catches of 1,148t over a 10-year period 2008-2017 (area between 700-2000m= 148,244.7km^2) equated to 7.7kg/km^2 and 51.2kg/100 hooks.

If the Tronio deploys 20,000 hooks per day for four weeks (i.e. 600,000 hooks), while remaining under the 75t threshold, the kg/100 hook rate should not exceed 12.5kg/100 hooks; considerably lower that other exploratory (NZ) and established (Falkland Islands) fisheries

Setting speed is between 7 and 8.5 knots. The average duration of the line setting operation of 5,000 hooks) is ~45 mins, whereas that of line hauling is 4 hours. Usually there are between 3 and 4 lines in the water simultaneously.

4.2 Fishing gear

The fishing gear to be used in the exploratory fishery is the Spanish longline system (Figure 6), a well-known gear configuration used in many toothfish longline fisheries (as specified in CCAMLR Gear Catalogue, specifically WG-FSA-11/53). The total length of the line can vary by deploying more or less sections (or baskets) per set line ranging from 60-140 baskets (3,640-10,240 hooks). This translates into a variation of length between 5,824 and 16,384 meters. Typically, in exploratory areas, and following acoustic surveying of the area of interest, a shorter line of approximately 5,000 hooks is set to first establish fish density. Normally, and depending on the fishing success of any initial lines, longer lines may be set to optimize efficiency. However, because of the exploratory nature of this proposal, only lines of approximately 5,000 hooks (estimated length 8,000m) will be set[1].

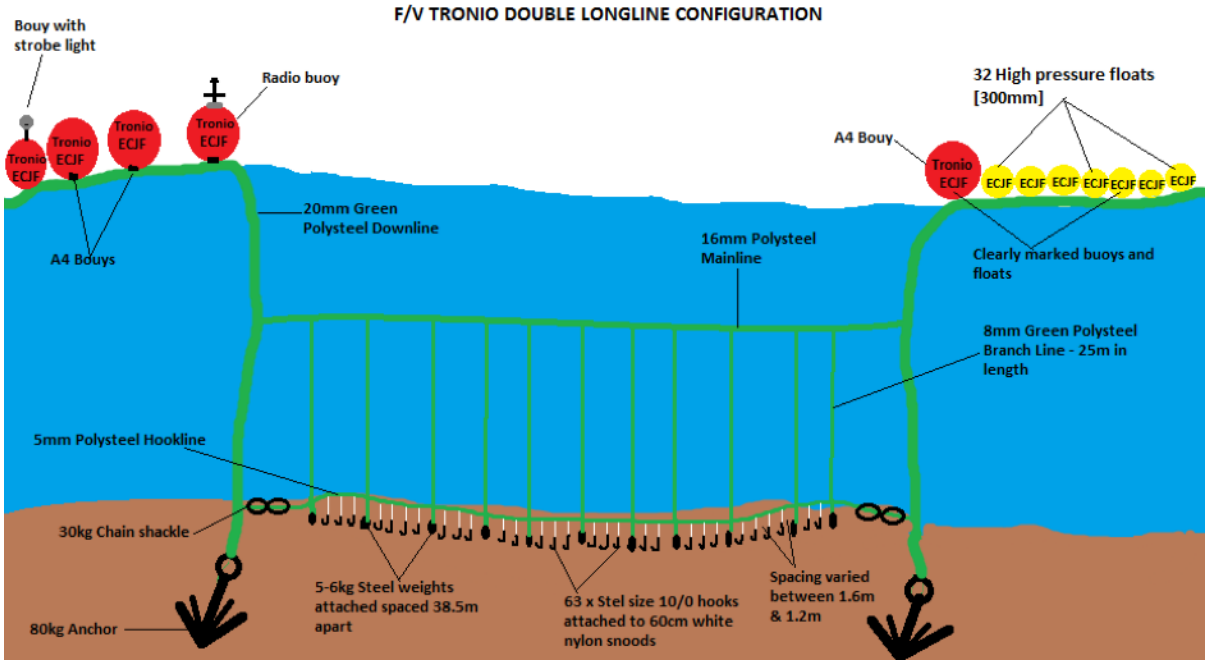

Figure 6: FV Tronio Spanish system in 2017, but note that all steel weights since per November 2017 are now 6kg (not 5kg), and hence achieving a greater sink rate than before. The CCAMLR minimum required sink rate is 0.3m/s. FV Tronio's line sink is in the region of 0.44m/s. 63 x Stell size 10/0 hooks with 60cm white nylon snoods are used.

[1] A 2% variation in number of hooks set may be expected for operational reasons. This detail will be recorded.

Figure 7 Hydrodynamic shaped steel line weights, 6kg.

Line Sink Rate

Between 2011 and 2017, 63 sink rate tests using the bottle test were conducted by observers. They all exceeded the CCAMLR requirements for sink rate (0.3m/s), as detailed in CM 24-02 (2014).

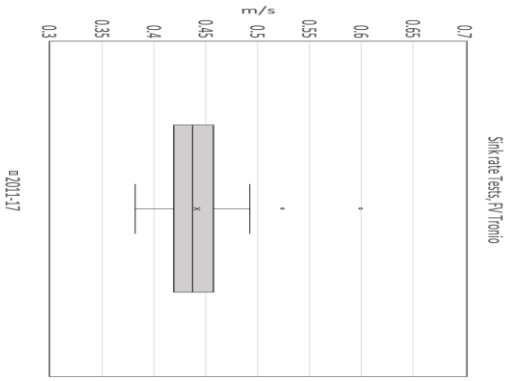

Figure 8: Sink Rate tests

Table 2: FV Tronio Line SInk Rate Tests 2011-17

	m/s
mean	0.44
min	0.38
max	0.60
SD	0.03

IUU Detection and Reporting

Whilst undertaking the exploratory fishing survey in the GVFZ RB, the FV Tronio will document and report any sighting of fishing vessels suspected of IUU fishing activities to the SPRFMO Secretariat. Furthermore, any abandoned or retrieved fishing gear suspected to be of IUU origin will be photographed, reported with relevant details on position, type of gear, any catches, and retrieved where possible. This is the vessel's normal operating practice under CCAMLR CM 10-02 Annex 10-02/A while fishing in the CCAMLR Convention Area.

4.3 Time period of the fisheries operation plan

The requested time period for the exploratory survey is four weeks per year, for three successive years. The optimum period of year, bearing in mind operational considerations in which this survey can be conducted is in October. Alternatively, the four-week period may be undertaken in austral winter months May-October, following all fishing operations in Antarctica.

4.4 Biological information on the target species

Due to the paucity of information on this region, we have been unable to establish whether Patagonian/Antarctic toothfish have ever been caught in this region, except for the two records registered with OBIS and apparent records held by the Australian Government (L. Georgeson pers com) one of the purposes of this exploratory trip is to establish a good record of the presence of toothfish.

The assessment report of longline fishing in the Macquarie Island Toothfish fishery from 2010 (https://www.environment.gov.au/system/files/pages/4f27ef7d-bb8b-41ef-b8bf-ae4449de1d4d/files/afma-assessment.pdf), the closest Patagonian toothfish fishery, reported a mean fish weight of 9.5kg in the area called Macquarie ridge. Tag and recapture data from this fishery suggested limited movement, and high site fidelity.

The life history of Patagonian toothfish is characterised by slow growth, a fecundity ranging between 48,900 and 567,490 (Collins et al., 2010) and late maturity. In CCAMLR Division 58.5.2, the fishery around Heard Island and McDonald Islands, fish up to 175 cm long and older than 50 years of age have been found (Welsford et al., 2011; Welsford et al., 2015). *Dissostichus eleginoides* are widespread across the entire Kerguelen Plateau (CCAMLR division 58.5) and are known to move long distances across the plateau associated with the different stages of the life cycle. On maturation they migrate to spawning locations, with tagging studies showing occasional migrations of more than 2,500 km to the deeper slopes around 1,400–1,800 m depth (Welsford et al., 2011).

Patagonian toothfish of Heard Island and McDonald Islands as well as Kerguelen, Crozet and Marion/Prince Edward Islands appear to be genetically homogenous (Appleyard et al., 2004) and distinctly different from those at more distant locations such as South Georgia and Macquarie Island (Appleyard et al., 2002).

As far as we have been able to establish, there has never been any toothfish fishing in CCAMLR area 58.4.1 SSRU A, or at least since the establishment of the SSRUs.

Patagonian toothfish in CCAMLR Subarea 88.1 are clearly at the southern edge of their range, only extending into the northwest corner of Subarea 88.1 in significant numbers. The fishery catches very few small fish (<50 cm) and the origin of Patagonian toothfish in this area is unclear. It is possible that these fish may be part of the same population as Patagonian toothfish around Macquarie Island as one *D. eleginoides* tagged at Macquarie Island was caught in SSRU 881B in 2007.

4.5 Risk assessment on non-target by-catch

Data gathered and summarised in this section is aimed at providing the SPRFMO Scientific Committee (SC) sufficient knowledge to make informed recommendations to the Commission, as required under Paragraph 8 of CMM 13-2020.

Methods

Methods for identifying Significant Adverse Impacts (SAI) are similar to those used previously in preparation for the exploratory fishing program carried out under CMM 14c-2019 Conservation and Management Measure for the Exploratory Fishing for Toothfish by EU Vessels in the SPRFMO Convention Area, detailed in the work-flow shown in Figure 9.

The aim is to make qualitative assessments that will incorporate key characteristics of the species aiding the evaluation of 'likeliness' and 'consequence' of bycatch interactions in the case of demersal longline fishing for toothfish in the region of the George V Fracture Zone (GVFZ).

We follow the guidance from the SPRFMO Bottom Fishery Impact Assessment Standard (BFIAS) (2011) for this risk assessment (CMM 03-2020). At the time of submission of this proposal, the BFIAS (2011) had been reviewed (Revision of SPRFMO Bottom Fishing Impact Assessment Standard presented at SC7-DW19) but was not yet adopted at COMM8 (2020) (Annex 7c paragraph 20(a) of CMM 03-2020). Nevertheless, we use elements of the proposed method/workflow in SC7-DW19, namely the recommended three level hierarchical methodology for the Ecological Risk Assessment for the Effects of Fishing methodology described in Hobday *et al.* (2011). . As this is an exploratory fishery in an area not well understood in terms of species presences or abundance, we take a SISCA (Scale Intensity Consequence Analysis) approach. Data on spatial overlap and catchability is evaluated and given qualitative assignments of 'Low', 'Low-Med', 'Med', 'Med-high', 'High' and combined to form overall risk. Mitigation is applied, and an RRA (Residual Risk Analysis) is presented. Species' IUCN status is used to inform decisions on triggers and actions to be taken for managing risk. Finally, there is a feed-back process for using new knowledge gained to reduce risk through enhanced mitigation.

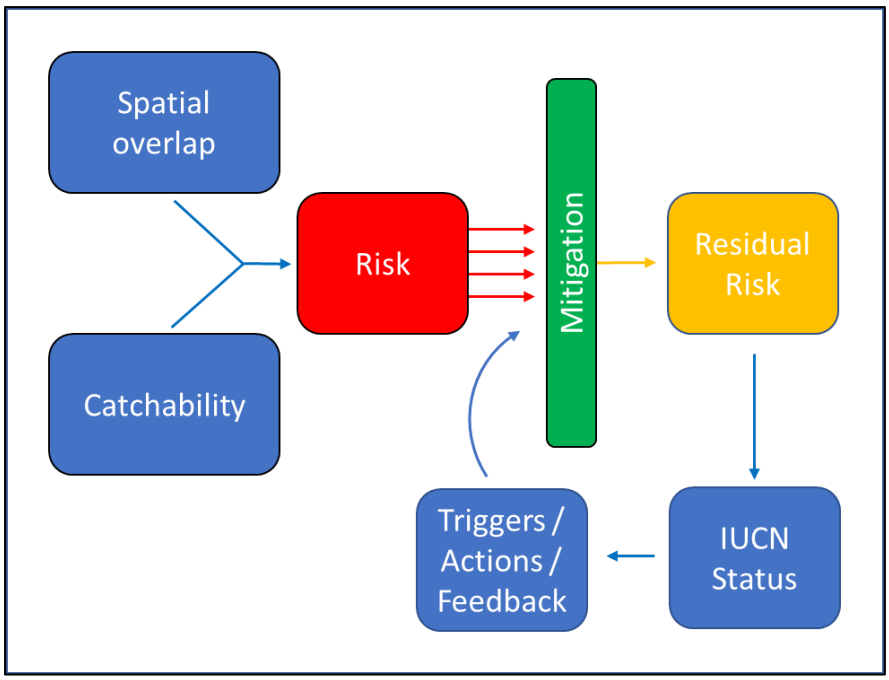

Figure 9: Risk assessment Process

Details on methods, data used, and analyses for providing a risk assessment for reducing significant adverse impact (SAI) is presented in Appendix 1: *By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block, South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area*

Ecological Setting

The ecological setting of the GVFZ RB is detailed in Appendix 1. In summary, the GVFZ RB is situated along the South East Indian Ridge system. The area is characterised by short chains of seamounts and spreading ridges generally rising to approximately 1000m depth (500m depth for the highest seamount) and surrounded by abyssal hills of approximately 2500m – 3500m depth. Hydrothermal vent fields along the ridge system have been the primary research focus for the area, whereas biological surveys of the seabed or water column are distinctly lacking. The oceanographic regime is characterised by eastward flowing Subantarctic Surface Waters, with relatively low annual surface primary productivity.

4.5.1 Non-target Fish

Summary Risk

Spatial overlap	Catchability	Risk
Medium (unknown)	**Grenadiers, Morids, Anguilliformes - High**	**High**
	Others - Low or unknown	**Low**
Mitigation		
Precautionary bycatch limit **Low number of lines proposed** **Lines will be set at least 3nm apart from each other, and not set at previous locations.**		
Residual risk after mitigation		

Low

Details on methods, data used, and analyses for providing a risk assessment for reducing significant adverse impact (SAI) is presented in Appendix 1: *By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block, South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area*

General assessment

An inventory of fish species observed on the GCFZ RB was produced from OBIS data. A total of 37 Families and 115 species/putative species have been recorded in area searched in OBIS. However, the records located within the proposed research block were very few, totalling 7 records including 4 Myctophidae, 1 Gobiidae, and 2 samples of *Dissostichus eleginoides*. Other records for the wide region were predominately small pelagic species.

Mitigation

An 8t total by-catch limit on individual fish species (finfish and rajids) per annum, will be adopted for the survey, with a total amount of all by-catch species combined not exceeding 30t. This would align with what occurs in the Macquarie Island fishery, where, for a 450t toothfish fishery, a combined by-catch limit of 200t is set with a 50t limit on any species. Once this limit has been reached, fishing will cease.

The move-on rule for fish by-catch followed in CCAMLR will be used for this proposal (CCAMLR, CM 41-03, 2019) namely:

- "The by-catch of finfish shall trigger a move-on rule if the catch of skates and rays exceeds 5% of the catch of *Dissostichus* spp. in any one haul or set, or if the catch of *Macrourus* spp. reaches 150 kg and exceeds 16% of the catch of *Dissostichus* spp. in any one haul or set.
- If the move-on rule is triggered, then the fishing vessel shall move to another location at least 5nm distant."

By-catch data will be reviewed annually by EU scientists to monitor cumulative impact.

Consequences to populations

After evaluation of spatial overlap, catchability and mitigation, it is considered that the consequences to the non-target fish populations are low with a high likelihood of recovery over short time frames.

4.5.2 Chondrichthyans

Summary Risk

Spatial overlap	Catchability	Risk
Skates - Unknown	Skates - High	Skates - Low
Sharks - Medium	Sharks- High	Sharks - Medium-High
Mitigation		
Precautionary bycatch limit **Skates are able to be release alive** ***Caveat - Risk assessments are possibly over-precautionary due to poor data.***		
Residual risk after mitigation		
Medium		

Details on methods, data used, and analyses for providing a risk assessment for reducing significant adverse impact (SAI) is presented in Appendix 1: *By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block, South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area*

General assessment

There are no records in OBIS of skate catch in the GVFZ RB region. Additionally, there are no skate species with predicted distributions in the region (Last *et al*. 2016). Despite the lack of species inventory, any catch of skates will be treated with usual precautionary mitigation measures of bycatch limits prescribed in the Fishing Operation Plan (Section 4), as well as releasing of all individuals assessed to have high likelihood of survival after release. Full biological information will be captured from retained individuals.

A total of 6 shark species were found to have possible distributions over the proposed fished area of the GVFZ RB (Appendix I). A mix of demersal and pelagic species are identified. Catchability of demersal species were considered to be 'high' whilst pelagic species were considered 'medium' catchability given the shorter time the line is suspended in the water column compared to time on the seabed.

Previous experience on the South Tasman Rise (CMM 14c-2019) has shown that demersal Somniosidae (sleeper sharks), Etmopteridae (lantern sharks) and Chimaeridae (ghost sharks) have a high catchability with demersal longline fishing gear. Although it is unknown if species of these groups are present on the GVFZ RB, a level of precaution should be taken considering that targeted fishing will be associated with seamounts.

Mitigation

Skates can often be recovered from the line and released alive, and this will be done in all cases where skates are likely to survive release. In the case of sharks, it is not likely that any will be in such condition to be released alive, particularly the larger species (e.g. Somniosidae, Lamnidae, Cetorhinidae), however every attempt will be made to release shark species alive where it makes practical sense and there is no risk to crew.

Primary mitigation for reducing risk to chondrichthyans is through precautionary bycatch limits. It is also likely that risk assessments here are over-precautionary, given paucity of available data for most chondrichthyans in SPRFMO and, particularly for demersal longline fishing in the region of the GVFZ RB.

Move-on rule

Deep-water sharks are not included in the move-on rule as per CCAMLR CM 41-03. However, for the purposes of this exploratory proposal, the vessel will move-on if the following by-catch levels are triggered:

If more than 4 individuals of any of the following families Somniosidae, Lamnidae, Cetrorhinidae, Alopiidae or more than 2 individuals of any one of these families is by-caught, the vessel shall move on, and a next line shall not be set closer than 5nm from the centre of the preceding line.

Additionally, after the first year's survey, currently scheduled for ~Sept/Oct 2021, an initial report will be available to the SC 30 days prior to their preparatory web-meeting in May/June 2022 (exact date yet to be determined). If overall shark by-catch, for families not covered by the move-on rule described above, is deemed excessive and of concern to the SC, mitigation measures such as a catch limited move-on rule may be added in the FOP for the subsequent 2nd and 3rd year's survey.

Consequences to populations
After evaluation of spatial overlap, catchability and mitigation, it is considered that the consequences to the shark populations are low with a high likelihood of recovery over medium time frames.

4.5.3 Seabirds

Summary Risk

<table>
<tr><th>Spatial overlap</th><th>Catchability</th><th>Risk of mortality</th></tr>
<tr><td rowspan="3">Medium</td><td>Albatrosses and Fulmars - High</td><td rowspan="2">Albatrosses and Fulmars - High
Petrels - High</td></tr>
<tr><td>Petrels - Medium</td></tr>
<tr><td>Penguins and Prions - Low</td><td>Penguins and Prions - Low</td></tr>
<tr><td colspan="3">Mitigation
Meets CMM-09-17
Exceed CMM-09-17; use of 2 x tory lines
Meets paragraphs 23 and 24 of CMM 14b-2020
Vessel light management at night
Proposed fishing time of year avoids overlap with Short-tailed Shearwater breeding in Candidate IBA</td></tr>
<tr><td colspan="3">Residual risk after mitigation</td></tr>
<tr><td colspan="3">Low</td></tr>
</table>

Details on methods, data used, and analyses for providing a risk assessment for reducing significant adverse impact (SAI) is presented in Appendix 1: *By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block, South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area*

General assessment
A total of 57 seabirds were identified as overlapping with the GVFZ RB to varying degrees (Appendix I). Seabirds interact with deep-set longline vessels in a number of ways. At the surface, birds are attracted to baited hooks during line setting at the stern of the vessel, where some species may be caught at the surface only (e.g. most albatrosses) or underwater if the species is able to dive and chase baited hooks while descending (e.g. white chinned petrels). During line hauling, birds are attracted to the starboard side of the vessel nearest the hauling bay with the risk again being caught by hooks while attempting to feed on bait. At-risk seabirds are therefore those larger seabirds that are able to feed on large squid and mackerel bait.

Birds striking the vessel itself, so called light-strike, may cause risk particularly at night when vessel lights can attract seabirds from a great distance. This would be a risk primarily to smaller birds or juveniles rather than larger adult albatross species, such as storm petrels and prions. Although this is not necessarily bycatch, it is related to ship fishing operations.

Mitigation
Taking note of **CMM 09-2017**, and particularly the specifications in **Annex 1**, the FV Tronio is able to comply fully with all aspects. The bird mitigation devices themselves are detailed below. Officers and crew in collaboration with onboard Compliance officers and Scientific Observers have refined some practical aspects of the devices to best suit the vessel. Figure 10 details the streamer line system

deployed during each setting as in place on the vessel in 2017, and which it still uses currently. Figure 11 and Figure 12 show two types of towed devices. The device as shown in Figure 12 shows some of the latest improvements. Note that CCAMLR specifies a single Bird Scaring line, whereas the Tronio deploys a Double BSL.

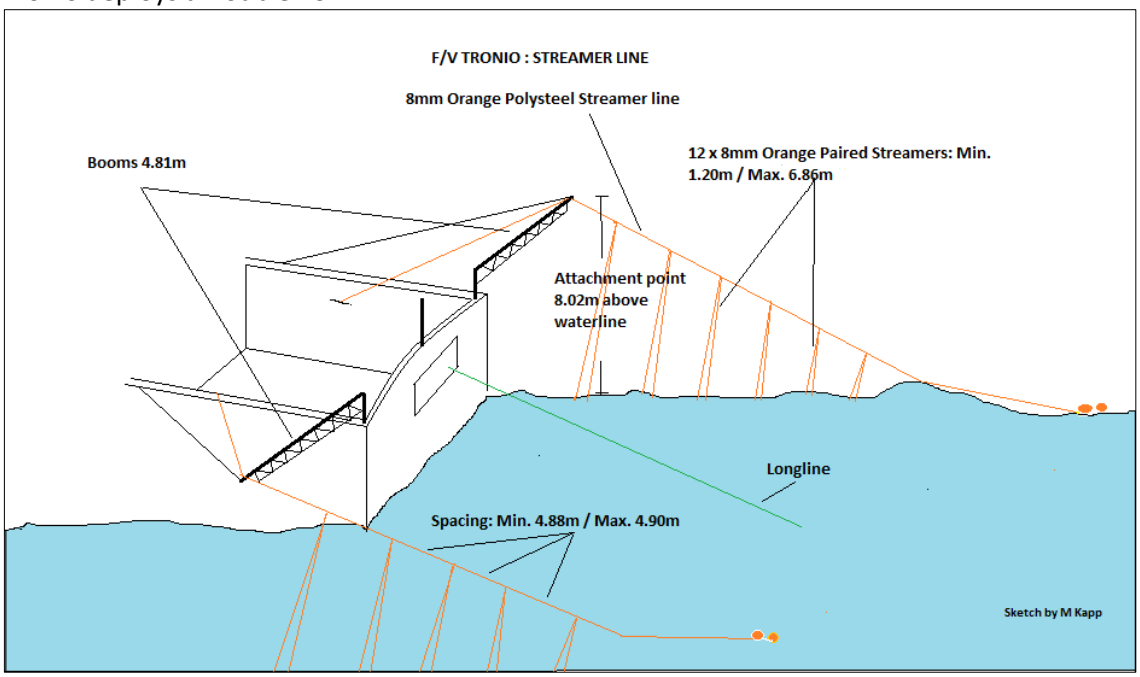

Figure 10 Streamer line alignment during setting.

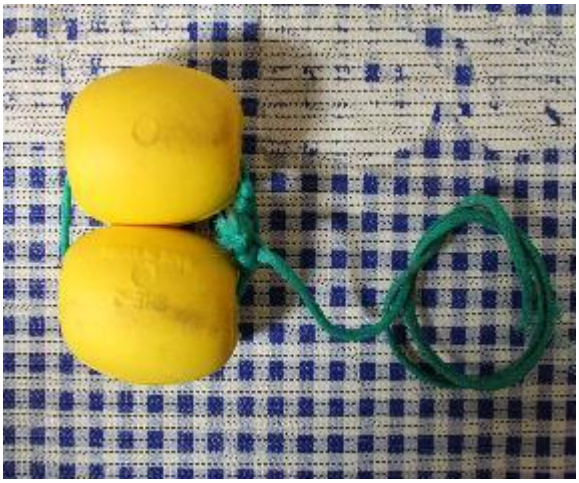

Figure 11 Towed device option 1

Figure 12 Towed devise option 2, providing additional drag

Seabird interactions during hauling are mitigated against in a number of ways. Firstly, the vessel always deploys a Bird Exclusion Device (BED) around the hauling bay to deter any seabird interaction with the line as shown in Figure 13 and in Figure 14.

Discard management will meet paragraph 23 of **CMM 14b-2020**, specifically

a) no dumping of offal while lines are being set or hauled,
b) any offal or discards shall be macerated prior to discarding.
c) discarding shall take place only at the end of haul or while steaming; and no biological material shall be discarded for at least 30 minutes before the start of any set or during any set, and
d) discarding will only take place from the opposite side to the hauling position

The FV Tronio has the ability to meet CCAMLR CM 26-01, which requires offal/discard storage and prohibits dumping of this south of 60°S.

Paragraph 6 of CCAMLR CM 25-02 (2018) requires hook removal from by-catch and discard species and this is standard practice on the vessel.

Figure 13 FV Tronio bird exclusion device (BED) around the hauling bay.

Figure 14 FV Tronio bird exclusion device (BED) around the hauling bay.

Vessel Strikes

Management of light emission from vessel at night will be done to avoid vessel-strike, reducing the use of light to the minimum required for safety reasons.

Trigger / Action

CMM 09-17 sets a trigger level of 0.01 birds/1000 hooks before additional mitigation measures must be made. In the instance of exceeding this limit, an evaluation of mitigation measures will be made, including ensuring correct deployment of mitigation, and strengthening mitigation where possible (e.g. further reducing night hours of setting).

Consequences to populations

After evaluation of spatial overlap, catchability and mitigation, it is considered that the consequences to the seabird populations are low with a high likelihood of recovery over short time frames.

4.5.4 Marine Mammals

Summary Risk

Spatial overlap	Catchability	Risk
High	Whales/Dolphins - Low	Whales/Dolphins - Low
	Otariids - Low	Otariids - Low
	Phocids - Medium	Phocids - Medium
Mitigation		
Meets paragraph 24 of CMM 14b-2020 **Avoidance of areas of visible mammal activity** **Elephant seals may have limited distribution in the GVFZ RB** **Fishing planned for November - likely low Elephant seal encounters**		
Residual risk after mitigation		
Low		

Details on methods, data used, and analyses for providing a risk assessment for reducing significant adverse impact (SAI) is presented in Appendix 1: *By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block, South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area*

General assessment
A total of 30 marine mammals were identified as overlapping with the GVFZ RB to varying degrees (Appendix I)

The majority of whale species have a high degree of potential overlap with the GVFZ RB region. Whales are likely to be at risk at or near the surface during setting or hauling, where entanglement would likely result in injury or drowning. Catchability of whales is thought to be very low and varies with species (Werner *et al.*, 2015). Orcas and Sperm whales have a very high degree of association with toothfish longline vessels, where interactions are more damaging economically to the vessel in terms of lost or damaged gear and depredation of catch off the line. Damage to individuals may occur, with mortalities low to near-zero. Similarly, dolphin mortalities are thought to be very rare among toothfish longline vessels.

Otariiid seals have been associated with toothfish longline vessels and have been observed to depredate on catch. Mortalities of fur seal and sea lions in relation to toothfish fishing appear to be very rare.

Specific at-risk species
Southern Elephant (*Mirounga leonina*) seals may be at risk to incidental mortality, as has been found in other regions. Van Den Hoff, Kilpatrick and Welsford (2017) summarise recent and historic reports of Elephant seal bycatch. These reports include video evidence of interactions with caught toothfish on the seabed as well as reports made by Scientific Observers of Elephant seal mortalities by drowning related to longline fishing.

Elephant seals can dive for up to 2h to depths over 1500m and bottom times of up to 15mins at deep-depths. Males tend to dive deeper (down to ~ 2000m) compared to females (~ 800m) (Prof. Mike Fedak pers com). Elephant seals are known to travel thousands of kilometres on 10-month long foraging trips (Hindell *et al.*, 2016). The closest colony to the GVFZ is on Macquarie Island. IUCN distribution data suggest overlap with the GVFZ RB. Elephant seal tracking data (Fabien *et al.*, 2018) suggest that elephant seals may primarily travel south from Macquarie Island (Figure 4, Appendix 1). However, elephant seals have been tracked across GVFZ RB on a number of occasions with some individuals spending some time in the area rather than simply transiting through.

Mitigation
Few mitigation measures have been recommended to avoid marine mammal by-catch. In the case of Orcas and Sperm whales, the vessel will naturally aim to avoid interactions due to depredation behaviour of toothfish, characteristic these species. Seasonal avoidance has been recommended for depredation mitigation and may also be effective for reducing by-catch among other species. Pre-setting and hauling assessments of mammal abundance in the vicinity will be done, and judgement will be made on a case by case basis as to whether vessel avoidance is necessary.

In the case of Elephant seals, there have been no effective mitigation measures recommended for avoiding elephant seal by-catch due in part, to their deep and long-duration diving capabilities. Seasonal avoidance is suggested, where fishing could be conducted in September-November when adult seals are primarily ashore (Van den Hoff et al 2017).

Any seal or whale by-catch will trigger a re-evaluation of fishing strategy.

In the very unlikely case of a whale entanglement and possible mortality as a result, prior to all subsequent lines being hauled a one-hour observation period will be conducted to ensure no whales are present.

Consequences to populations
After evaluation of spatial overlap, catchability and mitigation, it is considered that the consequences to the mammal populations are low with a high likelihood of recovery over medium time frames.

4.5.5 VME

Summary Risk

Spatial overlap	Catchability	Risk
VME indicator species - High	**High (damaged on seabed)**	**Medium**
Mitigation		
Limited impact footprint **3nm separation between lines** **Annual review of VME records and Benthic Camera records** **Spatial overlap of line setting in subsequent years will be dependent on the previous year's review, with the aim of eliminating cumulative effects**		
Residual risk after mitigation		
Low		

Details on methods, data used, and analyses for providing a risk assessment for reducing significant adverse impact (SAI) is presented in Appendix 1: *By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block, South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area*

General assessment
OBIS data were used to compile an inventory of possible VME species that will be encountered in the GVFZ RB. Very few records were found, with a total of 19 benthic invertebrate species (and putative species) recorded. There were only four sites within the GVFZ RB where benthic invertebrates were recorded (Figure 6, Appendix 1), and of these, none were located on proposed fishing areas of depths shallower than 2500m depth. There have been VME species encountered in the area (L. Georgeson pers com), and these records have been requested from the Australian authorities.

Seamounts are topographic features known to have in many cases globally, high benthic diversity compared to surrounding deeper habitats (Pritcher et al. 2007 for reviews). Recently, researchers have been developing models for predicting the distribution of hard structure/framework forming coral species, namely the Scleractinia. Predictive distribution model results show that the seamounts of the GVFZ RB may have relatively low habitat suitability for Scleractinians across a number of studies. Depending on the model and input data, Anderson et al. (2016) found habitat suitability indices of between <0.2-0.4 for the GVFZ RB, Tittensor et al. (2009) found decreasing habitat suitability with increasing seamount summit depth (0.6 at 500m depth to near zero probability at 1500m depth), and Davies and Guinotte (2011) predicted zero suitability in a binary model.

Mitigation

The potential impact of the longline is considered to be low (BFIAS SWG-10-DW-01A). The Spanish system minimizes contact between main line and seabed due to its positive buoyancy. Contact may be increased by other factors such as longitudinal movement of the main line over the seabed during hauling, or sidewise (sweeping) movements of the main line and hooks also during hauling. Movement of the fishing gear may occur in the presence of strong currents.

According to Sharp et al. (2009) and Welsford et al., 2014, longline movement on the seabed occurs mainly during hauling. Studies using video cameras attached to the gear show that there is lateral movement of the line over the seabed during the first phase of hauling where there is an inverse relationship between gear depth and lateral movement of the mainline and the hooks. These studies have been carried out on autoline fishing systems where the entire line lies on the seabed. In the case of Spanish longlines, both hauling and main line have positive buoyancy: only the anchor and weights (between 6 and 9 kg) joined to the hauling line are in direct contact with the seabed (although this may be unlikely at all times). Thus, there may be lateral movement of the gear during hauling, but its impact is expected to be smaller compared to autoline systems. Recent work in the Falkland Islands corroborates the notion of limited seabed impact by seabed longline fishing gear, where initial estimates of seabed contact were in the order of 10s -100s of meters in the immediate vicinity of the longline (Brewin *et al*. 2020)).

The footprint index for the Spanish longline system needs a more nuanced evaluation since, the gear having positive buoyancy, most of the gear does not touch the sea bottom. The parts of the gear that will have a direct impact on the bottom are:

1. The weights used as ballast.
2. The anchors and chains used for anchoring both ends of the gear.

The impact of these two parts on the seabed is due crushing on impact at the time of setting, and also potentially being dragged limited distances along seabed at the time of hauling. Movement of these while on the seabed is considered to be highly limited.

3. Hooks and lines should hang above the seabed with mostly only drop weights coming in contact with the seabed. However, in practice hooks and lines also may come in contact with the seabed as evidenced from invertebrates often being caught on lines and/or hooks. This may be due to variable tensioning on the line, uneven topography, or currents causing drag on the fishing gear. As such, although not likely to be the case 100% of the time, a precautionary assumption would be that the entire longline will at some point, come in contact to the seabed during setting, fishing, and hauling periods.

Under normal fishing conditions, the FV Tronio can deploy and retrieve around 32km of line per 24-hour period (around 20,000 hooks). The footprint and impact of this activity has been reported in the impact assessment report by the Spanish delegation to CCAMLR (for instance SC-CAMLR-XXXV/BG/05 for 2016-17 seasons).

Consistent with the assumptions described in the Report on Bottom Fisheries and Vulnerable Marine Ecosystems (SC-CCAMLR XXX, Annex 7, Appendix D), an estimated footprint index of 6.67×10^{-3} km^2 of seabed area per km of longline deployed can be applied.

Footprint index	Max Daily Footprint (est.)	Max Weekly Footprint (est.)	Max Monthly Footprint (est.)
6.67×10^{-3} km^2	0.2134 km^2	1.4941 km^2	6.4032 km^2

Consistent with the assumptions described in the Report on Bottom Fisheries and Vulnerable Marine Ecosystems (SC-CCAMLR XXX, Annex 7, Appendix D) an estimated impact index of 5.07 x 10^{-3} km^2 of seabed area per km of longline deployed can be applied.

Impact index	Max Daily Impact (est.)	Max Weekly Impact (est.)	Max Monthly Impact (est.)
5.07 x 10^{-3} km^2	0.1622 km^2	1.3568 km^2	4.8672 km^2

If the fishable area is indeed as estimated (17,415km^2), the maximum footprint in a four-week exploratory period would amount to 6.4032 km^2 and equating to 0.037% of the fishable area.

The maximum impact in a four-week exploratory period, which would amount to 4.8672 km^2, would equate 0.028% of the fishable area.

Due to the short duration of the exploratory phase (4 weeks for three successive years), and as shown above, it is expected that the impact of the fishing activity for the duration of the survey will be low. This combined with the low number of lines being set across a large spatial extent will ensure low local impact as well as ensure short-term recoverability of impacted habitat. In addition, it is proposed that each line set will be at least 3nm apart (measured from the mid-point of each line), and that no lines will be set on previously fished ground within the same annual survey season. Spatial overlap of line setting in subsequent years will be dependent on the previous year's review of VME impact data, with the aim of eliminating cumulative effects, satisfying requirements **of CMM 03-2020**.

In the absence of a predictive study or empirical data in the region, data collected such as depth, species, weight, and benthic imagery as part of the data collection program proposed will facilitate future impact analyses of longline fishing on VMEs.

The F/V Tronio has a broad experience working in the CCAMLR Convention Area where different CMs are in place regarding VME potential encounters (CCAMLR, CMs 22-06 and 22-07).

Trigger / Action
The EU (Spain), as established in paragraph 28 a) of CMM 03-2020, shall require vessels flying their flag to cease bottom fishing activities within one nautical miles of any location where evidence of a VME is encountered in the course of fishing activities, and to report the encounter, so that appropriate conservation measures can be adopted in respect of the relevant site.

The EU (Spain), until the SC has developed advice on SPRFMO threshold limits, shall require their vessel, if 10 or more VME indicator units are recovered in one-line segment, to complete hauling any lines intersecting with the Risk Area without delay and not to set any further lines intersecting with the Risk Area, as described in CCAMLR VME Risk Area assessment method. Under CCAMLR CM 22-07 (2013) paragraph 2(iii), where;

'VME indicator unit' is defined as 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.'

'Risk areas' (CCAMLR CM 22-07 paragraph 2(iv)) for VMEs will be delineated where 10 of more VME units are detected in any 'line segment' (1000-hook section, CM 22-07 paragraph 2(iv)).

The vessel shall immediately communicate to the Flag State the location of the midpoint of the line segment from which those VME indicator units were recovered along with the number of VME indicator units recovered.

No move-on rule is applicable because all lines will be set at minimum 3nm apart (measured from the mid-point of the line) as part of the Fisheries Operation Plan.

Consequences to populations
After evaluation of spatial overlap, catchability and mitigation, it is considered that the consequences to the VME populations are low with a high likelihood of recovery over medium time frames, and over small spatial scales.

4.5.6 Additional impact of the longline fishing activity

Gear Loss
Gear loss or of parts of it is very infrequent. We estimate that 1% to 2% of the total number of hooks may be lost, but most are loose hooks without any line, hence they wouldn't have a negative impact on benthic organisms. On the other hand, line breakage doesn't usually involve gear loss because even if breakage occurs on one end, the gear can be hauled back from the other end. In general, less than 1% of the gear set is estimated to be lost. Also, in places with a higher risk of line breakage or loss (for instance, near ice floe but highly unlikely in the GVFZ RB), the line set is usually shorter and the number of lines set at any one time is also smaller, therefore limiting gear loss. The rare occasions in which gear is lost are due to loss of the main buoy with radio beacon, which makes recovery near impossible. However, in an attempt to recover lost lines, a grapple system is used to try and recover all or part of the line.

The FV Tronio is typically able to deploy/retrieve on average around 20,000 hooks per day. FV Tronio will not operate for more than 4 weeks, during which it will be able to deploy/retrieve 120 lines, around 600,000 hooks.

During the Antarctic fishing season (2017/18) that the FV Tronio conducted in FAO areas 88.1 and 58.4.1, a hook loss rate (which includes sections of line) of 0.9% was recorded. During the survey on the South Tasman Rise in Oct-Nov 2019, no fishing line was lost at all, only loose hooks. If the Antarctic fishing season of 2017/18 can indeed be regarded as comparable, it may be estimated that some 5,400 hooks (including line sections) may be lost. In GFVZ t would equate to 8,640m of fishing line, and would include some 224 x 6kg weights.

Information on other relevant fisheries
There are two Australian Patagonian Toothfish fisheries that are prosecuted in their territories such as the Heard Island and McDonald Islands Fishery and the Macquarie Island fishery of which the latter is the nearest: the Heard and McDonald Island EEZ is some 2066+nm to the W of the GVFZ RB, whereas the Macquarie Island EEZ is some 500nm to the NE border of the GVFZ RB. The Macquarie Island Patagonian Toothfish fishery dates back to the mid 1990s and has been a certified MSC fishery since 2012 (https://fisheries.msc.org/en/fisheries/macquarie-island-mi-toothfish/@@view). The annual TAC for this fishery has up until the 2018/19 season been 450t (http://www.afma.gov.au/fisheries/macquarie-island-fishery/), but has recently (15 April 2020) been increased to 555t (https://www.legislation.gov.au/Details/F2020L00286) for the years 2020/21 and 2021/22. Given the distances involved between the GVFZ RB and the two nearest regulated toothfish fisheries mentioned it is unlikely that there will be impact on the toothfish stocks in either the Heard Island and McDonald Islands Fishery and the Macquarie Island fishery fisheries. Although tagging studies have shown occasionally larger distances in migration, the majority of migration in

other *D. eleginoides* fisheries suggest this to be an exception to the rule, with migration limited to less than 50km in the Falklands region (Brown et al 2013), and most fish less than 20km in the South Georgia region (Marlow et al 2003). The proposed collection of DNA and geochemical samples in the present study may help establish whether any and what regional connectivity between populations exists.

Trophic impact
Toothfish are a higher trophic level predator and the only likely natural predators are elephant seals and sperm whales (reviewed in Collins et al., 2010; Hanchet et al., 2015). Evidence shows that Elephant seals and Sperm whales will prey on Toothfish (Slip, 1995; Collins et al., 2010; Hanchet et al., 2015). However, dependence on toothfish in their diet is likely to be low. Given the low potential extraction of toothfish in this proposed survey, there is low likelihood of any impacts on dependent or related species.

5 Data Collection Plan

For the Fisheries Operation Plan period, the data collection referred to below are proposed for collection in addition to other elements that the Scientific Committee might develop in accordance with paragraph 9 of CMM 13-2020.

The F/V Tronio will fulfil with the data to be collected detailed in **CMM 02-2020**, and specifically those included in **Annex 3** (Standard for Bottom long lining fishing activity data) and a number of sections from **Annex 7** (Standard for Observer Data):

Annex 7
Section A: Vessel & Observer Data to be Collected for Each Observer Trip
Section D: Catch & Effort Data to be Collected for Bottom Long Line Fishing Activity
Section E: Length-Frequency Data to Be Collected
Section F: Biological Sampling to be Conducted
Section G: Data to be Collected on Incidental Captures of seabirds, mammals, reptiles (turtles) and other species of concern
Section H: Detection of Fishing in Association with Vulnerable Marine Ecosystems (where relevant for long lining)and
Section I: Data to be collected for all Tag Recoveries.

The F/V Tronio will comply with SPRFMO data collection requirements regarding standardized seabird, and marine mammal observations and other data recordings and opportunistic observations.

Sufficient data will be collected with the aim of establishing baselines to build future monitoring and mitigation, as required under **paragraphs 10 and 24 of CMM 13-2020**, and to assist the SC in providing recommendations to the Commission under the primary objective **of CMM 03-2020** and **CMM-03a-2020**, as well as and **Annex 7 of CMM 03-2020**.

All set and hauled lines (for which detailed start/end position, depths, date/time of start/end setting and start/end hauling, duration, bait type, etc. is recorded) the catch will be assessed for the following (responsible parties in brackets):

1. Identification of the entire catch (target and by-catch species of fish, skates and rays, mammals, sharks, seabirds) by species to the lowest possible taxonomic level. (crew with assistance from CapFish Compliance Officer/Observer).

2. Weight and number of all specimens of all species. (crew as directed by the Compliance Officer/Observer)

3. Representative random biological sampling of each fish species detailing size, weight (sub-samples), sex, maturity. A suggested representative sampling rate of catches could be 50 toothfish and any by-catch species per line (Compliance officer/Observer and National observer).

4. Tagging of toothfish at a rate of 5 fish per 1t per toothfish species. Acknowledging the MoU between SPRFMO and CCAMLR (SC-04-DW-01, "Collaboration between CCAMLR and SPRFMO in respect of Toothfish), CCAMLR tags will be obtained and used during this exploratory period (Compliance officer/Observer and National observer).

5. Collection of representative samples for ageing and other requirements of the target species. (Compliance officer/Observer and National observer)

6. Checking and confirmation of previously established Conversion Factors (to calculate green weight) already employed for Patagonian and Antarctic Toothfish. A CF of 1.72 has been commonly used in a number of the vessel's toothfish fishery operations, whereas in other regions CFs such as 1.79 and 1.85 have been stipulated by the flag state. Furthermore, establishing of CFs for other commercially viable fish species, if found. (crew/Compliance Officer/Observer and National observer)

7. Identification (to the most detailed taxonomic level possible) and quantification of any potential VME species adopting the same protocols as those in place within CCAMLR waters. Unless provided with alternative material by the SPRFMO SC, the company proposes to use CCAMLR VME identification guides. The total benthos recovered will be registered for each line. VME indicator units for each line segment and the midpoint of each line segment on all lines, including zero catches, should be reported in the fine-scale data. (Compliance Officer/Observer and National Observer)

8. Regular (daily) deployment of underwater camera (Figure 15 and Figure 16) with light system for recording of benthic habitat. This is to record data on:
   a) VME identification and benthic habitat
   b) Impact of the longline on the seabed
   c) Any predator/prey interactions
   (Compliance Officer/Observer and National Observer)

9. Collection of representative samples (frozen or DNA samples or both) of VME species for interested institutes, such as Museum Victoria. (Compliance Officer/Observer and National Observer).

10. Collection of representative samples (frozen or DNA samples or both) of fish, skate and shark species for institutes such as Museum Victoria. (Compliance Officer/Observer and National Observer).

11. Representative collection of tissue samples for DNA analysis from Patagonian/Antarctic Toothfish, to allow for comparison with other Patagonian/Antarctic Toothfish stocks. (Compliance Officer/Observer and National Observer)

12. Collection of 30 frozen tissue samples of Toothfish geochemical analyses by Oritain Ltd. for traceability studies. (Compliance Officer/Observer and National Observer)

13. Seabird/mammal observer tasks will be carried out. These include recording at each setting and hauling the species, number present, and interaction levels. If pinnipeds mortalities occur, whisker, teeth and DNA samples will be collected, and if possible, the animal will be kept for future necropsy. (Compliance Officer/Observer and National Observer)

14. Monitoring of light strikes. Daily checking of all deck spaces to monitor and log strikes, detailing species and condition. (Crew, Compliance Officer/Observer and National Observer)

15. Following paragraph Section G Annex 7 **CMM02-2020**, we will identify and photograph all captured shark species

16. If sharks and skates are alive, they will be returned to sea with least possible damage and if possible, hooks removed. Animals with low chance of survival will be retained for sampling, including representative DNA samples for iD

17. Oceanographic data – Valeport CTD deployment on at least 50% of the lines.

Figure 15: Benthic Camera Plate

Figure 16: Benthic Camera and Light

Science Team

The science team will be lead by the Company's general manager, Joost Pompert, who has over 25 years of experience in at sea commercial fisheries science activities, and also took part in the survey on the South Tasman Rise in Oct-Nov 2019. An experienced toothfish/longline observer will be contracted through Capricorn Fisheries Monitoring CC (www.capfish.co.za). A National Observer will also be on board for the duration of the voyage. Factory and hauling crew will be tasked as appropriate.

6 Post-Survey Science Reporting

The purpose of collecting the data as outlined above is to meet all the SPRFMO data collection requirements, which, inter alia, will advise the SPRFMO Commission on spatial management and sustainable catch levels in the GVFZ RB.

In the case of shark catches, we will aim to fill two main data gaps as identified in SC6-DW08, namely;

a) "Note that the assessment has highlighted that additional work on post capture mortality and gear selectivity of deep-water chondrichthyans would aid future analyses and inform potential future mitigation strategies that would minimise risk associated with susceptibility."
b) "Recommend to the SPRFMO Commission that identification protocols and biological data collection for deepwater chondrichthyans is strengthened for SPRFMO demersal fisheries."

In the case of VMEs, data will be collected to fill knowledge gaps as identified in **Section 6 of SC6-DW09**, specifically "Note that insufficient data from bottom longline fisheries exists to develop a data-informed move-on rule for that method".

- VME data collection will help to develop VME maps for the SPRFMO area as required under **CMM 03-2020.**
- Provide data to develop alternative VME threshold methods for demersal longlines such as the incorporation of a biodiversity component, as described in **Section 2.6 of SC6-DW09.**
- A deep-water video camera will be used to examine species occurrence, density and species / habitat relationships,), **as recommended by the BFIAS**. In addition, the real-world impact of demersal longline fishing on VME species and habitats will assessed.
- Environmental data will be collected (Conductivity, Temperature, Depth, Chlorophyll) to be incorporated into regional predictive modelling, **as recommended by the BFIAS,** and where appropriate.

In addition to the mandatory reporting of data to the SPRFMO Secretariat (CMM 02-2020), analyses of supplementary data and samples collected on the first year's survey will be treated in the following manner:

Data Analyses	Responsibility	Delivery date
Catch and by-catch data, tagging details	Georgia Seafoods ltd./SAERI (Falklands) Ltd./IEO Spain	60 days before the next SC meeting
VME mapping/spatial analyses	SAERI (Falklands) Ltd.	60 days before the next SC meeting
Deepwater Camera footage	SAERI (Falklands) Ltd.	60 days before the next SC meeting
DNA samples	Dr. Haseeb Randhawa	TBC
Geochemical samples	Oritain Ltd.	TBC
VME and fish samples	Museums Victoria	TBC

As this proposal covers a period of three years 2021-2023, it is envisaged that 3 annual reports will be submitted to SPRFMO SC, with a final more comprehensive report following the third survey. This third report will include detail as above from the entire period 2021-2023. Furthermore, it is envisaged that an approach to assessing stock size can be attempted using these data. This should provide information sufficient for the SC to be alerted to any sustainability concerns and what, if any, additional measures might be required to restrict the potential bycatch of deep-water sharks or other non-target species.

The company, in collaboration with their environmental consultants (SAERI (Falklands) Ltd) (SFL), https://www.south-atlantic-research.org/sfl, based in the Falkland Islands) have been engaged to provide the detail at the next Scientific Committee meeting following the initial survey, providing detail on the presence of the target species, by-catch species, as well as any encounters with VME species. Any fishing impact will be established through the data and imagery collected during this period, and this will be reported on. SFL employs a benthic ecologist (Dr. Paul Brewin) whom will be leading on the analyses. The toothfish DNA samples will be sequenced at Otago University in Dunedin, New Zealand under contract with Dr. Haseeb Randhawa (https://www.researchgate.net/profile/Haseeb_Randhawa), currently an Honorary Lecturer at Otago University. Otago University has first class facilities for this type of work, and the results will be published in a scientific journal.

Oritain Ltd. have been provided with toothfish samples from other regions in the southern oceans and will be analysing the geochemical differences between toothfish found on the STR, and those from elsewhere.

Museums Victoria (Melanie Mackenzie, Collection Manager, Marine Invertebrates) has agreed to receive all VME samples for curation and identification.

Museums Victoria (Dr. Martin Gomon, Senior Curator, Ichthyology) has agreed to receive any fish specimens to enhance their coverage of the Australasian region.

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8 Appendix 1:

By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block,
South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area

By-catch risk assessment for experimental Patagonian & Antarctic toothfish demersal longline fishery: George V Facture Zone Research Block, South Pacific Regional Fisheries Management Organisation (SPRFMO) Convention Area

SPRFMO Experimental Fishing Risk Assessment

Review table

Name	Reviewed by	Date
Version 1	P Brewin; P Brickle, J Pompert	13 July 2020
Version 2	P Brewin	14 July 2020

Prepared by: Dr Paul Brewin and Dr Paul Brickle

Citation

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CONTENTS

BACKGROUND

This risk assessment is prepared for the support of Georgia Seafoods Ltd's Patagonian toothfish exploratory fishing program in the region of the George V Fracture Zone (Figure 1), and to detail a mitigation strategy for minimising bycatch and overall impact on the marine ecosystem.

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

Data gathered and summarised in this report is aimed at providing the SPRFMO Scientific Committee (SC) sufficient knowledge to make informed recommendations to the Commission, as required under **Paragraph 8 of CMM 13-2020.**

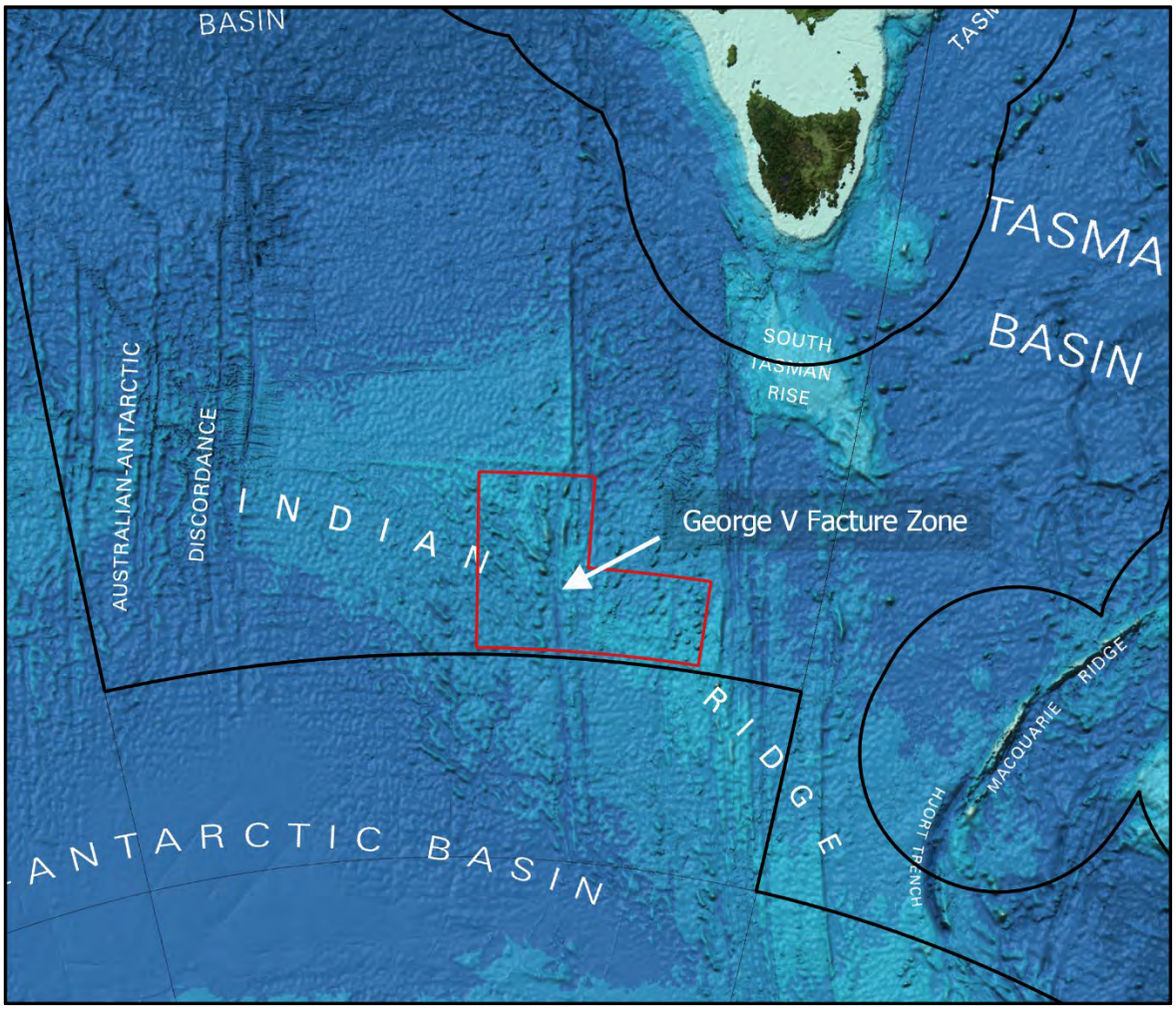

Figure 1 – Proposed exploratory fishing area in the George V Fracture Zone (shown in red). The SPRFMO conservation area is delineated as well as adjacent EEZs. Other topographic features are shown for reference. Base maps source, GEBCO (2014).

METHODS

Methods for identifying Significant Adverse Impacts (SAI) are similar to those used previously in preparation for the exploratory fishing program carried out under **CMM 14c-2019 Conservation and Management Measure for the Exploratory Fishing for Toothfish by EU Vessels in the SPRFMO Convention Area**, detailed in the work-flow shown in Figure 2.

The aim is to make qualitative assessments that will incorporate key characteristics of the species aiding the evaluation of 'likeliness' and 'consequence' of bycatch interactions in the case of demersal longline fishing for toothfish in the region of the George V Fracture Zone Research Block (GVFZ RB).

We follow the guidance from the **SPRFMO Bottom Fishery Impact Assessment Standard (BFIAS) (2011)** for this risk assessment. The BFIAS (2011) is currently under review (**Revision of SPRFMO Bottom Fishing Impact Assessment Standard** presented at **SC7-DW19),** and the method/workflow used in the present study contains elements of the recommended three level hierarchical methodology for the Ecological Risk Assessment for the Effects of Fishing methodology described in Hobday *et al.* (2011). As this is an exploratory fishery in an area not well understood in terms of species presences or abundance, we take a **SISCA** (Scale Intensity Consequence Analysis) approach. Data on spatial overlap and catchability is evaluated and given qualitative assignments of 'Low', 'Low-Med', 'Med', 'Med-high', 'High' and combined to form overall risk. Mitigation is applied, and an **RRA** (Residual Risk Analysis) is presented. Species' IUCN status is used to inform decisions on triggers and actions to be taken for managing risk. Finally, there is a feed-back process for using new knowledge gained to reduce risk through enhanced mitigation.

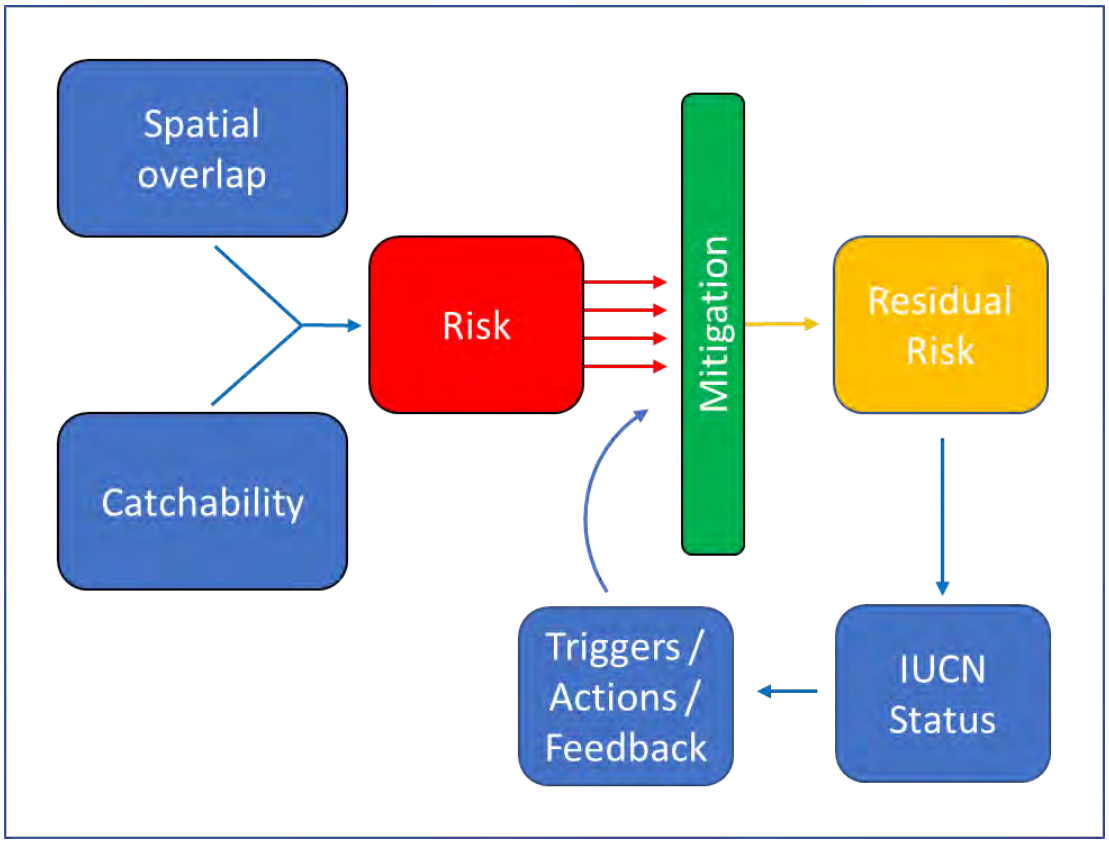

Figure 2. Risk assessment processes.

Scope of risk assessment

This assessment aims to identify the risk to;

- Target species
- Non-target (bycatch) bycatch species
- Seabirds, marine mammals, reptiles, and other species of concern
- Benthic habitats, biodiversity, and VMEs
- Conservation status of species identified above.

Consideration will be given to hazards caused by fishing, including impacts of gear and lost gear, as well as examining potential for bird strike, discards, and other potential attractants.

Spatial overlap

The BFIAS recommends that in areas where information is lacking on likelihood of occurrence [of VMEs] other information that is relevant to inferring the likely presence of vulnerable populations, communities and habitats should be used. This approach is taken for all species groups potentially impacted by fishing.

Date sources

Data on species observations and predicted occurrences were gathered from multiple validated online and published sources. Data for taxonomic groups and species were cross-validated between multiple sources. Online data were accessed on 7 July 2020.

- OBIS (Ocean Biogeographic Information Database). OBIS is an open-access web-distributed global atlas of marine biodiversity and biogeographic database, containing georeferenced species occurrence and associated metadata (Grassle, 2000). OBIS data positions for combined seabirds, fish, reptiles, mammals, invertebrates, and chondrichthyans are shown in (Figure 3).
- IUCN (www.iucnredlist.org) was used to gather species distribution data using published mapped spatial data (downloaded shape files) and online Threatened Species lists.
- BirdLife International (www.birdlife.org) holds the IUCN distribution shape files and Threatened Species lists for birds.
- *Biogeographic Atlas of the Southern Ocean* (De Broyer and Koubbi (eds), 2014). A published atlas of Southern Ocean marine species.
- FishBase (www.fishbase.org). A global species database of fish species and mapped predicted distributions via www.aquamaps.org
- *Rays of the World* (Last *et al.*, 2016)
- *Sharks and Rays of Australia* (Last and Stevens, 2009)
- *Fishes of the Southern Ocean* (Gon and Heemstra, 1990)
- Expert opinion from various institutions (SAERI, JNCC, University of St Andrews, Falkland Island Government Fisheries Department)

Species distributions were compared to the expected fishing area of the GVFZ RB, and a qualitative assessment of likely occurrence overlap was assigned. Qualitative assessment was made on the basis of 1) species observed occurrence in the GVFZ RB region (OBIS data), 2) the assumed distribution (e.g. IUCN) over the GVFZ RB region or if it is at the edge of the assumed range 3) prediction in adjacent areas of similar depth if not observed in the GVFZ RB.

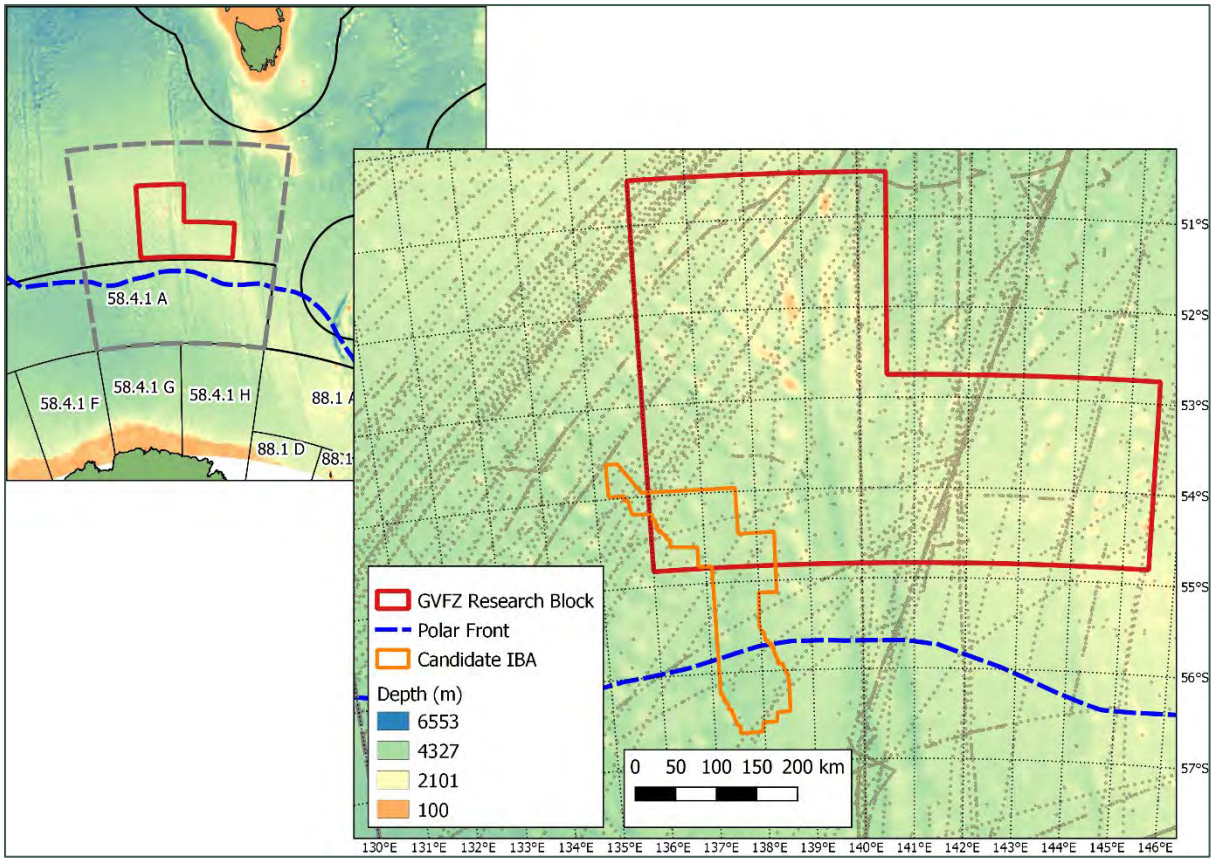

Figure 3. Extent and distribution of OBIS data used in the analysis (grey points). Also shown are the major oceanic fronts in the region, national EEZs, CCAMLR sub-areas, and candidate IBA (Short-tailed Shearwater Nov-Apr) (approximate position, re-drawn from http://www.birdlife.org/)

Catchability

Assuming no mitigation, we assess if the species is susceptible to being caught during demersal longline fishing operations. For seabirds, size, diving behaviour, and other characteristics were considered as gathered from various sources. For non-seabirds, vertical distribution of the species in the water column (either benthic or pelagic) is considered in a relative way; for example, given that the longline is associated with benthic/demersal habitats for long periods (12-16hrs soak time) compared to time spent in the water column during setting and hauling (~6 hrs), higher catchability scores were given to be benthic/demersal species compared to pelagic species based on longer or shorter exposure times to hooks/gear.

Conservation status IUCN

The species IUCN conservation status is considered in the assessment, acting as a modifier to the above. A more conservative approach to species risk with critical conservation status is taken.

Seasonality

Although seasonality may affect the actual species occurrence at the time of expected fishing in the GVFZ area, an assumption was made that likelihood of impact would be the same in the region despite seasonality, thereby applying the most precautionary assessment.

Proposed mitigation and residual risk

Measures for reducing the occurrence of bycatch will be given, and residual impact after mitigation measures will be assessed. The related data collection activities for each bycatch group will be summarised.

ECOLOGICAL SETTING

The proposed area straddles the South East Indian Ridge at approximately 139°E / 53°S, at a position roughly surrounding the George V Fracture Zone (Sempéré, West and Géli, 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 surround in abyssal hills of approximately 2500m – 3500m depth.

Geologically, the area has received a great deal of attention in relation to processes and formations along South East Indian Ridge system of active propagating rifts and transform faults, proximity to the Australian-Antarctic Discordance to the west and hydrothermal vent fields along its axis (e.g. Wang, Chen and Tao, 2011). The ridge system extends from the Rodriguez Triple Junction in the west and the Macquarie Triple Junction in the east, which joins further ridge systems to east and west forming a continuous ridge system between the South Pacific and Atlantic Oceans. This suggests that biological, the ridge system may be an important feature connecting distinct faunal assemblages of Atlantic and Pacific vent fields (Van Dover *et al.*, 2001; Nakamura *et al.*, 2012).

Herraiz-Borreguero and Rintoul (2011) summarise the circulation and physical properties of the Southern Ocean south of Australia. The region of the GVFZ RB is sandwiched between the Subantarctic Front in the north, and the Polar Front in the south. Eastward flowing Subantarctic Surface Water lies above Antarctic Intermediate Water to a depth of approximately 1500m followed by Antarctic Deep Water to the seabed. The region is characterised by relatively low annual surface productivity, situated between areas of relatively high productivity to the north and south (https://oceancolor.gsfc.nasa.gov).

Species inventories for the benthic and pelagic habitats are distinctly lacking in this region. Given the distribution of seamounts in the area, prudently it should be assumed that seamounts represent biological 'hotspots' in the region, as has been shown for seamounts globally (Pitcher *et al.*, 2007 for reviews).

There is a candidate Important Bird Area (cIBA) in the region the GVFZ research block (Indian Ocean, Antarctic and Southern 52 – Marine, http://datazone.birdlife.org/site/factsheet/indian-ocean-antarctic-and-southern-52--marine-iba-high-seas), proposed on the basis of suggested breeding assemblage between November – April. The depth range within the cIBA ranges from 3354 to 4181 m depth. The GVFZ research block is situated adjacent to CCAMLR Convention Area 58.4.1 SSRU A. There is currently a 0 (Zero) catch limit for toothfish fishing in this sub-area (CM 41-11 (2019)).

RISK ASSESSMENT - SEABIRDS

Summary Risk

Spatial overlap	Catchability	Risk of mortality
Medium	Albatrosses and Fulmars - High	Albatrosses and Fulmars - High
	Petrels - Medium	Petrels - High
	Penguins and Prions - Low	Penguins and Prions - Low
Mitigation		
Meets CMM-09-17 **Exceed CMM-09-17; use of 2 x tory lines** **Meets paragraphs 23 and 24 of CMM 14b-2020** **Vessel light management at night** **Proposed fishing time of year avoids overlap with Short-tailed Shearwater breeding in Candidate IBA**		
Residual risk after mitigation		
Low		

General assessment

A total of 57 seabirds were identified as overlapping with the GVFZ RB to varying degrees (Appendix I). Seabirds interact with deep-set longline vessels in a number of ways. At the surface, birds are attracted to baited hooks during line setting at the stern of the vessel, where some species may be caught at the surface only (e.g. most albatrosses) or underwater if the species is able to dive and chase baited hooks while descending (e.g. white chinned petrels). During line hauling, birds are attracted to the starboard side of the vessel nearest the hauling bay with the risk again being caught by hooks while attempting to feed on bait. At-risk seabirds are therefore those larger seabirds that are able to feed on large squid and mackerel bait.

Birds striking the vessel itself, so called light-strike, may cause risk particularly at night when vessel lights can attract seabirds from a great distance. This would be a risk primarily to smaller birds or juveniles rather than larger adult albatross species, such as storm petrels and prions. Although this is not necessarily bycatch, it is related to ship fishing operations.

Specific at-risk species

Without mitigation, many seabirds are at risk of incidental mortalities as result of fishing operations. Some species are known to be particularly at high-risk, such as white chinned petrels, sooty shearwaters, black-browed albatrosses, and fulmars. Penguins are least at-risk.

Albatrosses have an IUCN list rating of "VU – Vulnerable", "NT – Near Threatened", or "EN – Endangered". These rankings are due to their generally declining population sizes as reported from survey data. Petrels and Prions are rated mostly "LC – Lease Concern".

There is a candidate Important Bird Area (cIBA) in the fishing area, proposed for the protection of Short-tailed shearwater breeding aggregations during November-April. Proposed fishing will occur outside this period.

Mitigation

- Minimum seabird bycatch mitigation commensurate with **SPRFMO CMM 09-17**
  - Sufficiently weight line
  - Use of 2 tori lines
  - Use of bird exclusion devices (BED) around hauling bay

  - Line setting and hauling restricted to hours of darkness
  - Strategic batch discard management
- Management of light emission from vessel at night to avoid light-strike
- Fishing outside critical times for Short-tailed Shearwater breeding.

Trigger / Action

CMM 09-17 sets a trigger level of 0.01 birds/ 1000 hooks before additional mitigation measures must be made. In the instance of exceeding this limit, an evaluation of mitigation measures will be made, including ensuring correct deployment of mitigation, and strengthening mitigation where possible (e.g. further reducing night hours of setting, increasing line sink rate). Protocols under **CMM 14b-2020 para 23** will be met, including management of dumping of offal and discards.

Data collection

Data collection requirements under **Annex 7, Section G of CMM 02-2018** (Data Standards) will be met. Sufficient data will be collected with the aim of establishing baselines to build future monitoring and mitigation, as required under **paragraphs 10 and 24 of CMM 13-2020**. Additionally, data collection protocols under **CMM 14b-2020 para 24** will be met, including;

- Daily seabird observations by Scientific Observer
- All incidental mortalities will be stored for necropsies
- Daily monitoring and recording of seabird light-strike

RISK ASSESSMENT – MARINE MAMMALS

Summary Risk

Spatial overlap	Catchability	Risk
High	Whales/Dolphins - Low	Whales/Dolphins - Low
	Otariids - Low	Otariids - Low
	Phocids - Medium	Phocids - Medium
Mitigation		
Meets paragraph 24 of CMM 14b-2020 **Avoidance of areas of visible mammal activity** **Elephant seals may have limited distribution in the GVFZ RB** **Fishing planned for November - likely low Elephant seal encounters**		
Residual risk after mitigation		
Low		

General assessment

A total of 30 marine mammals were identified as overlapping with the GVFZ RB to varying degrees (Appendix II)

The majority of whale species have a high degree of potential overlap with the GVFZ RB region. Whales are likely to be at risk at or near the surface during setting or hauling, where entanglement would likely result in injury or drowning. Catchability of whales is thought to be very low and varies with species (Werner *et al.*, 2015). Orcas and Sperm whales have a very high degree of association with toothfish longline vessels, where interactions are

more damaging economically to the vessel in terms of lost or damaged gear and depredation of catch off the line. Damage to individuals may occur, with mortalities low to near-zero. Similarly, dolphin mortalities are thought to be very rare among toothfish longline vessels.

Otariiid seals have been associated with toothfish longline vessels and have been observed to depredate on catch. Fur seal and sea lion toothfish fishing related mortalities appear to be very rare.

Specific at-risk species

Southern Elephant (*Mirounga leonina*) seals may be at risk to incidental mortality, as has been found in other regions. Van Den Hoff, Kilpatrick and Welsford (2017) summarise recent and historic reports of Elephant seal bycatch. These reports include video evidence of interactions with caught toothfish on the seabed as well as reports made by Scientific Observers of Elephant seal mortalities by drowning related to longline fishing.

Elephant seals can dive for up to 2h to depths over 1500m and bottom times of up to 15mins at deep-depths. Males tend to dive deeper (down to ~ 2000m) compared to females (~ 800m) (Prof. Mike Fedak pers com). Elephant seals are known to travel thousands of kilometres on 10-month long foraging trips (Hindell *et al.*, 2016). The closest colony to the GVFZ RB is on Macquarie Island. IUCN distribution data suggest overlap with the GVFZ RB. Elephant seal tracking data (Fabien *et al.*, 2018) suggest that elephant seals may primarily travel south from Macquarie Island (Figure 4). However, elephant seals have been tracked across GVFZ RB on a number of occasions with some individuals spending some time in the area rather than simply transiting through.

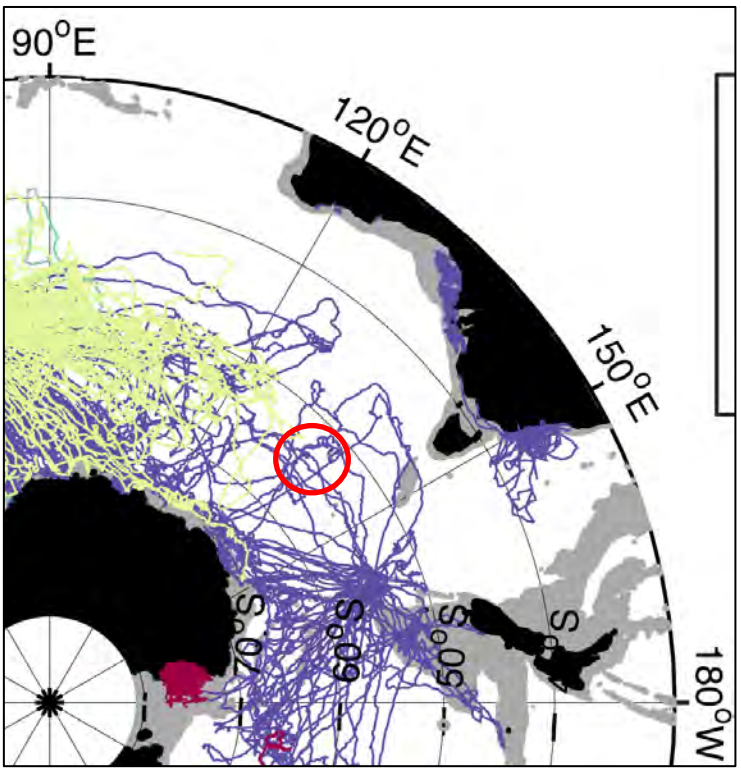

Figure 4. Elephant seal tracking data from Fabien et al 2018, cropped to focus on the GVFZ RB (red circle). Dataset is MEOP-CTD SH dataset: 387893 profiles, 122 deployments, 891 tags.

IUCN listing for all seals are "LC – Least Concern". Among whale species Fin, Sei, and Blue whales are listed as "EN – Endangered". Sperm whales are listed as "VU – Vulnerable", 5 species listed as "LC – Least Concern" or

less, and 12 species listed as "DD – Data Deficient". Dolphins are listed as either "LC- Least Concern" (4), or "DD- Data deficient" (3).

Mitigation

Few mitigation measures have been recommended to avoid marine mammal bycatch. In the case of Orcas and Sperm whales, the vessel will naturally aim to avoid interactions due to depredation behaviour of toothfish, characteristic these species. Seasonal avoidance has been recommended for depredation mitigation and may also be effective for reducing bycatch among other species. Pre-setting and hauling assessments of mammal abundance in the vicinity will be done, and judgement will be made on a case by case basis as to whether vessel avoidance is necessary.

In the case of Elephant seals, there have been no effective mitigation measures recommended for avoiding elephant seal bycatch due in part, to their deep and long-duration diving capabilities. Seasonal avoidance is suggested, where fishing could be conducted in September-November when adult seals are primarily ashore (Van den Hoff et al 2017).

Trigger / Action

Any seal or whale bycatch will trigger a re-evaluation of fishing strategy.

Data collection

Data collection requirements under **Annex 7, Section G of CMM 02-2020** (Data Standards) will be met. Sufficient data will be collected with the aim of establishing baselines to build future monitoring and mitigation, as required under **paragraphs 10 and 24 of CMM 13-2020**. Additionally;

- Cameras on longlines will be deployed – detection of potential Elephant seal interactions
- If caught, and possible to bring on board, gather species identification, sex, length, photographs.
- Sample, when possible to bring on board, whiskers (seals), DNA, stomach contents, length, sex, teeth sample for ageing.

RISK ASSESSMENT – NON-TARGET FINFISH

Summary Risk

Spatial overlap	Catchability	Risk
Medium (unknown)	**Grenadiers, Morids, Anguilliformes - High**	**High**
	Others - Low or unknown	**Low**
Mitigation		
Precautionary bycatch limit **Low number of lines proposed** **Lines will be set at least 3nm apart from each other, and not set at previous locations.**		
Residual risk after mitigation		
Low		

General assessment

An inventory of fish species observed on the GCFZ RB was produced from OBIS data. A total of 37 Families and 115 species/putative species have been recorded in area searched in OBIS. However, the records located within the proposed research block were very few, totalling 7 records including 4 Myctophidae, 1 Gobiidae, and 2 samples of *Dissostichus eleginoides*. Other records for the wide region were predominately small pelagic species.

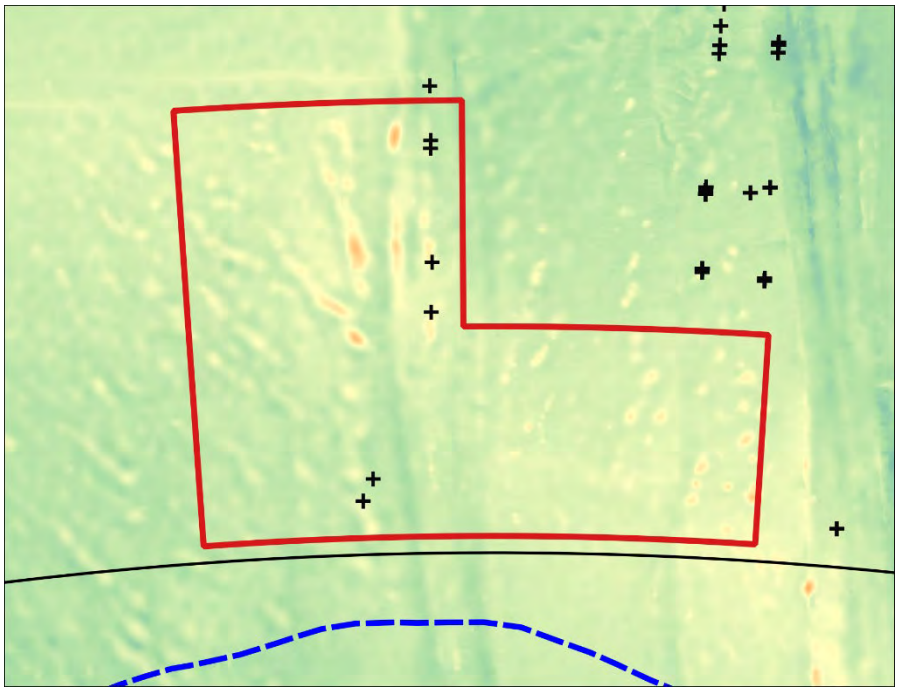

Figure 5. OBIS records of fish found within the GVFZ research block.

Previous results found during exploratory fishing on the South Tasman Rise **(CMM 14c-2019)** showed that non-target fish species caught were the Macrouridae, Moridae, and the Anguilliformes. This aligned with the risk assessment for fish bycatch that was conducted (**COMM7-Propo14.1).**

On the basis of previous experience on the South Tasman Rise, and other toothfish fisheries, we regard the Macrouridae, Moridae, and the Anguilliformes likely to be caught as bycatch. Other groups have a low likelihood of being caught.

Specific at-risk species

No potential fish bycatch species are particularly at risk

Mitigation

A 8t total by-catch limit on individual fish species per annum, will be adopted for the survey, with a total amount of all by-catch species combined not exceeding 30t. This would align with what occurs in the Macquarie Island fishery, where, for a 450t toothfish fishery, a combined by-catch limit of 200t is set with a 50t limit on any species. Once this limit has been reached, fishing will cease.

Trigger / Action

The move-on rule for fish by-catch followed in CCAMLR will be used for this proposal (CCAMLR, CM 41-03, 2018) namely:

- "The by-catch of finfish shall trigger a move-on rule if the catch of skates and rays exceeds 5% of the catch of *Dissostichus* spp. in any one haul or set, or if the catch of *Macrourus* spp. reaches 150 kg and exceeds 16% of the catch of *Dissostichus* spp. in any one haul or set.
- If the move-on rule is triggered, then the fishing vessel shall move to another location at least 5nm distant."

Data collection

Data collection requirements under **Annex 7, Sections E and F of CMM 02-2020** (Data Standards) will be met. Sufficient data will be collected with the aim of establishing baselines to build future monitoring and mitigation, as required under Data Collection Plan **(CMM 13-2020)**. Additionally**;**

- Samples will be retained for specialist identification and museum curation
- Samples for DNA analyses will be collected.

RISK ASSESSMENT – CHONDRICHTHYANS

SPRFMO SC6-DW08 Risk Assessment for Chondrichthyans

In this assessment for sharks and skates, the recent risk assessment completed in SC6-DW08 is also considered here in a comparative way. That is to say, the qualitative assessments assigned in this study use some similar concepts as the quantitatively scored, integrated assessment in SC6-DW08 using the PSA and SAFE methods, and therefore any direct use of that assessment here might be confounding.

SC6-DW08 notes that there are both "false positives" and "false negatives" that result in part, from lack of real-world interaction with fishing gears and lack of overall vessel reporting of interactions, respectively. In this sense, the assessment for sharks and rays in this study (and indeed all groups assessed here) is made in consideration of possible interactions using a specific gear type (demersal longline) with known bycatch profiles based on other toothfish fisheries, but from a region (GVFZ RB) where there is no available historic longline fishing knowledge.

Summary Risk

Spatial overlap	**Catchability**	**Risk**
Skates - Unknown	**Skates - High**	**Skates - Low**
Sharks - Medium	**Sharks- High**	**Sharks - Medium-High**
Mitigation		
Precautionary bycatch limit		
Skates are able to be release alive		
Caveat - Risk assessments are possibly over-precautionary due to poor data.		
Residual risk after mitigation		
Medium		

General assessment

There are no records in OBIS of skate catch in the GVFZ RB region. Additionally, there are no skate species with predicted distributions in the region (Last *et al*. 2016). Despite the lack of species inventory, any catch of skates will be treated with usual precautionary mitigation measures of bycatch limits, as well as releasing of all individuals assessed to have high likelihood of survival after release. Full biological information will be captured from retained individuals.

A total of 6 shark species were found to have possible distributions over the proposed fished area of the GVFZ RB (Appendix III). A mix of demersal and pelagic species are identified. Catchability of demersal species were considered to be 'high' whilst pelagic species were considered 'medium' catchability given the shorter time the line is suspended in the water column compared to time on the seabed.

Previous experience on the South Tasman Rise (**CMM 14c-2019**) has shown that demersal Somniosidae (sleeper sharks), Etmoptreridae (lantern sharks) and Chimaeridae (ghost sharks) have a high catchability with demersal longline fishing gear. Although it is unknown if species of these groups are present on the GVFZ RB, a level of precaution should be taken considering that targeted fishing will be associated with seamounts.

Specific at-risk species

Of the shark species potentially encountered on the GVFZ RB, three are listed as 'VU – Vulnerable', one species as 'NT – Near Threatened', and 2 as 'DD – Data Deficient'. Skate species are not determined.

Included in the compiled list of species potentially encountered in the GVFZ B is one **CMM 02-2020 (Data standards) Annex 14** species; *Lamna nasus* (Porbeagle shark).

Mitigation

Skates can often be recovered from the line and released alive, and this will be done in all cases where skates are likely to survive release. In the case of sharks, it is not likely that any will be in such condition to be released alive, particularly the larger species (e.g. Somniosidae, Lamnidae, Cetorhinidae).

Primary mitigation for reducing risk to chondrichthyans is through precautionary bycatch limits. It is also likely that risk assessments here are over-precautionary, given paucity of available data for most chondrichthyans in SPRFMO and, particularly for demersal longline fishing in the region of the GVFZ RB.

Trigger

Catch limits and move-on rules for bycatch species.

Data collection

Data collection requirements under **Annex 7, Sections E and F of CMM 02-2020** (Data Standards) will be met. Sufficient data will be collected with the aim of establishing baselines to build future monitoring and mitigation, as required under **paragraphs 10 and 24 of CMM 13-2020**. Additionally**;**

- Data collection on all chondrichthyan bycatch will be aimed at filling two main data gaps identified in SC6-DW08, namely;
    - **Note** that the assessment has highlighted that additional work on post capture mortality and gear selectivity of deep-water chondrichthyans would aid future analyses and inform potential future mitigation strategies that would minimise risk associated with susceptibility.

- **Recommend** to the SPRFMO Commission that identification protocols and biological data collection for deep-water chondrichthyans is strengthened for SPRFMO demersal fisheries.

This will be done through;

- Where possible, retention of whole animal or diagnostic features (e.g. jaws) with good quality photographs
- An assessment of morbidity and post-release observations of animal if returned.

RISK ASSESSMENT - VME

Summary Risk

Spatial overlap	Catchability	Risk
VME indicator species - High	**High (damage on seabed)**	**Medium**
Mitigation		
Limited impact footprint **3nm separation between lines** **Annual review of VME records and Benthic Camera records** **Spatial overlap of line setting in subsequent years will be dependent on the previous year's review, with the aim of eliminating cumulative effects**		
Residual risk after mitigation		
Low		

General assessment

OBIS data were used to compile an inventory of possible VME indicator species that will be encountered in the GVFZ RB. Very few records were found, with a total of 19 benthic invertebrate species and putative species recorded. There were only four sites within the GVFZ RB where benthic invertebrates were recorded (Figure 6), and of these, none were located on proposed fishing areas of depths shallower than 2500m depth.

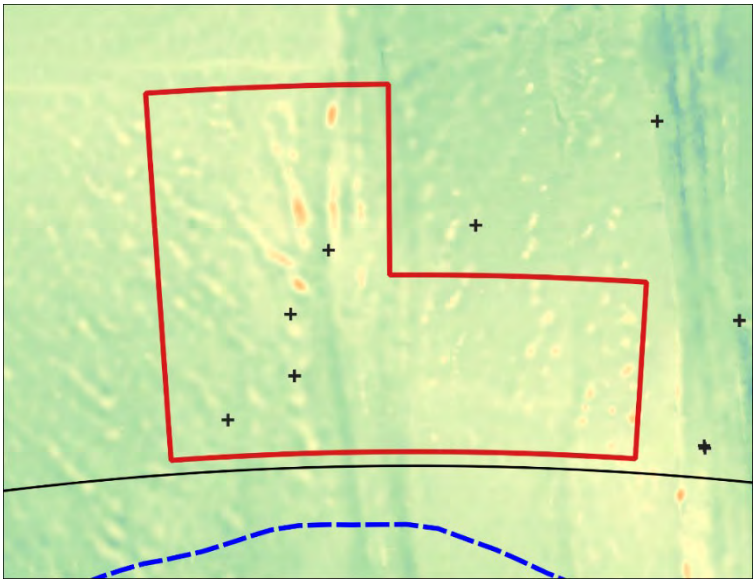

Figure 6. OBIS records of VME indicator species found within the GVFZ RB research block.

Seamounts are topographic features known to have in many cases globally, high benthic diversity compared to surrounding deeper habitats (Pritcher *et al*. 2007 for reviews). Recently, researchers have been developing models for predicting the distribution of hard structure/framework forming coral species, namely the Scleractinia. Predictive distribution model results show that the seamounts of the GVFZ RB may have relatively low habitat suitability for Scleractinians across a number of studies. Depending on the model and input data, Anderson *et al.* (2016) found habitat suitability indices of between <0.2-0.4 for the GVFZ RB, Tittensor *et al.* (2009) found decreasing habitat suitability with increasing seamount summit depth (0.6 at 500m depth to near zero probability at 1500m depth), and Davies and Guinotte (2011) predicted zero suitability in a binary model.

It is acknowledged in SPRFMO SC6-Report and references therein, that the footprint of demersal longline fishing is orders of magnitude lower than trawl fishing. This suggests that although proposed fishing in the GVFZ RB may overlap with VMEs, and that catchability (ie damage on the seabed) will also be high (assuming that any interaction of the longline will result in VME indicator species damage), the risk of the longline significantly damaging VMEs will be spatially limited as a consequence of longline design. Impacts will not likely have an impact on the health of the wider community. Nevertheless, there is concern over impact of demersal longline fishing on VMEs particularly as it relates to cumulative impacts.

Specific at-risk species

Many studies (e.g. Parker et al 2009) have identified certain invertebrate groups (Orders, Families) that are either sensitive to demersal longline fishing or are indicators of sensitive habitats. Specific species have not been identified as being particularly at-risk, but broadly include those species that form hard structures or frameworks with slow recovery potential.

Mitigation

It should be prudently assumed that there will be impact to VME indicator species when fishing on GVFZ seamounts from demersal longline fishing through impact from anchors, weights, hooks, and the line. SPRFMO SC6-Report focused primarily on impact of trawl fisheries on VMEs, using historical data to help guide the setting of thresholds, triggers, move-on rules, etc. Challenges in prescribing similar VME management tools for demersal longline fisheries have been identified, primarily related to lack comparative longline-derived VME catch and effort data, and the likely low detection rate of VME indicator species when using demersal longline fishing gear.

The footprint of a demersal longline is thought to be relatively low (**BFIA SWG-10-DW-01A**). This combined with the low number of lines being set across a large spatial extent will ensure low local impact as well as ensure short-term recoverability of impacted habitat. In addition, it is proposed that each line set will be at least 3nm apart (measured from the mid-point of each line). In addition, lines set positions in subsequent years will not overlap previous year line setting positions depending on an annual review of VME indicator species catch and evidence from seabed video monitoring. This will ensure that there are no risks of cumulative impacts on VME, satisfying paragraph **20 of CMM 03-2020**.

Trigger / Action

In the absence of a SPRFMO VME trigger, the CCAMLR VME Risk Area assessment method will be used. Under CCAMRL CM 22-07 (2013) paragraph 2(iii), a 'VME indicator unit' is defined as 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.'

'Risk areas' (CM 22-07 paragraph 2(iv)) for VMEs will be delineated where 10 of more VME units are detected in any 'line segment' (1000-hook section, CM 22-07 paragraph 2(iv)).

No move-on rule is required because all lines will be set at minimum 4nm apart (measured from the mid-point of the line) as part of the Fisheries Operation Plan (Section 4).

Data collection

Data collection requirements under **Annex 7, Sections H of CMM 02-2020** (Data Standards) will be met. Sufficient data will be collected with the aim of establishing baselines to build future monitoring and mitigation, as required under **paragraphs 10 and 24 of CMM 13-2020**, and to assist the SC in providing recommendations to the Commission under **CMM 03-18**. Additionally**;**

- Data will be collected to fill knowledge gaps as identified in **Section 6 of SC6-DW09**, specifically "Note that insufficient data from bottom longline fisheries exists to develop a data-informed move-on rule for that method".
- VME data collection will help to develop VME maps for the SPRFMO area as required under **CMM 03-18.**
- Provide data to develop alternative VME threshold methods for demersal longlines such as the incorporation of a biodiversity component, as described in **Section 2.6 of SC6-DW09.**
- A deep-water video camera will be used to examine species occurrence, density and species / habitat relationships, **as recommended by the BFIAS**. In addition, the real-world impact of demersal longline fishing on VME species and habitats will assessed.
- Environmental data will be collected (Conductivity, Temperature, Depth, Chlorophyll) for predictive modelling purposed (e.g. Maxent), **as recommended by the BFIAS**.

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Appendix I – Seabirds

Group	Species	common name	IUCN status	Spatial Overlap	Hooked during setting	Hooked during hauling	Light strike	Risk	Residual Risk
Penguins	*Aptenodytes forsteri*	Emperor Penguin	NT	Medium	Low	Low	Low	Low	Low
	Aptenodytes patagonicus	King Penguin	LC	Low	Low	Low	Low	Low	Low
	Eudyptes chrysocome	Southern Rockhopper Penguin	VU	Low	Low	Low	Low	Low	Low
	Eudyptes chrysolophus	Macaroni Penguins	VU	Low	Low	Low	Low	Low	Low
	Eudyptes schlegeli	Royal Penguins	NT	Low	Low	Low	Low	Low	Low
	Eudyptes pachyrhynchus	Fiordland Penguin	VU	Low	Low	Low	Low	Low	Low
	Eudyptes robustus	Snares Penguin	VU	Low	Low	Low	Low	Low	Low
	Eudyptes sclateri	Erect-crested	EN	Low	Low	Low	Low	Low	Low
	Pygoscelis papua	Gentoo Penguin	LC	Medium	Low	Low	Low	Low	Low
Albatross	*Diomedea exulans*	Wandering Albatross	VU	High	Med	High	Med	Med-High	Low
	Diomedea epomophora	Southern Royal	VU	Medium	Med	High	Med	Med-High	Low
	Diomedea sanfordi	Northern Royal Albatross	EN	Medium	Med	High	Med	Med-High	Low
	Thalassarche melanophris	Black-browed Albatross	LC	High	High	High	Med	Med-High	Low
	Thalassarche chrysostoma	Grey-headed Albatross	EN	High	High	High	Med	Med-High	Low
	Thalassarche carteri	Indian Albatross	EN	Low	High	High	Med	Med-High	Low
	Thalassarche chlororhynchos	Atlantic Yellow-nosed Albatross	EN	Low	High	High	Med	Med-High	Low
	Thalassarche salvini	Salvin's Albatross	VU	Low	High	High	Med	Med-High	Low
	Thalassarche cauta	Shy Albatross	NT	Medium	High	High	Med	Med-High	Low
	Thalassarche bulleri	Buller's Albatross	NT	Low	High	High	Med	Med-High	Low
	Thalassarche impavida	Campbell Albatross	VU	Medium	High	High	Med	Med-High	Low
	Phoebetria palpebrata	Light-mantled Albatross	NT	High	Med	Med	Med	Med-High	Low
	Phoebetria fusca	Sooty Albatross	EN	Med-High	Med	Med	Med	Med-High	Low
Fulmar	*Fulmarus glacialoides*	Southern fulmar	LC	High	Med	High	Med	Med-High	Low
Petrel	*Daption capense*	Cape Petrel	LC	High	Med	High	Med	Med-High	Low
	Thalassoica antarctica	Antarctic Petrel	LC	High	Low	Low	High	Medium	Low

	Aphrodroma brevirostris	Kerguelen Petrel	LC	High	Low	Low	High	Medium	Low
	Pterodroma lessonii	White-headed Petrel	LC	High	Low	Low	High	Medium	Low
	Pterodroma macroptera	Great-winged Petrel	LC	Med-High	Low	Low	High	Medium	Low
	Pterodroma mollis	Soft-plumaged Petrel	LC	Med-High	Low	Low	High	Medium	Low
	Pterodroma leucoptera	White-winged Petrel	VU	High	Low	Low	High	Medium	Low
	Pterodroma inexpectata	Mottled Petrel	NT	High	Low	Low	High	Medium	Low
	Pterodroma cookii	Cook's Petrel	VU	Low	Low	Low	High	Medium	Low
	Procellaria aequinoctialis	White-chinned Petrel	VU	High	High	High	Low	High	Low
	Procellaria parkinsoni	Black Petrel	VU	Low	High	High	Low	High	Low
	Procellaria cinerea	Grey Petrel	NT	Med-High	High	High	Low	High	Low
	Procellaria westlandica	Westland Petrel	EN	Low	High	High	Low	High	Low
	Halobaena caerulea	Blue Petrel	LC	High	Low	Low	High	High	Medium
	Oceanites oceanicus	Wilson's Storm Petrel	LC	High	Low	Low	High	Low	Medium
	Fregetta tropica	Black-bellied Storm Petrel	LC	High	Low	Low	High	Low	Medium
	Garrodia nereis	Grey-backed Storm Petrel	LC	Medium	Low	Low	High	Low	Medium
	Pelecanoides georgicus	South Georgia Diving-petrel	LC	Low	Low	Low	High	Low	Medium
	Pelecanoides urinatrix	Common Diving -petrel	LC	Medium	Low	Low	High	Low	Medium
	Macronectes giganteus	Southern Giant Petrel	LC	High	Low	High	Low	Medium	Low
	Macronectes halli	Northern Giant Petrel	LC	High	Low	High	Low	Medium	Low
	Pagodroma nivea	Snow Petrel	LC	Low	Low	Low	Medium	Low	Low
Shearwaters	*Puffinus tenuirostris*	Short-tailed Shearwater	LC	High	High	Med	High	Med-High	Medium
	Puffinus grisea	Sooty Shearwater	NT	High	High	Med	High	Med-High	Medium
	Puffinus gavia	Fluttering Shearwater	LC	Low	High	Med	High	Med-High	Medium
	Puffinus assimilis	Little Shearwater	LC	Low	High	Med	High	Med-High	Medium
Prions	*Pachyptila belcheri*	Slender-billed Prion	LC	Med-High	Low	Low	High	Low	Medium
	Pachyptila desolata	Antarctic Prion	LC	High	Low	Low	High	Low	Medium
	Pachyptila salvini	Salvin's Prion	LC	Med-High	Low	Low	High	Low	Medium
	Pachyptila turtur	Fairy Prion	LC	Med-High	Low	Low	High	Low	Medium
	Pachyptila vittata	Broad-billed Prion	LC	Med-High	Low	Low	High	Low	Medium
Terns	*Sterna paradisaea*	Arctic Tern	LC	Medium	Low	Low	High	Low	Medium

Gulls	*Larus dominicanus*	Kelp Gull	LC	Low	Low	Low	Low	Low	Medium
Skuas	*Stercorarius spp*	Skuas	LC	Med	Low	Med	Low	Low	Medium

Appendix II – Marine Mammals

Group	Species	Common name	IUCN status	Spatial Overlap	Catchability	Risk	Residual Risk
Seals	*Arctocephalus gazella*	Antarctic Fur Seal	LC	Medium	Low	Low	Low
	Arctocephalus tropicalis	Sub-Antarctic Fur Seal	LC	Medium	Low	Low	Low
	Arctocephalus forsteri	New Zealand Fur seal	LC	Low	Low	Low	Low
	Arctocephalus pusillus	Afro-Australian Fur Seal	LC	Low	Low	Low	Low
	Mirounga leonina	Southern Elephant Seal	LC	High	Medium	Medium	Medium
	Hydrurga leptonyx	Leopard Seal	LC	Low	Low	Low	Low
Whales	*Balaenoptera acutorostrata*	Common Minke Whales	LC	High	Low	Low	Low
	Balaenoptera physalus	Fin Whales	VU	High	Low	Low	Low
	Balaenoptera borealis	Sei Whales	EN	High	Low	Low	Low
	Balaenoptera bonaerensis	Antarctic Minke Whale	NT	High	Low	Low	Low
	Balaenoptera musculus	Blue Whale	EN	High	Low	Low	Low
	Berardius arnuxii	Arnoux's Beaked Whale	DD	High	Low	Low	Low
	Megaptera novaeangliae	Humpback Whales	LC	High	Low	Low	Low
	Eubalaena australis	Southern Right Whales	LC	High	Low	Low	Low
	Physeter macrocephalus	Sperm Whales	VU	HIgh	Low	Low	Low
	Orcinus orca	Killer Whale	DD	High	Low	Low	Low
	Globicephala melas edwardii	Southern Longfinned Pilot Whale	LC	High	Low	Low	Low
	Mesoplodon grayi	Gray's Beaked Whale	DD	High	Low	Low	Low
	Mesoplodon layardii	Strap-toothed Whale	DD	High	Low	Low	Low

	Mesoplodon bowdoini	Andrew's Beaked Whale	DD	High	Low	Low	Low
	Caperea marginata	Pygmy Right Whale	LC	High	Low	Low	Low
	Hyperoodon planifrons	Southern Bottlenose Whale	LC	High	Low	Low	Low
	Tasmacetus shepherdi	Shepherd's Beaked Whale	DD	Medium	Low	Low	Low
Dolphins	*Tursiops truncatus*	Common Bottlenose Dolphin	LC	Low	Low	Low	Low
	Lagenorhynchus obscurus	Dusky dolphins	LC	Low	Low	Low	Low
	Lagenorhynchus cruciger	Hourglass dolphins	LC	High	Low	Low	Low
	Lissodelphis peronii	Southern Right Whale Dolphin	LC	High	Low	Low	Low
	Delphinus delphis	Short-beaked Common Dolphin	LC	Low	Low	Low	Low
	Grampus griseus	Risso's Dolphin	LC	Low	Low	Low	Low
	Phocoena dioptrica	Spectacled Porpoise	DD	High	Low	Low	Low

Appendix III – Chondrichthyans

Group	Species	common name	IUCN status	Habitat	Spatial Overlap	Catchability	Risk	Residual Risk	SC6-DW08 assessment (PSA / SAFE)
Rays	*Rajiformes*	Rays	-	Demersal	Unknown	High	Medium	Low	Low / Low
Sharks									
Alopiidae (Thresher sharks)	*Alopias vulpinus*	Thresher shark	VU	Pelagic	High	Medium	Med-High	Low-Med	Low / Med
Lamnidae (Mackerel sharks)	*Lamna nasus*	Porbeagle	VU	Pelagic	High	Medium	Med-High	Low-Med	Med / Low
Somniosidae (Sleeper sharks)	*Scymnodalatias albicauda*	Whitetail dogfish	DD	Pelagic	Med-High	Med	Med	Low	Med / Low
	Somniosus antarcticus	Southern sleeper shark	DD	Pelagic	Med-High	Med	Med	Low	Med / High
Carcharhinidae (Whaler sharks)	*Prionace glauca*	Blue shark	NT	Pelagic	Low-Med	Med	Medium	Low	Low / Low
Triakidae (Houndsharks)	*Galeorhinus galeus*	School shark	VU	Pelagic	Low	Med	Medium	Low	Med / Low

Appendix A. – Vessel Installation Details

Vessel Overview			
Vessel name:	**F/V TRONIO**	**IMO Number**	**9361603**
Length	**55m**	**Gross Tonnage**	**1058GT**
Call Sign	**ECJF**	**Owner**	**PESQUERÍAS GEORGIAS, S.L**

Monitoring Objectives

Identify set and haul events with date/time/location. Document use of tori lines while setting. Record catch composition and dispensation. Explore whether fish tagging process can be documented.

Vessel Name Tronio

Installation Summary

Installation Date: Sept 19-22, 2019

Component	Y/N	Location	Power Source	Camera Mdoel/software	FPS and Framesize	v5 Sensor Port	Triggers	Thresholds	Photo?	Comments
Camera 1 -Setting. To monitor tori line usage	Y	Stern center		2.8mm fixed	2,1280x720		AN0		Y	
Camera 2 - Setting. To monitor whether actual setting is occuring while door is open.	Y	Inside setting area		2.8mm fixed	1,640x360		AN1		Y	
Camera 3 - Hauling. To monitor catch in water, dropoffs, retained and discards.	Y	Starboard hauling area		2.8mm fixed	5,1920x1080		AN2		Y	
Control Centre	Y	Wheelhouse	110v private line	v5.0 EMR - 5.1.4_20190306					Y	
GPS	Y	Roof wheelhouse							Y	
Monitor	Y	Wheelhouse							Y	
POE Switch 1	Y	Wheelhouse	v5-48v out						Y	
Analog Sensor 1 - Tori line sensor	Y	Port stern tie point				AN0	Cam1	1	Y	
Analog Sensor 2 - Hatch sensor	Y	Port stern setting door				AN1	Cam2	1	Y	
Analog Sensor 3 - Pressure sensor	Y	Hook line hauler				AN2	Cam3	120	Y	
Satellite Modem	Y	Roof wheelhouse							Y	Health statements tested

Camera Overview

Camera Name	Tori Line	Hardware	2.8mm fixed
Location	Stern Mast	Trigger Settings	AN0 only
View	Setting/Tori Line	Recording Exceptions	
FPS	2	Run On Time	20 min
		Image Resolution	1280x720

Camera View

Camera Location

Camera Name	Setting Room	Hardware	2.8mm fixed
Location	Setting Room ceiling	Trigger Settings	AN1 only
View	Setting/Tori Line	Recording Exceptions	
FPS	1	Run On Time	20 min
		Image Resolution	640x360

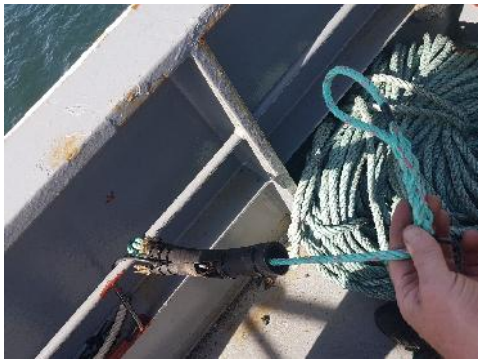
Camera View

Camera Location

Camera Name	Hauling	Hardware	2.8mm fixed
Location	Forward bulkhead hauling	Trigger Settings	AN2
View	Hauler	Recording Exceptions	
FPS	5	Run On Time	20 min
		Image Resolution	1920x1080

Camera View	Camera Location
	

Component Location Photos

GPS/SAT	Monitor
	
AN0 – Tori Line	**AN1 – Setting Hatch**
	
AN2 - Pressure	**Control Centre**
	

Catch Handling Description
Standard for Spanish toothfish longline. Tori line deployed, pre-baited snoods are attached to hook line which is attached to mother line. Hard floats and weights are used to get the right shape of the line just above the bottom. Hauling is done on starboard side and retained catch goes directly into the factor through a small hatch stern side of the hook line hauler. Handling of tagged fish can be seen in the background of the hauling area.