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South Pacific Regional Fisheries Management Organisation

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COMM 12 – Prop 23.1

Background Paper: Fisheries Operation Plan for Exploratory Hapuka Fishery

Cook Islands



Cook Islands Fisheries Operation Plan for an Exploratory Dropline and Jigging Fishery in the SPRFMO Convention Area.

Targeting Hapuka (*Polyprion oxygeneios*)

Dated 31 October 2023

Amendments included in this revision:

1. The amendment to the proposed reverence points to monitor our performance against the objective. We propose to use an interim **target reference point of 50%B₀** and an interim **limit reference point of 30%B₀**.
2. Addition of more detail on the number of fishable seamounts.
3. Some additional minor edits.



Contents

Introduction.....	4
1. Operator Details, Proposed Activities in the Management Areas and Target Species	5
1.1 Authorized flagged vessel.....	5
1.2 Scientific Principal.....	5
1.3 Official Flag-State Contact: Cook Islands Ministry of Marine Resources	5
1.4 Licensing.....	5
1.5 Areas of Interest	6
1.6 Target Species	6
1.7 Non-target associated and dependent species.	7
2. Methods	8
3.1 The Environment and Bathymetry of Foundation Seamount Chain	9
3.2 Exploratory Fishing Gear Used.....	10
4. Landing.....	13
4.1 Landing.....	13
4.2 Resource Biomass Calculations and Potential Management Reference Points	13
4.3 Planned Trips in the Management Areas and Vessel Monitoring.....	14
5 Monitoring of Vessel Operations.....	14
5.1 Vessel Movement in the Management Areas and Control of Vessel.....	14
5.2 Observers	14
6. Data Collection Methods.....	15
7. Vulnerable Marine Ecosystems Sampling.....	16
8. Risk assessment.....	17
8.1 Teleost and cephalopod bycatch.....	17
8.2 Elasmobranch bycatch.....	17
8.3 Seabirds	18
8.4 Marine mammals and turtles	19
8.5 VME impacts from dropline and jig fishing.....	20
9. References.....	22
Appendix A - Vessel Details - AKANUI.....	23
Appendix B - Observer Tasks and Sampling Instructions	23



Introduction

This document is the Fisheries Operation Plan (FOP), including data collection procedures, for a new Exploratory Dropline and/or Jigging Fishery for *Polyprion oxygeneios*, or Hapuka its common name, to be undertaken as an adjunct to the ongoing Cook Islands lobster trap fishing explorations. This Fisheries Operation Plan recognizes the Commission is mandated to adopt a precautionary approach and an ecosystem-based approach to the management of the fisheries resource within the SPRFMO Convention Area. The Cook Islands recognizes this FOP must be conducted in a manner consistent with all relevant Conservation and Management Measures (CMMs) adopted by the SPRFMO Commission listed in Section 1.4 of this document and is not exempt from complying with any Convention obligations nor any other CMMs adopted by the Commission. The Cook Islands new FOP anticipates a start date after the Commission meeting in 2024. The FOP will proceed with a precautionary and gradual approach until sufficient information is acquired to enable the Commission to adopt appropriately detailed CMMs for this fishery in the future.

The objective of this new FOP (responsive to CMM 14b-2023) is to test the fishery potential of *Polyprion oxygeneios* and collect and provide the scientific data for evaluating the sustainable exploitation of the population(s) found on the fishing areas within the SPRFMO Convention Area. To ensure the FOP is developed in a precautionary manner, the data collected will be made available to assess any potential impacts on the target species, associated or dependent species, and the marine ecosystem, and to evaluate any mitigating measures.

This FOP will collect fishery data to:

1. Determine the geographical range of the target species within the Foundation Seamount Chain and Northern Seamounts (Figure 1), including the depth of catch, vertical stock distribution and relative stock density.
2. Evaluate the biology of the target species including review of age and size composition, size-at-maturity and spawning season information, evaluation of DNA information to assess stock distribution, connectivity and possibly stock size and other relevant biological information to better understand these species.
3. Assess the species and size composition of any bycatch.
4. Document any potential Vulnerable Marine Ecosystems (VMEs) in the research zone, plot their locations and evaluate VME density.
5. Ministry of Marine Resources (MMR) Cook Islands will routinely report back to the Scientific Committee and the Commission for feedback on the progress of the FOP.

Given the current governance regime in the high seas management of the fishery resources in the Southern Pacific Ocean with the formation of the SPRFMO Commission, the Cook Islands acknowledges that exploratory and commercial fishing voyages for target species are now mandated to account for interactions and footprints left on the environment. The Cook Islands is familiar with this and will have on board their vessel the following documents:

1. FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas.
2. The Conservation and Management measures as adopted by SPRFMO.
3. Ecosystems and Biodiversity in Deep Waters and High Seas. (2006) UNEP Regional Seas Report and Studies no. 178. United Nations Environment Program.
4. Evidence of a VME form. (20141). Ministry of Fisheries, New Zealand.
5. Template for the compilation of information describing specific habitats in the Southern Pacific Ocean.



It is intended that this fishery will take place in association with the existing exploratory fishery for lobsters in CMM 14b-2023 (Conservation and Management Measure for Exploratory Potting Fishery in the SPRFMO Convention Area). For the first year of the FOP, the first trip is scheduled to start after the 2024 Commission meeting, followed by additional trips during the same year. The fishery will be conducted off the same vessel as the lobster fishery and both dropline and jigging gear will be tested within the two areas noted in Table 1 of CMM 14b-2023. It is envisioned that combined trips fishing for lobster/crab and *Polyprion oxygeneios* (on the same fishing grounds) will be undertaken. The proposed total allowable catch (TAC) is 500 tons of green weight for *Polyprion oxygeneios* with an additional 100-ton allowance for retained teleost and cephalopod bycatch. It is worth noting here that the TAC for New Zealand EEZ an area that is smaller than the areas described here) is 2,182 tons with an annual catch of just over half that level (Fisheries New Zealand 2023). The TAC will not be allowed to be taken from a single seamount and, in order to spread the catch and effort, no more than 25t per year or 15t per trip per seamount will be permitted from any one seamount. If the 25t and 500t limits are reached, this would mean 20 seamounts are wholly fished, which would approximate a 30% coverage of the available seamounts.

It is proposed to initially run this exploratory fishery for three years with annual reviews by the SC and Commission meetings.

1. Operator Details, Proposed Activities in the Management Areas and Target Species

1.1 Authorized flagged vessel

The operator of the vessel will be a company incorporated under the laws of the Cook Islands and based in Avarua, Rarotonga. The current vessel details are provided in Appendix A.

1.2 Scientific Principal

The principal scientific adviser for the Cook Islands, has substantial experience in fisheries science and biology and works in several other regional fisheries management organizations (RFMOs). The Cook Islands are cognizant of the requirements and objectives of SPRFMO, particularly in respect of the sensitive nature of the marine environment and benthos when conducting bottom fishing operations.

1.3 Official Flag-State Contact: Cook Islands Ministry of Marine Resources

The primary contact for all flag state matters and official SPRFMO correspondence:

Pamela Maru, Secretary, Ministry of Marine Resources, PO Box 85, Avarua, Cook Islands.

email: p.maru@mmr.gov.ck Ph: +68228721

1.4 Licensing

The Marine Resources Act 2005 provides the Ministry of Marine Resources (MMR) the authority to issue fishing licenses and high seas permit, which, inter alia, enables the authorization of Cook Islands flagged fishing vessels to fish. The Marine Resources Act 2005 also requires flagged vessels to comply with all Cook Islands laws and the regulations, and all SPRFMO Conservation and Management Measures adopted by the Commission. This includes Data Standards (CMM 02-2022), standards for the collection, reporting, verification, and exchange of data on the management of the Bottom Fishing (CMM 03-2023), minimization bycatch of Seabirds (CMM 09-2017), Exploratory Fisheries (CMM 13-2021) and the CMM established specifically for this exploratory potting and trap fishery and Exploratory Trap Fishery (ETF) (CMM 14b-2023) in the SPRFMO Convention area. Under the Marine Resources Act 2005, the Cook Islands have considerable powers to control, and regulate fishing activities, including the application of sanctions against a fishing company, master, crew, and the vessel if the



SPRFMO requirements of this FOP are not met. In line with the Marine Resource Act 2005, the flagged vessel operates under the terms of an Access agreement and a high seas authorization license issued by MMR.

1.5 Areas of Interest

The area of operation to conduct this exploratory fishery is that which is outlined in CMM 14b-2023. The geographic area for this FOP exploratory fishery is identified in the areas identified in Figure 1. The Foundation Seamount Chain (an area of approximately 243,00km²), approved by the SPRFMO Commission in CMM14b-2023 with defined boundaries longitude 31'00s, 100'00w; 31'00s, 134'00w; 40'00s, 134'00w; 40'00s, 100'00w. The northern Seamounts is located east of Chile's, Easter Island region EEZ and lies within 21'00s, 101'00W; 21'57s, 101'00w; 23'55s, 94'13w; 25'06s, 92'50w; 27'00s, 92'50w; 27'00s, 84'00w; 21'00s, 84'00w. The northern Seamounts contains several seamounts the Cook Islands intends to investigate.

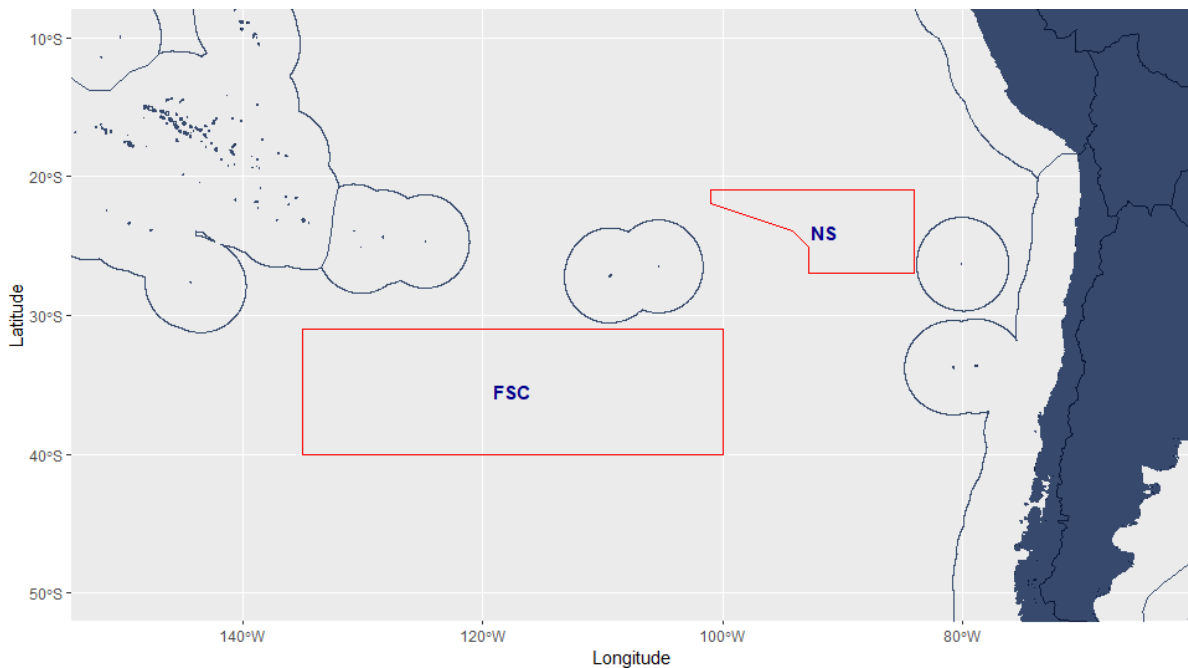
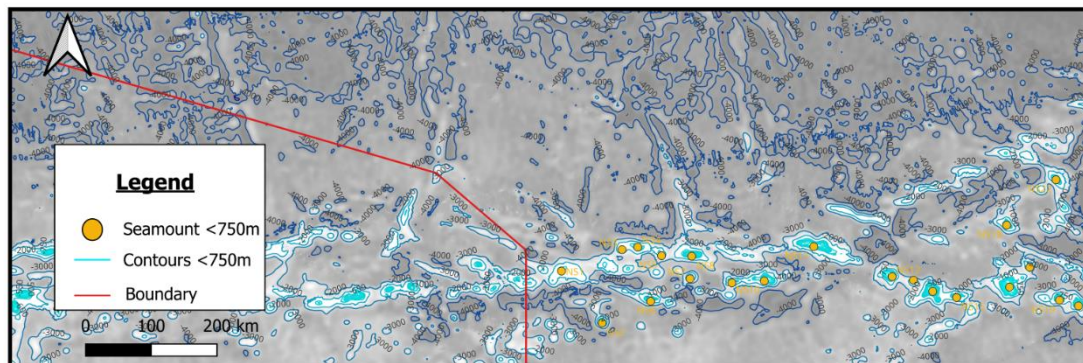


Figure 1. Area of proposed exploratory operations, FSC = Foundation Seamount Chain; NS = Northern Seamounts.

The area contains 65 seamounts at fishable depth (Figure 2), only a few have been sampled. Anecdotal evidence from other fisheries that participated in the area in the past suggests that hapuka are widely distributed in the region and often found in association with shallower (<1,000m) seamounts.



Northern Seamounts



Foundation Seamount Chain

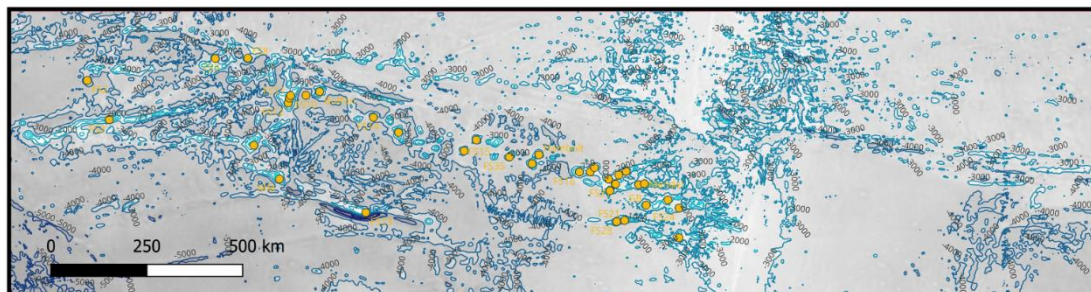


Figure 2: Detail of the two fishing areas showing the death contours and the seamounts at fishable depths.

1.6 Target Species

The primary target research species will be *Polyprion oxygeneios*. *P. oxygeneios* are piscivorous predators, generally found in association with rocky substrates in depths of 100-300m, however, their depth distributions are not well understood within the proposed fishing areas and they could occur in deeper water. In New Zealand they attain sexual maturity at 10-23 years and have a longevity more than 60 years (Francis et al. 1999). Age has not been validated, however, given the longevity of this species bomb-radiocarbon analysis could be undertaken if enough large old fish are caught.

The size-at-sexual maturity varies from 85-90 cm (TL) (Paul 2002), but these data are somewhat uncertain as the spawning grounds are not well documented and few ripe running females have been sampled.

Juvenile *P. oxygeneios* are thought to be pelagic drifting with seaweed for an unknown period. Migration patterns are also not well understood and genetic analysis of this population could be undertaken to evaluate how close seamount populations are linked and where these populations may be linked to.

It is not known the extent to which *P. oxygeneios* and *P. americanus* overlap within the area, but it is likely that some overlap will occur.

1.7 Non-target associated and dependent species.

It is anticipated that any species that prey on a lure will be susceptible to this gear. While this will exclude species of special interest such as marine turtles it will include other teleost and elasmobranch species. All elasmobranchs will be released, and some teleosts will be retained. Historic line fishing in the area suggests a relatively low bycatch rate, but this will be more clearly evaluated at the end of the first trip.



2. Methods

The Cook Islands will deploy dropline and/or jigging gear targeting *Polyprion oxygeneios* in the vicinity of deep-water seamounts to a depth of 1,000 meters. The Cook Islands intends to only allow the use of dropline and jigging fishing methods. The approach should have minimal adverse impact on the benthic environment. It is anticipated that at least 80% of the teleost species harvested will be *Polyprion oxygeneios*. Very little bycatch is expected. This assumption is based on oral communication with vessel captains who have attempted line fishing in the past in that area. There are no other fishing records using dropline or jigging available for the area that could lend data to provide information to base guesses on extent of bycatch quantities and species composition. It is also not known how well these historic records distinguished between *P. oxygeneios* and *P. americanus*. The Cook Islands intends to deploy droplines and jigs both gears are selective, have very low impact on the marine benthic ecosystem. All elasmobranchs will be required to be released immediately after they are hauled to the surface.

The recording of lost gear is a priority for the Cook Islands as it is an indicator of the vessel's imprint in the SPRFMO Convention area. If any gear is lost, the Cook Islands flagged vessel will report the event in the daily logs during the fishing activities. The Cook Islands believes that its choice of fishing gear and prior knowledge of the area and the experience of the crew should result in a minimal gear loss.

Seabird interactions will be monitored by the observers. Deployment of the lines will be done at port and starboard of the vessel, the weight of the sinkers result in rapid sinking of the gear until the hooked lines are fully submerged with line tension applied at depth. This would minimize the potential impact with birds, and other fisheries of this type, tend to have low interaction rates with seabirds, mammals, and marine reptiles. Hooks with lures are being used further reducing the attractiveness to seabirds and marine turtles. The New Zealand fishing advice regarding the reduction of seabird catch suggests that "*Using artificial baits/lures can be another successful strategy for avoiding seabird capture, although seabirds occasionally mistake artificial baits for the real thing and become hooked. Gannets will occasionally dive on trolled lures or stickbaits and shags sometimes bite soft-baits. Diving petrels usually ignore them*" (www.fishing.net.nz/fishing-advice/how-to/catch-fish-not-birds/).

Dropline and jigging lines hang vertically in the water and their sink rates¹ are high resulting in low potential for interactions. The vessel will be prepared for interactions with seabirds, marine reptiles, and mammals during operations. CMM 09-2017 does not mention specific protocols for dropline or jig fishing, it is nevertheless one of the observer's designated tasks to record any interactions, take pictures of the encountered species and decide whether lines may be hauled and/or set in that location. The protocols also required that, if more than one marine mammal or turtle encounter the vessel or gear and suffered any potential injury or harassment during a fishing day, the fishing operation would move to the next prescribed station outside a circle with a 5 nautical mile radius from the location of the encounter or move to the next scheduled seamount.

Lines will be set and hauled using (1) jigging reels located on port and starboard side of the vessel or (2) the droplines which will use the same winch as that used during the exploratory potting fishery. The catch of the target and bycatch species will be weighed, and observers will undertake the required sampling. Cameras will be installed on the port and starboard side of the vessel to monitor the fishing activities. All bycatches will be sampled along with the target species and all elasmobranchs will be released as quickly as possible after being identified and length measured by the observers if possible.

The fish will be filleted and frozen on board and offal will be macerated before being dumped. No dumping of offal will be conducted while lines are being set or hauled. Discharging of waste will only take place at the end

¹ Time depth recorders will be deployed to measure the sink rate of both the dropline and the jig gear and the sink rates will be reported back to the SC.



of a haul or while steaming and no biological material will be discarded for at least 30 minutes before the start of any set. Biological sampling will be undertaken by one or two Observers, appointed by MMR. Observers follow the specification of the Scientific Sampling Plan detailed in Appendix B.

To ensure the FOP is developed and implemented in a precautionary and gradual basis according to the best available science, the following data will be collected:

1. Determine the geographical range of the target species within the Foundation Seamount Chain and Northern Seamounts (Figure 1), including the depth of catch, vertical stock distribution and relative stock density.
2. Evaluate the biology of the target species including review of age and size composition, size-at-maturity and spawning season information, evaluation of DNA information to assess stock distribution, connectivity and possibly stock size and other relevant biological information to better understand these species.
3. Assess the species and size composition of any bycatch.
4. Document any potential VMEs in the research zone, plot their locations and evaluate VME density.
5. Ministry of Marine Resources (MMR) Cook Islands will routinely report back to the Scientific Committee and the Commission for feedback on the progress of the FOP.

3.1 The Environment and Bathymetry of Foundation Seamount Chain

The Foundation Seamount Chain, due to its location, length and East/West orientation is subject to upwelling of nutrient-rich water from the Antarctic circumpolar current, driving the cold nutrient-rich waters north where a mixing of the Easterly sub-tropical current takes place (Figure 3). This flow travels largely parallel to and across the ridges and seamounts in the Foundation Seamount Chain, mixing the sub-tropical waters with the cold sub-Antarctic waters. The mixing extends from the sea surface to depths of 2,000-4,000 m and can be as wide as 400 km.

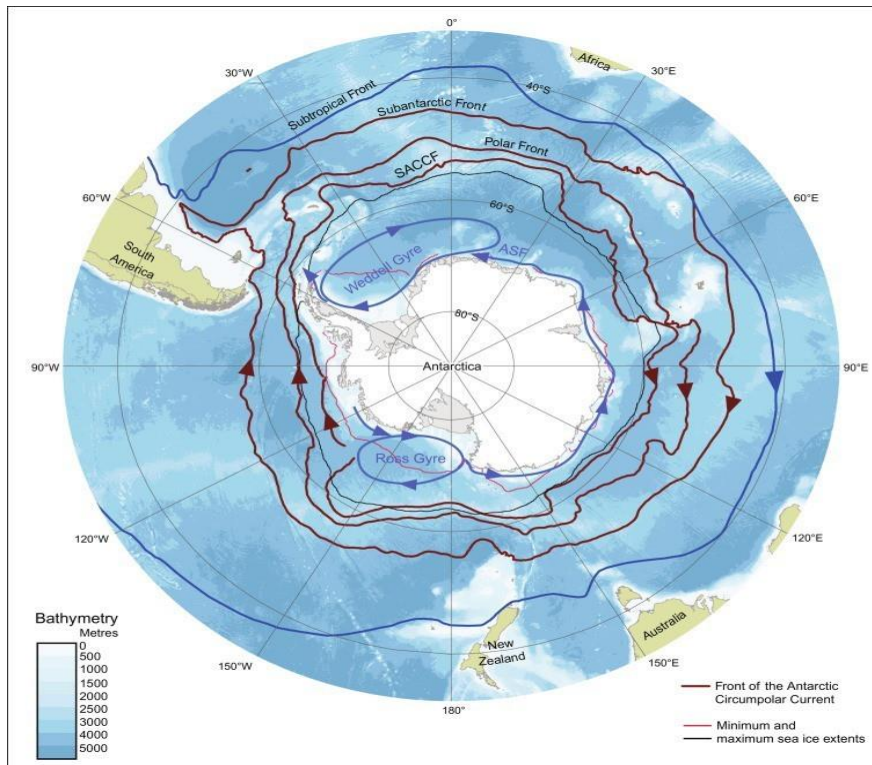


Figure 3. Schematic of Antarctic circumpolar current (Sheppard, 2018)

The cold flow is intensified by upwelling of deep water caused by the combined effects of the drag of surface winds of the Southeast Trades and the Earth's rotation. The upwelling brings abundant nutrients close to the surface, where the eddies are believed to be sufficiently strong to reverse the direction of the surface currents in this area where shallow undercurrents exist, that flow in a direction counter to that at the surface. These along with the shallow depth of the seamounts create accessible habitats for crustaceans and densities high enough for potential commercial exploitation.

The oceanography of the Foundation Seamount Chain has not been extensively investigated on a fine scale, except by a high resolution bathymetrical multinational survey conducted in part by Dr. David Sandwell of Scripps Institute of Oceanography in California. Communications have been made with Dr. Sandwell regarding his work on Marine Gravity Anomaly from Satellite Altimetry and Predictive Seafloor Topography. This fine scale bathymetric survey of the FSC provided him with soundings data to enhance and validate his predictive model to map seafloor topography from satellite altimetry data. He has shared with the Cook Islands his comprehensive bathymetric charts of the Foundation Seamount Chain generated from his survey. This survey used satellite data, and then was followed up with an at-sea ship survey of the Foundation Seamount area using multi-beam echo-sounders (Maia et al., 1999) RF Sonne survey of 1995 (Devey et al., 1997).

3.2 Exploratory Fishing Gear Used



Jigging

It is proposed to fish with up to 12 jigging machines, six on port and six on starboard side. Lures will be used instead of bait. Each jigging machine will be equipped with up to 30 hooks. A detailed description of the fishing method is given below, as provided by the supplier of the jigging equipment (<https://www.beinsson.fo/en/>):

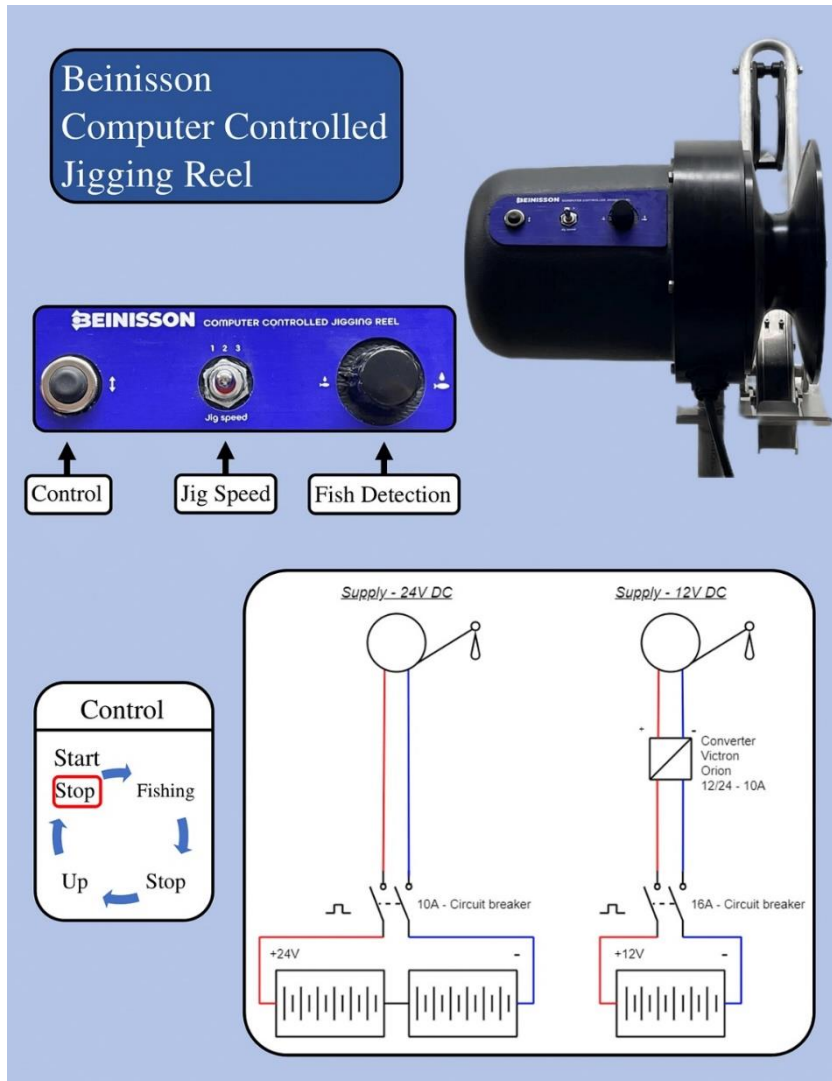


Figure 4. Beinisson Computer Controlled Jigging Reel

This machine is meant for fishing at the seafloor. The wheel can contain 300 m fishing line of 1.8 mm. There are 3 jig speeds to choose from with the switch in the middle. If the depth decreases and the sinker touches the seafloor, the machine sets higher seafloor automatically, thereby minimizing contact with the seafloor. When the machine detects a fish, it starts hauling, it accelerates to hauling speed gradually and slows down before the ring between the fishing line and the snood touches the pulley.

Dropline

Droplines are used to catch fish that live on or near the sea floor and are a simple method which requires little gear and few crew, making it well suited to smaller vessels.



Droplines use a main line with an anchor at one end and a float at the other. Each hook is individually connected to a short 30-50 cm monofilament or cord 'snood' which is then clipped to the mainline. Droplines can also use a branch line which joins onto the mainline near the bottom. When using this type of line, individual snoods are attached to the branch line instead of the mainline.

The number of hooks on each line varies between operations from 20 to over 100. Droplines are normally left to 'soak' for around 6 hours before being hauled. The downline is hauled using hydraulic winches fixed to the deck of the boat. The number of lines a vessel sets each day depends on the vessel size and number of crew on board. It is envisaged that less than 5 lines per day will be set. The depth which droplines are set varies depending on the target species but generally ranges from 250 to 1,000m, but it is not envisaged that the gear will be deployed below 750m. Droplines are very versatile and can also be set in shallower or deeper water by simply adding and removing additional rope to the downline.

Dropline fishing causes very little damage to the sea floor and generally has limited level of bycatch. Like fishing with a rod and reel, fish are brought to the surface slowly and are often alive when they reach the boat, which greatly increases the likelihood of survivability for non-target species returned to the water (Australian Fisheries Management Authority, 2023)

It is proposed to use up to 10 lines in the water at the same time, with each line containing maximum 100 hooks and fishing between 150 and 750m with a maximum depth of 1,000 meters.

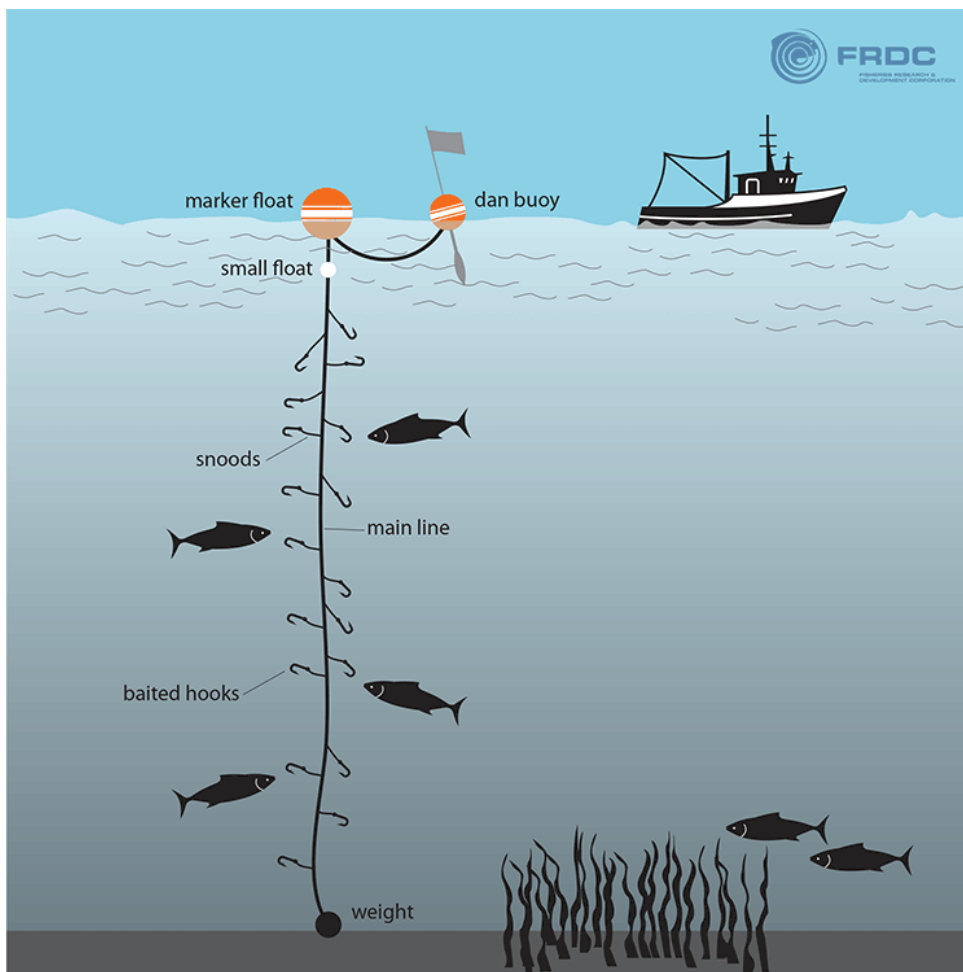


Figure 5. Dropline layout



4. Landing

4.1 Landing

The vessel will discharge all catch to an approved facility at an approved port. Should the vessel land its catch in a third State, it will be required to follow that State's requirements and will follow all requirements in the "Conservation and Management on Minimum Standards of Inspection in Port" (CMM 07-2022).

4.2 Resource Biomass Calculations and Potential Management Reference Points

The proposed total allowable catch for all areas fished requested under this FOP is 500 tons per calendar year of *Polyprion* species² and 100 tons of all other teleost and cephalopod bycatch. The TAC for New Zealand (an area that is 30% smaller than the areas described here) is 2,182 tons with an annual catch of just over half that level (Fisheries New Zealand 2023). At this early stage of the fishery biomass trends are unlikely to be easily estimated through fishery data. However, other methods to assess the stock size and status are possible, these include spawner per recruit analysis using age and length data, or close-kin mark-recapture genetic techniques. Data will be collected that will allow MMR to attempt both approaches.

Target and limit reference points will be developed in future based on the outcomes of the research efforts associated with this fishery. As such we propose as our interim objective for this fishery **to explore the fishery potential of *Polyprion oxygeneios* to sustain a commercial fishing operation in the Foundation Seamount Chain and the Northern Seamounts**. To monitor our performance against this objective we propose to use an **interim target reference point of 50%B₀ and an interim limit reference point of 30%B₀** as our initial reference points unless that data analysis undertaken as part of this exploratory fishery suggests alternative reference points may be more appropriate. As these will be challenging to estimate initially, we will use standardized CPUE analysis and a percent change in CPUE (change from CPUE_{init}³ which we will equate with B₀) as our initial means to monitor changes in biomass, and as our data becomes more informative other metrics may be more appropriate. In the short-term this may mean spawner per recruit analysis, or close-kin mark-recapture genetic, followed by a medium-term more data rich assessment if the fishery continues and the data allow.

This approach is sufficiently conservative, making it consistent with Article 2 of the convention. The staged approach applied to the monitoring of reference points will allow the Ministry of Marine Resources, Cook Islands, and SPRFMO to make decisions annually as to how this exploratory fishery is performing against these objectives and the requirements of Article 2 of the convention. In addition, the approach provided provides for the use of edible bycatch but requires the release and protection of Species of Special Interest (SSI) as well as at risk species such as elasmobranchs that are required to be released.

This fishery intends to retain all edible bycatch species (within the bycatch limit) and as such will minimize waste. All species not retained will be released alive as quickly as possible while adhering to our best practice release guidelines.

² We refer here to species and not *P. oxygeneios*. While we are likely to be catching *P. oxygeneios* we currently do not know the extent to which *P. americanus* will contribute to the catch. This will be clarified after sampling has taken place on the first trip. But any *P. americanus* caught will be included in the target TAC.

³ As the fishers will need some time to learn the fishery, CPUE_{init} will be calculated as the mean CPUE_{t1-t1} determined as a stable period of the CPUE series derived at some period in the first year and agreed by the Scientific Committee.



4.3 Planned Trips in the Management Areas and Vessel Monitoring

The areas of interest shown in Figures 1 and 2 consist of distant-water, high seas seamounts and adjacent fishing grounds that cover a combined area of approximately 4.2 million km². Sixty five seamounts at fishable depths have been identified. The remote nature of the area in the central-south and eastern Pacific Ocean has been a conservation buffer and a barrier to further fisheries development. This schedule of fishing operations and the proposed alternate fishing methods take into consideration the balance between the financials of the fishing project and the important opportunity to collect scientific information, to test the commercial viability of the resource for sustaining ongoing exploitation.

This proposed experimental fishery is intended to take place on the same trips as the Cook Islands exploratory trap fishery for lobster and crab. It is proposed that this fishery will be undertaken over three years 2024-2026 inclusive, with annual reporting and amendments following the advice of the SC and Commission.

The Cook Islands anticipates submitting annual Fisheries Operations Plans throughout this endeavor to the SPRFMO SC at their annual meetings as well as an analysis of the previous year's catch and effort and report back on the results of biological data analysis.

The Cook Islands endeavors to undertake a VME and benthic footprint analysis of this fishery.

The analysis of catch and effort as well as biological material will be ongoing beginning at the end of the first trip. The intention would be that a detailed report on the catch, effort and biological analyses would be presented to the Scientific Committee annually beginning in 2024 at SC12. Noting that it is unlikely that we would detect a stock response to a small fishery from a relatively mobile species in a single year, and it is possible that we could have greater variability within a trip and between seamounts than between years.

5 Monitoring of Vessel Operations

5.1 Vessel Movement in the Management Areas and Control of Vessel

The vessel and its operators will report to MMR all vessel activities in the Management Areas to MMR's legal specifications and requirements. This will include, but is not limited to:

- Notification of: Entry and Exit from SPRFMO waters.
- Adequate prior notice when planning a trip into the SPRFMO Convention area.
- Adequate prior notice of date and port of arrival after a trip in the SPRFMO Convention area.
- While at sea the vessel must report its location and current activity to MMR through VMS and through mandated email reporting.
- While at sea, the Master will be responsible for the day-to-day operations of the vessel and ensuring compliance in accordance with Cook Islands law and SPRFMO CMMs.
- Vessel Monitoring System: the vessel must have a VMS system approved by MMR on board and will report simultaneously to both the MMR and SPRFMO as per the requirements of CMM 06-2023 for the option described in Paragraph 9.b, once the SPRFMO system is advised as operational. While at sea, in the event of VMS failure of automatic reporting, the procedure outlined in Annex 3 of the CMM 06-2023 shall apply.

5.2 Observers

Biological sampling will be undertaken by two Observers, appointed by MMR. Observer data collection includes:



- Sampling and recording of catch (all species landed) on each line.
- The catch of each species will be weighed. All lines will be sampled, measured, and recorded by the observers.
- Retained catch will be counted and sampled for individual weight, total and fork length (where applicable).
- Discards will be identified to a species level and counted.
- Any fish not able to be identified will be photographed and sample of tissue (from retained species) will be taken for later identification.
- To the extent possible all *Polyprion oxygeneios* will be sampled for length, weight, sex, and maturity. A subsample of fish selected through a random stratified sampling design will have their otoliths removed and retained for age estimation; and the collection of genetic samples will be undertaken.
- Data will be recorded daily and summarized at a trip level. These data will be captured in an access database and forwarded to MMR for use by the MMR research team and collated for SPRFMO reporting.
- VME bycatch, while is highly unlikely, will be recorded.
- If the total VME bycatch for a fishing day location exceeds 2% of the weight of the target species, those fishing stations would be deleted from future fishing plans using the gear that landed the VME indicator taxa.

6. Data Collection Methods

MMR has an established and approved data collection program and connected procedures. Use of a comprehensive data capture system and sampling methodology has been implemented under the guidance of an experienced scientific and fisheries management team.

This data collection can accommodate this exploratory dropline and jig fishing operation including tracking and observations of bycatch on lines to record the catch, confirm the existence of VMEs, collect biological data and the collection and reporting of the required data sets necessary to evaluate future biomass assessments and geographical distribution of the target species.

During fishing activities, data will be collected daily in accordance with CMM 02-2022 using two daily logs as follows:

- Daily Effort, catch data and Production Logs will be collected to better understand and evaluate the target trends. The Daily Effort, Catch and Production (SPRFMO Fishing Activity Report) will capture operational information on a set-by-set basis as described in Annex 5 and 6 of CMM 02-2022. Lost gear will also be recorded on a set-by-set basis. MMR requires this logbook to be submitted weekly.
- Daily Environmental Log to Observers will record discards and waste management, SSI abundance and interactions and mitigation measures.

The daily fishing logs and observer data collection will be based on the SPRFMO data templates (<https://www.sprfmo.int/fisheries/data-2/data-submission/>) for dropline and squid jig⁴ fishing and will include all the minimum data fields required in CMM 02-2022 Annex 4, 7 and 9.

In addition, biological material including age, growth, mormpometrics and reproductive information will be collected.

⁴ Minor modifications will be required to make these appropriate for fish.



All data will be submitted to the Secretariat in accordance with the requirements outlined in SPRFMO (2023).

7. Vulnerable Marine Ecosystems Sampling

The Cook Islands is very conscious of its obligation regarding any potential VMEs that might be encountered. While dropline and jigging fishing is relatively benign, encounters with VME indicator species can't be excluded and observers have been trained to report any indications of VME indicator species, volumes, weights, and frequency of occurrence in accordance with the SPRFMO protocols, which are described in CMM 03-2022. Observers carry and are familiar with the numerous guides available and the stringent reporting of the observers is testament to their rigor and familiarity in this regard in relation to their activities in the exploratory trap fishery (CMM 14b-2023).

By using the areas of interest as shown in Figure 1, MMR will be considering seamounts only shallower than 1,000m. MMR recognizes that it is also where the majority of potential VMEs might be expected to occur. According to CMM 03-2023 and bottom fishing impact assessments (BFIAS), the observer(s) on board the flagged vessel will register and map out the interactions with VMEs. It is imperative that the observer(s) work closely with the vessel skipper to track dropline and jigging line setting and hauling using the on-board sea-bottom tracking technology.

MMR considers that the impact of this exploratory program will have minimal impact on the sea floor, as the likely total bottom contact on these areas will be slight, <1% of the total assessed target area and involves only the sinker/weight. However, MMR will continue to take a precautionary approach where:

- Restricting in relation to dropline the number of lines to 10 with maximum 100 hooks per line and, in relation to jigging, the number of lines to 12 and maximum 30 hooks per line on small seamounts and as far as possible keep line sets on low profile ground where the likelihood of encountering a VME e.g. coral outcrop, is reduced;
- Where potential VME indicator species are encountered, the flagged vessel will follow the Cook Islands VME protocol including collecting images, as well as requiring the vessel to leave the area and "move-on" in accordance with the relevant CMMs significant; and
- Drop lines will not be allowed to be deployed within the Kopernik valley, an area known to have high rates of VME indicator species interactions.

The approach will aid developing and collecting data to allow comprehensive VME assessments to be undertaken by MMR.

If significant quantities of VME indicator taxa are found attached to the line, (more than 2% of the target species weight per day), then the vessel will move on in accordance with CMM 03-2023 to the next fishing site. In the event VME areas are identified, the coordinates are recorded, and these areas will be removed from the fishable stations database.

Further the Cook Islands will use a camera system as part of the FOP and is designed to video record the hauling of the lines at the location of the hauling and at the setting location of the lines. Therefore, one camera will be installed on port and one on starboard. The recordings will then be observed by the observer to analyze the potential interactions with seabirds, mammals, or marine reptiles. The recordings will also be used to analyze and identify potential landings of VME or bycatch on the hooks of the lines, so that corrective measures can be taken for the next fishing trips to comply with the BFIAS.

The vessel is also equipped with three underwater cameras. These will be deployed on the droplines to quantify the benthic impact of the anchors.



8. Risk assessment

8.1 Teleost and cephalopod bycatch

It is estimated that some teleost bycatch will be caught in this gear including any teleosts that are attracted to lures. This may include both pelagic and suprabenthic species. Fish such as tuna⁵ (*Thunnini*); mahi mahi (*Coryphaena hippurus*); trumpeter (*Latris lineata*); *Mora moro* and terakihi (*Nemadactylus macropterus*) could be caught. It is also possible that some squid could be caught. Some of these species could have commercial value and will be retained, while others may not. Given the relatively shallow depths of the gear some of these fish could be released alive. However, until we evaluate the species composition of the first trip the species and their release condition is somewhat speculative. The table below can be more informatively updated after the first trip is complete and the data analysed.

Cook Islands Hapuka Fishery Risk Summary Table - Teleost bycatch

Species	Spatial overlap	Catchability	Risk of mortality
Pelagic teleosts eg tuna, mahi mahi	High	High	Low if not retained
Suprabenthic teleosts eg terakihi	High	Medium	Species dependant low to high
Squid	Medium	High	Low
Mitigation			
Precautionary bycatch limit of 100t (all non-target species included). Vessel required to carry release weights to release teleosts that suffer from barotrauma and which are not retained.			
Risk if released after mitigation			
Pelagic teleosts - low			
Suprabenthic teleosts - low			
Squid - low			

8.2 Elasmobranch bycatch

Some elasmobranch bycatch is to be expected. Any elasmobranch that is attracted to a lure could be caught. Species that have been observed and caught in other gear in the area include blue sharks (*Prionace glauca*) and scyliorhinid catsharks. However, the gear uses nylon streamers⁶ which most large elasmobranchs will bite off and not get caught, any elasmobranchs that are caught will be required to be cut off the line and not brought onboard. As the gear is set relatively shallow and the soak times are relatively short any individuals that are caught can be released and can be expected to survive. Elasmobranchs are required to be released from Cook Island vessels, and the vessel is provided with safe release guidelines.

⁵ Any tuna landed will be reported to the relevant RFMO (WCPFC or IATTC) as required.

⁶ The Cook Islands prohibits the use of wire traces on gear used in this fishery.



Cook Islands Hapuka Fishery Risk Summary Table - Elasmobranchs

Species	Spatial overlap	Catchability	Risk of mortality
Pelagic sharks eg blue sharks	High	Low	Low
Benthic sharks eg scyliorhinid catsharks	High	Low	Low
Mitigation			
<p>All Cook Island vessels are required to release elasmobranchs that are inadvertently caught in the fishing gear. Given the shallow nature of the gear post-release survival is predicted to be high.</p> <p>The vessel will use nylon snoods (the use of wire traces are prohibited) which are known to effectively exclude most elasmobranchs from the catch. Release guidelines provided to ensure survival.</p>			
Risk if released			
Pelagic sharks - low			
Benthic sharks - low			

8.3 Seabirds

The area where this fishery occurs is in the mid-latitudes and in lower latitudes than one would expect to regularly encounter high densities of seabirds. However, they are seen periodically, more so in the cooler months. Seabirds like albatross petrels and shearwaters are expected to overlap with this fishery. In the lobster fishery on the Foundation seamount chain observers have noted and recorded all the birds observed during setting and hauling operations. Albatross, petrels, and shearwaters have been observed, at times, sitting in the water behind the vessel or following the vessel. The observers have reported *“Apart from the shearwater feeding of small bait pieces washed off from the [lobster] bait jars, no other bird interaction with the vessel or fishing gear was observed.”*

In order not to attract birds to the vessel, offal will be macerated before being dumped. No dumping of offal will be conducted while lines are being set or hauled. Discharging of waste will only take place at the end of a haul or while steaming and no biological material will be discarded for at least 30 minutes before the start of any set. Moreover, the dropline is heavy and will sink fast and close to the vessel making low risk for capture-at-setting, capture risk of birds on lures on the haul is low. Jigs are also designed to sink fast and are close to the vessel lowering the risk of seabird capture. The use of lures and not bait is also predicted to reduce the chance of seabird interactions. If birds are attracted to the vessel while fishing and are deemed to be at risk of capture additional mitigation options will be considered such as bird bafflers or short tori lines, and these are provided for in the vessel permitting conditions.

Cook Islands Hapuka Fishery Risk Summary Table - Seabirds

Species	Spatial overlap	Catchability	Risk of mortality
Albatross	Medium	Low	Low



Cormorants	Low	Low	Low
Penguins	Low	Low	Low
Petrels, prions and shearwaters	Medium-high	Low	Medium-Low
Mitigation			
<p>Offal will be macerated before being dumped. No dumping of offal will be conducted while lines are being set or hauled. Discharging of waste will only take place at the end of a haul or while steaming and no biological material will be discarded for at least 30 minutes before the start of any set.</p> <p>The gear is set close to the vessel making it difficult for birds to access the gear at both set and haul.</p> <p>No bait will be used only lures.</p>			
Risk after mitigation			
Albatross - low			
Cormorants - low			
Penguins - low			
Petrels, prions and shearwaters - low			

8.4 Marine mammals and turtles

No marine turtles have been observed in the associated lobster fishery and marine mammals are rarely sighted. However, some cetaceans have been observed by the vessel observers. Most of these have been too far away from the vessel to identify but both Mysticeti and Odontoceti have been recorded in the area. No seals, sealions or elephant seals have been observed by the vessel. None of these species would be expected to take a lure, but unintended entanglement is a rare possibility.

Depredation is a possibility from some cetaceans. Depredation events will be recorded by the observers, and these will be included in any reporting back to the Scientific Committee. In the event of persistent depredation, the vessel will remove the gear from the water and move to another seamount.

Given the rare nature of encounters no physical mitigation is planned, however if pods of dolphins or whales approach the vessel droplines will not be deployed and jigs will be removed from the water until they have moved out of sight of the vessel.

To avoid the inadvertent ingestion or entanglement of marine mammals or turtles, Cook Island vessels are prohibited from discarding any plastic from the vessel.



Cook Islands Hapuka Fishery Risk Summary Table - SSI

Species	Spatial overlap	Catchability	Risk of mortality
Whales	High	Low	Low
Dolphins	High	Low	Low
Seals, sealions and elephant seals	Medium	Low	Low
Turtles	Medium	Low	Low
Mitigation			
<p>If pods of dolphins or whales approach the vessel droplines will not be deployed and jigs will be removed from the water until they have moved out of sight of the vessel.</p> <p>Depredation events will be recorded and if persistent the vessel will remove the gear from the water and move to another seamount.</p>			
Risk after mitigation			
Whales - Low			
Dolphins - Low			
Seals, sealions and elephant seals - Low			
Turtles - Low			

8.5 VME impacts from dropline and jig fishing

The main potential impact on VMEs of this operating of likely to come from damage caused by the anchor of the dropline or potential entanglement with branched invertebrates such as corals. Compared to other gear, such as trawl or the relatively low impact trap fishery (Brouwer et al. 2020) the potential impact from this gear is very small.

Only the first hook on the droplines and jigs could have the potential to entangle and break fragile benthic invertebrates. The anchors, while heavy and could cause damage to anything they land on, have a very small footprint and the lines generally lie above the substrate. In order to further reduce the impact, the Cook Islands is limiting the number of dropline to 10 per day, and has a VME encounter threshold. The VME indicator taxa threshold is 2% of the target species weight per day. If VME indicator taxa are found attached to the line in excess of the threshold, then the vessel will be required to move on to the next fishing site and will record the location as a potential VME area. We will deploy cameras on the droplines to quantify the benthic impact of the anchors. In addition, known VME areas, such as the Kopernik valley are closed to dropline fishing.



Cook Islands Hapuka Fishery Risk Summary Table - VME

Species	Spatial overlap	Catchability	Risk of mortality
VME indicator taxa	Unknown	Low but damage under anchor high	Medium
Mitigation			
<p>A very limited impact footprint, due to the small area of the gear that touches the bottom.</p> <p>Very low probability of a hook entangling fragile invertebrates.</p> <p>Closure of high VME encounter areas such as the Kopernick valley.</p> <p>Post trip review of encounter rates and camera footage and updating of high VME encounter areas.</p> <p>The VME indicator taxa threshold is 2% of the target species weight per day.</p>			
Risk after mitigation			
VME indicator species - Low			

Overall, the risk to elasmobranchs, seabirds, marine mammals, marine turtles and VMEs is relatively low when compared to other fishing methods. Some teleost bycatch is likely, but it is likely that that would be retained with few species being released.

9. Proposals for the year

This proposal is to fish widely throughout the Foundation Seamount Chain and the Northern Seamounts, collecting catch and effort information on the *Polyprion oxygeneios* fishery as well as biological material from the target species. This FOP includes a Total Allowable Catch (TAC) but based on the results as the fishery develops, we can amend the TAC and include size limits, closed seasons, and closed areas if appropriate.

Information on species of special interest as well as species of concern such as elasmobranchs will be collected. Corals and rhodoliths are indicators of VME, their occurrence will be recorded by the observers and the positions recorded on charts. In the interim, areas with high catch rates if VME indicator species will be avoided in any future fishing operations.

All relevant data will be submitted to SPRFMO as required under the various CMMs and withing the dates required.

To ensure precautionary and appropriate management measures can be developed for this fishery, the Cook Islands intends to collect the following biological information to help inform future management options:

Collection of morphometric information from *Polyprion oxygeneios* including:

- Total length.
- Whole weight.
- Gutted weight; and
- Processed state.
- In addition, other biological information will be collected on both target and bycatch species (see Appendix B1 for details).



10. References

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Appendix A - Vessel Details - AKANUI

Participant:	COK (Cook Islands)
Vessel Flag:	COK (Cook Islands)
Vessel name:	AKANUI
Registration:	14398
Call Sign:	E5U4268
Lloyd's/IMO Number:	5417210
Previous Names:	Vardborg
Vessel Type:	06.9.0 Trap Setters – Trap Setters nei
Gross Tonnage:	274.00
Gross Register Tonnage:	274.00
Previous Flag:	FRO (Faroe Islands)
When Built:	1963
Where Built:	Faroe Islands
Length (m):	39.60
Length Type:	LOA
Moulded Depth (m):	3.66
Beam:	7.02
Power of Main Engine(s) (kW):	441.00
Hold Capacity (m ³):	55.00
Authorised Date (Start):	13-Apr-2023
Authorised Date (End):	31-Dec-2023
Flag Authorisation Start Date:	02-May-2022



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Appendix B - Observer Tasks and Sampling Instructions



The sampling protocols below must be clear and understood in conjunction with the requirements for capturing data in the Access database. If you are unsure what to capture under the field names, refer to the bottom left corner (of the database page) for the field description.

NOTE: DATA THAT ARE NOT RECORDED BY THE OBSERVERS MAY NOT BE ENTERED INTO SPRFMO OBSERVER DATABASE.

For reference, Observers must also read the Cook Islands Fisheries Operational Plan

The table below should provide a view of the sampling requirements that must be undertaken by the Observers:

Table B.1: Observer Sampling Procedure

Database Page	Cruise Report Section
Trip Details	1) Trip Summary and 2) Cruise Details and 4) Catch Details
<ul style="list-style-type: none"> Vessel details Trip Summary Retained or landed catch (number and weight) per target species <p>Note: these data should be entered directly into the access database using the smart pdf form.</p>	<p>Provide a brief outline of the work carried out, including any specific and/or additional tasks in the Trip Summary. Also include observer details (name and company).</p> <p>Cruise Details must include sail/dock dates and port etc.</p> <p>Insert a table of the landed catch (total number and weights summed for the trip) under the Catch Details heading</p>
Set and Haul	3) Fishing Operations
<ul style="list-style-type: none"> Start position (latitude and longitude in decimal degrees) Fishing at anchor or drifting. If drifting, record the end position also. End position (latitude and longitude in decimal degrees) Type of gear (drop line/jig) Number of lines Number of hooks per line Number of fishers Lure type Start time (local time) End time (local time) Depth (m) Total catch weight (kg) target and each bycatch species Number of fish retained for each species. Number of fish discarded (by species) 	<p>Under Fishing Operations, write a description of the fishing method, lost fishing gear, environmental observations and comment on any information that the database does not cover.</p> <p>Please cross check your positions with those recorded by the vessel. It is probable that you will record these from the vessels log, that's ok however if you detect any discrepancy in your personal observation, please keep a record in your notebook and record detail in your cruise report. You can add paragraphs to your Cruise Report as you need.</p>
Sampling	



<ol style="list-style-type: none">1. For each <i>Polyprion oxygeneios</i> landed record<ol style="list-style-type: none">a. Total length (cm)b. Fish whole weight (kg)c. Sexd. Maturity statee. Processed statef. Processed weight (kg)g. Life status at captureh. Note: if the catch rates are too high record these details for every second fish.2. At each seamount (on each trip) - collect 6 otoliths per 1cm size bin for both males and females. Once a size bin is full stop collecting otoliths from that size class. For each of these fish collect a genetic sample. Make sure that all the information under 1 above are collected for each of these fish.3. For all other retained fish record:<ol style="list-style-type: none">a. Speciesb. Total length (cm)c. Fork length (cm) (if appropriate)d. Fish weight (kg)e. Life status at capturef. Note: if the catch rates are too high record these details for every second fish.4. For discarded species:<ol style="list-style-type: none">a. Speciesb. Length (if brought onboard)c. Life status at captured. Life status at release5. Note that for each set, all retained fish should be weighed (total catch weight) and count the number of fish as part of the set and haul information. All discards must be counted.<ol style="list-style-type: none">a. Bycatch species of concern (Y/N)b. Species of concern speciesc. Species of concern numberd. Environmental observationse. Gear information (including Lost lines)• f. Problems	
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