SPRFMO
South Pacific Regional Fisheries Management Organisation

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Manta, Ecuador, 29 January to 2 February 2024

COMM 12 – Prop 16.1

Cook Islands Fisheries Operation Plan for an Exploratory Trap Fishery in the SPRFMO Area

Cook Islands

Changes from FoP accepted by MOP 10

1. Closure of the Kopernik Seamount to lobster fishing.
2. Allow for longer lines with 200 traps when setting for crabs, that is for sets below 350m.
3. Inclusion of a risk assessment.
4. Minor editorial amendments.

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ExecutiveSummary

In 2018, the Cook Islands was granted permission to undertake a three-year exploratory trap fishing operation provided by Conservation Management Measure (CMM) 14b-2018, which was subsequently superseded by CMM14b-2020 then CMM 14b-2023. This program is based primarily on the known seafloor structures above 500m depth, located in the Foundation Seamount Chain (FSC), southeast of French Polynesia, primarily due south of Pitcairn Islands at latitude 30-34 degrees south. From the 62 documented seamounts along the FSC, 13 seamounts had seafloor that rose above 500m and these were identified for initial exploratory fishing. To date the Cook Islands has successfully completed seven trips with new and important biological information collected for lobster *(Jasus caveorum)* and crab *(Chaceon sp.),* though crab remains relatively data poor. These trips provided information on populations present as well as information on target stocks and marine ecosystems. Information collected during these first trips have guided revisions of the Cook Islands Fisheries Operations Plan (FOP), which has assessed the effectiveness of existing mitigation measures, to ensure that the bottom trap fishery is developed through a precautionary and gradual process, in accordance with the best available scientific information. To maximize the value of future data collection for the Cook Islands and its flagged vessel, the Cook Islands has screened the collected material and analysed all available data to ensure relevant adjustments are made to current exploratory methods, in accordance with the CMMs in force at the time.

This FOP addresses the assessment made from SPRFMO and its subsidiary bodies, namely the Scientific Committee. The FOP draws on the findings of the formal sampling program outlined in the previous FOP submitted to the 10thth regular session of the Commission (COMM 10), in particular refining current methods to conform to the Convention, CMM13-2020 and other relevant CMMs, proposes long term viability of the target species as well as mitigation measures to ensure the integrity of Vulnerable Marine Ecosystems (VMEs) is maintained within the fishing operation area.

The Cook Islands proposes to maintain the following agreed limits from COMM 8:

- the Total Allowable Effort (TAE) fishing day limit being 80 days per trip, or 60 days for the Kopernik Seamount.
- CPUE limits of 4kg per trap on the Kopernik Seamount estimated through a weekly rolling average (but see below).
- 20 ton Total Allowable Catch (TAC) for *Jasus caveorum* on Kopernik Seamount per trip
- Temporal closure during the *Jasus* caveorum spawning season (July to September)setting and hauling no more than five lines of 100 traps per day for *Jasus* caveorum.
- Spatial restrictions (i.e limiting fishing to those areas described in Table 1 of the CMM, prohibiting fishing in the Kopernik Valley below depths of 250m)
- a global Total Allowable Catch of 300 tonnes across exploratory areas outlined in Figure 1. The rationale for this is not to be less precautionary, but rather to allow the Cook Islands more flexibility in operations to survey grounds for suitable fishing while still remaining within an appropriate potential catch limit. Following the advice of the Scientific Committee 7, this document includes the intent of the TAC, TAE and the proposal for further analysis.

However, the Cook Islands proposes the following amendments to the management arrangements to improve our understanding of the crab population. This includes:

- Closing Kopernik Seamount will remain closed to lobster fishing in 2023 and 2024.
- Increasing the number of pots per line to 200 for sets targeting crabs only (those below 350m)

- Setting and hauling no more than five lines of 200 traps per day for *Chaceon* sp.
- Removal of the trip limits given there are catch and effort controls on all relevant sites.

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.

1.2 *Scientific Principal*

The principal scientific adviser for the Cook Islands, Dr. Stephen Brouwer has substantial experience in this type of exploratory research fishing operation proposed, including experience in other exploratory and research fishing in similar fisheries in 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 below named individual is the primary contact for all flag state matters and official SPRFMO correspondence:

Pamela Maru, Secretary, Ministry of Marine Resources
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Email: p.maru@mmr.gov.ck
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1.4 *Licensing*

The Marine Resources Act 2005 provides the Ministry of Marine Resources (MMR) the authority to issue fishing license and high seas permits, which, *inter alia*, enables the authorization of Cook Islands flagged fishing vessels to fish. These authorization documents require the 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 (CMM02-2022), Bottom Fishing (CMM03-2023), minimising bycatch of Seabirds (CMM09-2017), Exploratory Fisheries (CMM13-2021) and the CMM established specifically for this exploratory potting and trap fishery (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 in the event that SPRFMO requirements are not met. In line with the Marine Resource Act 2005, the flagged vessel operates under the terms of an Access Agreement with MMR and a high seas authorisation issued by MMR.

1.5 *Areas of Interest*

This plan confirms that the area of operation to conduct this exploratory fishery is that which as outlined in CMM 14b-2021. The geographic area for this exploratory fishery is identified in the boxed areas of the SPRFMO Management area shown in Figure 1. The Foundation Seamount Chain, approved by the SPRFMO Commission in CMM14b-2020 with defined boundaries longitude 134'W– 100'W, latitude 31'S-40'S with an area 3,060 x 999 km2. 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 with proposed feature specific TACs which will count towards the global TAC of 300t.

The areas open to fishing are those specified in Table 1 of CMM 14b-2023. Fishing below 250m depth is prohibited within the Kopernik Valley.

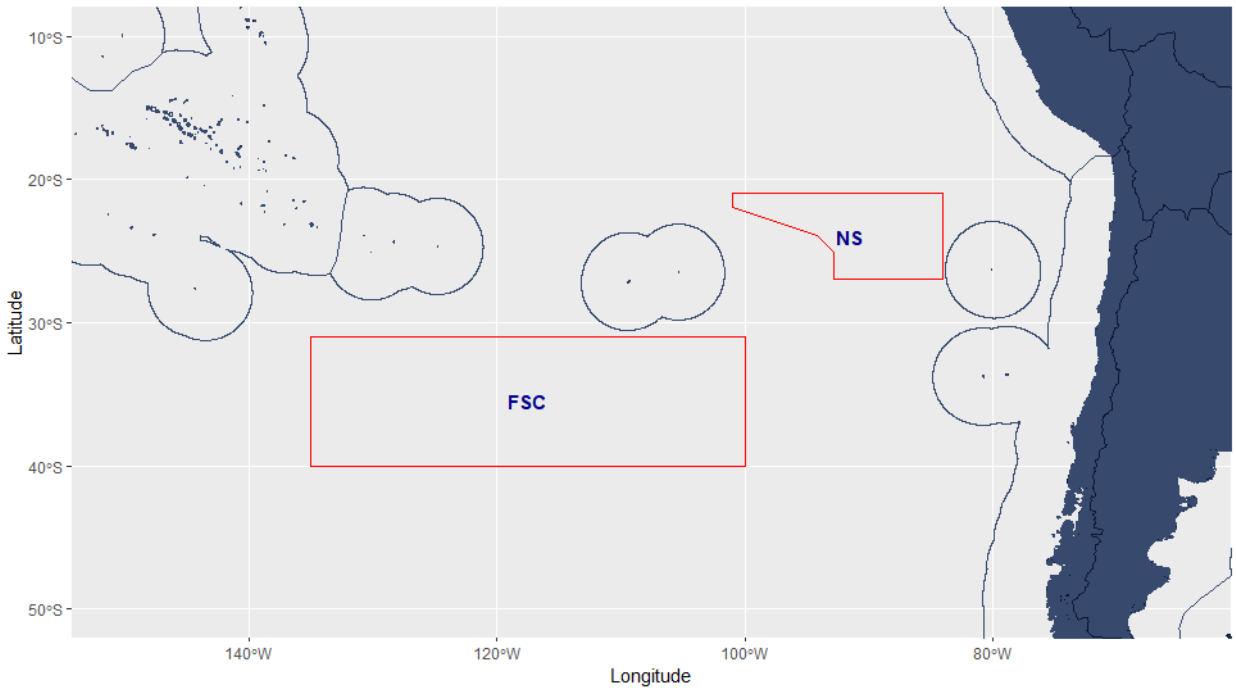

Figure 1: Area of proposed exploratory operations, FSC = Foundation Seamount Chain; NS = Northern Seamounts.

2 History of this exploratory fishery

The Cook Islands has submitted successive Fisheries Operation Plans to the Scientific Committee and provided information on the development of this fishery annually. This information documents resource biomass estimation, consolidated findings to date of VMEs, with plotted locations of VMEs indicator species and a VMEs map are presented using a range of effective fishing areas and depth strata. For logistical reasons, no fishing was undertaken since SC8; hence no additional information was able to be submitted to SC9.

The initial 'Fisheries Operation Plan' (FOP1) for the Cook Islands (COMM6 INF 07) was approved at the 6th South Pacific Regional Fisheries Management Organization (SPRFMO) Commission meeting held in Lima, Peru in 2018, with the adoption of CMM 14b-2018 (superseded by CMM 14b-2020). The Commission is empowered to adopt precautionary and ecosystem-based approach exploratory fisheries. The Commission adopted CMM 14b-2018, though it was clear that all fishing conducted under this exploratory proposal needed to be undertaken consistently with all relevant CMMs adopted by the SPRFMO.

To ensure the FOP continued to be developed on a precautionary and gradual basis according to the best available science, the data collected since operations commenced in 2018 has been made available to assess the potential impacts on the target species, associated or dependent species, and the marine ecosystem and to evaluate the effectiveness of the current CMM. In this regard, the Cook Islands continues to collect the necessary data to fulfill its obligations to follow the exploratory protocols as laid out by SPRFMO below:

- Determine the geographical range of the target species within the Foundation Seamount Chain, which includes depth range and relative stock density;
- Evaluate the biology of the target species including review of size composition, sex ratios, variation in DNA signatures and other relevant biological information to better understand these species;
- Document any potential Vulnerable Marine Ecosystems (VMEs) in the research zone, plot the locations of VME indicator species and produce a VME map for each seamount researched;
- Identify the composition and extent of potential VMEs using video to assist in the evaluation of potential VMEs and other seafloor structures to better understand the type of habitat and the density of the target and by catch species;
- Build a robust reporting plan while collecting all research data, and have it compiled for easy dissemination to the SPRFMO SC and MMR to better understand the biology of the target species, stock densities, population dynamics and species interactions across the research zone and the development of a sound biomass assessment in support of a management strategy for a future fishery.

Further, CMM 14b-2023 required effort limitation through designating fishing on 15 seamounts (Table 1) during the course of two trips in 2019-20, each with a maximum of 80 fishing days. The maximum harvest level set by SPRFMO was 300 tonnes of whole weight for the combined species of *Jasus caveorum* and *Chaceon sp.* in years 1 July 2019- 30 June 2020 and 1 July 2020-30 June 2021.

CMM 14b-2023 builds on CMM 14b-2020, but it expanded the areas open to fishing to include the Northern seamount chain, and permitted the vessel to test alternative trap designs to those specified in this Fisheries Operation Plan. It also specified a 20t limit for *Jasus caveorum* on the Kopernik Seamount trip, to be caught within the overall 300t global TAC.

3 Introduction and Methodology

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 2). 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 2000-4000 m and can be as wide as 400 km.

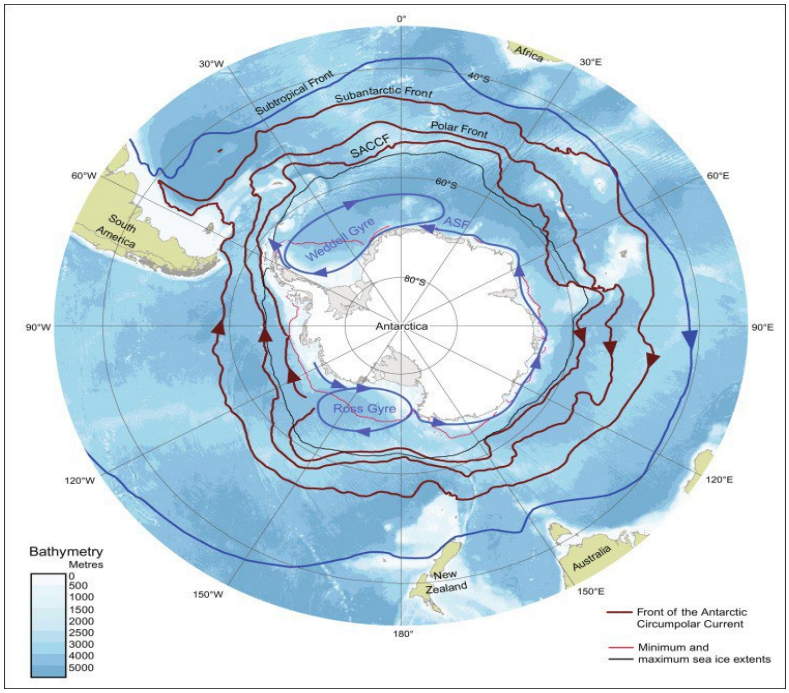

Figure 2: Schematic of Antarctic circumpolar current (Sheppard, 2018)

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 (Smith and Sandwell, 1997).

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 bathometric 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*

Since 2019 the Cook Islands has deployed traps set on longlines designed to catch deep-water crustaceans on seamounts. The traps used are 150cm diameter at the base, 75cm high and 50cm diameter at the top. The entrance to these traps is 35cm in diameter and the trap is covered with netting of 5cm mesh. The backbone (ground line) and float line for each string of traps is made of 25mm polypropylene rope with each trap on each string spaced 25m apart. The traps have been constructed with "escape gaps" to allow for escapement of the small organism (Figure A.1). When targeting *Jasus caveorum* or *Chaceon sp*. the escape gaps will remain open. Other trap designs may also be tested when exploratory fishing is commenced for the smaller *Projasus sp.*, the escape gaps will be closed with a flap of netting. These traps were the trap types used on the four trips undertaken so far. Modifications were made with cotton breaker lines in case traps were lost to minimize ghost fishing effects. In addition, trials with small mesh on selected traps were undertaken to test selectivity (Figure A.1), and to attempt to target *Panularus sp*.

The aforementioned traps were custom made by the first company undertaking this exploratory fishery. Moving forward, a combination of trap sizes will be used. The vessel will use 10 pots of the original size to every string, and the remaining pots will be 150cm diameter at the base, 75cm high and 50cm diameter at the top. The entrance to the trap is 35cm in diameter and the trap is covered with netting of 5cm mesh. The backbone (ground line) and float line for each string of traps is made of 25mm polypropylene rope with each trap on each string spaced 25m apart. The traps have been constructed with "escape gaps" to allow for escape of the small organisms. When targeting Jasus sp. or Chaceon sp. the escape gaps will remain open. Other trap designs may also be tested.

The Cook Islands intends to persist with this selective approach deploying traps only in survey areas where there is a likelihood of a high density of the target lobster or crab species. The approach has proven successful with all trips completed to date with low bycatch and a single lobster species caught *J. caveorum*, as well as crabs (*Chaceon sp*.). The catch rates for the different trap designs will be evaluated and correction factors applied to the alternative designs to ensure the continuity of the data series.

4 Operations under CMM 14b-2020

CMM 14b-2020 was implemented on the 20th May 2020 and expires in September 2021. In the first year the Cook Islands agreed to conduct two 30 fishing day exploratory trips on 8 of the 62 documented seamounts in the FSC. Thirteen of the documented seamounts are known to be above 500m depth as outlined in Table 1. The first of these trips commenced on the 19th Mar 2019 - 20th May 2019, the second trip from the 27th May- 12th Jul 2019, the third trip from 24th Oct 2019 - 31st Dec 20019 and forth trip from the 2nd Feb 2020 - 20th May 2020. These dates are inclusive of steaming time to and from the fishing grounds.

In FOP1 the intended target species was spiny lobster *(Jasus sp.)* and based primarily on the known seafloor structures above the 500m depth (Table 1). The 8th Commission meeting in February 2020 approved the exploration of the 13 seamounts and an additional 2 seamounts that were within the range of fishable depth.

As this is the first fishery experience for longline trap operations for lobster in the FSC, it is likely that some of the initial data collection procedures may need to be modified following the first round of analyses. The current setup of the FOP may require some refinements, particularly the operational deployment and retrieval of fishing gear and deck handling procedures of catch. Any changes made will be done only after consultation with the scientific team, or if needed, direct consultation with the SPRFMO SC. Similar to the FOP1, consideration is given to unknown factors impacting the efficiency of the day-to-day operations. This extended to weather conditions, catch sizes per trap, bycatch interaction, marine mammals and seabirds interactions (CMM 09-2017). The Cook Islands anticipates that the selectivity of the fishing gear and fishing methods used has resulted in less than 5% of bycatch to the total landings. A minimum of 10% of traps hauled per fishing set is sampled by the onboard observers.

The recording of lost gear and traps is a priority for the Cook Islands as it is an indicator of the vessel's imprint in the SPRFMO Convention area. Lost traps have potential negative impacts in the environment and lead to ghost fishing. If any gear is lost; the Cook Island flagged vessel will report the event in the daily logs during the fishing activities. Sections of the traps nylon mesh will be cut with and then sewn back together with cotton string, in the event that traps are lost and not found. The cotton string will eventually decompose, and the traps will then remain opened so ghost fishing is mitigated. The Cook Islands believes that its choice of gear, methods and prior knowledge of the type of area to be researched will result in a minimal imprint on the seafloor.

Table 1: The 13 & 2 alternative seamounts with seafloor depths expected to be above 500 m

Seamount	Depth Range	Fishing Status	Km^2 0-500M	Description	Comments
Darwin A	300-500	Yes	90.41	Elongated Structure	Flat Summit Plateau
Galilei	300-500	Yes	12.4	Conical Structure	Circular Flat Summit
Humboldt	300-500	Yes	3.22	Circular Structure	Flat Summit
Jenner	300-500	Yes	22.72	Elongated Structure	Flat Summit
Kopernik	180-500	Yes	115.2	Circular Structure	Flat Summit
Linne b	200-500	Yes	11.89	Circular Structure	Flat Summit
Mendel	150-500	Yes	47.96	Elongated Structure	Flat Summit
Mendeleiev	200-500	Yes	9.18	Circular Structure	Flat Summit
Mercator	300-500	Yes	46.77	Elongated Structure	Flat Summit
Platon	300-500	No	3.11	Flank Structure	Rift Zone
MM	150-500	Yes	318.87	Elongated Structure	Flat Summit with Cones
GB	150-500	Yes	13.59	Elongated Structure	Flat Summit
Buffon	300-500	Yes	1.17	N-S Elongated Structure	Scatted Cones
Alternate 1	<500	No	Unknown	Unknown	Unknown
Alternate 2	<500	No	Unknown	Unknown	Unknown

Analysis from the initial two trips showed that the soak time for the traps on the bottom varied but it became clear that shorter soak times produced higher catch rates (Brouwer et al., 2019). Soak times therefore were maintained at about 24 hours for the proceeding two trips, with setting and retrieval of lines occurring within 24 hours, except for when weather and sea conditions did not permit.

The backbone line (ground line) used to attach the traps and float line used is buoyant polypropylene and, as such, the risk of entanglement and bottom damage is reduced. Floats for each longline string were appropriately marked to ensure easy identification. The methodology of setting was as follows:

- The first float and float line were deployed behind the vessel from the stern and paid out in full, the length of the float line being 1.5 times the maximum bottom depth in the area;
- The backbone line which the traps are attached is then similarly paid out, while the vessel steams slowly ahead;
- The remaining float line and float are paid out from the opposite end of the longline string;
- No anchors are used; the traps themselves are sufficiently heavy to keep the gear in place on the bottom. This limits anchor damage to the seabed and benthos;
- The entire gear is "stretched" gently to minimize the risk of self-entanglement on the way to the bottom. The sink rate of these trap strings is observed to be less than 1 m/s, so a trap will take approximately 10 minutes to reach a depth of 500m.

Seabird interactions will be monitored by the observers. Deployment of the trap longline will be done directly off the stern of the vessel, the traps weight result with initial rapid sinking of the gear until the

trap was fully submerged with line tension applied at depth. This would minimise potential impact with birds and mammals or other potential endangered, threatened and protected species. Bait jars will be filled with bait and tethered to the inside of the trap while the traps are being staggered and attached to the ground line just before they are deployed off the stern of the vessel. Typically, on pelagic and other longline type operations, seabird mortality is expected – this is not the case for trap setting where no bait is exposed, and line sink rates are high. The flagged vessel will be prepared for interactions with seabirds, reptiles or mammals during operations; although as reported in the observer reports no bird or marine mammals have been entangled in the gear during the four trips undertaken so far. CMM 09-2017 does not mention specific protocols for bottom trap fishing, it was nevertheless one of the observer's designated tasks to record any interactions, take pictures of the encountered species and decide whether or not traps may be hauled and/or set in that location. Protocol also required that if more than one marine mammal or turtle came into contact with the vessel or gear and suffered any potential injury or harassment during a fishing day, the fishing operation on any seamount 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. Traps retrieved from the hauling station located mid-ship on the starboard side where the catch of the target species was weighed and observers can undertake the required sampling. All bycatch from each set will be accumulated in a small, stackable, plastic deck container (tote) and weighed and counted at the end of the set. The observer station is located near the hauling station; this is to allow the observer easy access to catches from selected traps for sampling collection before the catch was moved to the factory.

All offal obtained from the process of tailing on board is to macerated before dumping. No dumping of offal is conducted while lines are being set or while lines are being hauled. Discharging of waste will only take place at the end of a haul or while steaming and no biological material was discarded for at least 30 minutes before the start of any set or during any set. Discharging of waste is permitted from the opposite side of the vessel from the hauling position.

Biological sampling will be undertaken by at least one, and preferably two where possible, Observers, both appointed by MMR. Both observers follow the specification of the Scientific Sampling Plan which is detailed in Table B.1. This included:

- Catch of each trap was sorted into target species and bycatch;
- The catch of the target species was weighed and summed over all traps in the longline set. A predetermined subset of traps (10%) were selected and sampled by the designated Independent Observers;
- Retained catch was counted and sampled for individual weight, carapace length, sex, maturity and spawning stage;
- Depending on the amount landed bycatch or a subsample of bycatch was sorted to the nearest taxon to estimate the total amount of bycatch by taxon per longline set, following the sampling plan;
- Data is recorded daily and summarized on a trip by trip basis. This data is captured in an access database format and forwarded to MMR, SPRFMO SC and used by the research team as needed;
- With regard to VME bycatch, if the total bycatch for a fishing day location exceeded 5% of the

weight of lobsters/crab, those fishing stations would be deleted from future fishing plans;

It is common practice for *Jasus sp.* and other lobster commercial fisheries to avoid areas and seasons with the likelihood of high proportions of berried fish. The proportions of berried lobster were therefore closely monitored. MMR will continue to monitor the number of berried females and avoid seasons when females are carrying eggs, which is thought to go from June to October. In cases where berried females are landed, the vessel will retain them onboard in a tank with flowing water and then return them to the sea at the end of the set by lowering a trap filled with these individuals, with an opening mechanism that ensures they reach their habitat. A sample from for each seamount will be retained which will be added to the subset group of lobsters selected for sampling in order to analyze its condition, berry cycle and general characteristics. Further, the distribution and seasonality of the *Jasus* sp., *Projasus* sp. or *Chaceon* sp. abundance in the designated seamounts will become clearer as the fishery progresses.

Although the SPRFMO Commission adopted CMM 14b-2021 in January 2021, no fishing was undertaken pursuant to that CMM.

4.1 *Target Species*

The primary target research species will be *J. caveorum*. While *J. caveorum* are the primary target group, *Projasus* sp. remains a target species on only deeper seamounts. Similarly, *Chaceon* sp. will be targeted in deeper waters.

4.2 *Non-target, associated and dependent species*

Based on the seamounts fished on the first four trips, bycatch and non-target species catch was low (< 5%). While it is apparent that deeper sets will encounter crabs, it cannot be said conclusively that this pattern will be typical of the entire FSC. As noted in the initial analyses, small amounts of fish bycatch were caught in the traps comprising of trumpeter, rock cod, and terakihi. Because of low occurrence and the highly selective nature of the gear, impact projections and risk assessment are not possible for these species at this time. With regard to other bycatch, in particular mammals and turtles, the strategy followed is and will be consistent with the requirements of CMM 09-2017.

4.3 *Landing and/or Transshipment*

The vessel will discharge all catch to an approved facility at an approved port or, if transhipment is undertaken, it will be undertaken consistently with relevant CMMs, including CMM 12-2020 and does not intend to engage in any transshipment operations either at sea or in port. Should Tthe vessel land its catch in a third State, it will be required to follow that State's requirements. will follow all requirements as discussed in the "Conservation and Management on Minimum Standards of Inspection COMM 10 – Prop 02.1 *CK Fisheries Operation Plan* 14 in Port" (CMM 07-2019). The Cook Islands anticipates all production from this exploratory program will be discharged at Lima, Peru and

will follow all aspects of CMM 07- 2020 including Annex I-Port Call Request, Annex II-Port State Inspection Standards and Annex III-Format for Port Inspection Reports.

5 Resource Biomass Calculations and Potential Management Reference Points

Our interim objective for this fishery is to explore the fishery potential of *J. caveorum*, *Projasus* sp. and *Chaceon* sp. 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 40%B_0 and an interim limit reference point of 20%B_0 as our initial reference points unless 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 have used standardized CPUE analysis and a percent change in CPUE (change from $CPUE_{init}$ which we will equate with B_0) as our initial means to monitor changes in biomass, and as our data becomes more informative other metrics may be more appropriate. $CPUE_{init}$ was estimated at Kopernik Seamount as 10kg per trap. As a precautionary measure for the Kopernik Seamount we have set a Trigger Reference point at 4kg/trap at which time management action is triggered. $CPUE_{init}$ is yet to be established for other seamounts or other species.

The maximum allowable catch approved by SPFRMO in CMM 14b-2023 for the Cook Islands is 300 tones per fishing year, expiring on 30 September 2023. The Cook Islands' strategy for this new fishing exploratory program remains as per CMM14b-2023 with a TAC of 300 tons. J. caveorum will remain the primary target species above 500 m depths with fishing at deeper depths primarily targeting *Projasus* sp. and *Chaceon* sp.

Based on fisheries on other seamounts outside the FSC, MMR expects that each of the target species exists within the proposed areas. This nevertheless remains an area of uncertainty as Panularus sp. have not been caught and the possibility of there being other commercially exploitable crustaceans still exists.

Preliminary estimates of biomass Kopernik Seamount have been made and are presented in (Brouwer and Wichman, 2020 and Brouwer et al. 2023), along with weekly changes in biomass through the duration of the fishery. These results vary depending on the estimates of the effective fishing area used in the analysis, but unfished biomass is likely to be around 1,400t (range 800-3,120t). This biomass has been impacted by the catch and the fishing response by the population has been strong with biomass declining strongly over the course of the fishery (Brouwer et al., 2023). This has required the closure of Kopernik Seamount for the remainder of 2023 and 2024.

Brouwer et al. (2019) and Brouwer et al. (2023) have done a thorough assessment (including length analysis, sex ratios etc.). A simple harvest control rule and reference point that are intended to be precautionary will continue to be applied, until the biomass assessment analysis has been reviewed by the SC, and an alternative proposed. This harvest control rule uses CPUE as the default reference point to track relative biomass over time, it assumes the efficiency of a unit of fishing effort remains constant and does not fluctuate or improve over time. A key point is that since the exploratory fishery will occur on multiple seamounts of different sizes, each seamount will need to be monitored separately, but managed along similar principles.

A 40% CPUE limit reference point (i.e. CPUEmax *0.4) is suggested, and on Kopernik Seamount this

would equate to a CPUE of 3.9Kg/trap lift. This is thought to be a reasonable precautionary approach to avoid overexploitation in the absence of other information, if the CPUE is reflective of abundance. In the context of the trips conducted to date, the CPUE threshold reference point would apply only to Kopernik Seamount. As further suggested in the FOP, the value of 40% CPUE can be used as a control rule to lower annual harvest level in the upcoming year for a specific seamount if its CPUE for the current year is approaching a 40% CPUE reduction. In addition, a TAC and TAE will be applied to further regulate fishing activity in year two and three.

It was previously suggested that a depletion experiment might be a useful approach to inform the stock assessment. While this has not been undertaken specifically, the concentrated fishing effort on Kopernik Seamount and the relatively obvious stock response could be examined through a depletion experiment. However, if the biomass estimation procedure (Brouwer et al. 2023) is accepted by the SC, a depletion experiment analysis may not be required or desirable. In addition, if the stock is allowed to recover for a time before the vessel returns to fish the recovery rates of the resource can also be estimated, which would be informative in future decision making.

6 Planned Trips in the Management Areas and Vessel Monitoring

The areas of interest Figure 1, consists of distant-water, high seas seamounts and adjacent fishing grounds that cover a combined area of approximately 4.2 million km2. The remote nature of the target research grounds in the central-south Pacific Ocean has been a conservation buffer and a barrier to further fisheries development. This schedule of fishing operations takes into consideration the balance between capital costs to get to the fishing areas and the important opportunity to collect scientific information, while testing the commercial viability of the resource for sustaining ongoing exploitation.

CMM 14b-2023 which a precautionary catch limit has been set by SPRFMO at 300t is as follows:

1. With the 300 t, separated into three units i.e. 100t combined catch per trip for lobster and crab in year two;
2. This TAC would apply annually for 2021-2024;
3. In addition, specifically for Kopernik Seamount, the following reference point shall apply:
    - A limit reference point of 4 kg/trap hauled (which is equivalent to 40% of the baseline catch rate) will be set and if reached the seamount will be closed to lobster fishing for the remainder of that calendar year or longer as determined by the Cook Islands Ministry of Marine Resources.

The Cook Islands endeavors to undertake a VME and benthic footprint analysis of this fishery. The rate at which a limit reference point may be reached should be agreed on. Ordinarily, BLIM would be much lower, or about 20% of biomass, being the point at which recruitment impairment might occur. However, for seamount lobsters, recruitment has been seen to be variable (Cockcroft et al, 2020) and aiming for a lower level of depletion (i.e. higher biomass) may be a pertinent management objective. Therefore, until better information is forthcoming a limit reference point that approximates a stock depleted to 40% will be maintained.

For all other seamounts on which a resource base may be found a similar approach can be applied on a trip-by-trip basis – that is:

1. Establish average CPUE (Kg/Trap hauled);
2. BLIM of 40% of initial CPUE ($CPUE_{init}$).

Fishing under this exploratory program would follow a similar pattern to that of the last seven trips in 2019-2023. Including the scope for repeating experimental line setting to review the effective fishing area that is required for biomass estimation. The vessel will on each trip undertake the experimental line setting prior to systematically fishing the selected seamounts and trial fishing new seamounts if suitable depths are identified.

6.1 New Features in the Management Areas

Should a new feature not listed in Table 1 be discovered within the management areas and prove to be at fishable depth, MMR can approve trial fishing surveys to be undertaken on such features. In this case the vessel will be required to fish systematically in a grid pattern, in order to survey the areas and allow for unfished biomass estimates to be estimated prior to any attempts to fish the areas in a commercial manner. The observers on board the vessel will be involved in this decision-making process and will notify MMR of proposed features to undergo such fishing surveys.

Should the depth profile or VME encounter rate indicate that the area is unsuitable for fishing, the vessel will cease survey operations and move on[1] from the feature.

7 Monitoring of Vessel Operations

7.1 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 SPRFMO Convention waters;
- Adequate prior notice of date and port of arrival after a trip in SPRFMO Convention waters;
- While at sea the vessel will 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 will 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 06-2020 for the option described in Paragraph 9.b, once the SPRFMO system is advised as operational.

7.2 *Observers*

The vessel will comply with all of the directives from MMR for 200% Observer coverage during all fishing operations described in this FOP and CMM 14b-2023.

The main duties of the observer are outlined in detail in Table B.1 and are in accordance to CMM 14b-2023. The independent observer shall also be responsible for the data collection and capture on an already establishes scientific observer data base (MS Access).

8 Data Collection Methods and Scientific Sampling Plan

MMR has an established and approved data collection programme and 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 is consistent with a robust exploratory trap fishing operation including tracking and observations of bycatch on traps to confirm the existence of VMEs, biological data collection of the target species and a data collection reporting system to compile data sets necessary to evaluate biomass assessments and geographical distribution of the target species using traps.

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

- A Daily Effort regarding Catch data and Production Log will be collected to better understand and research the target species. The Daily Effort, Catch and Production (SPRFMO Fishing Activity Report) will capture operational information on a set-by-set basis and will be described on this form. Lost gear is also recorded on a set-by-set basis or trap by trap basis. MMR requires this logbook to be submitted weekly.
- Observers will record discards and waste management, wildlife abundance and interactions and mitigation measures. Prior to each exploratory trap fishing trip, an assessment will be made to determine whether the area might be a Vulnerable Marine Ecosystems (VMEs).

9 Vulnerable Marine Ecosystems Sampling

The Cook Islands is very conscious of its obligation with regard to responding to any potential VMEs that might be encountered. While bottom trap fishing is relatively benign, encounters with VME indicator species is to be expected and Observers have been trained to report any indications of VME indicator species, volumes, weights and frequency of occurrence (Brouwer et al., 2020a) in accordance with the SPRFMO protocols, which are described in CMM 03-2023.

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 and, as has been done on the already-

completed trips, photograph all potential VME species fouled on traps, submit these for identification as needed, and retain samples as needed for identification.

By using the analysis of seamounts included in Table 1, for trips this far (Brouwer et al., 2020a), MMR will be considering seamounts only shallower than 500m. MMR recognizes that it is also where the majority of potential VMEs might be expected to occur. According to CMM 03-2020 and bottom fishing impact assessments (BFIAS), the observers 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 line setting using the on-board sea-bottom tracking technology, and importantly, to relate this to location of traps on the lines as they are set and hauled.

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 sight, <1% of the total assessed target area. However, MMR will continue to take a precautionary approach where:

- Sets shall not occur on the Kopernik valley; 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.

The approach will aid developing and collecting data to allow comprehensive VME assessments to be undertaken by MMR. Camera mounted on a meshless trap frame will be used for data collection on the benthic environment and will build a thorough database allowing the assessment of BFIA for future use, as assessed with current trips in Brouwer et al. (2020b).

If significant quantities of VME indicator are found in or attached to traps or by the camera study (more than 1% of the total lobster/crab weight per set), then the vessel will move on to the next fishing site[1]. In the event VME areas are identified, the coordinates are recorded and these areas are removed from fishable stations database. Knowing the vessel will have the capability to deploy cameras to film bottom structure and benthos, the vessel will deploy these cameras per the camera study on a regular basis, especially where new areas are being fished and the data will be provided to MMR in the reports at the end of each trip.

The majority, if not all of the seamounts identified for this exploratory fishery, have not been commercially fished in the modern era and, as such, very little is known about the potential for VMEs to occur on these seamounts. Nevertheless, and as required by the BFIAS, if the vessel encounters VME indicator species volume of more than 1% of the total weight of the target species landed by line, they will move-on to the next fishing site, and will flag the location as a potential VME area, where traps with cameras will be dropped in order to assess the amount and type of VMEs that could be potentially found in that area.

Further underwater video cameras will be dropped periodically when evidence of very high CPUE, gear damage, anomalous substrate, or sensitive bycatch areas are observed. Cameras will be attached to net-free trap frame for observation of the substrate near the footprint of the gear (Figure A.1). The vessel must investigate the correct camera system to use during the camera survey/study.

[1] The trigger for "moving on" will occur if the flagged vessel encounters a VME interaction of more than 10% of the total pots landed per line. They will move-on to the next fishing site, and will record the location as a potential VME area. In VME areas pots with cameras will be dropped in order to assess the abundance and type of VMEs that could be potentially found in that area.

10. Risk assessment

10.1 Teleost and cephalopod bycatch

Some teleost bycatch is caught in this gear including any teleosts that are attracted to bait. This includes fish such as hapuka (*Polyprion oxygeneios*) trumpeter (*Latris lineata*); *Mora moro* and terakihi (*Nemadactylus macropterus*) could be caught. Octopus also enter the traps and get caught from tile to time. Given the relatively shallow depths of the gear some of these fish and octopus could be released alive. The table below can be more informatively updated after the first trip is complete and the data analysed.

Cook Islands Trap Fishery Risk Summary Table - Teleost bycatch

Species	Spatial overlap	Catchability	Risk of mortality
Suprabenthic teleosts eg terakihi	High	Medium	Species dependant low to high
Octopus	High	Medium	Low
Mitigation			
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			

10.2 Elasmobranch bycatch

Some elasmobranch bycatch has been observed. Any elasmobranch that is attracted to bait and will enter a trap could be caught. Species that have been observed and caught in other gear in the area include blue sharks (*Prionace glauca*) and scyliorhinid catsharks. Elasmobranchs are required to be released from all Cook Island vessels, and the vessel is provided with safe release guidelines.

Cook Islands Hapuka Fishery Risk Summary Table - Elasmobranchs

Species	Spatial overlap	Catchability	Risk of mortality
Pelagic sharks eg blue skarks	High	Low	Low
Benthic skarks eg scyliorhinid catsharks	High	Low	Low
Mitigation			
All Cook Island vessels are required to release elasmobranchs that are inadvertantly caught in the fishing gear. Given the shallow nature of the gear post-release survival is predicted to be high. Release guidelines provided to ensure survival.			
Risk if released			
Pelagic sharks - low			
Benthic sharks - low			

10.3 Seabirds

The area where this fishery occurs is in the mid-latitudes and in lower latitudes than one would expect

to regularly encounter most albatross species, but they are seen in the cooler moths. Other seabirds like petrels and shearwaters overlap with this fishery. Observers have noted and recorded all the birds observed during setting and hauling operations of the related lobster fishery. Flesh footed shearwater have been observed, at times, sitting in the water behind the vessel as has one albatross. However, very few have been observed around the vessel. The observers have reported "*Apart from the shearwater feeding of small bait pieces washed off from the bait jars, no other bird interaction with the vessel or fishing gear was observed*."

In addition, offal is macerated before being dumped. No dumping of offal is 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. Overall birds tend not to get entangled in traps.

Cook Islands Hapuka Fishery Risk Summary Table - Seabirds

Species	Spatial overlap	Catchability	Risk of mortality
Albatross	Medium	Low	Low
Cormerants	Low	Low	Low
Penguins	Low	Low	Low
Petrels, prions and shearwaters	Medium-high	Low	Low
Mitigation			
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.			
Risk after mitigation			
Albatross - low			
Cormerants - low			
Penguins - low			
Petrels, prions and shearwaters - low			

10.4 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 are capable of entering the traps, but unintended entanglement of baleen whales with the floatline is a rare possibility.

Given the rare nature of encounters no physical mitigation is planned, however if pods of whales approach the vessel traps will not be deployed 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			
If pods of dolphins or whales approach the vessel droplines will not deploy traps until they have moved out of sight of the vessel.			
Risk after mitigation			
Whales - Low			
Dolphins - Low			
Seals, sealions and elephant seals - Low			
Turtles - Low			

10.5 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 floatline and from the traps landing on the seabed. Compared to other gear, such as trawl the potential impact from this gear is very small and VME encounters are not common (Brouwer et al. 2020).

The anchors and traps, while heavy and could cause damage to anything they land on, but have a very small footprint and the lines float above the substrate. In order to further reduce the impact, the Cook Islands. If VME indicator taxa are found attached to the traps 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 traps to quantify the benthic impact. In addition, known VME areas, such as the Kopernick valley are closed to dropline fishing.

Analyses have shown that there is minimal impact on the sea floor, as the likely total bottom contact on these areas is estimated to be <1% of the total assessed target area. In addition, as far as possible the vessel is required to keep line sets on low profile ground where the likelihood of encountering a VME is reduced. If the vessel encounters VME indicator species in volumes of more than 1% of the total weight of the target species landed by line, they will move-on to the next fishing site.

Cook Islands Hapuka Fishery Risk Summary Table - VME

Species	Spatial overlap	Catchability	Risk of mortality
VME indocator taxa	Unknown	Low but damage under anchor high	Medium
Mitigation			
Very limited impact footprint, due to the small area of the gear that touches the bottom. Closure of high VME encounter areas such as the Kopernick valley. Post trip review of encounter rates and camera footage and updating of high VME encounter areas. The VME indicator taxa threshold is 1% of the target species by line and if reached the vessel is required to move on to the next site.			
Risk after mitigation			
VME indiocator 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 and octopus bycatch is expected but live release of these species is possible.

10 Proposals for the year

This FOP includes a number of management options for the lobster and crab fisheries including the Total Allowable Catch (TAC), species specific TAC, feature specific TAC, size limits, trap mesh size rules and closed seasons. Corals and rhodoliths are indicators of VME their occurrence was noted by the vessel and the positions recorded on charts. Additional work is still needed to assess the camera footage of sets to assess the benthos. In the interim, areas with indicator species for VMEs will be avoided in the future fishing operations. Initial indications are that the corals appear to be more abundant on the seamount slope and if this trend persists, fishing operations could be restricted flat surface of the seamounts in the future.

To ensure precautionary and appropriate management measures are in place, the Cook Islands have adjusted and expanded future fishing operations to include:

1. Collection of morphometric information from *Jasus sp.* Including:
    - Carapace length;
    - Tail width;
    - Whole weight; and
    - Tail weight.
2. Continue the collection of morphometric information from *Chaceon sp.* Including:
    - Carapace width;
    - Tail width;
    - Whole weight;
    - Processed weight; and
    - Half crab weight.
3. Tag lobsters in pre-malt condition to assess the growth rate and population size estimates;
4. Periodically collect still camera footage of the benthos or when evidence of very high CPUE, gear damage, anomalous substrate, or sensitive bycatch areas are observed on sets to assess the benthic environment;
5. Use small mesh nets on a sub-sample (5-10%) of the sample traps to collect biological information on smaller subset of the lobsters and crabs;

6. In areas where catch rates are very low the observer should attempt to collect biological samples from each trap;

7. A 40% CPUE limit reference point[2] on Kopernik would equate to a CPUE of about 3.9Kg/trap lift;

8. An effort limit of 200 pots per line when targeting Chaceon crabs (when fishing below 300m), given the data poor nature of the fishery and to diversify targeting of species within the fishery.

11 References

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[2] Typically, a limit reference point such as B(lim) would aim for 20% of unexploited biomass. A more precautionary approach would raise that level to, for example 20-50%.

A Appendix

Figure A.1: Standard Type & Configuration to be used in the Exploratory Fishing Operations

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 database titled SPFRMO_Lobster_V8_blank (Access file). 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: NO DATA THAT IS NOT RECORDED BY THE OBSERVERS MAY BE ENTERED INTO SPRFMO DATABASE.

For reference, Observers must also read the Cook Islands Fisheries Operational Plan (SC8/DW-01)

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

Table B.1: Observer Sampling Procedure contd

Database Page Trip Details	Cruise Report Section 1) Trip Summary and 2)Cruise Details and 4)Catch Details
• Vessel details • Trip Summary • Retained or landed catch (number and weight) per target species Note: please use the line form to record this information on hard copies	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). Cruise Details must include; sail/dock dates and ports etc. Insert a table of the landed catch (total number and weights summed for the trip) under the Catch Details heading
Set and Haul	3) Fishing Operations
• Positional • Trap details (type, spacing, number, sampled) • Total catch per target species per trap • Bycatch species of concern (Y/N) • Environmental observations • Gear information (including Lost traps) • Problems	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. 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. Relationship between catch composition (and catch rate) and depth at which a trap is set: We need the approximate depth of at least some of the traps that you sample. There are 3 depth soundings made per line (start, mid and end). Would it be possible to sample traps at these points, so that we will have the numbers / size / species comp. per trap as well as the depth for that trap? If you work it into your normal sampling schedule, you may be able to do this without increasing the total number of traps that you sample per line?
Trap Tally	4) Catch Details

Please receive this information from the vessel. The Cook Island observer should collect and capture these data; • Record weight per target/non target species in kilograms per trap • Bycatch weight is recorded for all "other" bycatch species summed together per trap • Record whether the trap was Missing, Damaged or Not damaged	Approx. 1000 traps will be set per day on five lines of 200 traps per line, or only 100 traps per line when fishing smaller seamounts. Catch of each trap will be sorted (by the crew and Cook Island observer) into target species *(Jasus, Projasus and Chaceon)* and bycatch. Each of the target species will be weighed per species. All bycatch will be "lumped" together and weighed.
Sampling	9) Biological Data Summary
1. For each 10th trap (starting at number 1) measure the first 40 lobsters/crabs but if there are less than 40 in the trap, measure all of them; 2. Weigh the 40 lobsters/crabs (i.e. sample weight per species). You will have the total weight of all lobsters/crabs caught by the trap from the Trap Tally data; and also the weight of the subsample of 40 lobsters. Therefore, individual lobsters are NOT weighed during the size composition sampling; 3. Once you reach a minimum of 200 lobsters on a line (i.e. 5 traps of 40; or 20 traps of 10 lobsters, if this is all that was caught) then you can stop measuring on that line; 4. For lobsters (Jasus and Projasus) and crab (Chaceon) record;	The international observer (i.e. CapMarine Observer) is required to sample 10% of the traps per line i.e. sample every 10th trap that comes up, which equates to 20 traps per line of 200 traps. Please measure length to the nearest mm and total sample weights kg using a motion compensated scale. All traps hauled will also be recorded by the deck camera for by-catch and other potential issues to be assessed. Provide a brief description of any sub-sampling tasks undertaken during the cruise. List all the types of samples collected and the location where they are to be stored. Describe the design, sampling strategy and outcomes when using traps with smaller mesh size.

- Trap number;
- Species , Sample weight (per sp. per trap);
- Measure type, Lobster length = CL (mm); crab length = CW (mm);
- sex & berry stage = F1 – F4, BF - Female with berry, FM – female mature, I – female immature, M – Male, NF – no female maturity defined;
- shell condition = 1-3;
- sex – automatically updated;
- berry – automatically updated;
- Retained Sample No = If samples are retained i.e. bagged and tagged, please record the serial number for the species on the database as well as on the label in the bag. This also includes blood or tissue samples taken;
- Please take photos of unknown species and label them with the Retained Sample No.

Note, orange highlight on the database means that you must re-check that you have captured the data correctly. Please also collect five samples of each lobster Jasus sp., Projasus sp. and Chaceon sp. crab per seamount, which will be bagged on a species by species basis and landed at the end of each voyage. The sample bags containing the crustaceans will be identified by the vessel name, common name and scientific name (if known) of the crustaceans, approximate weight of the total samples and details of a contact person. Additionally, any interesting species caught as bycatch and unable to be identified at sea by the observers will be bagged and preserved along with details mentioned above.

Collect genetic samples: 5 Jasus, 5 Projasus, 5 Chaceon please. Best is to break of a leg with some muscle tissue inside, and then cut it in half to make sure the ethanol gets through the shell to the tissue. Fill the tube to the top with the ethanol and store it in the freezer. Please fill the ethanol up from time to time – it gets sucked into the tissue and can also evaporate. Introducing small-mesh traps: • For now, the standard mesh size is retained and sampled in the same way as on trip 1, but it would be useful to introduce some small-mesh traps as well, to assess the relative abundance of smaller lobsters and crabs. • Sample a total of 5 small-mesh traps, which are fitted to the line, exactly in the same way as the normal traps. • Each time the line is hauled, the observer should sample these 5 traps, along with the standard mesh-traps. • For example, if the line consists of 100 traps, then the catches would be measured for 5 small-mesh traps and 5 standard mesh traps (10% sampling). If 200 traps, then measure the 5 small-mesh traps and 15 standard mesh traps. etc. In this way our normal sampling regime is maintained, while we add the test with small-mesh traps.	
Bycatch	5)Biological Data Summary
For every trap sampled i.e. every 10th trap record: • Species code for all the invertebrate (particularly VMEs) and vertebrate bycatch species in the trap; • LiveDead = alive, dead or unknown; • Location = inside the trap, outside the trap or on the line; • Retained (Y/N); • Condition = broken or whole , Number, Weight (kg); • Comment; • BioSampleNumber = bycatch serial number; Please retain unknown species for ashore identification. The serial number must correspond to the label in the sample bag.	Provide information about the bycatch sampling and include a summary of the state, location on the trap/line and condition of the species caught. Please report on any interactions with seabirds, turtles and marine mammals. Describe any bycatch mitigation devices used by the vessel and comment of their effectiveness. Insert table of all retained samples with reference to the Biological Sample number.
Length - Weight (conversion factors)	9)Biological Data Summary

Length-weight data for Jasus caveorum. You need to measure CL, Total length (TL), whole weight (WW) and tail weight (TW). Maybe just do a few per line. Tail weight should be from tails removed by the factory in the normal way, not cut off. In the end (after the trip) it would be good to have a nice broad size range covered (50 – 170 mm CL) and equal numbers of males and females (50 – 100 of each sex), if possible. 1. Measure a max of 200 individuals per retained species across the size distribution for the entire trip. 2. For each size class (<40mm, 40-49, 50-59, 60-69, 70-79, 80-89, 90-99, 100-109, 110-119, 120-130, >130 mm) measure a minimum of 5 males and 5 females and record; • Sex (M/F) • Measurement type (CL or CW) • Length (mm) after processing, Total Length (mm) • Whole weight (kg), Processed weight (kg) There may not be many species in the smaller and larger length categories but even 1 individual will be useful.	Provide a summary of conversion factors used by the vessel and your calculated values for the appropriate areas. Provide a description of how the conversion factors were calculated in the comments section A length-weight regression equation can also be derived from these data.