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SC7-Obs03

Exploratory lobster trap fishing: Stock assessment and Impacts of fishing on *Jasus caveoruum*

High Seas Fishing Group

7th Meeting of the Scientific Committee

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Cook Islands exploratory lobster trap fishing in the SPRFMO

Preliminary Analyses : Stock Assessment and Impacts of Fishing on the target species *Jasus caveorum* based on information from two exploratory trips conducted on the FV Altar 6 from March – July 2019

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Fishing conducted under the flag of the Cook Islands and the mandate of the

Ministry of Marine Resources

Government of the Cook Islands

Contents

Executive summary

This paper should be read in conjunction with SC7-DW02 (Cook Islands exploratory lobster trap fishing in the SPRMO – Trips 1 and 2) and provides supporting information on the biology and stock structure of rock lobster *Jasus caveorum.*

An analysis of the changes in catch, catch rates and size composition of *Jasus caveorum* was undertaken using the data gathered from Trips 1 and 2 of the exploratory lobster trap fishing. This analysis showed that lobsters were found in commercial quantities on Kopernic seamount while another seven seamounts, which were all in deeper waters, yielded negligible quantities of lobster but modest quantities of crab (*Chaceon* spp).

Average catch rates of lobster on Kopernic seamount during Trip 1 were 11.0Kg/trap lift for 1-day soak times and 9.3Kg/trap lift for 2-day soak times. During Trip 2, catch rates were 8.65Kg/trap lift for 1-day soak times and 7.07 Kg/trap lift for 2-day soak times.

Overall catch rates on Kopernic seamount at the beginning of Trip 2 increased from those recorded at the end of Trip 1 to 9.24 Kg/trap lift in week 1 and 10.46 Kg/trap lift in week 2. Both of these catch rates were above those seen during the last 2 weeks of Trip 1. The catch rate however then decreased during the last week of trip 2 to 6.86 Kg/trap lift.

The reason for these changes in catch rate was an influx of large male rock lobsters into the exploitable stock on Kopernic seamount that was fished. Average size of males during the first week of Trip 2 was 137.3mm CL compared with 117.6mm at the end of Trip 1 whereas the average size of females was 102.5 and 100.0 respectively. During the remainder of Trip 2, these average sizes of both sexes remained steady with only a slight decrease during the last week.

It is considered highly probable that the increase in numbers and size of male rock lobsters is a result of immigration into the fished area of the Kopernic seamount, although a change in catchability for these large male lobsters cannot be ruled out. This may infer that the population on the fished areas of Kopernic is not a 'closed' population but is receiving replenishment/recruitment from outside of the currently fished area. The identification of the source of this replenishment/recruitment is an important issue to be resolved to inform future management measures for the fishery.

The first two trips of experimental fishing have demonstrated that, for each trip, fishing reduced the calculated numbers of lobsters during each trip with these calculated values being in broad agreement with observed changes in catch rates. During the five weeks of Trip 1 (April/May 2019), 7489 trap lifts on Kopernic seamount resulted in a reduction in relative numbers of lobsters by 24.5%. Numbers then recovered, probably as a result of an influx of large male lobsters between Trip 1 and 2 (June/July 2019) before fishing resumed in June 2019. During the 3 weeks of Trip 2, 4532 trap lifts then resulted in another reduction in relative numbers, this time by 13.0%. Overall, lobster abundance was 3.7% higher at the end of Trip 2 compared with the abundance at the end of Trip 1. The decrease in abundance during Trip 2 was therefore more than offset by the increase in abundance between Trips 1 and 2.

During the two periods of fishing and based on calculated changes in abundance, there has been an estimated 21.7% decline in abundance since exploratory fishing began in April 2019 to the end of Trip 2 in July 2019.

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No further update on the initial estimate of the virgin biomass was made following Trip 2, with this estimate remaining at 1720t. Between the start of the exploratory fishing activities in April 2019 and the end of Trip 2 in July, a total of 115,257 Kg has been taken from Kopernic seamount. This represents 6.7% of the estimated virgin biomass.

The estimated impacts of fishing have therefore been modest, particularly for a previously unfished stock which is expected to initially have a large proportion of larger and older animals. Therefore, it appears that there is no evidence for concern regarding the current status of the stock.

1. Objective of the paper

To provide a preliminary assessment of exploratory fishing using traps for the spiny lobster *Jasus caveorum based* on the information collected from the first two fishing trips undertaken by the *FV Altar 6* between from March- July 2019 to the Foundation Seamount area (Figure 1).

2. Data Availability

Data on catches of *Jasus caveorum*, as well as all other species taken during Trip 1 (5th April – 6th May 2019) and Trip 2 (27th May – 12th July 2019) of experimental fishing for deep-water lobster in the southern Pacific Ocean was recorded by on-board observers, together with detailed data, by trap and haul of fishing effort, by-catch and environmental variables. Sampling of the total catch of approximately every 10th trap was also undertaken and sizes, sex, maturity state and other biological variables were recorded. These data were entered into a comprehensive MS Access Database and supplied in raw data form for the following analyses. The data was also included in a detailed Cruise Report.

3. Gear Selectivity

Based on the size frequency of all lobster taken during Trip 2 and their backward projection to re-construct full size distribution of the population, the size of first capture (sexes combined) was calculated to be 85.5mm carapace length. Further analysis, including analysing the results of sub-samples of traps covered in small-mesh nets, will be used in future analysis to refine this parameter.

4. Fishing Effort, Catches, Catch Rates and Trends

4.1 Catches and their distribution during Trips 1 and 2

During Trip 1, hauling of 7,515 traps on the Kopernic seamount (the only seamount that yielded consistent catches of lobster) resulted in a total catch of *J. caveorum* of 76,148 Kg at an average overall catch rate of 10.13 Kg/trap haul.

During Trip 2, 60 hauls of trap lines were undertaken which resulted in a catch of 39,109 Kg of lobster (*J. caveorum*) being taken from a total of 4959[1] traps lifted. In addition, 403 Kg of deep-water crab (*Chaceon* sp) were taken.

Three seamounts were subject to trap fishing during trip 2 (being Kopernic, Darwin A and Jenner), bringing to eight the number of seamounts fished during the first two trips. The majority of fishing activity was on Kopernic seamount (4532 trap lifts of 1- or 2-day soak times or 90% of the total fishing effort) since the other two seamounts were in deeper water where few, if any lobster were found although some moderate catches of deep-water crabs were taken.

The average depth[2] on Kopernic seamount where fishing took place was 196 metres whereas the other two seamounts were in deeper waters, with fishing being undertaken in average depths of 428

[1] 5053 traps were set on the three seamounts and 4959 lifted. The remaining 94 were lost

[2] Average depths for fishing activities were calculated from the arithmetic mean of 6 depth recordings taken during each set and hauling of pot lines, being at the start, midpoint and end of setting the line and the start, midpoint and end of hauling the line

metres (Jenner) and 339 metres (Darwin A) (Figure 1). Preliminary data from the first two trips suggest that lobsters are mainly found in depths between 150 and 250 metres, whereas *Chaceon* crabs are found in waters deeper than 250 metres.

As in Trip 1, the catch during Trip 2 was dominated by males with 66.0% of the total catch being males and 34.0% being females. This compares with Trip 1 where 62.5% of the catch were male and 37.5% female. The proportion of males captured during Trip 2 therefore increased by 3.5% compared with Trip 1.

An analysis of the catches and catch rates of *J. caveorum* from all trap sets for all fished seamounts was carried out using the Access Database supplied by CapMarine. The raw data on catch rates were used (i.e. no attempt was made to standardise the catch rates for environmental or biological variables).

4.2 Catch rates and trends in mean size

Following on from the analysis done for Trip 1 regarding the effect of trap 'soak time' on catch rates, it was recommended that, where possible, long soak times be avoided and the number of days between setting and hauling traps be restricted to 1 or 2.

During Trip 2, this recommendation was acted upon with 98% of trap pulls being done within 2 days of trap setting and 87% within 1 day.

Therefore, all analysis of catches, fishing effort and CPUE was based on 1- and 2-day soak times only. This resulted in a total of 4532 trap lifts on Kopernic seamount being considered from a total of 4939 trap lifts.

Average catch rates (on Kopernic seamount only because there were too few catches of *Jasus* on the other, deeper, seamounts) were 8.65Kg/trap lift for 1-day soak times and 7.07 Kg/trap lift for 2-day soak times.

Overall catch rates on Kopernic seamount, shown in Figure 1, increased from those recorded at the end of Trip 1 to 9.24 Kg/trap lift in week 1 (week ending 16th June 2019) of Trip 2 and further increased to 10.46 Kg/trap lift in week 2. Both of these catch rates were above those seen during the last 2 weeks of Trip 1 of 8.21 and 7.2 Kg/trap lift. The catch rate however then decreased during the last week of trip 2 to 6.86 Kg/trap lift.

The reason for these changes in catch rate appears to be the influx of large male rock lobsters into the areas of Kopernic seamount that were fished.

Table 1 shows the average size by week for males and females during Trip 2, based on samples of all lobsters taken from every ten traps, with the mean size of both males and females being relatively consistent during the 3 weeks of Trip 2 with only a slight decrease during the last week.

Comparing these sizes with the sampling data from Trip 1 (Table 2), the increase in the average size of male lobsters can be seen while the average size of female lobsters has not changed significantly between the two trips.

4.3 Changes in numbers of *J. caveorum*

Sampling data collected from counting and measuring the entire contents of each tenth trap have been used to directly calculate catch rates in numbers as well mean lengths by sex for each week of Trips 1 and 2. These mean lengths have then been converted to mean weights using the length-weight relationship from other similar *Jasus* species (Heydorn, 1969 Morgan, 1974a) of $W=0.0006518*L^{2.9801}$, where L=carapace length in mm, W=weight in grams. The catch rate in numbers (from the sampling data) and the catch rate by weight (from all traps) have also been calculated for each week of fishing during Trip 1 and 2 and are shown in Table 3 and Figure 3.

The analysis shows that the mean weight of captured lobsters has increased noticeably between Trip 1 and Trip 2. In addition, it is apparent that there have been different trends in CPUE measures by weight and numbers.

While CPUE in weight increased in the time period between the end of trip 1 and the beginning of trip 2, the changes in CPUE by numbers showed an even larger increase. The overall increase in CPUE by weight during this period can therefore be attributed to both an increase in numbers of lobsters and an increase in mean size (and weight) for males.

In the last two weeks of Trip 1, CPUE in both weight and numbers fell, with the decrease in CPUE by weight also being influenced by a decrease in mean weight of captured lobsters. However, as large males moved into the area at the beginning of Trip 2, CPUE in weight increased to reflect the larger average sizes of males with CPUE in numbers also rising significantly by week 2.

However, by the end of week 3, both CPUE in numbers and also in weight had declined, again presumably as a result of fishing.

The data also showed different trends for males and females in catch rates by numbers (Figure 4). Again, the low catch rates at the beginning of Trip 1 are evident for both sexes, a probable consequence of the vessel and crew not yet having the experience to locate the better fishing areas and to use the gear effectively. An increase in CPUE for both sexes then follows by week 2, followed by a steady decline in the numbers of both sexes for the remainder of Trip 1.

By the beginning of Trip 2, the catch rate (in numbers) of males had increased substantially while the catch rate of females remained at about the same level as it was at the end of Trip 1. The increase in abundance of males coincided with their increase in average size at the beginning of Trip 2 and led to an increase in catch rates by weight (Figure 2) by the second week of Trip 2. By the end of Trip 2, catch rates for both sexes had declined with male catch rates ending higher than they were at the end of Trip 1 and female catch rates being approximately the same.

5. Changes in relative abundance during Trip 2 and comparisons with Trip 1

Two approaches were used to both measure the change in abundance during trip 2 and to attempt to explain the reasons for the observed changes, particularly changes since Trip 1. These approaches were:

a) Examining the changes in catch rate (a simple measure of stock density) over time for the duration of the trip and comparing this with similar data from Trip 1. This analysis is provided in Table 3 and Figures 3 and 4.

b) Using estimates of fishing effort and natural mortality to estimate the changes in numbers of lobsters present on the Kopernic fishing grounds during Trip 2 and comparing this with Trip 1.

Changes in these various measures of lobster abundance on the Kopernic seamount during Trip 2 will be influenced by a number of factors including (a) the increasing experience of the crew in locating and fishing previously unknown productive fishing grounds – this includes relying more on short soak times for traps and also avoiding deeper areas where lobsters seem to be less abundant; (b) natural rate of change in abundance of lobsters due to mortality (natural mortality) (c) the fishing effort (number of traps and their design) used in catching lobsters and the mortality (fishing mortality) that this imposes on the lobster stock (d) changes in abundance due to movements into and out of the fished area and (e) changes in the vulnerability of the lobsters to capture (catchability) as a result of environmental and biological factors such as moulting, temperature etc.

5.1 Changes in catch rate over time

Changes in CPUE in both numbers and weight during each week of Trip 1 and Trip 2 are shown in Table 3 and Figures 3 and 4 where it is shown that an influx of large male lobsters during week 1 and 2 of Trip 2 resulted in an increase in numbers and average size of captured lobsters. This also resulted in the weekly CPUE in both weight and numbers by week 2 of Trip 2 increasing. Subsequently, however, both CPUE in numbers and in weight then declined by week 3.

This 'influx' of large males, both in numbers and average weight, during Trip 2 can be a result of (a) large male lobsters, that were previously not entering traps (perhaps because of moulting) becoming available to, and entering the traps or (b) a migration of large lobsters into the fished area, perhaps for mating.

If the latter, (which is considered highly probable) this infers that the population on the fished areas of the Kopernic seamount is not a 'closed' population but is receiving replenishment/recruitment from outside of the currently fished area. The identification of the source of this replenishment/recruitment is an important issue to be resolved to ensure appropriate management of the resource.

6.2 Changes in estimated numbers of *J. caveorum*

The numbers of lobsters can decrease over time due to both natural mortality and fishing mortality although numbers can also increase as a result of recruitment to the fishable stock, immigration etc.

Although CPUE data (above) can provide an indirect estimate[3] of changes in the number of lobsters over time, a more direct measure can be made using the population parameters of the stock. Some of these population parameters are being collected as part of the current exploratory fishing. In the meantime, and until these become available, data from other, similar species can be used.

[3] Influenced by changes in catchability as a result of biological (moult stage, sex, maturity stage, size etc) and environmental (water temperature, moon phase, wind/currents etc) factors

Therefore, using a natural mortality rate from Frusher & Hoenig (2001) for *Jasus edwardsii* of 0.02 per year (or 0.000385 per week), estimates of average catchability[4] of 1.83×10^{-5} (Ziegler et al, 2003) and the number of traps hauled each week (i.e. the fishing effort), the relative changes in abundance in numbers for the 3 weeks of Trip 2 can be calculated and compared with similar results from Trip 1.

However, a critical assumption in such an analysis is that there has been no recruitment to the stock through either growth or migration between Trip 1 and Trip 2. In this case, there has clearly been an immigration of large males to the population, presumably for mating.

To take this immigration into account, the catch rates in numbers during week 1 of Trip 2 (i.e. 7.91 lobsters/trap lift, Table 3) has been re-calibrated by (a) reference back to the catch rate in numbers at the end of Trip 1 (10.12 lobsters/trap lift) and (b) by calculating the expected decline in numbers from the end of trip 1 to the beginning of Trip 2 as a result of natural mortality (there being no fishing mortality during this period). The difference between the expected calculated numbers per trap lift at the beginning of Trip 2 and the actual numbers therefore provides a measure of the relative recruitment to the population during this time.

This approach indicates that the catch rate in numbers per trap lift during week 1 of trip 2 was about 24% higher than expected if there had been no 'recruitment'. Therefore, by inference, recruitment had added about 24% more animals to the fishable stock between Trips 1 and 2.

Once Trip 2 fishing had commenced, fishing mortality reduced numbers and the estimated relative abundance of lobsters began to decline through weeks 2 and 3.

However, importantly, the increase in abundance due to recruitment of large males between Trips 1 and 2 (and probably continuing during Trip 2) more than offset the decrease in abundance due to fishing during Trip 2.

As a result, the estimated abundance (in numbers) of *J. caveorum* at the end of Trip 2 was approximately 3.7% higher than the estimated abundance at the end of Trip 1.

The results of such an analysis are shown in Figure 5, together with the catch rates for the same period.

7. Fishery and Management Implications

The first two trips of experimental fishing have demonstrated that, for each trip, fishing reduced the calculated numbers of lobsters during each trip with these calculated values being in broad agreement with observed changes in catch rates[5] (see Figure 4).

During the five weeks of Trip 1 (April/May 2019), 7489 trap lifts on Kopernic seamount resulted in a reduction in relative numbers of lobsters by 24.5%. Numbers then recovered, as a result of an influx of large male lobsters between Trip 1 and 2 (June/July 2019) before experimental fishing resumed in June 2019.

[4] i.e. the factor, q, that relates fishing effort, f (number of traps pulled) with instantaneous fishing mortality, F, through the relationship F=qf.

[5] Apart from the first week of Trip 1 where the vessel and crew were learning how and where to best fish for lobsters.

During the 3 weeks of Trip 2, 4532 trap lifts then resulted in another reduction in relative numbers, this time by 13.0%.

These two periods of fishing therefore provided, not unexpectedly[6], very similar reduction rates in numbers per 1000 trap lifts of 3.2%/1000 trap lifts for Trip 1 and 2.9%/1000 trap lifts for Trip 2, an average of 3.05%.

This information could be used, in conjunction with other biological information such as recruitment timing, to estimate the maximum fishing effort (or catch, which can be determined based on expected catch rates) in a specific time period that would result in a pre-determined level of stock reduction.

For example, if a 20% reduction in stock abundance in a specific time period was considered acceptable, then that result could be achieved by not allowing the total number of trap lifts on Kopernic during the period to exceed 6550 (i.e. 0.2/0.0305). During the egg-bearing season, a much lower reduction would probably be acceptable (even zero) and the calculation could be applied again to determine the number of pot lifts (or level of catch) permitted.

Clearly, as additional data is gathered, the precision of this relationship between fishing effort and percentage reduction of the stock during any time period can be improved.

8. Biomass Estimation

In the scientific report (stock assessment) of Trip 1, estimates of initial standing biomass of *J. caveorum* were made. These estimates used the results of experimentation by Watson et al (2009) on American lobsters (*Homarus americanus*) which showed that a baited trap had an influence on lobsters at distances up to 11 metres or an area around the trap of approximately 382 m^2. This figure is similar to the area of bait influence calculated by Evans & Evans (1996), Yamane & Itaka (1987) and by Morgan(1974b) for *Panulirus* species.

Using this figure as an approximation, the total area influenced by the trapping on Kopernic seamount during trip 1 was estimated to be 2,918,480 m^2. This area was compared with the results of detailed mapping which showed that the area of Kopernic seamount available for fishing was approximately 66.03 Km^2 or 66,030,000 m^2. The total area influenced by trapping was therefore 4.42% of this area fished, from which 76.1t of lobsters were taken.

Based on this, it was estimated that the total exploitable biomass of *J. caveorum* on the area fished was approximately 1,720 t, at a density of around 2.60 Kg of lobsters per 100 square metres.

However, this calculation was subject to a number of key assumptions including (a) is there is an even distribution of lobsters over the whole area of the Kopernic seamount? (b) is the area of influence of the pot similar to that found for *H. americanus*? (c) how do seasonality factors of recruitment impact standing biomass? and (d) what is the extent of catchability changes as a result of environmental and biological factors (e.g. see Wilberg et al, 2010)?

[6] Not unexpected because the number of trap lifts per week were used to calculate fishing mortality (F), a component in calculating relative numbers. Therefore, the measure of relative numbers and fishing effort are not entirely independent.

These assumptions need to be further tested on future trips, particularly the issue related to seasonal recruitment.

As a result, it is therefore not possible to update the current estimate of biomass on Kopernic seamount of approximately 1720 t.

In summary, the results of the analysis of data from Trip 2, including comparisons with data from Trip 1, have shown:

a. During Trip 2, 60 hauls of trap lines were undertaken which resulted in a catch of 39,109 Kg of lobster (*J. caveorum*) being taken from a total of 4959 trap lifted.

b. The majority of fishing activity was on Kopernic seamount (4532 trap lifts or 90% of the fishing effort) since two other seamounts that were fished (Darwin A and Jenner) were in deeper water where few, if any lobster were found.

c. As a result of an analysis of the impact of soak time on catch rates made at the completion of Trip 1, 98% of trap pulls during Trip 2 were done within 2 days of trap setting and 87% within 1 day. Average catch rates on Kopernic seamount during Trip 2 were 8.65Kg/trap lift for 1-day soak times and 7.07 Kg/trap lift for 2-day soak times.

d. Overall catch rates on Kopernic seamount (there were too few catches of *Jasus* on the two other, deeper, seamounts for analysis) increased from those recorded at the end of Trip 1 to 9.24 Kg/trap lift in week 1 and 10.46 Kg/trap lift in week 2. Both of these catch rates were above those seen during the last 2 weeks of Trip 1. The catch rate however then decreased during the last week of trip 2 to 6.86 Kg/trap lift.

e. The reason for these changes in catch rate was an influx of large male rock lobsters into the areas of Kopernic seamount that were fished. Average size of males during the first week of Trip 2 was 137.3mm CL compared with 117.6mm at the end of Trip 1 whereas the average size of females was 102.5 and 100.0 respectively. During the remainder of Trip 2, these average sizes of both sexes remained steady with only a slight decrease during the last week.

f. It is considered highly probable that the increase in numbers and size of male rock lobsters is a result of immigration into the fished area of the Kopernic seamount. This infers that the population on the fished areas of Kopernic is not a 'closed' population but is receiving replenishment/recruitment from outside of the currently fished area. The identification of the source of this replenishment/recruitment is an important issue to be resolved to inform the future management arrangements of the resource.

g. Estimates of lobster abundance during Trip 1 and 2 were calculated using both weekly catch rates and population parameters. These analyses showed that lobster abundance decreased during Trip 1 by about 24-29% but then increased by 24% by the start of Trip 2, before declining again during Trip 2, presumably as a result of fishing.

h. Overall, lobster abundance was 3.7% higher at the end of Trip 2 compared with the abundance at the end of Trip 1. The decrease in abundance during Trip 2 was therefore more than offset by the increase in abundance between Trips 1 and 2.

i. No further update on the initial estimate of the virgin biomass was made following Trip 2, with this estimate remaining at 1720t.

j. Between the start of the exploratory fishing activities in April 2019 and the end of Trip 2 in July, a total of 115,257 Kg has been taken from Kopernic seamount. This represents 6.7% of the estimated virgin biomass. Based on calculated changes in abundance, there has been an estimated 21.7% decline in abundance since exploratory fishing began in April 2019 to the end of Trip 2 in July 2019.

k. The estimated impacts of fishing have therefore been modest, particularly for a previously unfished stock which is expected to initially have a large proportion of larger and older animals. Therefore, it appears that there is no evidence for concern regarding the current status of the stock

9. References

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Figures and Tables

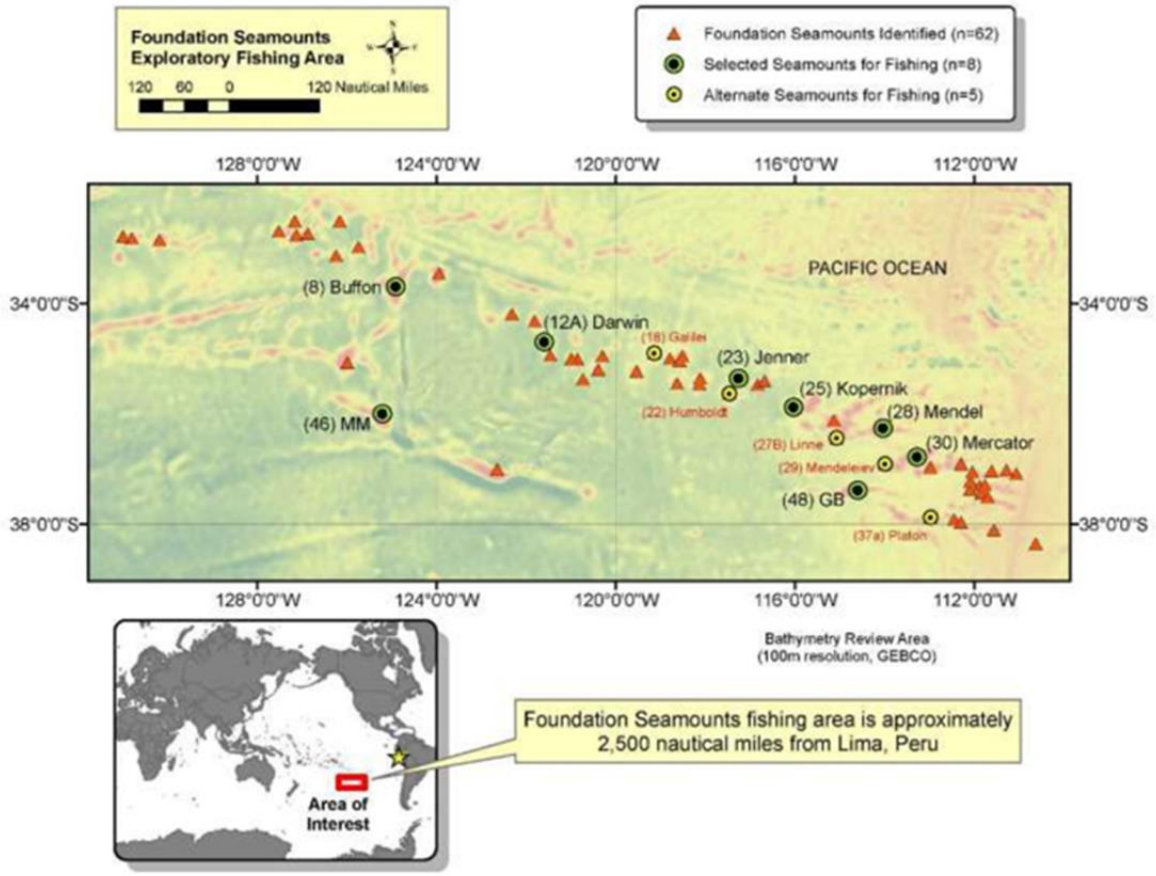

Figure 1. Location of the Foundation Seamount chain in the southern Pacific / SPRFMO area designated for exploratory trap fishing.

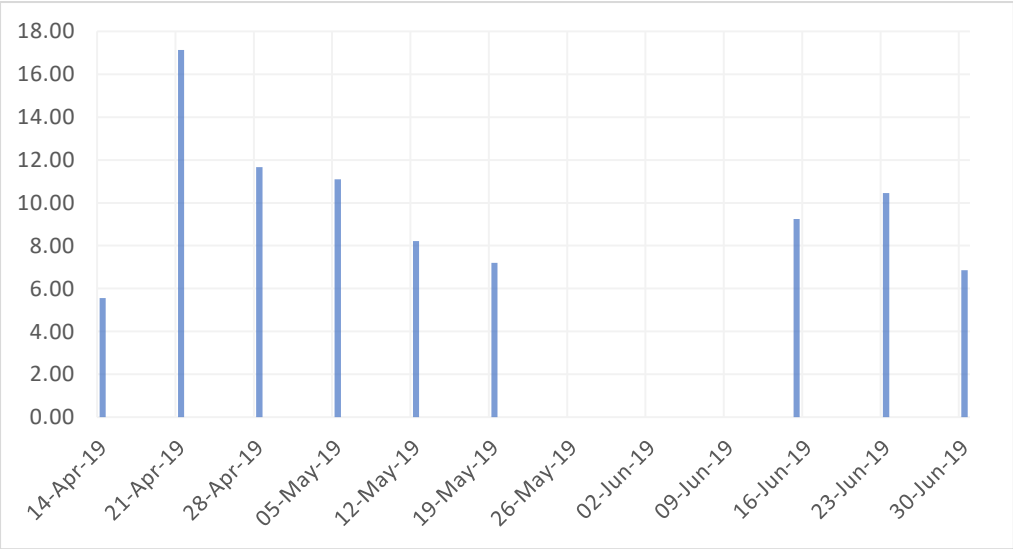

Figure 2. CPUE (Kg/trap lift sexes combined) for Trips 1 and 2

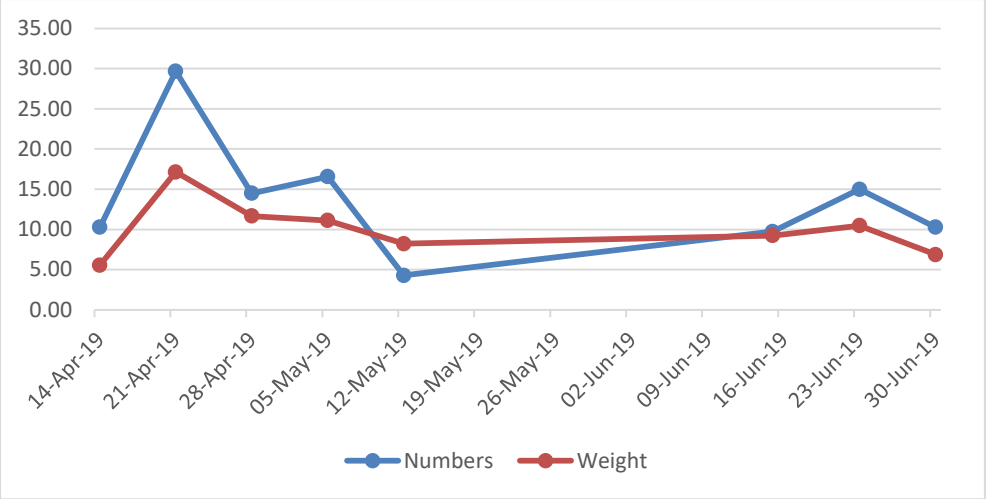

Figure 3. Change in CPUE by numbers and weight: Trips 1 and 2 – sexes combined

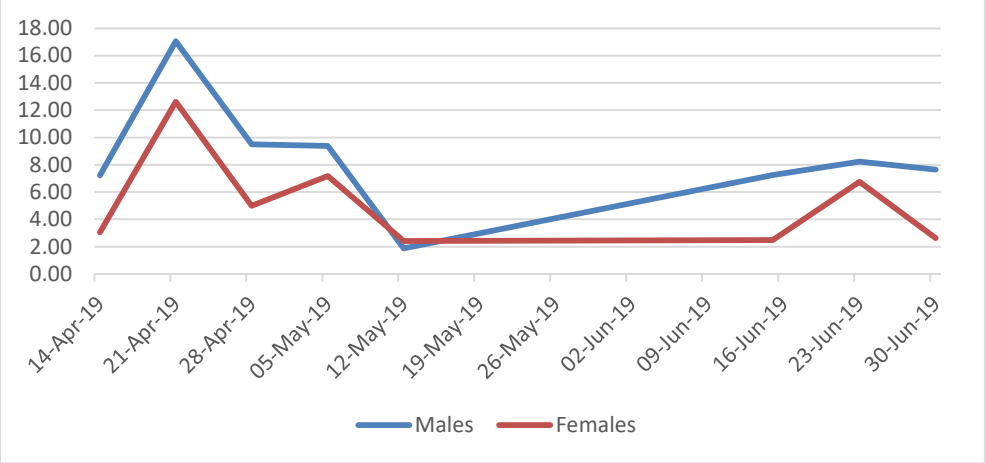

Figure 4. Catch rate (No sampled trap lift) by sex for Trips 1 and2.

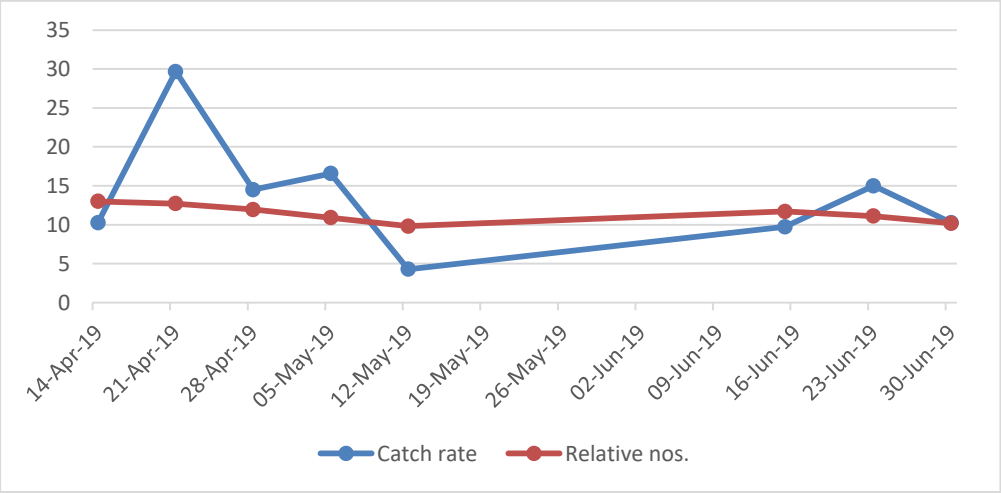

Figure 5. Changes in catch rates (in numbers) and calculated relative abundance for *J. caveorum* for Trips 1 and 2

Table 1. Changes in catch rates and mean size of *J. caveorum* during Trip 2

week	Dates (of haul)	catch rate (kg/trap haul)	Effort (trap lifts)	*Mean size (mm CL)*	
				Males	Females
1	15-Jun-19	9.24	1925	137.3	102.5
2	23-Jun-19	10.46	771	137.1	100.8
3	30-Jun-19	6.86	1836	131.1	100.0

Table 2. Changes in Mean size of *J. caveorum* by sex between Trip 1 and Trip 2

Week ending	**Mean size, mm Carapace Length (Males)**	**Mean Size, mm Carapace Length (Females)**
	Trip 1	
14-Apr-19	128.1	103.0
21-Apr-19	127.0	104.0
28-Apr-19	127.9	103.0
05-May-19	123.8	102.0
12-May-19	117.6	100.0
	Trip 2	
15-Jun-19	137.3	102.5
23-Jun-19	137.1	100.8
30-Jun-19	131.1	100.0

Table 3. Changes in CPUE of *J. caveorum* by weight and by numbers for Trips 1 and 2

Week ending	**Mean weight (sexes combined, g)**	**CPUE (weight, Kg/trap lift). For all traps**	**CPUE (numbers, Nos/trap lift). From sampling data**
	Trip 1		
14-Apr-19	991.2	5.56	10.27
21-Apr-19	982.7	17.13	29.67
28-Apr-19	988.7	11.66	14.49
05-May-19	916.3	11.10	16.57
12-May-19	811.6	8.21	4.28
	Trip 2		
15-Jun-19	1169.4	9.24	9.73
23-Jun-19	1151.6	10.46	14.99
30-Jun-19	1037.6	6.86	10.27