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Cook Islands Exploratory Fisheries for Hapuka and Lobster

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Cook Islands exploratory fisheries for hapuka and lobster

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Executive Summary

This report presents catch, effort, and biological sampling data from Trip 8 aboard the *Akanui* targeting hapuka (*Polyprion oxygeneios*) in a dropline and jig fishery and crabs in a trap fishery. This is the eighth trip conducted under the Cook Islands exploratory fishery program, but the first completed trip in the new Cook Islands exploratory dropline and jigging fishery operating under Fisheries Operation Plan CMM 14g-2024 of the South Pacific Regional Fisheries Management Organisation (SPRFMO). The trip was conducted from September to December 2025.

In the hapuka fishery, hapuka dominated the catch, comprising 97.2% of total retained weight (13,996.5 kg) and 91.7% of total fish numbers (986 fish). Total hapuka catch was within the FOP trip and seamount limits of 15 t. Dropline sets (n = 25) produced the highest CPUE at 37.44 fish/set and 536.56 kg/set, dropline-B sets (n = 3) achieved 16.33 fish/set and 193 kg/set, and a single jig set caught one hapuka (3.6 kg).

All hapuka were retained and processed as Retained Filleted (RFI), with a mean processed weight retention of approximately 33% of whole weight. Life status on capture was predominantly alive but injured (A2; 81.1%), with 16.7% of fish alive but likely to die (A3) and 2.2% in good condition (A1), indicating limited post-release survival potential for this species at these depths.

Bycatch species in the hapuka fishery included trumpeter (*Latris lineata*); spiny dogfish (*Squalus sp.*); tarakihi (*Nemadactylus macropterus*); bluenose (*Hyperoglyphe antarctica*); porae (*Nemadactylus douglasii*); and blackbelly rosefish (*Helicolenus dactylopterus*). No Vulnerable Marine Ecosystem (VME) interactions were recorded.

A total of 954 hapuka were biologically sampled, with length, weight, maturity, sex, otolith, genetic tissue, and stomach content data collected. Genetic samples were obtained from 101 fish. Stomach contents were analysed for 238 fish, with fish and cephalopods as the dominant prey items.

In the trap fishery, catch and biological sampling of *Chaceon* crabs during trip 8 indicates a stable population with no evidence of decline in size structure across the exploratory fishery to date. The majority of crabs landed were in the 12-14 cm carapace width range, with most individuals exceeding the estimated 50% maturity threshold of approximately 10cm. Reproductive data suggests a winter spawning period, supported by both berry state and shell state observations, though a sampling gap from July to October, coinciding with the lobster fishery closure, limits the completeness of seasonal biological information. Post-processing, approximately 62% of whole crab weight is retained, providing a reliable conversion factor for catch reporting and stock assessment purposes.

Fishing effort directed at crabs during trip 8 was distributed across three seamounts, with the majority of sets concentrated on Kopernik Seamount within the Foundation Seamount Chain. Catch was dominated by the target species *Chaceon* crabs, with only minor bycatch including prawns, gastropods, teleosts, and a small number of VME indicator taxa, predominantly octocorals.

Crab CPUE was low but consistent with previous trips and slightly elevated in trip 8, likely reflecting the targeted nature of this trip's fishing strategy rather than a change in population abundance. Trap fullness data indicates that saturation was not a significant

factor, and the overall consistency of CPUE across trips suggests that current fishing effort levels are not producing a detectable stock response.

1 Introduction

In 2018 the Cook Islands submitted a proposal to the South Pacific Regional Fisheries Management Organization (SPRFMO) Scientific Committee's 6^{th} meeting (SC-06), to carry out an exploratory research programme. The intent was to undertake trap fishing for the purpose of obtaining scientific information while targeting South Pacific rock lobster (*Jasus caveorum*), deep sea rock lobster (*Projasus* sp.) and golden deepsea crab (*Chaceon* sp.). This fishery has been ongoing currently under CMM 14b-2024 and was augmented by a fishery targeting hapuka (*Polyprion oxygeneios*), and a new exploratory fishery was proposed working alongside the trap fishery from the same vessel, targeting deep-water seamounts within the Foundation Seamount Chain and Northern Seamounts (Figure 1). This work aims to assess the potential for a long-term fishery in the Convention Area.

The Cook Islands Ministry of Marine Resources (MMR) has established an exploratory dropline and jigging fishery for hapuka under a Fisheries Operation Plan (FOP) approved under Conservation and Management Measure CMM 14g-2024 of the South Pacific Regional Fisheries Management Organisation (SPRFMO). The FOP adopts a precautionary and gradual approach, with a proposed total allowable catch of 500 t green weight for *P. oxygeneios* and an additional 100 t allowance for retained teleost and elasmobranch bycatch. To spread effort, no more than 25 t per year or 15 t per trip per seamount is permitted.

Hapuka are large, long-lived deepwater perciform fish distributed across the southern hemisphere, including the waters of New Zealand, Australia, and the broader South Pacific. Hapuka is a high-value commercial species associated with rocky substrates, typically caught at depths of 100–300 m, though depth distributions in South Pacific is not well characterised. Within New Zealand waters, *P. oxygeneios* attains sexual maturity at 10–23 years and has a longevity exceeding 60 years (Francis et al., 1999). Size-at-sexual maturity is approximately 85–90 cm total length (TL), though spawning grounds are not well documented and few ripe running females have been sampled (Paul, 2002). The total allowable catch (TAC) within the New Zealand EEZ is 2,182 t, with annual catches just over half that level (Fisheries New Zealand, 2023).

The objectives of the FOP are to: (1) determine the geographical range and relative stock density of the target species across the seamount chain; (2) evaluate the biology of the target species including age and size composition, size-at-maturity, spawning seasonality, and genetic connectivity; (3) assess the species and size composition of bycatch; and (4) document and evaluate potential Vulnerable Marine Ecosystem (VME) interactions.

For the trap fishery, the traps are set on a longline. The proposal was based on a precautionary ecosystems approach mandated by the SPRFMO. The proposal complies with the application requirements of SPRFMO Conservation and Management Measure (CMM) 13-2016 and CMM 03-2018 and SPRFMO's Bottom Fishery Impact Assessment Standard (BFIAS). This exploration has resulted in a number of analyses being undertaken and should be read in conjunction with Brouwer et al. (2019); MMR (2020); Brouwer and Wichman (2020); and Brouwer et al. (2020a).

The fishery design work is ongoing and eight trips have been conducted by a Cook Islands vessel between March 2019 and December 2025. Preliminary results from the first seven trips are presented in Brouwer et al., 2019 and Brouwer et al., 2020b with this report

focusing on trip 8.

This report presents catch composition, catch rates, and biological sampling data collected during trip 8 aboard the *Akanui* between September and December 2025.

2 Methods

2.1 Hapuka Fishing operations

Three gear types were deployed: droplines, dropline-B and jigs using jigging machines. Sets were identified by a unique set number encoding the vessel name, trip number, set type, and sequential set number.

Droplines consist of a main line with an anchor at one end and a float at the other, with individual hooks attached via 120 cm monofilament snoods clipped to the mainline, most (68%) had nylon leaders with the remaining 32% having braided leaders. Up to 10 lines were deployed simultaneously, each with a maximum of 100 hooks, with the potential to fish down to depths of 1,000 m. Sets for approximately 6 hours with lines being hauled frequently using hydraulic deck winches. Dropline fishing has minimal benthic impact, with only the sinker in contact with the seabed, and generally results in low bycatch rates. Fish are retrieved slowly and are often alive at the surface, improving survivability of released non-target species.

An alternative form of dropline (dropline-B) were also deployed during the trip on three occasions. These were three 15 minute sets. The Cook Islands is still in discussion with our observer how best to describe these sets. Given the low catch rates, it appears unlikely that this will be attempted again.

Up to 12 jigging machines (six port, six starboard) were deployed, each equipped with up to 30 hooks using lures rather than bait. The jigging machines are designed for fishing close to the seabed, with automatic seabed detection to minimise seabed contact. Only one jigging day was attempted during this trip; while the gear caught the fish, the large size of hapuka presented challenges for the hauling capacity of the machines, and the jigging setup will be reconsidered for future trips.

All retained catch was identified weighed and counted on each set. Product state was recorded for all retained fish. Catch was calculated as the total number of fish retained and total weight retained (kg) by species, and effort was number of sets by set type. All elasmobranchs were required to be released immediately upon retrieval.

Biological sampling of hapuka was undertaken by two observers appointed by MMR following the Scientific Sampling Plan detailed in the FOP. A sub-sample of *P. oxygeneios* and other species had detailed data collected from each fish. Fork length (FL, mm); total length (TL, mm); and whole weight (kg) were recorded for all sampled fish where possible. Sex, maturity state, life status on capture, retained/discarded status, otolith collection, genetic sampling, and stomach contents were recorded.

Maturity was scored on a 0–5 scale (0 = immature, 5 = spent) with U recorded for unknown. Life status on capture was recorded as: A1 (alive, good condition), A2 (alive, injured), A3 (alive but likely to die), D (dead), or U (unknown). Otoliths were removed from a random stratified sub-sample of fish for future age estimation. Genetic tissue

samples were collected for assessment of stock distribution and connectivity. Stomach fullness was estimated as a percentage (0–100%) and stomach content proportions were recorded by prey category: fish, cephalopod (squid/cuttlefish), octopus and crustaceans.

2.2 VME monitoring

Observers monitored all sets for VME indicator taxa in accordance with CMM 03-2022. If VME indicator taxa exceeded 2% of the target species weight per fishing day, the vessel was required to move on to the next planned station. Droplines were not deployed within the Kopernik valley, an area known to have elevated VME indicator taxa interactions.

2.3 Crab trap fishing

Traps were set on a longline with a maximum of 100 traps if targeting lobster and a maximum of 200 per line when targeting crabs. Traps were spaced at 25m intervals. A 75kg chain stabilizer and marked buoys were deployed at both ends of the line. Stackable top loading traps were used. The traps were 150cm diameter at the base, 75cm high and 50cm diameter at the top. The entrance to the trap was 35cm in diameter and the trap was covered with netting of 10.2cm mesh (knot to knot 5.1cm). The backbone (ground line) and float line for each string of traps was made of 26mm polypropylene rope. The traps were constructed with 'escape gaps' with 51mm diameter to allow for escapement of the small organisms. To prevent ghost fishing the trap was also fitted with a sewn in cotton string where parts of the traps' nylon mesh was cut and sewn back together with cotton string, so that if lost and not found, the cotton string will eventually degrade and the traps will remain opened. The traps were baited with ground up mackerel placed in bait jars that were attached to the inside of the trap with a snap.

A specially designed camera frame, fitted with an underwater camera that can be either deployed with or without a mesh net is available. The footage will be stored on a memory card and will be used to identify bottom structure, the benthos and potential Vulnerable Marine Ecosystem (VME) areas. This work has yet to be undertaken.

The vessel generally set lines straight after they were hauled. The soak time varied between 24 hours and 48 hours. Initially, the vessel experimented with long soak times of 48 hours and more, but later realised that shorter soak times yielded better lobster catch and tried to haul the lines within 24 hours. This was not always possible as the factory crew could not always process large catch within that time frame or when inclement weather prevented line hauling safely.

The observers were instructed to record the weights of the total *J. caveorum*, *Projasus* sp., *Chaceon* sp. and bycatch for each trap before retained species were processed. The non-retained bycatch was stored in a separate bin and discarded at the end of the line by lowering it to the sea floor in the first trap of the next line set. Some species were retained for further analysis ashore. The observer collected the contents of every tenth trap which equated to approximately 10% of the traps per line being sampled. Biological information for *J. caveorum* and *Chaceon* sp. such as; length, batch weight, sex, maturity stage and shell condition were collected. Bycatch information included length, alive/dead, location on the trap (inside or outside the trap), number and weight per species. Retained biological samples were bagged, tagged and frozen for further analysis ashore.

The crew did not always retain small *Chaceon* sp. These were placed in a crate and periodically discarded overboard on the opposite side of the hauling station, while still alive.

The data were captured directly into excel forms and a Microsoft Access database. Subsequently data were extracted from the database using the R (R Core Team, 2023) package RODBC (Ripley and Lapsley, 2022) and all analyses were performed in R.

Data were collected by the vessels and observers as part of a predetermined sampling and catch reporting strategy. For each set the vessels recorded the catch by species per set in a logsheet that included, location (start, middle and end of each set), date and time (of set and haul), setting speed, the trap type, target species, depth at start, middle and end of each set as well as recording various environmental parameters. In addition, the observer recorded the weight of catch for each trap and collected biological samples from every 10^{th} trap.

The observers were required to measure the first 40 target species (both lobsters and crabs) in every tenth trap (starting with number one). If there were less than 40 in the trap, then the observer simply measured all the individuals. The sample weight was recorded by species but not individual weight. During the size composition sampling, the total weight per trap was recorded by the national observer. Once a minimum of 200 lobsters were measured per line (i.e. 5 traps of 40; or 20 traps of 10 lobsters, if this was all that was caught) the observer stopped measuring lobsters on that line.

The observers sampled an average of 10% of the traps per line for biological information such as length, weight, sex, maturity stage and shell condition for the target species (*J. caveorum* and *Chaceon* sp.). Bycatch was sampled for species, length, weight, condition (dead/alive/broken or whole) and location caught on the trap. The observers measured and recorded the presence of eggs (berry) on both lobsters and crabs and the berry state. The vessel recorded the number of berried females returned by set. In addition, individual morphometric data were collected.

The observers noted and recorded all the birds observed during hauling and setting operations.

3 Results

3.1 Hapuka dropline and jig fishery

3.1.1 Catch composition

Fishing was attempted in both the Foundation Seamount Chain (FSC) and Northern Seamounts (NS) Table 1. Most sets were made at Kopernik Seamount and attempts were made at four seamounts in the NS area. The NS area was fished towards the end of the trip and the vessel could not re-provision fuel so the trip was shortened to allow it to return to port. Seven species were retained during Trip 8 (Table 2). Hapuka was the dominant species by both weight and number, comprising 97.2% of total retained weight (13,996.5 kg) and 91.7% of total fish retained (986 fish; Table 2). Trumpeter (*Latris lineata*) was the second most abundant species by weight (171.5 kg; 1.2%), followed by spiny dogfish (*Squalus sp.*); 137.5 kg; 1.0%). The spiny dogfish are as yet unidentified.

Photographic identification attempts were made but were inconclusive. The photographic information suggested that here are likely two species and the species from the FSC and NS areas may be different. In future trips we will attempt to collect genetics and retain some type specimens for more detailed analysis and species identification.

3.1.2 Hapuka product state

All hapuka were processed as Retained Filleted (RFI). One blackbelly rosefish was recorded as RCC. The mean retention proportion for hapuka (processed weight / whole weight) was approximately 33%, consistent with 100% filleting of retained fish.

3.1.3 Dropline and jig catch rates

Catch rates by species and set type are presented in Table 3. Drop sets had the highest effort (25 sets) and the highest hapuka CPUE at 37.44 fish/set and 536.56 kg/set. Dropline-B sets (3 sets) achieved a CPUE of 16.33 fish/set and 193 kg/set for hapuka. A single jig set retained one hapuka (3.6 kg).

The vessel tested only a few large hook types (Figure 2). Most hooks were retained with a few losses during the trip (Figure 3) and the highest catch rates were on size 13/0 C and L hook types (Figure 4).

3.1.4 Dropline and jig retained and discarded catch

All hapuka, porae, tarakihi, trumpeter, bluenose, a blue shark, blackbelly rosefish, and takahiri sampled were retained (Figure 5). Spiny dogfish had a discard rate of 23.2%.

3.1.5 Hapuka biological sampling

Hapuka condition on capture

The condition on capture for all sampled species is shown in Figure 6. For Hapuka, 81.1% of sampled fish were alive but injured (A2), 16.7% were alive but likely to die (A3), and 2.2% were alive and in good condition (A1). Most other species were predominantly A1 or A2 on capture.

Hapuka length and weight

Length frequency distributions for all sampled species are presented in Figure 7, and the hapuka length frequency is shown in Figure 8. The length by depth group data are presented for all species in Figure 9. These data show that for most species there is little variation in the length with depth except for porae where smaller fish occur in deeper water and trumpeter where larger fish occur in deeper water.

The length–weight relationship for hapuka followed a power curve $W = a \cdot L^b$, fitted using non-linear least squares, and is presented alongside the total length to fork length linear regression in Figure 10.

Hapuka sex and maturity

Maturity-at-length by sex for hapuka is presented in Figure 11. Immature fish (stages 0–1) were present across the smaller length classes, with mature stages (3–5) more prevalent

in larger fish. Stage 2 fish occur in most size classes for females and only in large size classes for males. The female stage 2 fish may be misidentified and clarification from the photographs taken by the observer will help clarify this in future. This can also occur if the fish are not spawning and mature fish have resting gonads that are difficult to distinguish from immature stages.

Hapuka genetic sampling

Genetic samples were collected from 101 fish (8.9% of sampled fish) these samples will be retained frozen in RNALater solution until a larger sample is ready for analysis.

Hapuka stomach contents

Stomachs were sampled from a subset of fish. Stomach fullness ranged from 0 to 100%; 94 stomachs were empty (0%) and 95 were full (100%), with intermediate fullness classes less frequently recorded. Stomach fullness by length bin and prey composition by length bin is presented in Figure 12. Fish were by far the dominant prey items with cephalopods and crustaceans also being recorded.

3.2 Trap fishery

3.2.1 Crab biological sampling

Crab length

In trip 8 most of the crabs landed were relatively small, mostly 12-14cm carapace width (Figure 13). Overall, during the exploratory fishery, the size of crab is not declining (Figure 14).

Crab maturity

Maturity estimates are best collected during the spawning season. The size-at-50% maturity is around 10cm (Figure 15) but at this stage no modelled estimates have been calculated it would be preferable to do this once a full year of samples have been collected. Information from the crab berry state indicate that the crabs are carrying eggs during the Austral winter (Figure 16), however, samples are not available from July to October as the lobster fishery is closed at that time and the vessel has not fished in those months.

Crab shell state

Crustacean shell state is informative as an indicator of the onset of spawning. The crab shell state is presented in Figure 17. These data, like the berry state data, are less informative due to the lack of samples from July to October.

3.2.2 Crab processing

Upon capture crabs are halved and washed with the legs and body retained. The relationship between the processed weight and whole weight is liner (Figure 18). On average 62% of the crab is retained post processing.

3.2.3 Trap catch and Effort

During trip 8 traps were set on three different seamounts two in the Foundation Seamount Chain (FSC) and one in the Northern Seamounts (NS) area. Within the FSC, 29 sets were made on Kopernik seamount and seven on Lavousier Seamount. Within the NS area one set was made on Seamount NS16.

Trap catch

The catch comprised *Chaceon* crabs with a very small amount of bycatch (Figure 19). Most of the bycatch was made up of unidentified prawns and gastropod molluscs, with a number of teleosts such as cusk-eels (Table 4). All of the prawns and most of the gastropods and teleosts were retained for crew consumption. Four of the bycatch species were VME indicator taxa, mostly octocorals.

Trap effort

Almost all traps set were targeting crabs. Crab target sets are set in deep water generally deeper than 400m with lobster targeting occurring in sets shallower than 200m on this trip (Figure 20). Trap were consistently set at 25m apart along the trap line backbone. The number of traps set on a line varied from 125-200 when targeting crabs. A few short line (5-10 traps) were set on Kopernik Seamount to collect genetic samples as well as on Seamount NS16 (Figure 21). In all traps hapuka was recorded by the vessel as the bait.

Trap CPUE

Trap fullness is recorded as of traps are 100% full their catching capacity declines. Only two traps were 100% full with almost all traps being less than 50% full (Figure 22).

Overall, the CPUE for crabs is relatively low at Kopernik Seamount (around 3kg per trap) but is a little higher at Lavousier Seamount (around 4kg per trap) (Figure 23). Lobster CPUE is higher at Kopernik Seamount (around 5kg per trap) but was very low at Seamount NS16.

Looking at the data for all trips, the CPUE for crabs throughout this exploratory fishery is relatively consistent but slightly higher in trip 8 (Figure 24). Trip 8 was specifically targeting crabs and as such the higher CPUE for this trip is not unexpected.

4 Discussion

4.1 Hapuka dropline and jig fishery

Trip 8 aboard the *Akanui* on Kopernik Seamount represents the first completed trip of the Cook Islands exploratory dropline and jigging fishery for *P. oxygeneios* under FOP CMM 14g-2024. The results confirm that Hapuka is abundant on Kopernik Seamount and that the dropline fishery is capable of targeting the species efficiently, with Hapuka comprising 97.2% of total retained weight and 91.7% of total fish numbers. The catch was well within the FOP limit of 15 t per trip per seamount, and the total trip catch of approximately 14 t is consistent with a precautionary and gradual approach to developing the fishery.

Dropline CPUE was high at 37.44 fish/set and 536.56 kg/set, while dropline-B CPUE (16.33 fish/set; 193 kg/set) was lower. The single jigging set was successful in catching hapuka; however, the large size of fish encountered on this seamount presents a logistical challenge for current jigging equipment, and the gear configuration will be reconsidered for subsequent trips. This finding is consistent with the FOP's acknowledgement that jigging machinery capacity may need to be adapted for the size of fish encountered in this fishery.

The high proportion of A2 fish on capture (81.1%) reflects the physiological stress associated with rapid decompression during retrieval from depth, which is typical of hook-and-line fisheries targeting deepwater species. The notable proportion of A3 fish (16.7%) and the low proportion in good condition (A1; 2.2%) together suggest that post-release survival for discarded hapuka would be limited without specific treatment like decompression of the gas bladder prior to release. All hapuka sampled were retained (100% retention rate), and all were processed as RFI with a mean processed weight approximately 33% of whole weight, consistent with full filleting. This product recovery rate is relatedly low for a perciform fish which range from 30-50% recovery rate, and slightly lower than hapuka production in other areas which get 35-40% fillet recovery. Thay may be due to the filleting technique used or the relatively inexperienced crew.

Bycatch was limited, with seven species recorded in the retained catch. Spiny dogfish (*Squalus sp.*) had a discard rate of 23.2%. All teleost bycatch species were retained. No VME indicator taxa interactions were recorded during the trip for droplines or jigs.

Biological sampling was comprehensive, with 954 hapuka sampled for length and weight, maturity, sex, otoliths, genetic tissue, and stomach contents. The bimodal distribution of stomach fullness (many empty and many full stomachs) is consistent with opportunistic feeding behaviour and suggests that fish were actively feeding prior to capture on at least a proportion of sets. But could also be a reflection of the gas bladder expanding forcing the fish to regurgitate and food in the stomach. Fish and cephalopods were the dominant prey items recorded, consistent with the known piscivorous diet of *P. oxygeneios*.

Maturity data will contribute to the FOP objective of characterising size-at-maturity for this population, and otolith and genetic samples will support future age estimation and stock connectivity analyses.

This trip provides a strong foundation for the continuation of the FOP, assessing the commercial viability of the dropline fishery for hapuka and generating the first biological dataset for this population. Continued annual reporting to the SPRFMO Scientific Committee, combined with accumulating biological and catch data across multiple trips and seamounts, will be essential for evaluating the sustainable exploitation of this resource and informing future CMMs.

4.2 Trap fishery

This was the first trip where the trap fishing effort was largely directed at crabs. Previous trips were lobster and crab target trips. The biological sampling conducted during trip 8 provides useful preliminary insights into the population characteristics of *Chaceon* crabs in the surveyed seamounts.

The size composition of crabs landed during trip 8 was dominated by individuals with

carapace widths predominantly in the 12–14 cm range. Understanding the size structure of the catch is important for assessing whether harvesting pressure is concentrated on immature or mature individuals. The data presented here indicates that as yet there is no evidence of changes in the size structure of *Chaceon* crabs in the FSC.

Estimates of size-at-maturity suggest that 50% maturity is reached at approximately 10 cm carapace width, meaning that the majority of crabs in the current catch are above the estimated maturity threshold. However, these estimates should be interpreted with caution as they have not yet been derived from formal modelling approaches. It would be preferable to defer such analyses until a full annual cycle of samples has been collected, ensuring that seasonal variation in maturity-related traits is adequately captured.

The berry state data indicate that female crabs are carrying eggs during the Austral winter months, consistent with a winter spawning period. Similarly, shell state data - which can serve as an indicator of moulting and the onset of reproductive activity - support this seasonal pattern. A notable limitation of both datasets is the absence of samples from July to October, coinciding with the closure of the lobster fishery and the consequent absence of fishing effort during this period. This gap covers a potentially critical phase of the reproductive cycle and may obscure important biological signals. If the hapuka fishery persists at that time of year an opportunity to fish for crabs (and lobster) to collect non-destructive biological samples would be informative for both species.

The processing data demonstrate that the relationship between processed weight and whole weight is linear, providing a reliable and consistent conversion factor for estimating whole-weight equivalents from processed product. The average retention rate of approximately 62% post-processing is a useful baseline for catch reporting and stock assessment purposes, enabling more accurate conversion of landed product weights to whole-weight catch estimates in future.

Trip 8 fishing effort was distributed across three seamounts: Kopernik and Lavousier seamounts within the Foundation Seamount Chain (FSC), and Seamount NS16 in the Northern Seamounts (NS) area. The majority of effort was concentrated on Kopernik Seamount (29 sets), with considerably fewer sets on Lavousier (7 sets) and a single exploratory set on NS16. This uneven distribution of effort limits direct comparisons of catch rates among seamounts and reflects the operational priorities of the trip rather than a systematic survey design. The Cook Islands will work with the vessel for future trips to spread the fishing effort more evenly across more seamounts and areas.

The catch composition was strongly dominated by *Chaceon* crabs, with bycatch comprising only a minor component of the total catch. The bycatch assemblage included unidentified prawns, gastropod molluscs, and several teleost species such as cusk-eels. Notably, four bycatch taxa were identified as VME indicator taxa, predominantly octocorals. Most of the non-target species, including prawns, gastropods, and teleosts, were retained for crew consumption rather than discarded, which is a positive outcome from a waste minimisation perspective.

Trap fullness data indicate that catching capacity was rarely approached, with only two traps recorded at 100% full and the vast majority below 50% capacity. This suggests that trap saturation is unlikely to have caused significant bias in catch rate indices during this trip, though continued monitoring of fullness is warranted as a standard component of CPUE standardisation. It is also indicative of the widely distributed but low density of

the *Chaceon* population in the FSC.

Bait use was recorded as hapuka throughout the trip. This differs from other trips and the Cook Island will need to investigate the impact of bait type on catch rates. Inconsistencies in bait type and quality could introduce variability in catchability, and it will be included in CPUE standardisations in future to improve the comparability of CPUE data across sets and trips.

The consistent CPUE for crabs in the exploratory fishery thus far suggests that the level of fishing effort directed at crabs is not causing a stock response and can be maintained at the current levels or even increased. Additional, evidence for this is the lack of change in the size of the crabs caught during the exploratory fishery.

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Table 1: Sets by seamount in trip 8.

Area	Seamount	Drop	Drop-B	Jig
FSC	Kopernik	18	3	1
	Lavousier	1	0	0
NS	NS16	3	0	0
	NS19	1	0	0
	NS2	1	0	0
	NS25	1	0	0

Table 2: Species landed in trip 8.

Species	Scientific name	Kg retained	Number retained	Percent by weight	Percent by number
Hapuka	Polyprion oxygeneios	13996.5	986	97.2	91.7
Trumpeter	Latris lineata	171.5	18	1.2	1.7
Spiny dogfish	Squalus sp.	137.5	24	1	2.2
Tarakihi	Nemadactylus macropterus	49	39	0.3	3.6
Bluenose	Hyperoglyphe antarctica	41	1	0.3	0.1
Porae	Nemadactylus douglasii	5.7	3	0	0.3
Blackbelly rosefish	Helicolenus dactylopterus	2.9	4	0	0.4

Table 3: Catch rate by species and set type in trip 8.

Set type	Sets	Species	Fish retained	Weight retained (kg)	CPUE (fish/set)	CPUE (kg/set)
Drop	25	Blackbelly rosefish	4	2.9	0.16	0.12
	25	Bluenose	1	41	0.04	1.64
	25	Hapuka	936	13413.9	37.44	536.56
	25	Porae	3	5.7	0.12	0.23
	25	Spiny dogfish	24	137.5	0.96	5.5
	25	Tarakihi	38	48	1.52	1.92
	25	Trumpeter	18	171.5	0.72	6.86
Drop-B	3	Hapuka	49	579	16.33	193
	3	Tarakihi	1	1	0.33	0.33
Jig	1	Hapuka	1	3.6	1	3.6

Table 4: Bycatch in the trap fishery from trip 8.

VME	Species	Scientific name	Total	Pecent retained	Pecent discarded
Non-VME	Prawn	Dendrobranchiata	114	100	0
	Gastropod	Gastropoda	105	74.3	25.7
	Cusk-eel	Ophidiidae	43	90.7	9.3
	Blackbelly rosefish	Helicolenus dactylopterus	30	90	10
	Volcanic rock	NA	16	0	100
	Rattail	Macrouridae	11	81.8	18.2
	Spiny Crab	Brachyura	3	0	100
	Hydrozoa	Hydrozoa	2	0	100
	Sea Urchin	Echinoidea	2	0	100
	Unidentified Crab	Brachyura	2	0	100
	Jellyfish	Medusozoa	1	0	100
	Spider Crab	Majidae	1	0	100
	Spiny lobster	Palinuridae	1	100	0
	Starfish	Asterozoa	1	0	100
VME indicator taxon	Bamboo coral	Octocorallia	8	0	100
	Antipatharia	Antipatharia	2	0	100
	Glass sponge	Hexactinellid	1	0	100
	Stony coral	Scleractinia	1	0	100

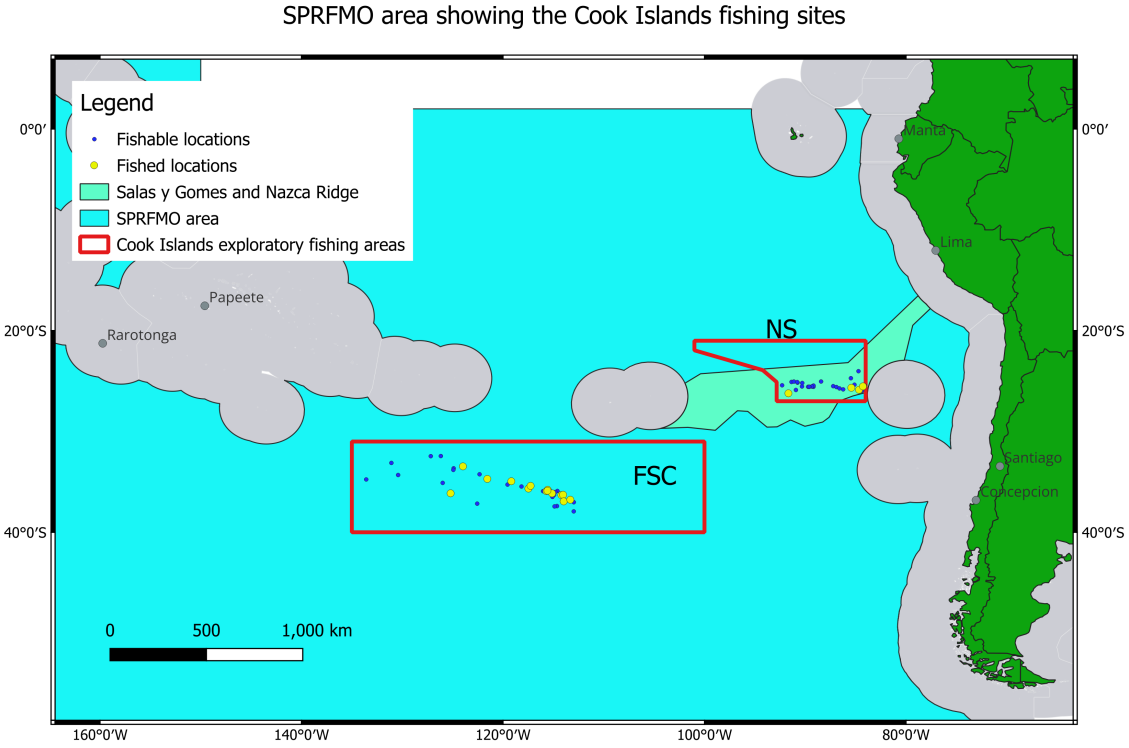

Figure 1: Fishing sites for the Cook Islands exploratory fisheries in the SPRFMO Convention Area.

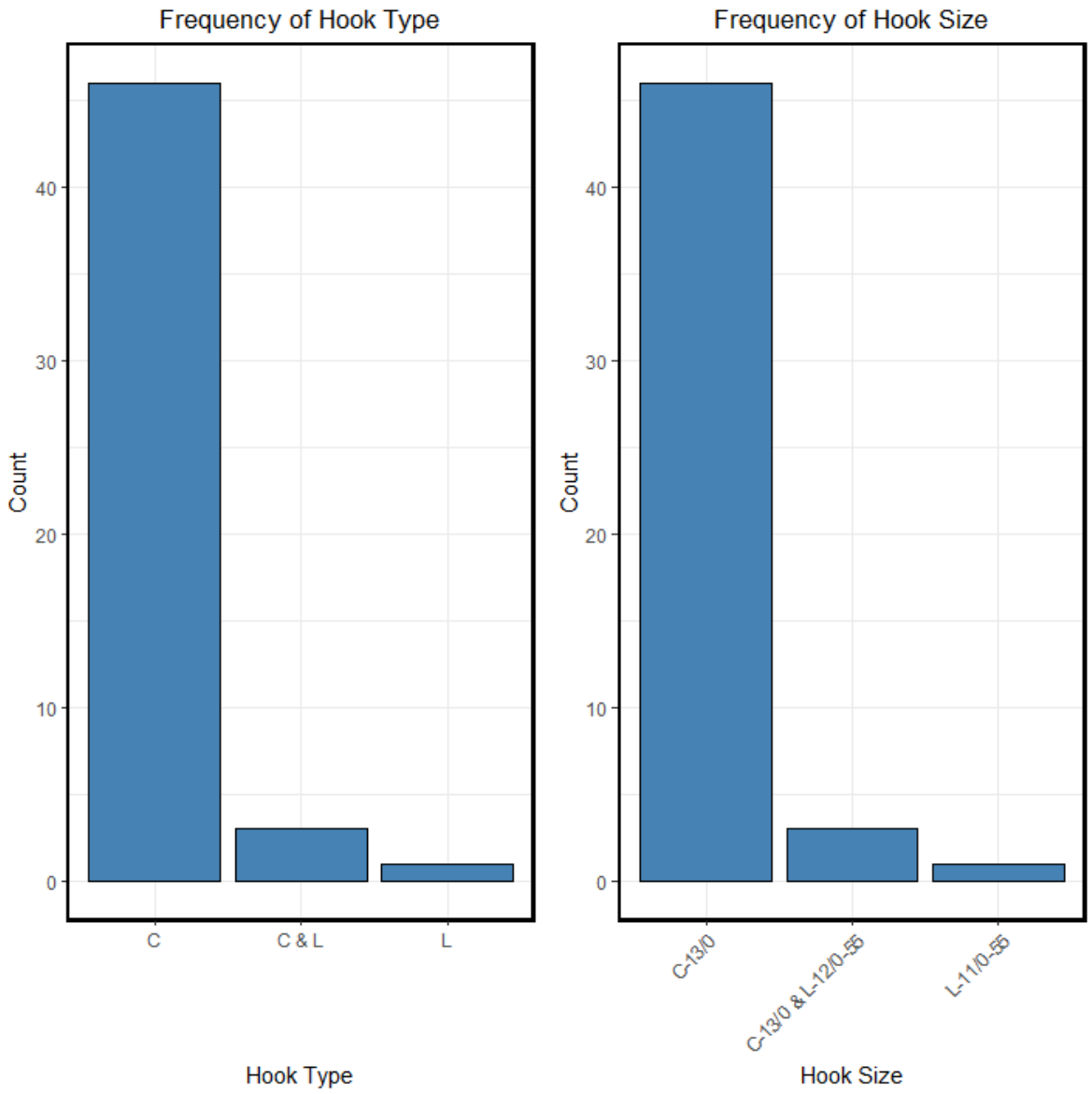

Figure 2: Hook types used in the Cook Islands hapuks exploratory fisheries in the SPRFMO Convention Area.

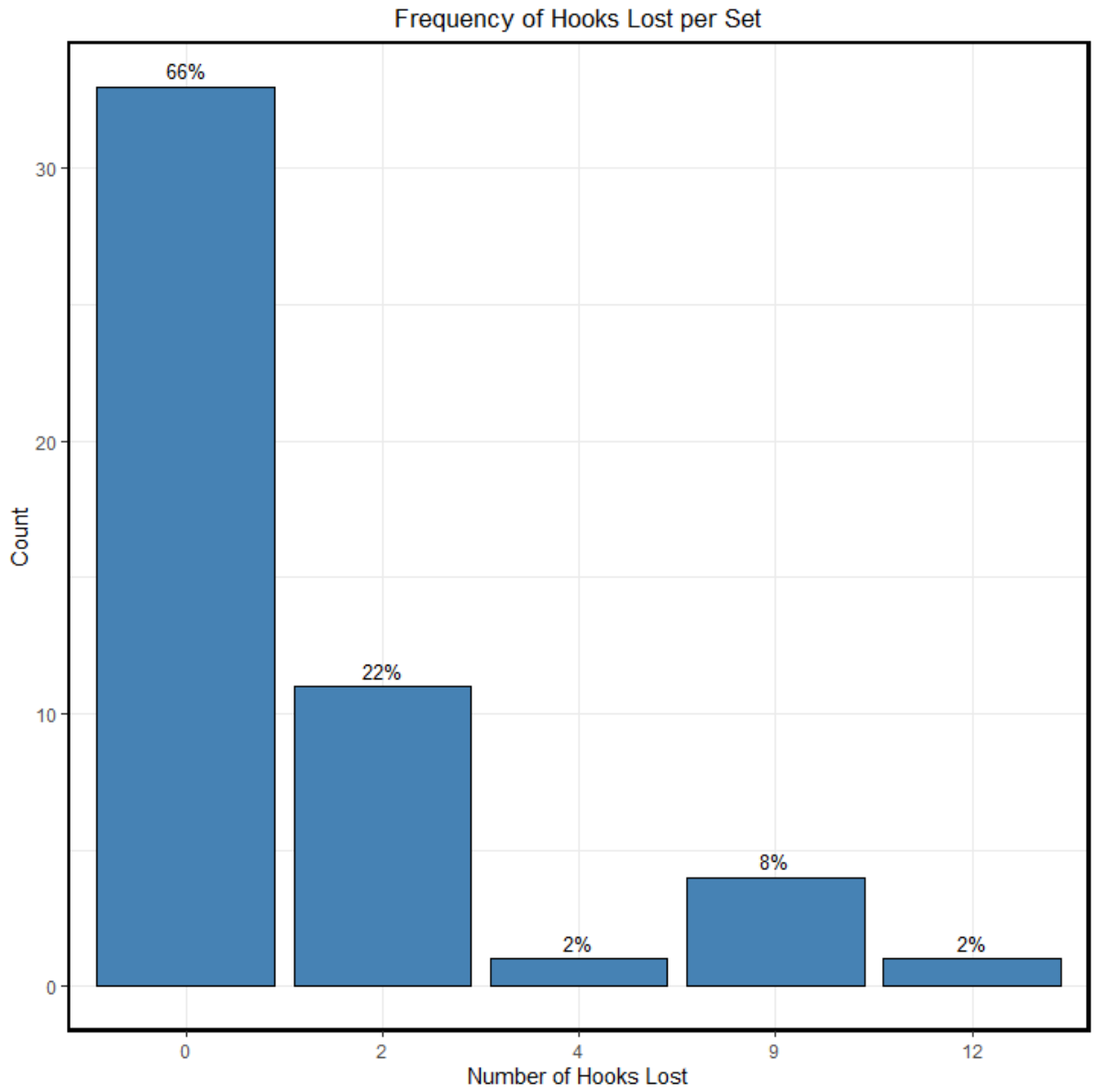

Figure 3: Hooks lost in the Cook Islands hapuks exploratory fisheries in the SPRFMO Convention Area.

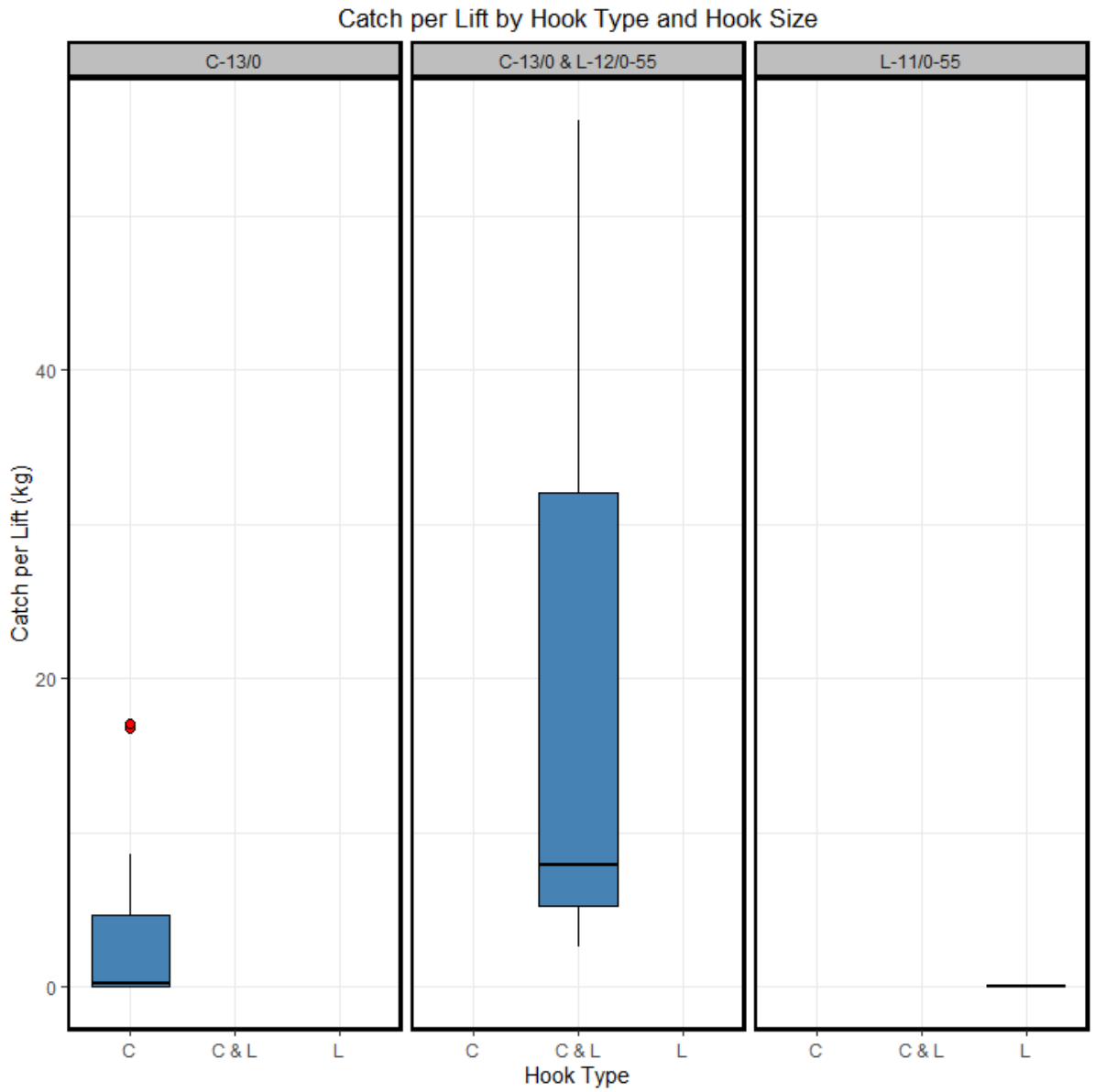

Figure 4: The catch of hapuka by hook size and type in the Cook Islands hapuks exploratory fisheries in the SPRFMO Convention Area.

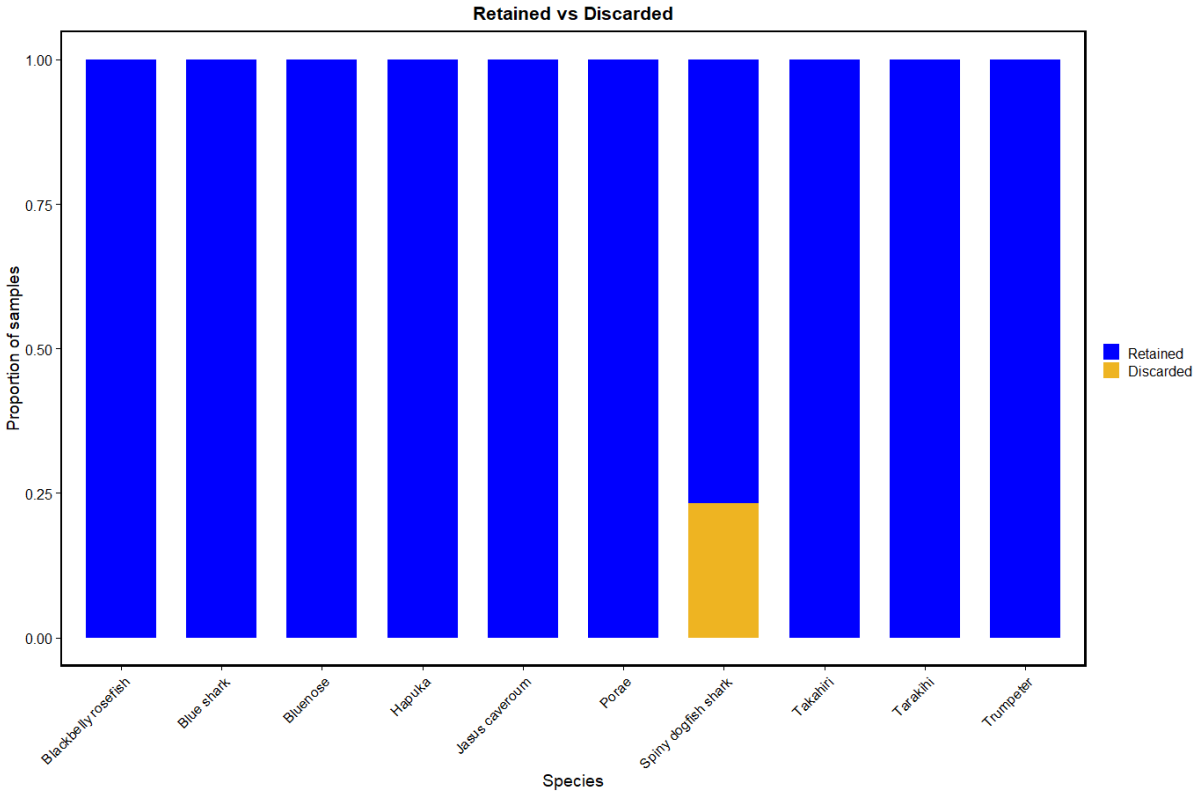

Figure 5: Proportion of sampled fish retained or discarded by species.

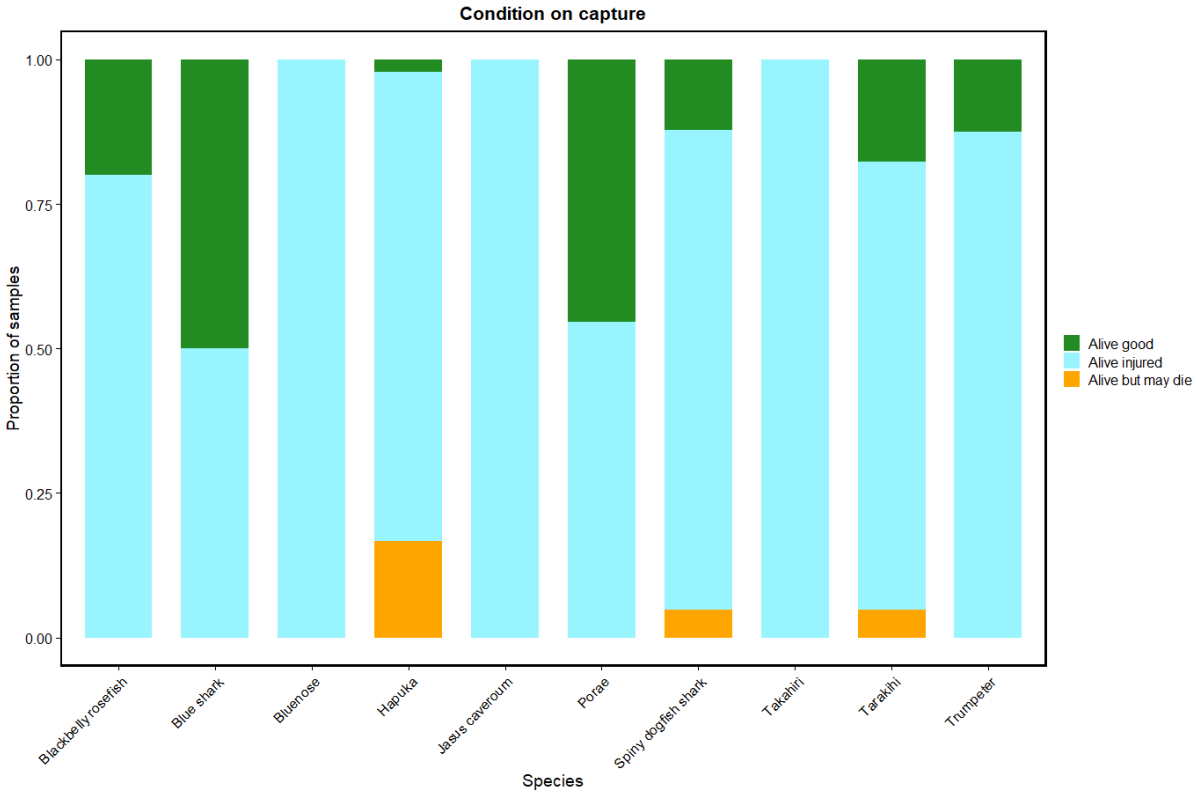

Figure 6: Proportion of sampled fish in each condition on capture category by species. A1 = alive, good condition; A2 = alive, injured; A3 = alive, likely to die.

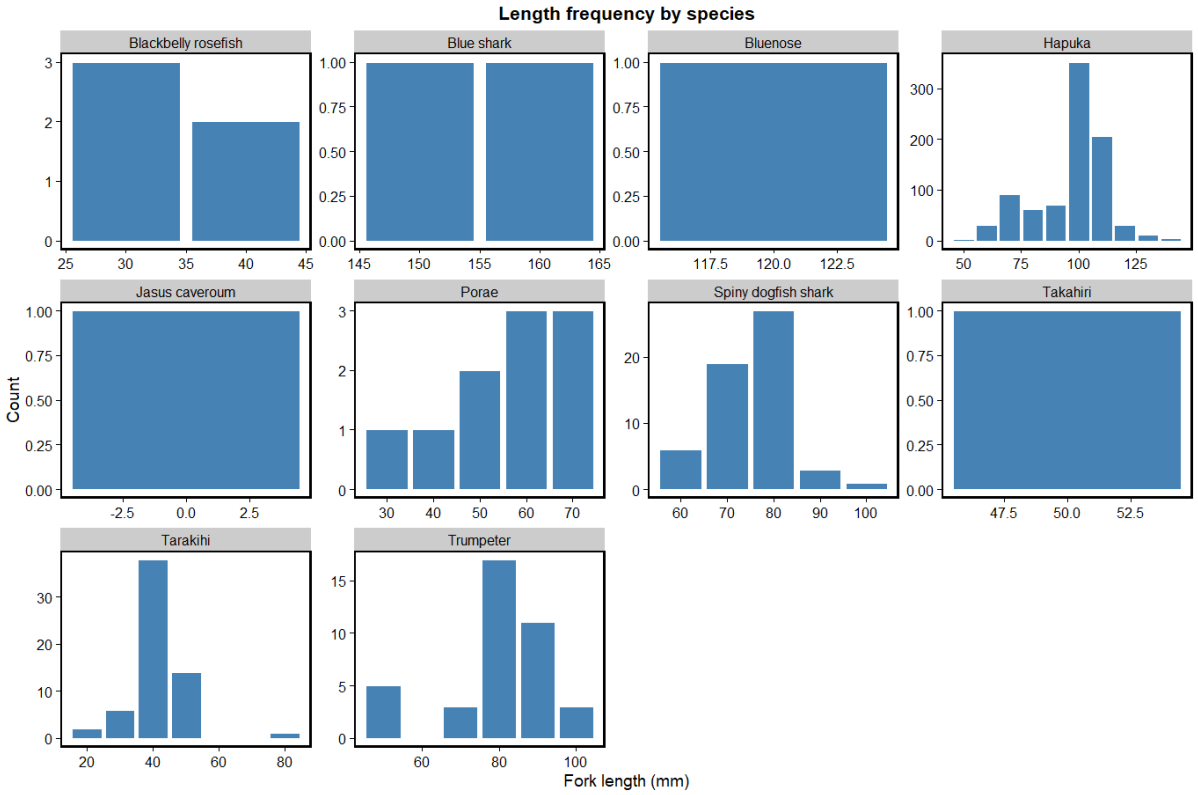

Figure 7: Fork length frequency distributions for all sampled species.

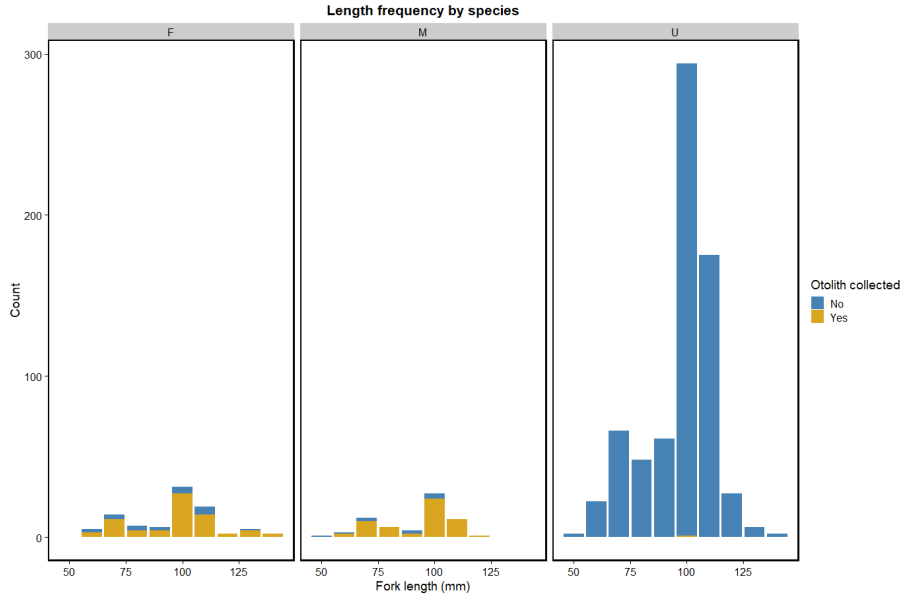

Figure 8: Length frequency (FL mm) for hapuka caught in the Cook Islands dropline fishery.

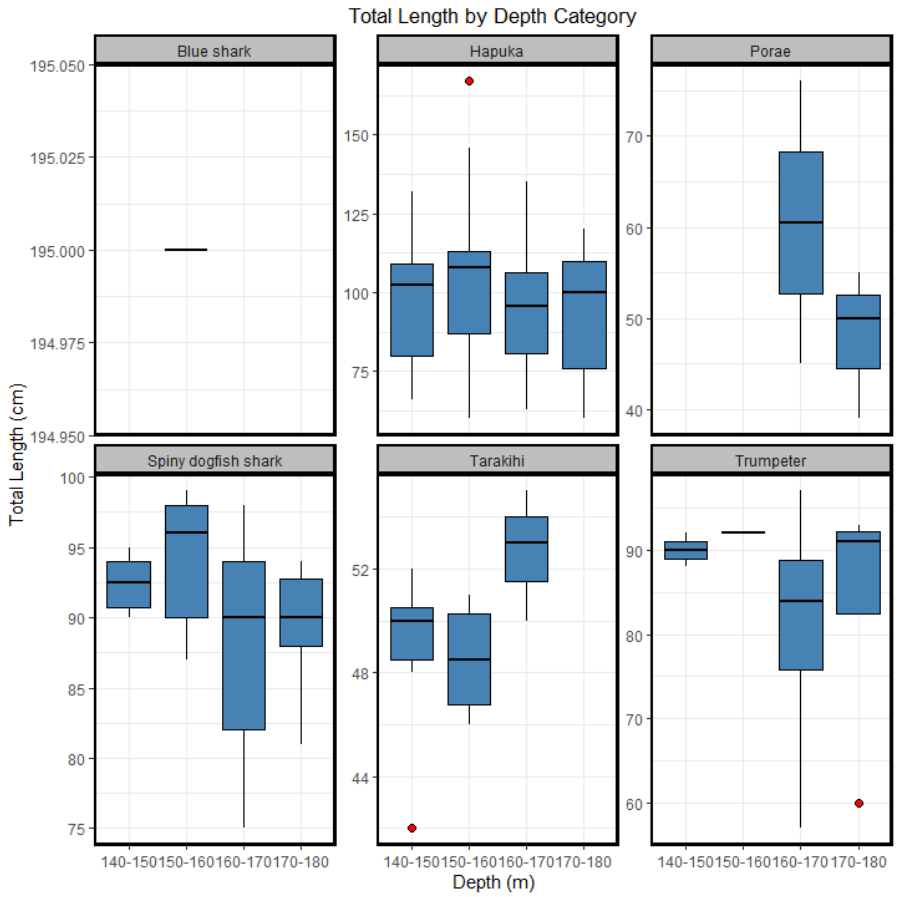

Figure 9: Length frequency (FL mm) by depth for fish caught in the Cook Islands dropline fishery.

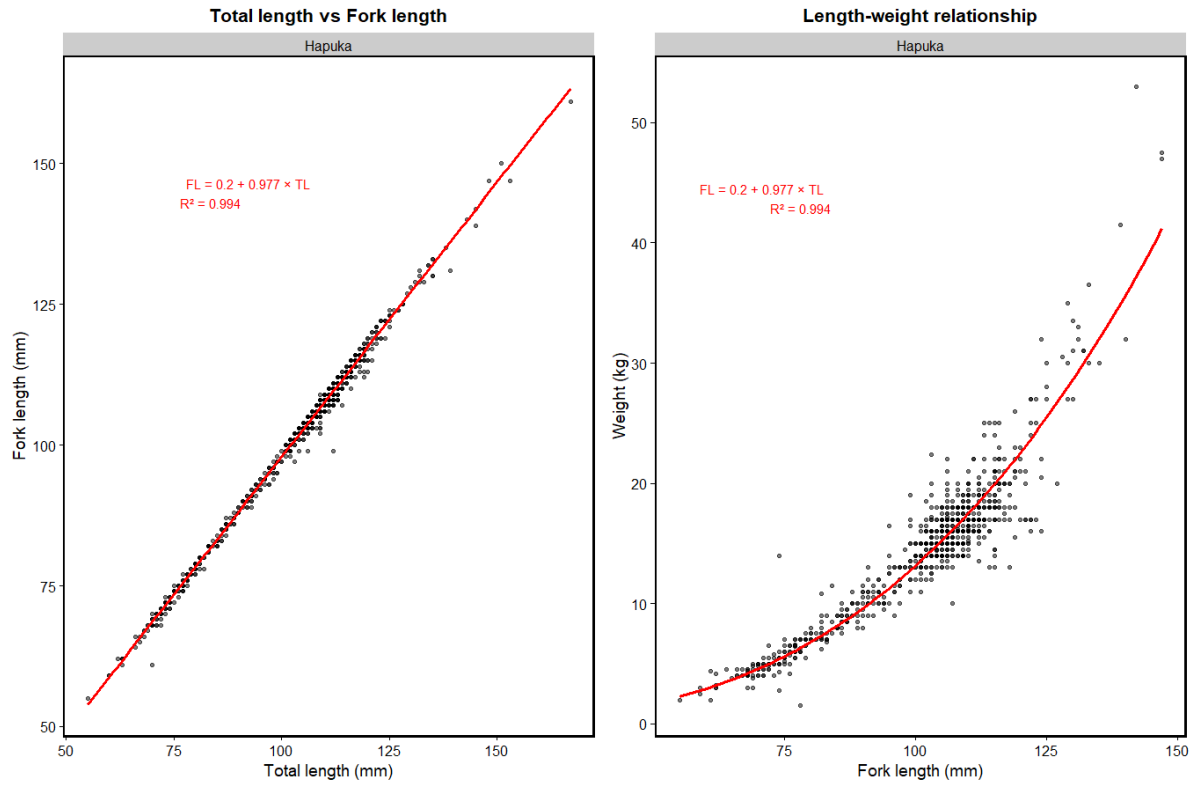

Figure 10: Maturity at length by sex for hapuka. Maturity stages: 0 = immature through to 5 = spent; U = unknown.

Figure 11: Maturity at length by sex for hapuka. Maturity stages: 0 = immature through to 5 = spent; U = unknown.

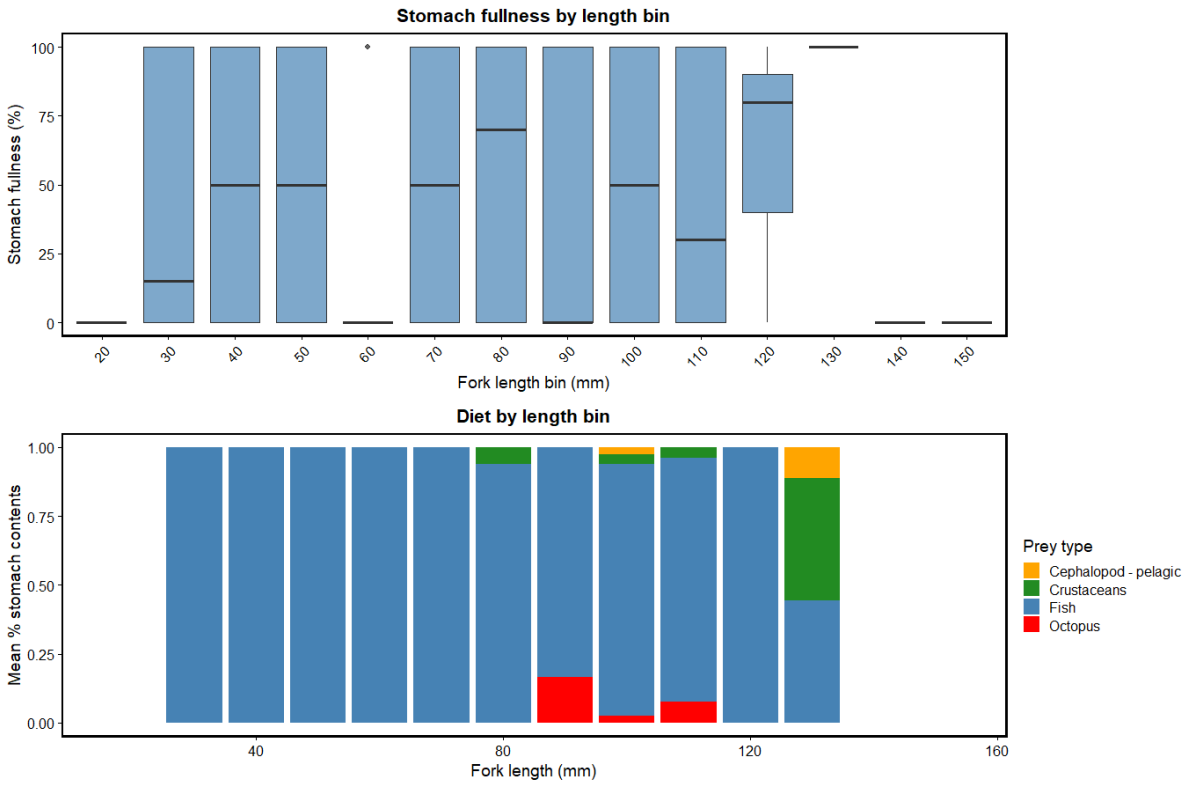

Figure 12: Stomach contents for hapuka. Stomach fullness (top) and prey composition by length bin (bottom).

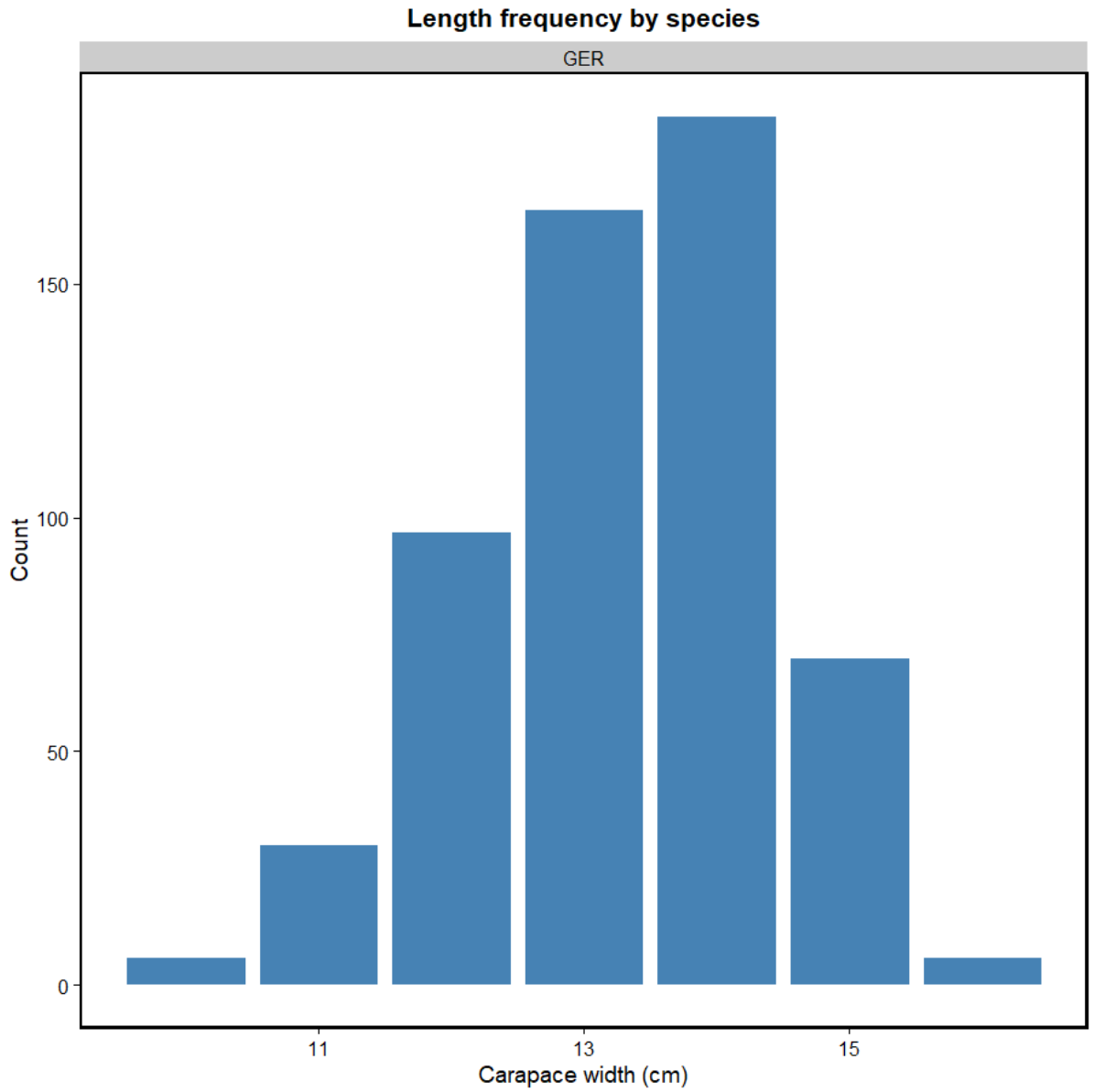

Figure 13: *Chaceon* **carapace width from the catch taken in trip 8.**

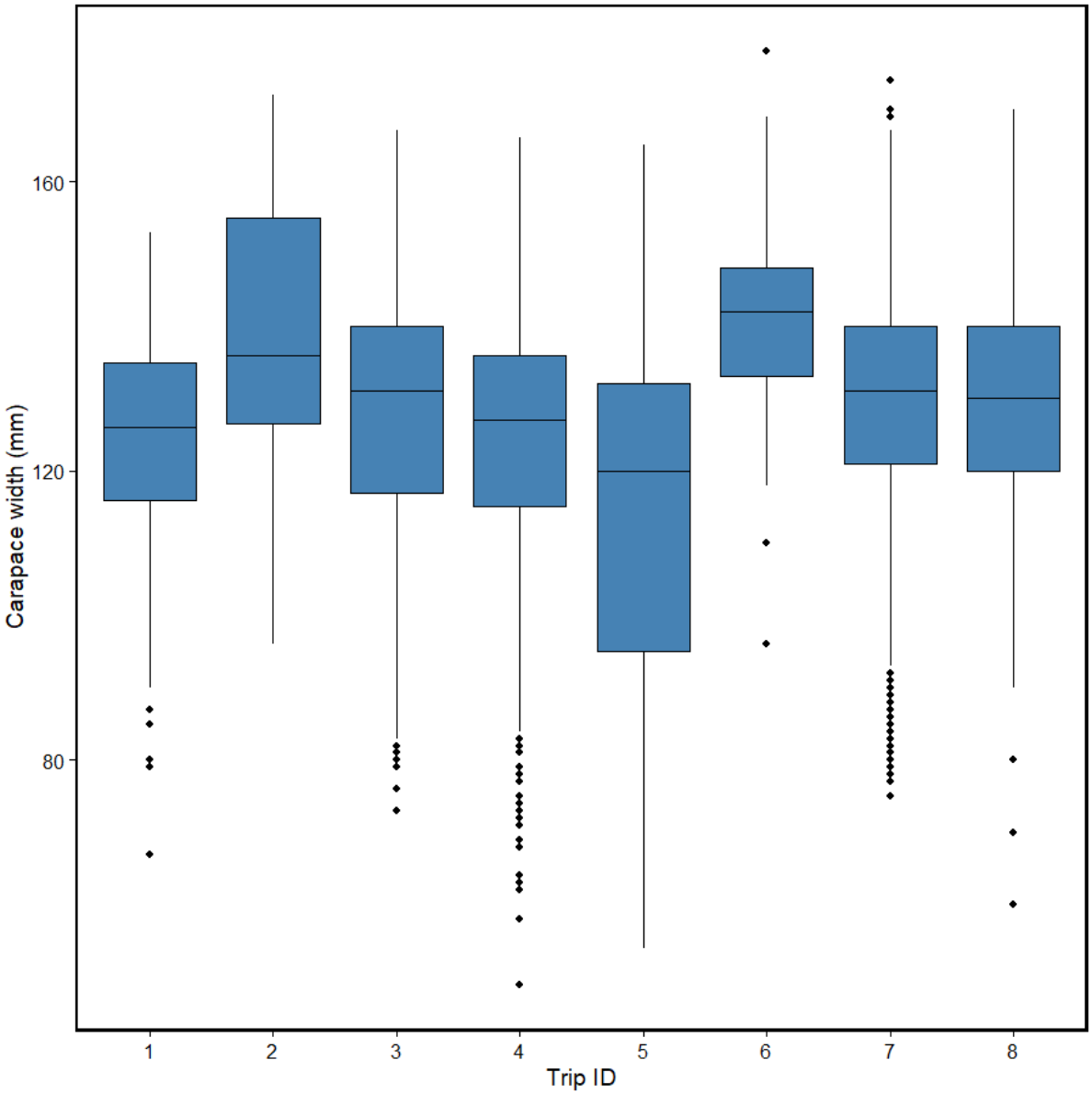

Figure 14: ***Chaceon*** **carapace width from the catch taken in all trips.**

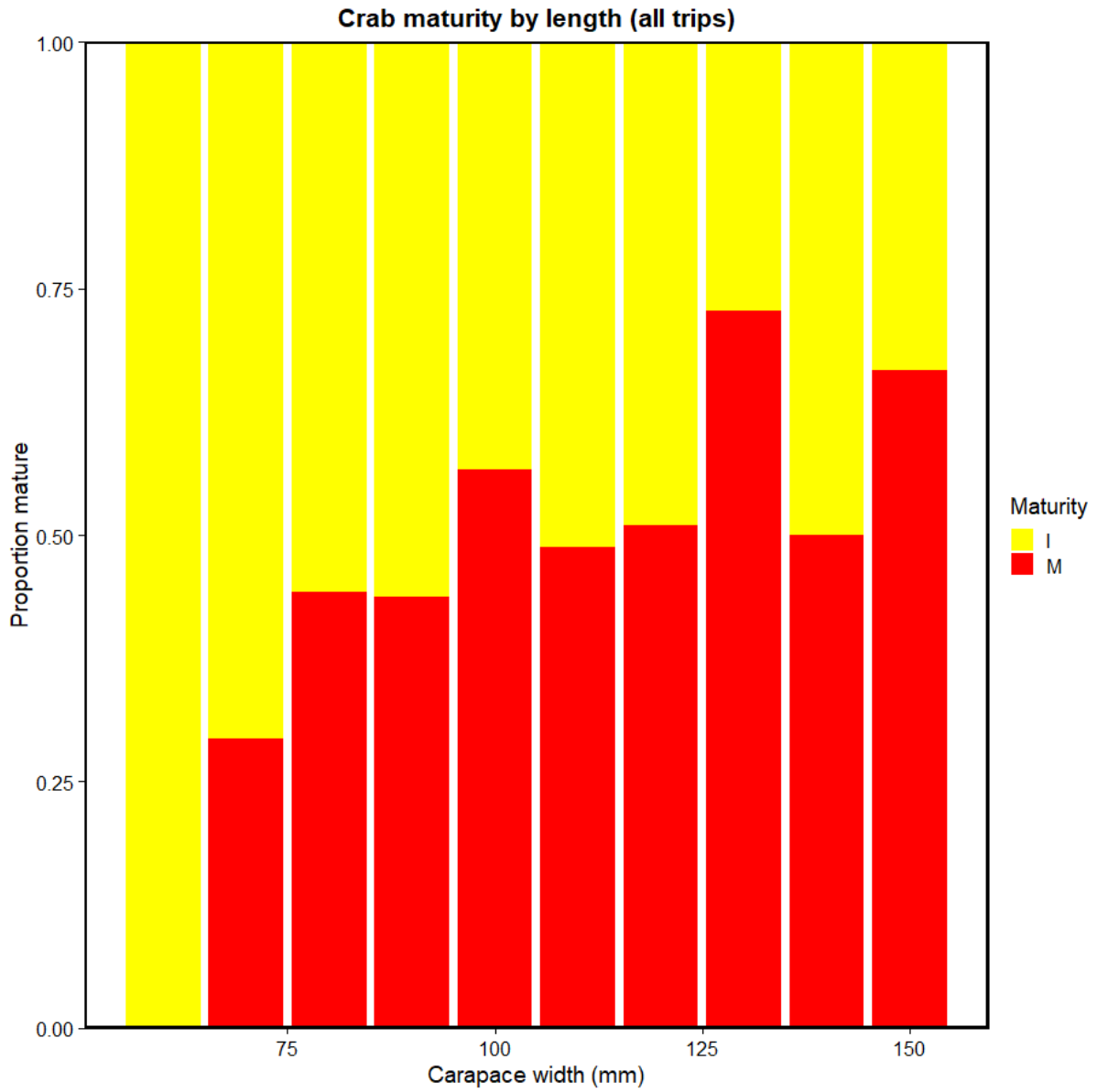

Figure 15: ***Chaceon*** **maturity estimates width from the catch taken in trip 8.**

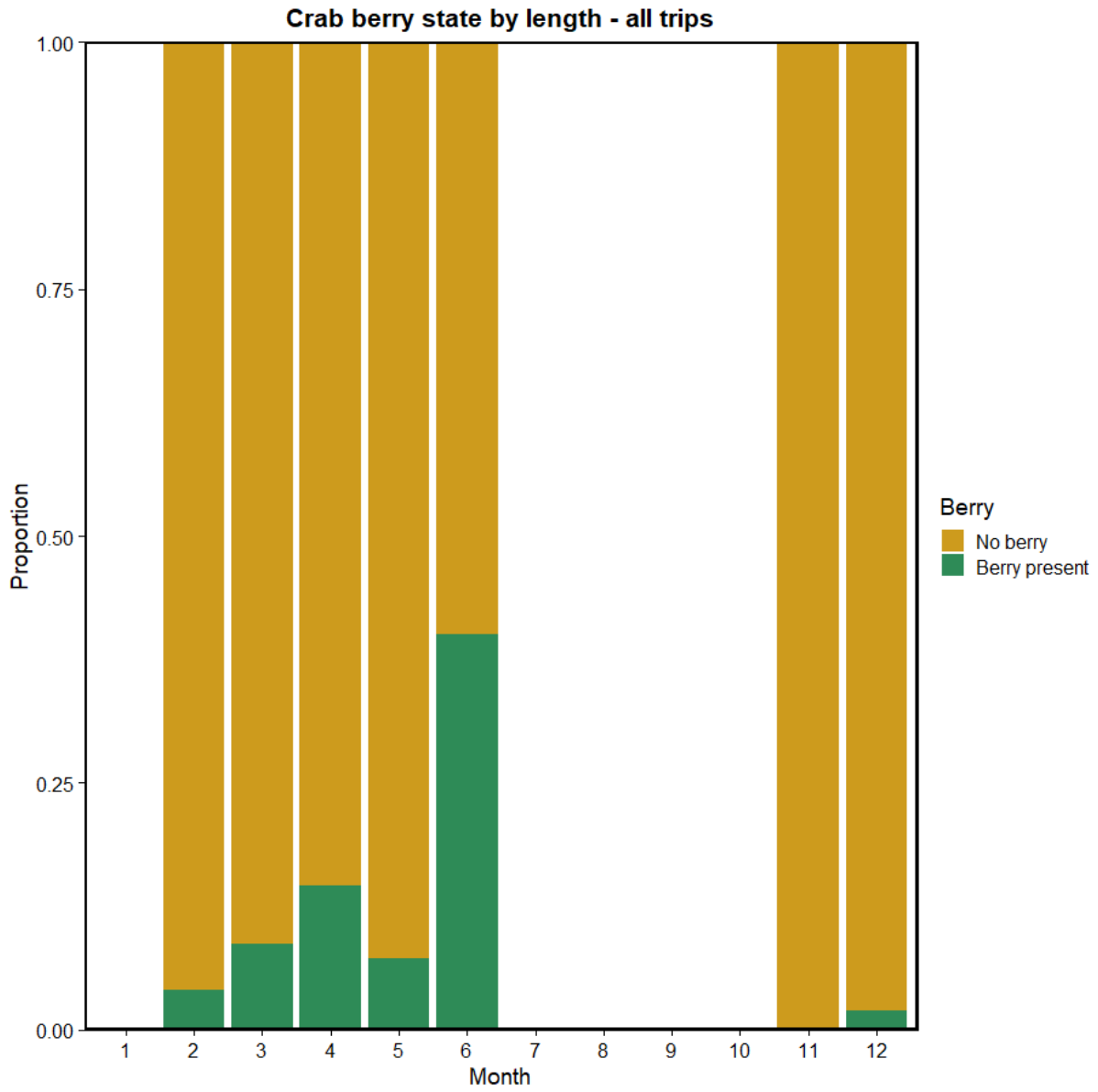

Figure 16: *Chaceon* **berry state (present or absent) on female crabs from all trips.**

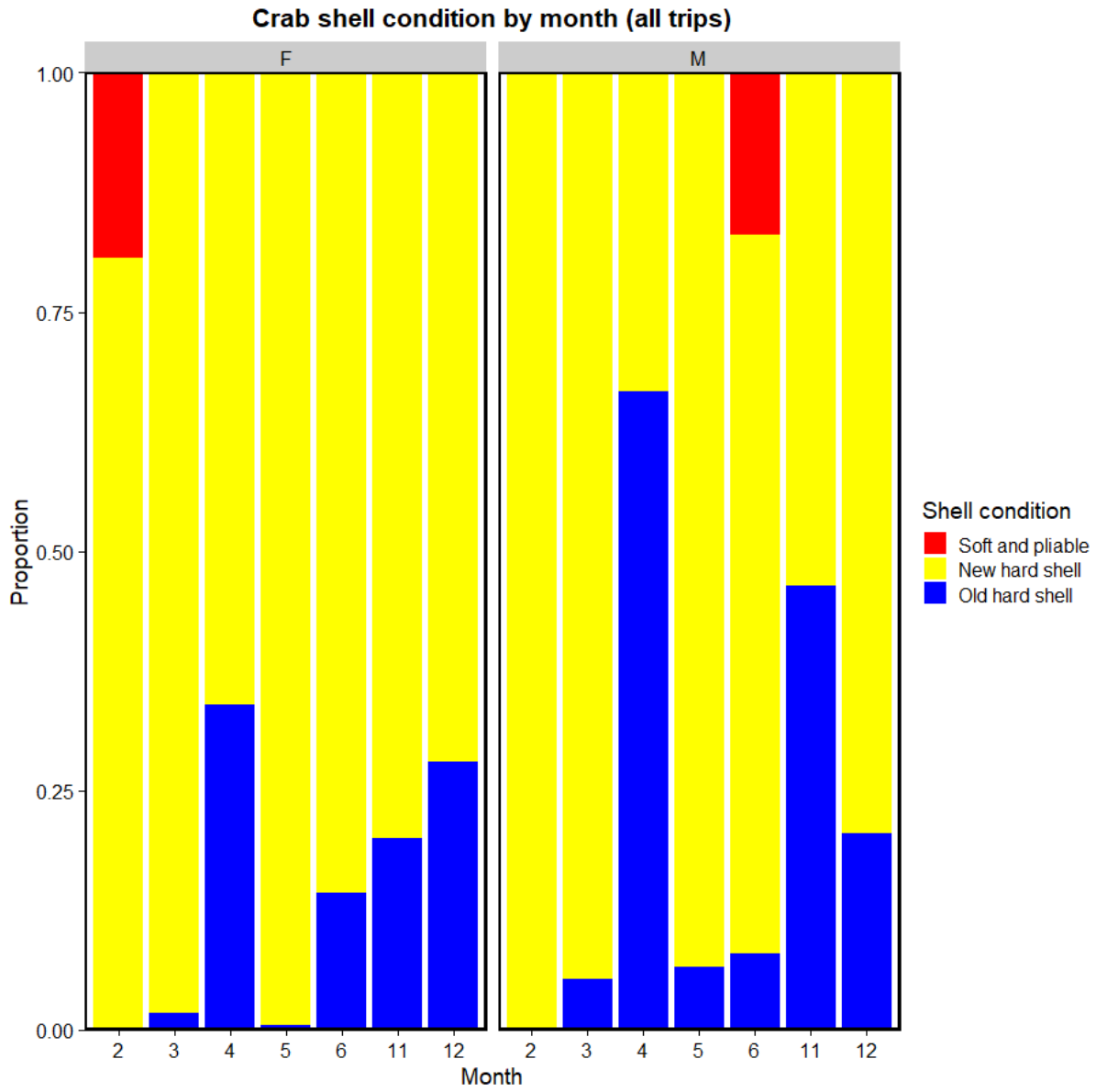

Figure 17: *Chaceon* **carapace state by month from the catch taken in all trips.**

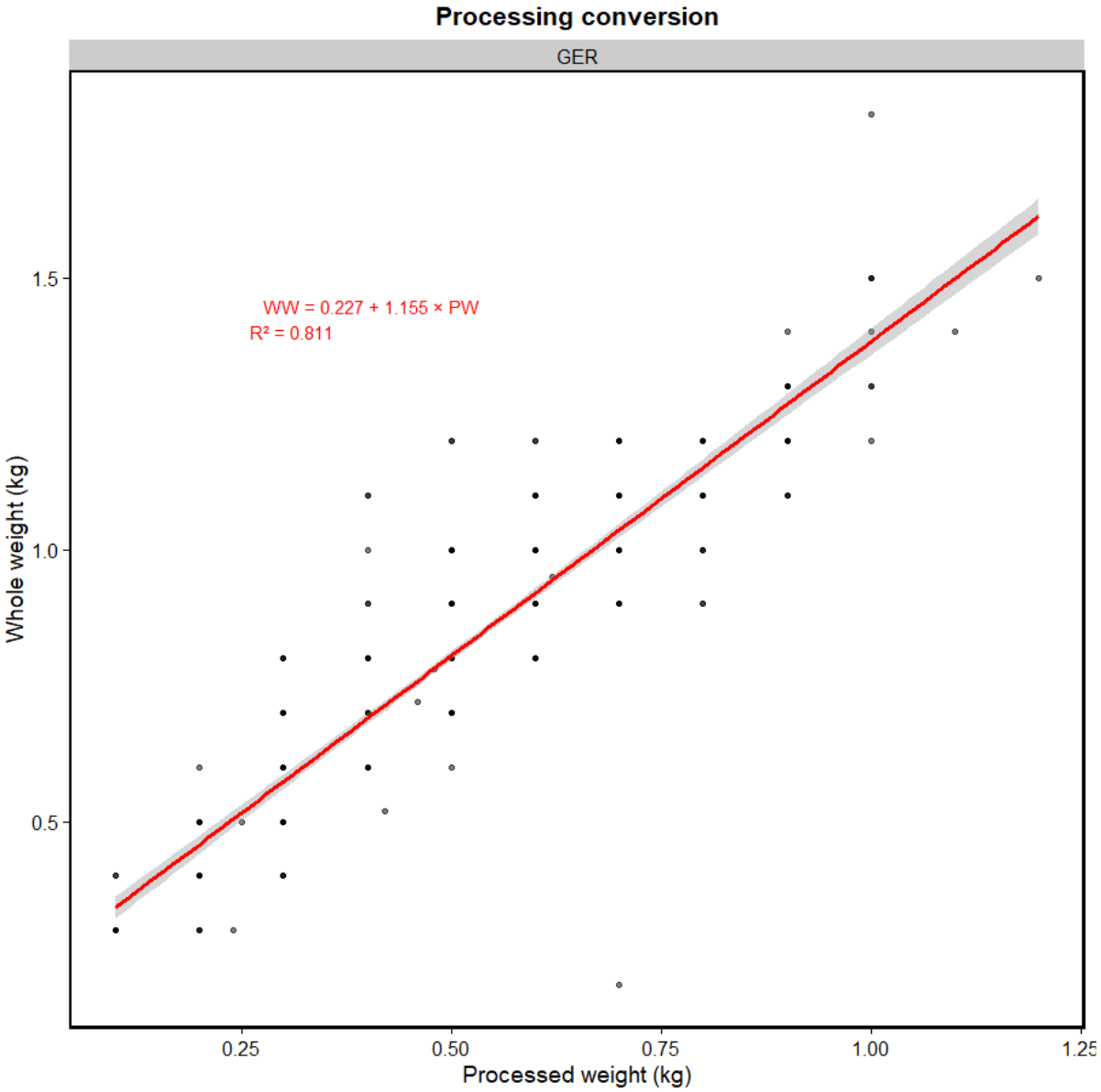

Figure 18: ***Chaceon*** **processing conversion from processed state to whole weight.**

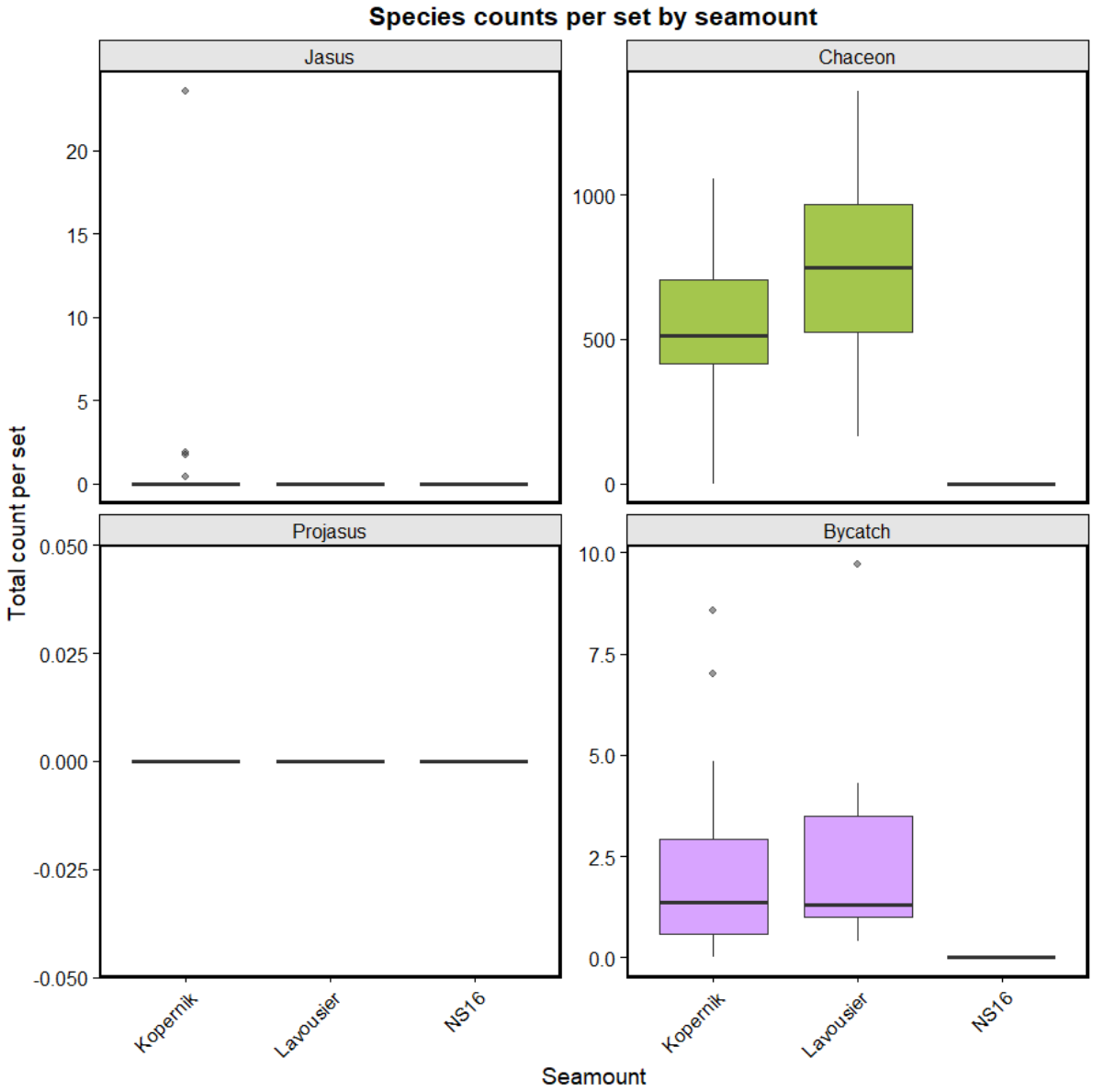

Figure 19: Trip 8 trap species catch.

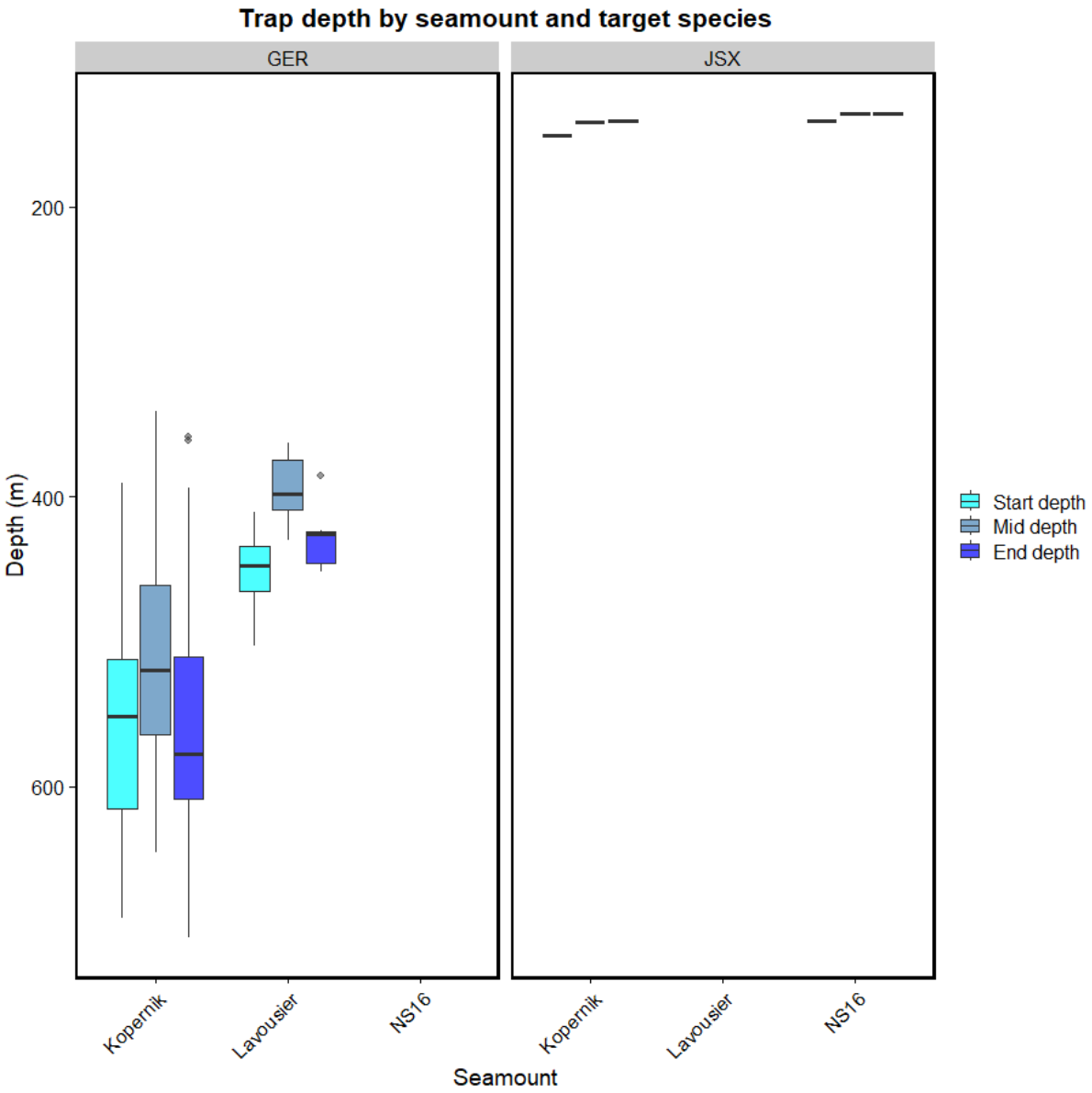

Figure 20: Trip 8 trap set depth.

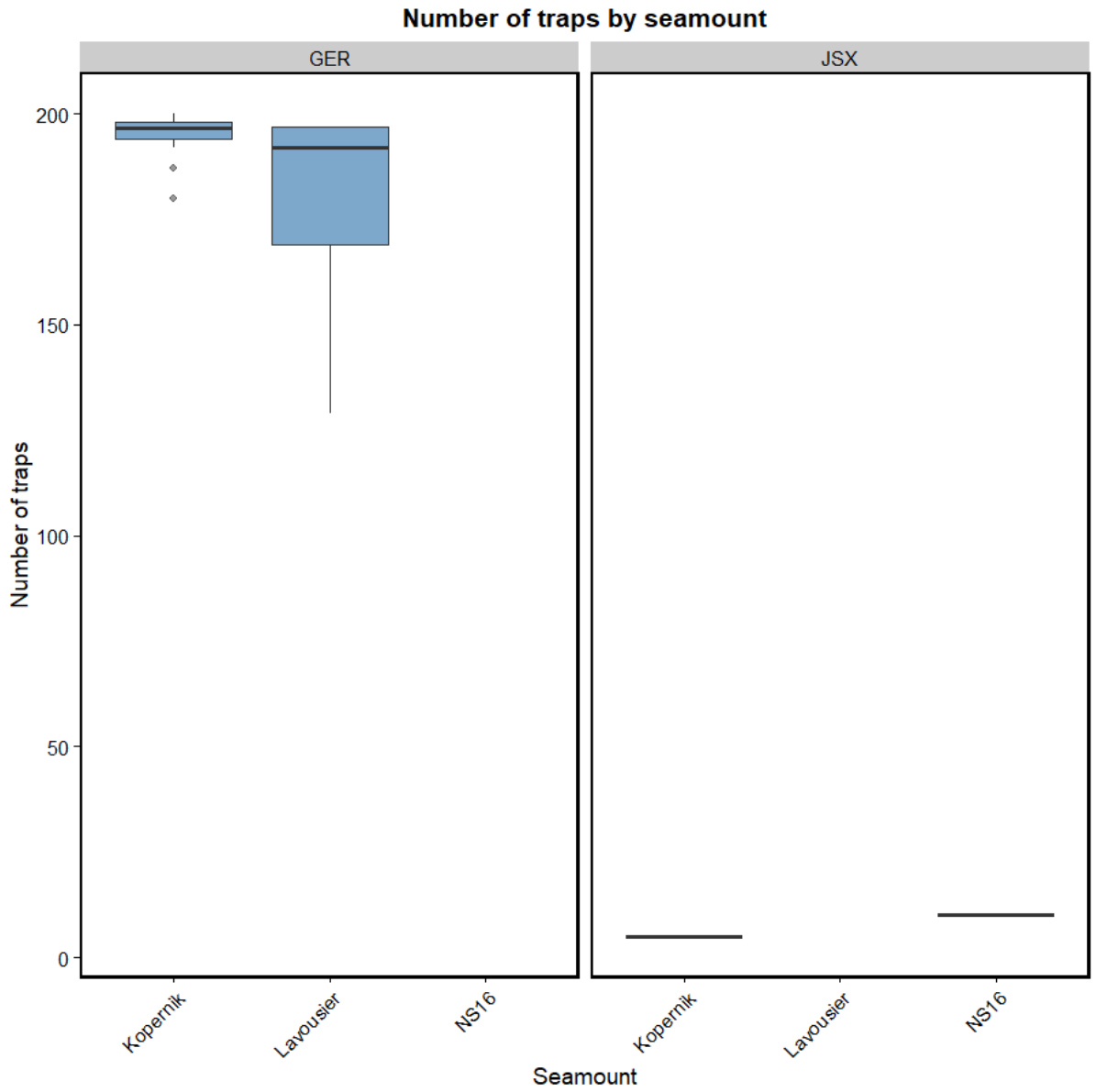

Figure 21: Trip 8 number of traps per line.

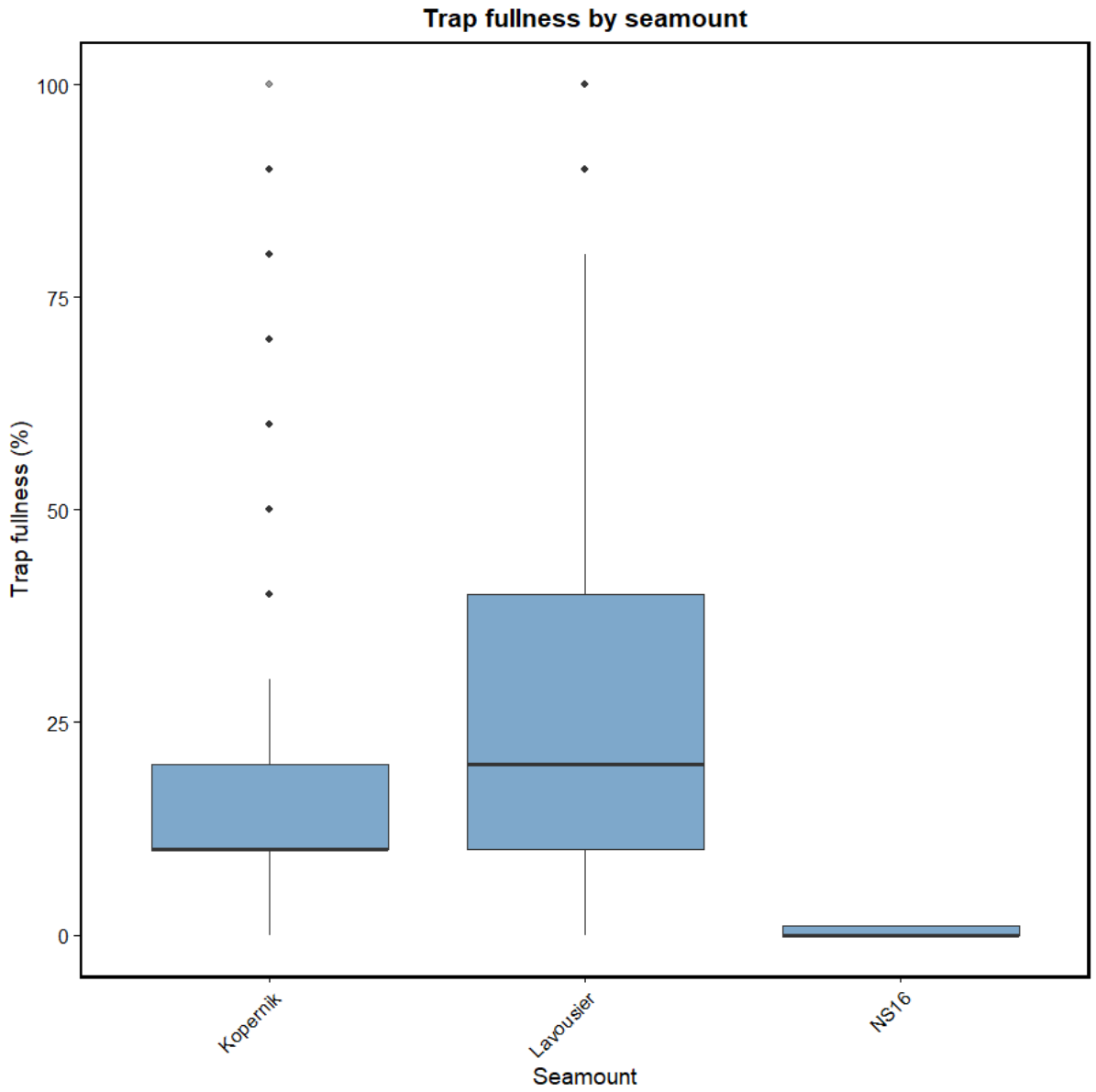

Figure 22: Trip 8 trap fullness.

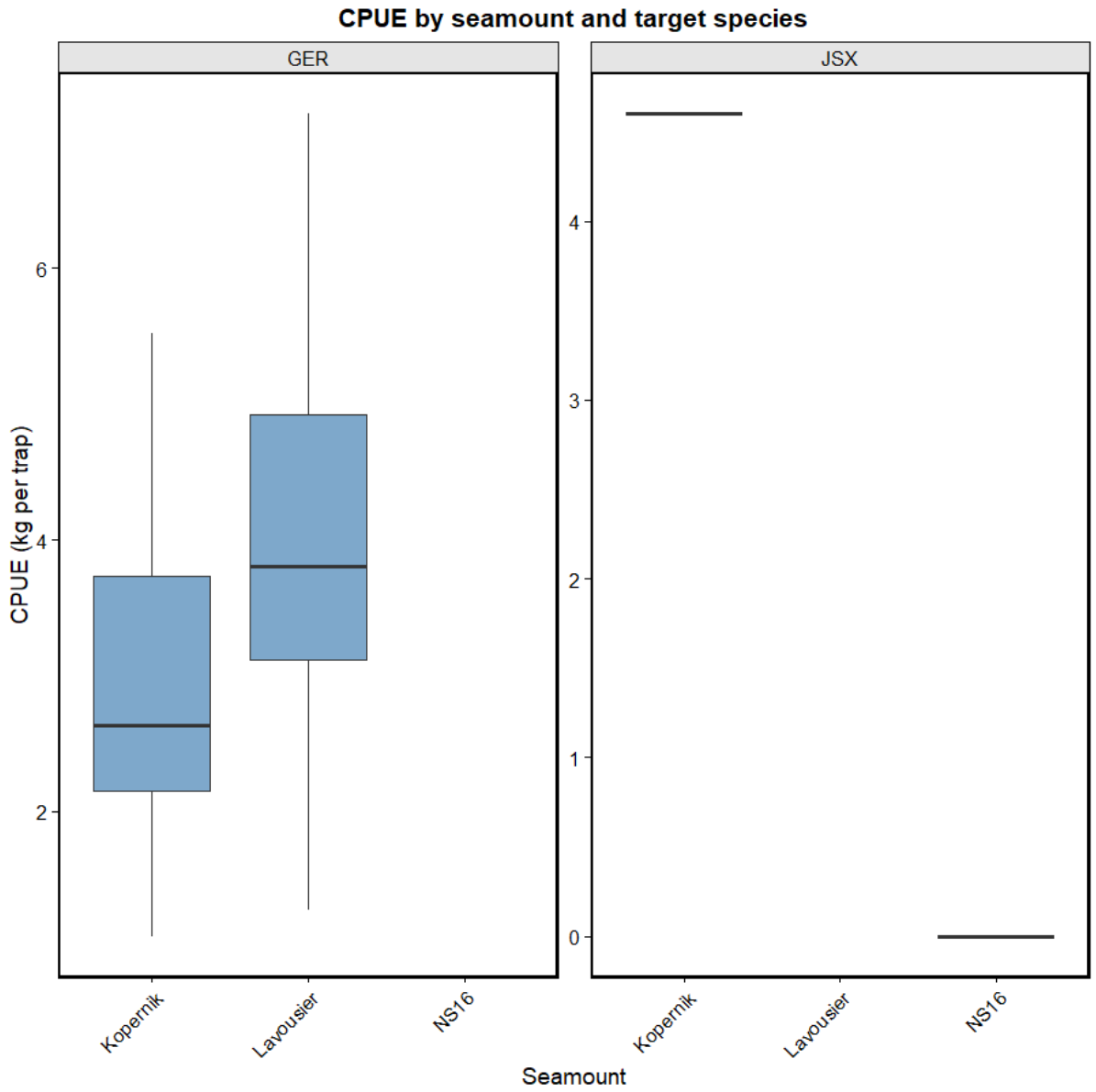

Figure 23: Trip 8 CPUE (Kg per trap).

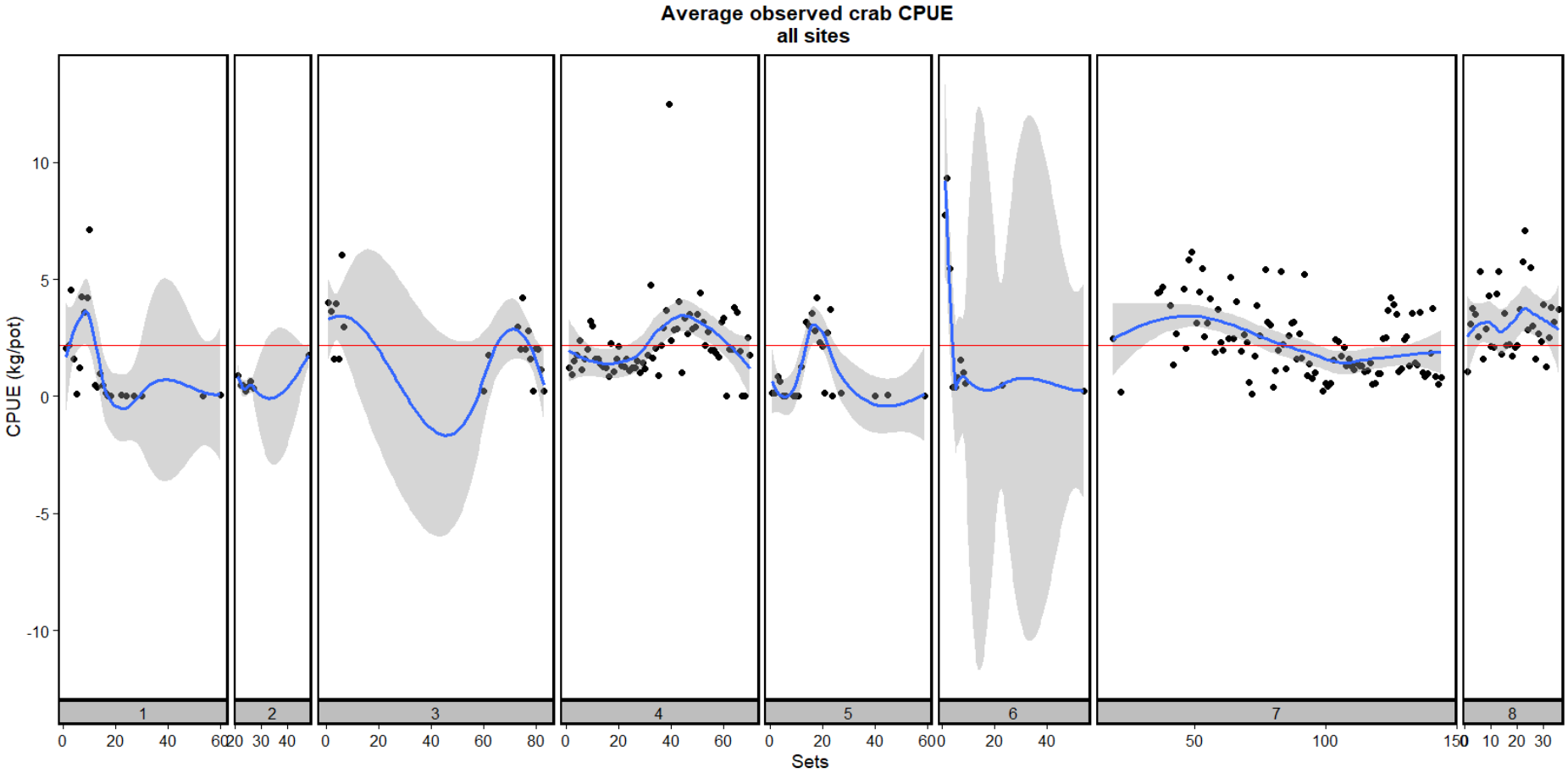

Figure 24: *Chaceon* **CPUE (Kg per trap) from all trips.**