A Preliminary Assessment of Using Fish Traps as a Monitoring Tool for Special Fisheries Conservation Areas in Jamaica

Una Evaluación Preliminar del Uso de Trampas de Pescado como una Herramienta de Monitoreo de Áreas Especiales de Conservación Pesquera en Jamaica

Une Évaluation Préliminaire de l'Utilisation de Pièges à Poissons comme un Outil de Surveillance pour les Aires de Conservation de la Pêche Spéciaux en Jamaïque

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ABSTRACT

Monitoring commercially important fish populations in marine reserves is crucial. However, efficient standardised methodologies are needed for consistent results. Using passive capture methods like fish pots can be beneficial as this removes the ―diver effectl associated with UVCs and improves coverage in space and time. This study was therefore designed to determine appropriate bait type and soak time for use with fish pots to obtain accurate data for effective monitoring of marine reserves. The study design involved deploying six rectangular traps at two locations: within and outside the Discovery Bay SFCA, Jamaica. At each location, four different baits (commonly used by fishermen) were tested: Mackerel, Cow skin, Bread and Dog-food with Sardine. The traps with each bait type were left to soak for one week and were checked by SCUBA on days 2, 4, and 7. On each occasion, species, abundance, size as well as injury to individual fish were recorded. Preliminary analysis indicated that there was significant difference in diversity and abundance of fish between locations (ANOVA $p < 0.001$). However, abundance (ANOVA $p < 0.522$) and diversity (ANOVA $p < 0.565$) of fish was not significantly different between bait types. The abundance (ANOVA $p < 0.762$) and diversity (ANOVA $p < 0.449$) of fish were also not significantly different between the days soaked. However, there was a significant positive correlation between soak time and injuries to fish. Results of this study suggest the possibility of increasing the speed and efficiency of obtaining SFCA monitoring data from fish pots by using short soak times and any available bait type.

KEY WORDS: Jamaica, methods, pot trapping, bait, soak time

INTRODUCTION

Special Fisheries Conservation Areas, more widely known as marine reserves or 'no-take' areas, were implemented in Jamaica as a management strategy in response to declining fish stocks. By establishing reserves, increases in average individual size, stock abundances and diversity of fishable species were expected (Watson and Munro 2004). However, in Jamaica there is no protocol for monitoring spatial and temporal changes in marine reserves. Monitoring commercially important fish populations in reserves is crucial especially in Jamaica where fisheries contribute to the economy through tourism, employment and food security. Several monitoring programmes (e.g. Hill and Wilkinson 2004, Brandt et al. 2009) suggest using underwater visual census (UVCs), whether transect or point counts, as a monitoring method.

However, using passive capture methods like Antillean fish traps can be beneficial as this removes the "diver effect" associated with UVCs, can be used in different habitats and improves coverage in space and time. Like UVCs, fish traps can provide information on species composition, relative abundance and biomass which are metrics that are monitored in marine reserves. This study was therefore designed to assess the effectiveness of using fish traps as a monitoring tool and to also determine appropriate bait type and soak time for use with traps to obtain accurate data for effective monitoring of marine reserves.

METHODOLOGY

Antillean rectangular traps with double horse neck funnels were used. Each trap measured 0.61m in height, 1.83m in width and 1.22 m in length with a volume of 1.36 m^3.Traps were constructed from galvanized hexagon-shaped mesh (1.5 inches) fixed to a wooden frame. Six traps were deployed at two locations in Discovery Bay, Jamaica: within and outside of the reserve. At each location, four different baits were tested: Mackerel, Cow skin, Bread and Dog-food with Sardine mixture. Approximately 1 kg of bait was placed in mesh canisters which were hung in the centre of each trap. The baited trap was left to soak for one week and was checked by SCUBA on days 2, 4, and 7. On each occasion, counts of the number and species of each fish in the traps were conducted and their lengths were estimated. Damages to fish were ranked based on severity and recorded. On the seventh day, the contents of the traps were released, and the trap was left open until the next cycle.

RESULTS

Diversity and Mean Cumulative catch

Preliminary analysis indicated significant differences in diversity expressed as species richness and mean cumulative catch of fishable species between locations *(t-test* $p < 0.001$).

Approximately 52 species were captured, of which 44 species were commercially fishable species. Thirty nine commercially fishable species were caught in the reserve while 25 were captured outside. In total, there were 1,750 counts of fish within the reserve versus 462 counts of fish outside the reserve. The mean cumulative catch within the reserve was 41 $\pm$ 4 individuals versus outside the reserve which was 9 $\pm$ 2 individuals.

Bait Type and Soak Time Versus Mean Cumulative Catch

Analysis of variance (ANOVA) tests highlighted that the difference was not significant between mean cumulative catch and soak time for each location (Figure 1).

Bait Type and Soak Time Versus Mean Number of Species

Analysis of variance (ANOVA) indicated that the number of species differed significantly for each bait type for traps outside the reserve ($p \leq 0.01$). Tukey's Post Hoc revealed that the dogfood with sardine bait captured the highest while the lowest was observed using cowskin.

Within the reserve, the mean number of species differed significantly within increasing soak ($p<0.02$). The highest was observed after seven days while the lowest was observed on the second day (Figure 2).

Relation Between Soak Time and Damage to Fish

Approximately 1.8% of the total amount of individuals died due to damage. There was a significant correlation between increase in soak time and damage to fish, however, the relationship was not strong (Spearman's Correlation coefficient (r_s) = 0.058).

DISCUSSION

Using fish traps to monitor reserves can yield useful data to highlight the effectiveness of the protected area by collecting information on species richness, relative abundance and biomass. Limitations such as gear selectivity, species specific catchability and determining the area fished by the pot should however be considered. Also, the measure of absolute abundance is difficult (Acosta et al. 1994). Baiting a trap temporarily increases the rate of ingress versus using un- baited traps however after two days the bait is usually exhausted and any increases in diversity and mean catch beyond two days would usually be a result of predator- prey relation and/or conspecific attraction (Munro 1974).

Lack of significant difference in mean cumulative catch for different soak time suggests pots could be used more flexibly. Theoretically, increase in soak should result increase in catch, however, potential damage to fish with increasing soak time should be considered. Fish traps could be an effective and efficient means of monitoring changes in reserves. Further analysis is needed to be conclusive about the effectiveness of the different bait types and soak time.

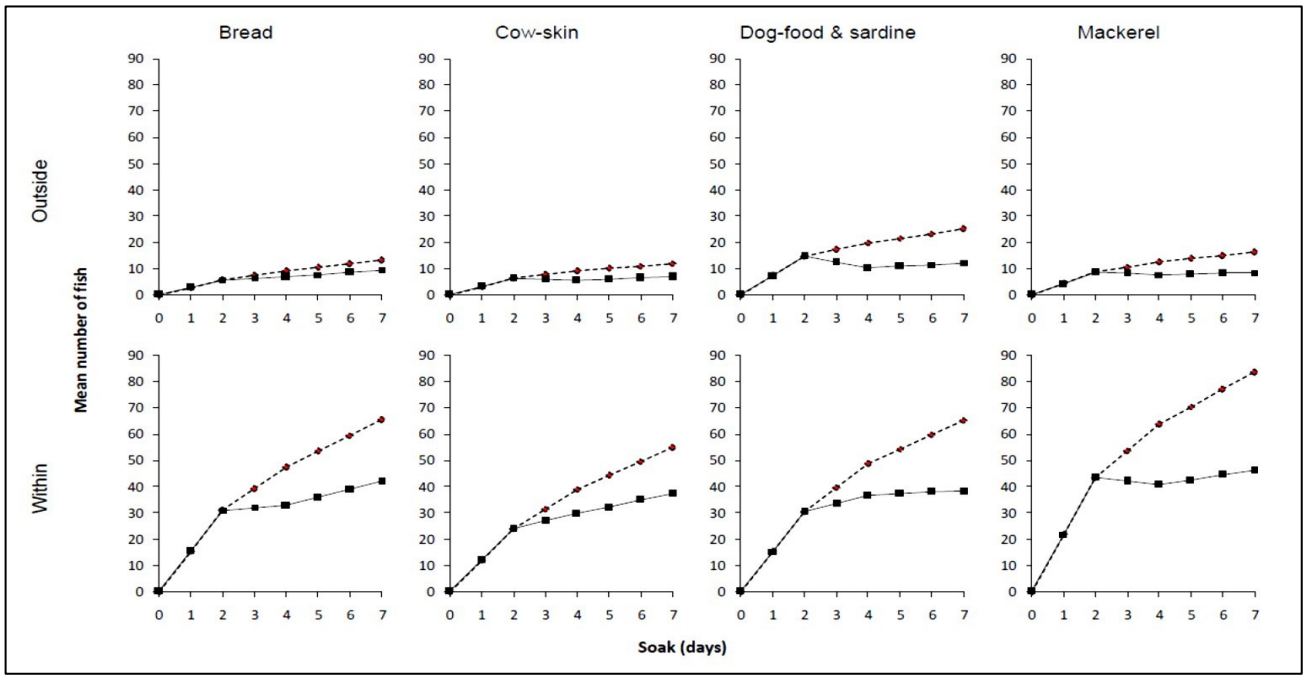

Figure 1. Mean cumulative observed ingress, I s (upper curve) and mean cumulative catch, Cs (lower curve) at each location over a pe (7 days) throughout sample period January - April 2014) based on 2,212 counts over four sampling occasions.

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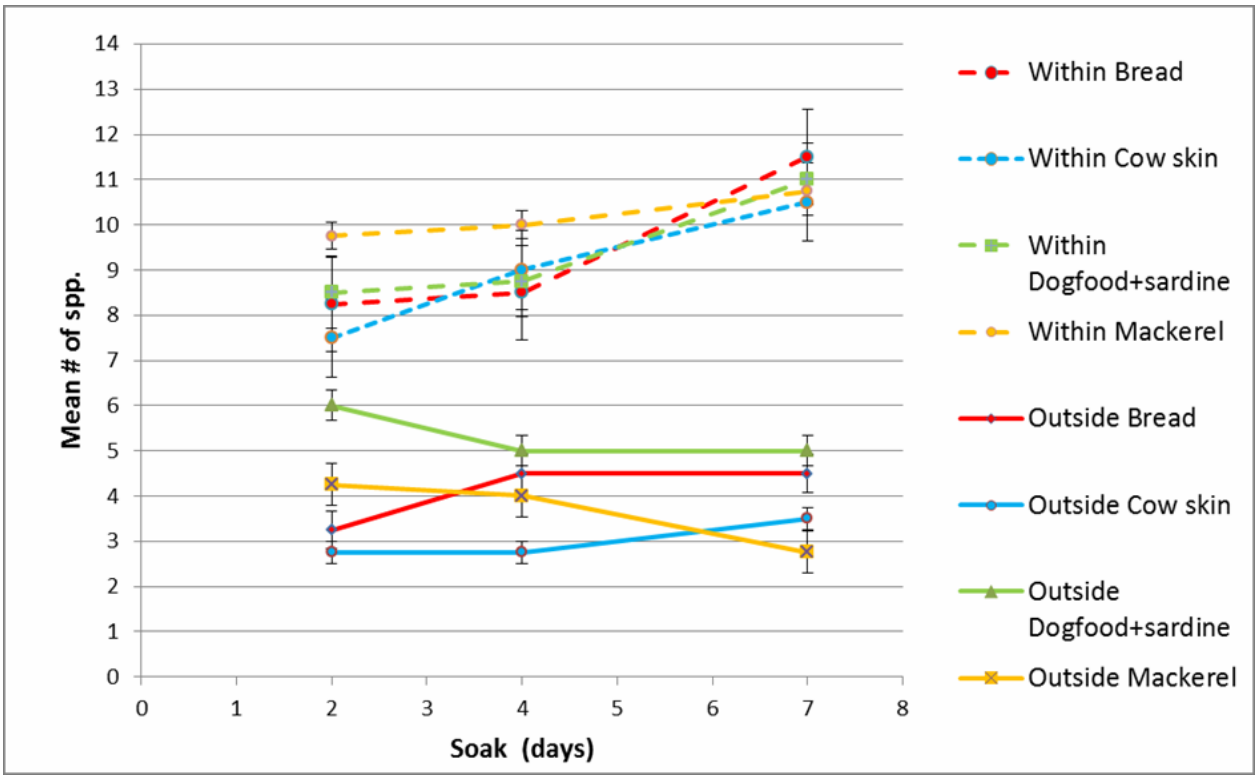

Figure 2. Mean number of species at each location (solid line –outside reserve/fished, dashed line-inside reserve/ unfished) over a period of one week (7 days) throughout sample period January- April 2014) based on 2212 counts over four sampling periods.