EFFECT OF DAILY HOLDING - WATER CHANGE ON MICROBIAL LOAD OF LIVE PRESERVED FRESHWATER- SNAIL (*Corbiculid heterodont*)

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ABSTRACT

Ten live freshwater- snails (*Corbiculid heterodont)* of approximately the same size, were purchased from Swali market in Yenagoa and distributed five into each of two 10 L plastic basins (labelled A and B) containing two litres of tap water each. Water in Container A was Changed daily while that in Container B was Unchanged. Microbial loads were compared between the intestinal tracts of the snails from the changed and unchanged waters. Microbial loads were also compared between the changed and unchanged waters. Indication was that for the Changed holding - water, water-snail intestinal microbial load decreased from 3.62E+ 10 on the first day to 2.97E+ 09 on the third day. This was over 12 fold reduction in microbial load. For the Unchanged holding - water intestinal microbial load, the decrease from the first to the third day was from 3.48E+10 to 2.20E+10. This was only a 1.6 fold reduction. For the Changed holding water, microbial load decreased from 2.52E+ 02 on the first day to 1.26E+ 02 on the third day indicating a 2 fold reduction in microbial load. For the Unchanged holding water however, there was increase from the first to the third day from 2.31E+02 to 2.56E+02. This was a 1.11 times increase. Discussion was on the importance of changing of holding water in order to improve curing of the freshwater snails after they have been harvested from the polluted Niger River.

Keywords: *Bivalvia*, radiation, freshwater, contamination, clams, water snail, curing.

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INTRODUCTION

Live Freshwater-snail (Bivalvia) sales in Nigeria

The sale of live water – snail is a thriving innovation in the sale of sea foods especially in the cities of Nigeria. This is due largely to the non availability of refrigeration and other modern methods of fish preservation in the rural communities where clams and backwater fishes are breed or caught and carried to the cities. A whole network of entrepreneurs are involved in these sales; starting from the rural breeders or use of fish traps or diving to capture them, to the petty traders who buy them off the fishermen in the rural areas, sell them to the business women in the cities and to individual consumers. All along till it gets to the final consumers, water snails would be kept alive in basins of water without feeding for two to three days; water is often changed daily in order to extend their life span.

Live freshwater - snail cure of microbial load has been practiced inadvertently from time by the local community often by changing keeping water of fish on daily bases for reason of prolonging their life during sales. Microbial load reduction probably takes place following the starvation of the clams during the keeping period as a result of the passing out of microbes in their faeces and this is facilitated by daily changing of the keeping water.

The Bivalves

The name "bivalve" refers to the two-part shell that characterizes some species of Molluscs. The two halves of the shell are joined by a ligamentous hinge and held shut by a pair of strong adductor muscles. Bivalves belong to the invertebrate phylum *Mollusca*; well-known bivalves include clams, gastropoda, scallops, mussels, and oysters. More than 15,000 species of bivalves exist all of which are aquatic, living in both marine and fresh-water environments. Most bivalve species go through a free-swimming larval stage before taking on their characteristic adult form and lifestyle. They are filter feeders in which currents of water are drawn into the body and through the gills, where tiny food particles are caught in the gill mucus. This flow of water also accounts for their mode of respiration, allowing organisms to obtain fresh oxygen.

The Clams live underground, using a muscular foot to dig down into sand or mud. They take in water for filter - feeding and gas - exchange through an extended part of the body called the siphon, or neck. The siphon is also used to disperse eggs or sperm. Common predators of clams include starfish and eels. Defensive behaviour involves retracting the body and closing the shell as tightly as possible. The giant clam can grow to lengths of 1.2 meters (4 feet) and is unusual in that it harbours algae (e.g., Dinoflagellates) within its tissues. The algae obtain shelter and protection from their host, while the clam obtains important nutrients that are products of algal photosynthesis.

Microbiological quality of freshwater snails

Microbial quality of freshwater snail samples from Itu creek, Niger Delta Nigeria was studied by Bukola *et al*, 2011. The bacteria isolates were Proteus sp., Sreptococcus pyrogens, Shigella flexneri, *Staphylococcus aureus, E. coli, Klebsiella aerogenes, Citrobacter, Bacillus subtilis, Bacillus cereus, Aeromonas sp., Micrococcus liteus, Streptococcus salivanus, Salmonella typhi, Vibrio parahaemolyticus, Vibrio sp. and Vibrio cholera. Proteus sp, Aeromonas sp.* and *Micrococcus liteus* had the highest frequency of occurrence. The fungi isolates were *Aspergillus terreus, Cladosporium sp, Fusarium oxysporum, Cryptococcus sp,* *Aspergillus flavus, Aspergillus glaucus and Aspergillus niger* in which *A. niger*, *A. terreus* and *F. oxysporum* had the highest occurrence. The total heterotrophic count of the samples ranged from 4.0 x10^7-1.42 x 10^8 cfu/g. The total microbial counts obtained was higher than the specified standard limits (1x10^5 cfu/g) for bacteria and fungi and 1.x10^2 cfu/g for coliforms). Ezeama (2004) carried out the microbiological characterization and sensory quality attributes of potassium sorbate treated and untreated smoked freshwater snail. Indication was that there were decreases in total viable counts in the smoked treated samples till day 4 of storage while smoked untreated samples exhibit population decreased till day 2. Significantly lower counts were obtained for smoked treated samples than for the fresh control and smoked untreated samples.

According to Efiuvwevwere and Ezeama (2004), bacteriological profiles of freshwater snail subjected to microcosms simulating local storage conditions indicated unappreciable change in samples subjected to body of water changed intermittently while much higher microbial populations were found in the intestines.

The aim of the present study was to determine the variability in the microbial load in the changed or not changed holding water (and in the corresponding intestines) in the freshwater – snails sold in Bayelsa State of Nigeria. The study was aimed at improving the microbiological quality of local live freshwater - snail sales.

MATERIALS AND METHODS

Water snail samples

The water snail samples used in this study were species of African freshwater snails. (*Corbiculid heterodont); called Kpeku* or *Gbou* in Ijaw). The freshwater snail samples were purchased from Swali market in Yenagoa, Bayelsa State.

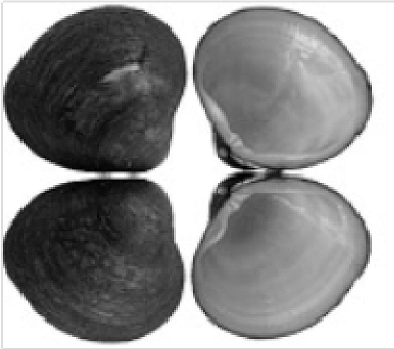

Plate 1: ***Corbiculid heterodont*** **(Freshwater snail).**

Treatments

Ten live freshwater- snails (*Corbiculid heterodont)* of approximately the same size, were purchased from Swali market in Yenagoa and distributed five into each of two 10 L plastic basins (labelled A and B) containing two litres of tap water each. Water in Container A was Changed daily while that in Container B was Unchanged. Microbial loads were compared between the changed and unchanged waters. Microbial loads were also compared between the intestinal tracts of the snails from the changed and unchanged waters.

Assessment of the intestinal tract microbial load

For each of the three days of the experiment, one gram of the intestine of the freshwater snail was extracted using sterile forceps and scissors. This was macerated in a sterile porcelain mortar and washed with 10 ml of sterilized deionised water into the first test tube. Serial 10- fold dilutions were made to the tenth tube. From the ninth tube in triplicates, 0.1 ml was spread unto nutrient agar for the determination of the TCFU ml^{-1}. While for the holding water, 10-fold dilutions serial dilutions were made to the third test tube and spread.

Statistical Analysis

Where normality and homescedasticity were satisfied, data from each day and treatment were analyzed using one-way analysis of variance (ANOVA). *Post-hoc* Tukey tests were used to identify significantly different groups. All the effects were considered significant at the P= 0.05 or lower.

RESULTS

Plate 1 shows picture of the shells of the freshwater snails. Fig 1 shows the effect of daily changing of holding water on the TCFU of the intestinal bacteria of the freshwater snails. For the Changed holding water, intestinal microbial load decreased from 3.62E+ 10 on the first day to 2.97E+ 09 on the third day. This was a 12.2 times reduction in microbial load. For the Unchanged holding water, the decrease from the first to the third day was from 3.48E+10 to 2.20E+10. This was only a 1.6 times reduction. In Fig 2, the effect on the microbial load of the Changed and Unchanged water were shown. For the Changed holding water, microbial load decreased from 2.52E+ 02 on the first day to 1.26E+ 02 on the third day. This was a 2 times reduction in microbial load. For the Unchanged holding water, there was increase from the first to the third day from 2.31E+02 to 2.56E+02. This was a 1.11 times increase.

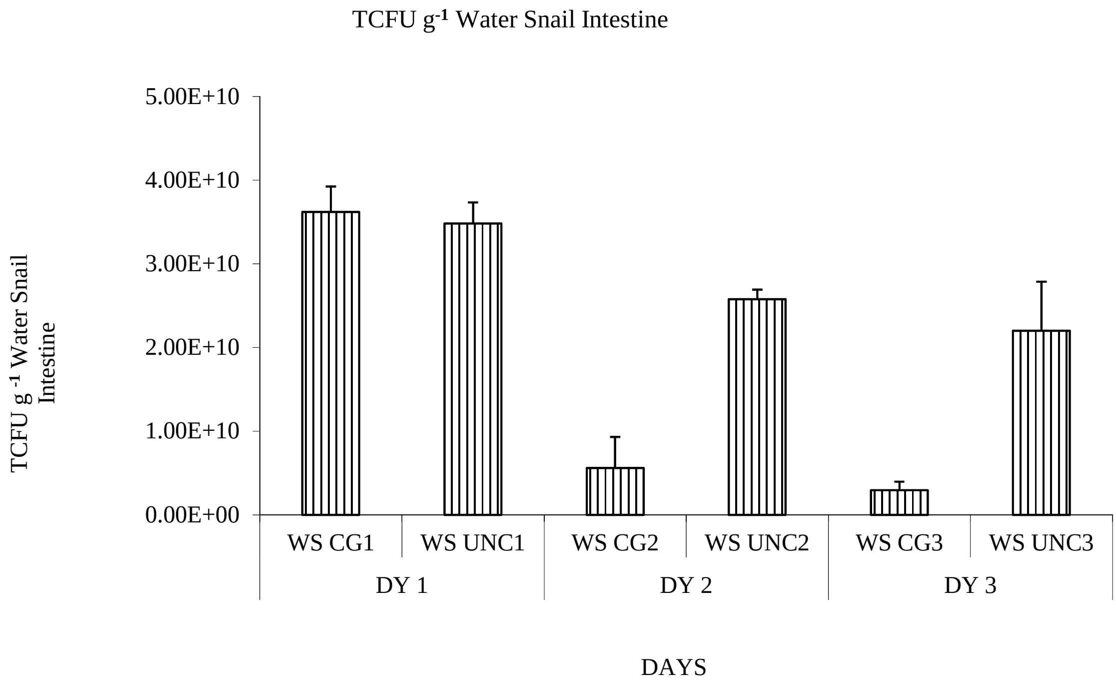

Fig 1: TCFU g-1 of Intestine of Water Snails in Changed and Unchanged Water Treatments.

The differences in the mean values among the treatment groups were greater than would be expected by chance; there was statistically significant difference. ANOVA (P = <0.001).

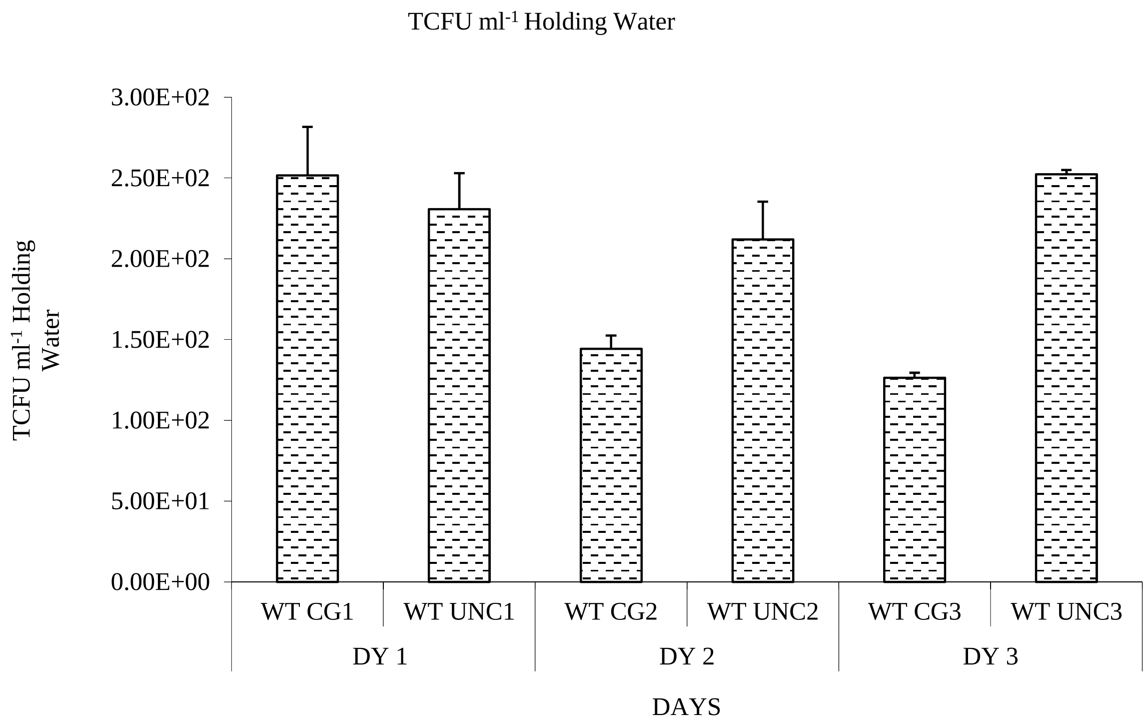

Fig 2: TCFU ml^{-1} of Holding Water of Snails in Changed and Unchanged Water Treatments.

The differences in the mean values among the treatment groups were greater than would be expected by chance; there is a statistically significant difference.

ANOVA (P = 0.003).

DISCUSSIONS

The effect of daily changing of holding water for three days on the TCFU of the intestinal bacteria load showed a 12.2 times reduction. While for the Unchanged holding water, for the same period, the intestinal microbial load indicated only a 1.6 times reduction. For the holding, the Changed water showed a decrease of 2 times reduction in microbial load after three days while there was an actual increase of 1.11 times for the Unchanged holding water. It was obvious that changing of holding water for the water snails while in captivity without feeding them probably could effectively cure them of their microbial load. This is of particular interest considering the fact that the habitat from which they were caught (the

Niger River) is noted for being highly polluted. Health indicators show that the Niger Delta has the highest risk from waterborne diseases in Nigeria. Cholera, Typhoid Fever and Gastroenteritis; three of the deadliest water transmitted diseases of the world are endemic in the Region. In the Niger Delta, over 80% of death cases are related to waterborne diseases as against the National Average of 26% (Egunjobi, 1993). Invariably, there is a likely hood of eventually making freshwater snails to be safe for human consumption especially if the holding period could be extended to about five days. The method is simple method and could be adapted for improving the microbiological quality of local live freshwater - snail sales. The method could supplement and improve on clam farming in Nigeria which has been on the increase in recent times.

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