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The Impact on People who Trade on the Fish Species *'Limnothrissa miodon'* - Kapenta for their Livelihood: Practical Perceptions of Traders of Siavonga

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Abstract
Lake Kariba is the world's largest man-made lake and reservoir by volume. It lies 1300km upstream from the Indian Ocean, along the border between Zambia and Zimbabwe. Lake Kariba was filled between 1958 and 1963 following the completion of the Kariba dam at its north eastern end flooding the Kariba Gorge on the Zambezi River. Culturally controversial, the local people believed that the construction of the dam would anger the Zambezi river god Nyami-nyami, who rise up and cause the dam would wall to collapse destroying the bridge as well as resulting in floods of catastrophic proportions. It is believed that the Nyami-nyami lives under a rock close to the Kariba dam wall. The rock is called 'Kariwa' meaning trap as the local people believed if you canoed past its location you would be sucked down in whirlpool never to be seen again. This where the name Kariba originates from, laced with the local mythology. In the late 1960s a type of fish Limnothrissa miodon locally known as Kapenta was introduced in Lake Kariba from lake Tanganyika. Kapenta is a small sardine fish which supports a large and viable fishery for Zimbabwe and Zambia. Kapenta, a type of fish also known as fresh water sardine has several chemical compositions that help reduce the risk of various diseases including prostate cancer. A recent chemical composition analysis of Kapenta by the National Food and Nutrition Commission (NFNC) shows a great variation in the nutrient composition for the dry and fresh Kapenta. NFNC principal nutritionist Mr. Musonda Mofu says dry Kapenta contains 209 calories of food energy compared with 85 calories of food energy in fresh Kapenta. In addition dry Kapenta contains 63 grammes of protein and only 16 grams of protein in fresh Kapenta. The paper reflects on the declining population of this small nutrient rich fish due to over-harvesting, climatic changes with increasing temperatures and with the decreasing levels of water storage. A cumulative study on the pattern of nurturing the fish for economic and social flexibility is the main concern of this paper.

Keywords: Culturally Controversial, Nyami-nyami, Catastrophic Proportion, Kariwa, Chemical Composition, Nutritionist, Declining Population

Introduction

Background of the Study

The main focus of the study is Lake Kariba of Zambia that is a resource of the fish species that provides the livelihood to thousands of people living in the catchment areas of the dam. The area for any reader other than the continent of Africa is referred as Siavonga. The climatic conditions and the weather related aspects and the water reliability has always shown greater prospects to the growth and harvest of the species of fish, commonly called Kapenta in Zambian language. The narrative in reference to the old traditional cultures is brought to concern in the abstract and this folklore is believed to be true to this day and hence the regards and special reverence to the dam Kariba of the southern province of Zambia.

This place found to be the ideal place for breeding large amount of fish and in the late 1960s a type of fish Limnothrissa miodon locally known as Kapenta was introduced in lake Kariba from lake Tanganyika. Kapenta is a small sardine fish which supports a large and viable fishery for Zimbabwe and Zambia.

Nutritional Levels of Kapenta

A type of fish also known as fresh water sardine has several chemical compositions that help reduce the risk of various diseases including prostate cancer. A recent chemical composition analysis of Kapenta in reference to the study made by the National Food and Nutrition Commission (NFNC) shows a great variation in the nutrient composition for the dry and fresh Kapenta. NFNC principal nutritionist Mr. Musonda Mofu says dry Kapenta contains 209 calories of food energy compared with 85 calories of food energy in fresh Kapenta. In addition dry Kapenta contains 63 grams of protein and only 16 grams of protein in fresh Kapenta. A review reference justified in support of the study. Kapenta has a high content of Iron and Vitamin A. It also has low levels of saturated fats and is a rich source of omega 3 and omega 6 fatty acids. It is also rich in Vitamin B12 which is important in the promotion of cardiovascular well-being since it is intricately tied to keeping levels of homocysteine in balance. Consumption of the whole Kapenta is also helpful as the intestines of Kapenta provide a rich source of micronutrients.

Statement of the Problem

It is found that the Kapenta catches have declined in the recent past compared to the earlier years. The people who sell the fish stated that the ordering of Kapenta has become too expensive. They stated that currently they can only order a maximum of 1 crate from the Rig boat owners while previously they could order a maximum of 4 crates in a day from the same people. This research was targeted on traders who have been in the business for at least 3 years. Declining stocks of Kapenta catches have negatively affected the living conditions of the Kapenta traders in Siavonga as this has led to low income levels in their households. Some sociologists and environmentalists argue that the declining fish catch cannot be solely attributed to climatic change but can be a result of social vegetative issues of the lake, pollution, overfishing and illegal fishing around the waters of Kariba. People are seen not to comply with the norms and regulations of the government when imposed in regard to the non-harvesting season of the year. Further the purpose of the study relates to the topic sentence taken to concern and the result is analyzed to create awareness among the people.

Descriptive Survey: Qualitative

The aspect of research methodology is a critical relevance of the study and a descriptive survey design was taken to practice. The major purpose of descriptive survey research design is description of the affairs as it exists at present (Kothari). According to (Kerlinger) descriptive survey design is a branch of scientific investigation which studies large and small populations or universe by selecting and studying sample chosen from the population to discover the relative incidence, distribution and interrelations. Data collected were ethically assessed to avoid complications of the situational stances. The target population for the study selected Rig owners and selected Kapenta traders and the officer from the fisheries department of Siavonga district.

Pretext of Literature Review taken to Discussion

The termed realism 'aquaculture' is the controlled process of cultivating aquatic organisms for human consumption. The article is mainly based on this realism of existence and befittingly taken to quote the literary analysis of (Murisa) which showed that there is a decline in the overall nutrient levels in lake Kariba's epilimnion due to the more stable thermocline associated with an average of climatic changes that has affected the growth and establishment of nurseries around the catchment areas of Kariba.

In addition, (Ndebele-Murissa et al.) has reflected on variation in climatic-weather conditions that has altered the lake Kariba's thermal properties. This has

a direct proportionate affect on the volume of the epilimnion that has shrunk resulting in a rapid decline in the overall nutrient levels. The reduced overall nutrient levels have affected plankton production, the essential nutrient food for the fish, in general.

The literature review of (Magadza) related that fact that the reduction in the Kapenta stocks can be explained through the food chain and by the nutrient reductions which in turn are known to be influenced directly by lake water levels and warmed up waters.

Further, (Musumali et al.) explicates that Kapenta fish is estimated to provide 4% animal intake protein as in usage. It therefore, plays an important role in the economy through employment to the rural poor and provides affordable protein to most household of Zambia.

Socio-Economic Reflex

'The lake's socio-economic and environmental data have often remained relatively obscure. This oversight in the acquisition of socio-economic data has resulted in knowledge gaps essential to address food security and poverty among small-scale fishers'. The stated fact by the authors depict the concern that the preferential occupational standards depict the challenges faced and the low priority of income earned. Hence the socio-economic relevance is a low key, though to denote the high consumption of Kapenta on nutritional grounds.

The focus of this study was to understand the socio-economic conditions of small-scale fishers and to identify the environmental threats that may have negative effects on fisheries biodiversity and the livelihoods of the fishers in Lake Kariba, Zambia. The results obtained showed that the communities around Lake Kariba depend on fisheries as a source of income and employment. While the overall fish production has not significantly reduced in the past 13 years, fish species of high economic value have declined.

'The fishers in Lake Kariba are vulnerable to resource degradation cascading into the loss of social, economic, and ecological proceeds that can be attained through responsible fisheries' (Imbwae et al.). The stated fact by the authors referred by the authors denote the existing conditons of the fishery of Kapenta.

Fishing of *Limnothrissa miodon*-Kapenta in lake Kariba

The researcher sampled and interviewed some Rig owners to find out how Kapenta is fished and only the Rig boat so far has been observed as the only boat that fishes Kapenta. The following responses were given by the Rig owners to the researcher. The Kapenta fish is caught at night using Kapenta Rigs. The Rig boat was specifically designed to fish Kapenta and it has the following characteristics;

- It is big and more balanced than other types of boats to carry a rim that holds the fishing net. The fishing net measures roughly around six meters in diameter and around eight to ten meters in length. The net is then used to bring the fish up from anything from forty meters deep in the lake.
- Because of its size, it is able to withstand the pressure of the heavy winds in the lake in the event that the lake experiences heavy winds without capsizing.
- The engine of the Rig boat runs the alternator which produces light and the light attracts the Kapenta and then it is caught.
- The Rig boat uses LED lights which are lighted by the alternator.

Prospective Economic Avenue: Preservation of the Kapenta after it has been fished

After the Kapenta has been fished by the fishermen in the night, the Rig owner and fishermen weigh the caught Kapenta and then sell it the Kapenta traders. The Kapenta is sold per crate and a crate of Kapenta weighs 20 kilogrammes. The traders then buy the Kapenta from Rig owners to the markets for re-selling to the local public.

The Kapenta that remains behind after selling is then preserved and sold by the traders to the general public. The fresh Kapenta is packed in trays which are sealed with a cling foil plastic and then frozen

before it is sold. The fresh Kapenta is usually packed in 200mg packs or 400mg packs. The sealed packets of fresh Kapenta is sent to the super-markets as shown below.

The Kapenta which is sold as dry Kapenta is usually dried on Kapenta drying racks. On a hot sunny day the Kapenta takes four to five hours to dry. Kapenta which is being dried on a Kapenta drying rack to be sold as dry Kapenta.

Possible Reason to Ascertain if Climate Change is leading to the Declining Stocks of Kapenta in lake Kariba: Natural Sequences, Living with Nature

Climate change is the long term shifts in temperatures and weather patterns. Due to the lack of the meteorological department in Siavonga district the researcher spoke to ten proprietors of Rig boats patterning to their observations regarding the declining stocks of Kapenta. The Rig owners who were interviewed had been in the business for at least 5 years. Observationally, the Rig owners stated that whenever the region experienced high amounts of rainfall, they experience high catches of Kapenta. However, the Rig owners stated that whenever the region experienced extreme high temperatures in October and September, Their fishermen recorded low Kapenta catches. The fact that Rig owners stated that they experienced high Kapenta catches whenever the region experienced high rainfall, this shows that the lake has a lot of runoff from the streams which join the Zambezi river. The Zambezi river then pours its water in lake Kariba which has a lot of runoff and nutrients. The nutrients help the phytoplankton to grow very well in lake. Phytoplankton is food the Kapenta. The Kapenta in the lake then grows at a fast rate as they have enough food to feed on and they also reproduce at the faster rate because of the high nutrient levels in the lake.

The fact that Rig owners stated that they experienced low Kapenta catches whenever the region experienced extreme high temperatures, this shows that high temperatures does affect the rate at which Kapenta reproduces whenever its very hot. This shows that Kapenta does not reproduce very fast when it is very hot and that growth for Kapenta is slow. It also shows that phytoplankton growth is slow due to high temperatures. Climate changedoes affect the stocks of Kapenta in that when the region experiences extreme high temperatures the fishermen experienced low catches of Kapenta meaning that the stocks of Kapenta would have reduced in the lake as the Kapenta would not have enough food due to the reduced growth of phytoplankton. The fishermen experienced high catches of Kapenta meaning the stocks of Kapenta would increase because of the increased runoff in lakes which transports nutrients into the lake during heavy rains. The increased nutrients bring about an increase in the reproduction and growth of Kapenta.

To Ascertain if Overfishing is Leading to the Declining Stocks of Kapenta in Lake

The researcher identified through a relational chat with the fisheries officer the carrying capacity of Rigs on lake Kariba and how the lake is distributed between the two countries (Zambia and Zimbabwe). The fisheries officer stated the lake Kariba has a carrying capacity of 500 Rig boats both on the Zambian and Zimbabwean part of the lake Kariba. Lake Kariba is shared between the two countries

with the Zambian side having 45% of the lake and the Zimbabwean side having 55% of the lake. The Zambian side has over 100 registered Rig boats with the department of fisheries. Siavonga town alone has 380 registered Rig boats. The fisheries department authorizes fishing of Kapenta for a period of 21 days when there is a full moon and bans fishing for a period of 10 days when there is no moon in the sky. The 10 days period is to allow breeding of Kapenta and for it to grow.

To Ascertain whether Illegal Fishing of Kapenta takes place in Lake Kariba

To find an answer to this concern, the researcher approached the fisheries officer and the Kapenta traders. To this identity, the fisheries officer stated that the net that the Rig boats use does not capture very small Kapenta which is still in its infancy. He said before a license is issued to a Rig owner to allow them to fish Kapenta, the fisheries department inspects the net on the Rig boat so that very small Kapenta is not caught but only matured and big Kapenta is fished in the lake. The fisheries officer also stated that they do carry out random patrols in the night and if they find an unregistered Rig boat, both the workers and the owner of the Rig boat are prosecuted. He also stated licensed Rigs do pay monthly returns according to the amount of Kapenta that they caught. This is an experiential relevance to the topic of concern.

A Few Responses of Rig Owners who were Interviewed to take Referential Content to Analyze:

i) The researcher asked the proprietors of Rig boats on how the catches of Kapenta have been when the region experienced heavy rainfall?
   Response: In response, the Rig owners stated that whenever the region experienced high amounts of rainfall, they could catch good amount of Kapenta.
ii) The Rig owners were questioned on the catch during high temperatures during the months of September and October?
   In response, the Rig owners stated that during the high temperatures in October and September, the yield was low.
iii) A question was raised to the Kapenta traders if they observe any form of illegal fishing from the Rig owners?
   In response, the traders said that they do not observe illegal fishing but they asserted the fact that they do not get receipts.

A sample of questions and responses are reflected for an analogy to assess the findings.

Status Quo of Life and Living of Dependent People on this Aspect of Research

The samples taken to reference responded to how the declining stocks of Kapenta have affected their livelihoods; The traders stated that the reduced crates of Kapenta that they were ordering reduced their household income. Reduction in house hold income led to a reduction in the capacity of the traders to provide basic needs for their families such as buying food, providing shelter for their families, taking their children to good schools as they cannot afford all these services.

Effect on Livelihood: The declining stocks of Kapenta has affected the ordering of crates of Kapenta for sales in the markets as well as preserving them as dried fish for future use. The traders feel that the stock decline would affect their living standards as the money they would earn has gone to minimal levels as they are completely dependent on the availability of crates of Kapenta. The major analysis taken to relevance is the significant objectives of this study which was to determine how the declining stocks of Kapenta in lake Kariba have affected the social economic status of the Kapenta traders in Siavonga district. 100% of the traders who were requested to reflect on the challenges, stated that the number of crates of Kapenta they have been ordering from the Rig owners have declined. The steady decline in the number of crates of Kapenta that they have been ordering from the Rig owners have had a negative impact in their lives as this has reduced their disposable income at household level.

Consequences of the Decline: A General Awareness of a Struggle of a Home: Reduction in the household income led to a reduction in the capacity of the traders being able to provide basic needs for their families such as buying food, providing good shelter for their families, taking

their children to good schools as they are not able to pay for such facilities for their families to enjoy. However, the major concern of such identity is to bring-in a reliable alternative to the livelihood of the commoners who deal in selling of Kapenta for their living.

The Objective of Climatic Effect taken to Discussion: Geographical Specification of the Area

The study was to the truth of the analysis was conducted to establish the fact that climate change has also contributed to the declining stocks of Kapenta in lake Kariba. The objective was achieved by interviewing the Kapenta Rig owners on their observations during times that the region experienced enough rainfall in the rain season and during times that the region experienced very high temperatures in summer. The Rig owners stated that in times when the region experienced high rainfall, they caught a lot of Kapenta, this could be attributed to the fact that when the region experienced high rainfall, the Kapenta in lake Kariba reproduced more and grew faster.

Possible Increase in the Growth Rate of Kapenta-Seasonal Fluctuations

The growth of Kapenta increased because the Kapenta had enough food from the runoff of the rains into the lake. The runoff carries with it leaves, twigs and other degradable substances which when after they enter the lake they decompose and produce more nutrients for the phytoplankton of the lake. When the phytoplankton grows at a faster rate, Kapenta has enough food to feed on making it grow fast as well. The Rig owners also stated that they experienced low catches of Kapenta when temperatures were very high, this could be attributed to the fact that Kapenta does not grow very well when temperatures are very high and also phytoplankton does not reproduce well when temperatures are very low. This growth factor has a proportional effect on Kapenta and it is evidence that in low temperatures the Kapenta has less food to eat and does not grow well. Nevertheless, the Rig owners experience low catches of Kapenta.

The other objective of this study was to find out if overfishing and illegal fishing is contributing to the declining stocks of Kapenta in Lake Kariba. According the fisheries officer at Siavonga district fisheries office, the total carrying capacity of lake Kariba for Kapenta fishing Rig boats is 500 and to the drastic reality, the Zambian side of lake alone is only 45% of the surface area of the Lake Kariba where nearly 1000 Kapenta fishing Rig boats are harboured. The fact that the Zambian side alone has nearly 1000 Kapenta fishing Rig boats which denotes that overfishing does take place on Lake Kariba, leading to the declining stocks of Kapenta in Lake Kariba.

The Crux of the Situation that Happens Repeatedly

Illegal fishing as a common practice takes place on Lake Kariba as this was ascertained when the researcher spoke to the Kapenta traders. They stated that the Rig owners do not give them receipts when they order Kapenta from them. It only shows that the Rig owners' do not pay the equivalent tax at the department of fisheries when paying for the total returns of harvested Kapenta in the lake. This shows that there is illegal fishing on the part of the Rig owners and this also leads to the declining stocks of Kapenta in Lake Kariba and the harvested Kapenta is sold in some other place other than the local area.

Summative thought of the Study: Finding and Recommendations

The paper is an explicit expression of the geographical conditions of the area of Lake Kariba which has a direct influence on the breeding and growth of Limnothrissa moidon, called in local verbatim as 'Kapenta'. The various factors related to the declining of the stock of Kapenta in Lake Kariba, which is the most ideal habitat for these fish is discussed in precise in this article. The stock is relationally equated to the mass of food intake of the fish to the availability of phyto-plankton which is a variation according to the seasonal changes. The reproductive phase of the fish is affected due to the lessening of the availability of the phytoplankton available. Henceforth, the direct proportional decline of the harvest of the fish is experienced by the traders. Secondly, it can also be concluded that declining stocks of Kapenta in lake Kariba are also caused by

overfishing and illegal fishing as this could be seen from the number of Kapenta fishing boats on the lake which exceeds of the total carrying capacity of the recommended Rig boats on the lake.

Finally, the declining stocks of Kapenta have negatively affected the Kapenta traders of Siavonga district as they now have reduced income which in turn impedes their ability to provide the adequate needs of the families. To the point of view, certain restrictions to be initiated for the betterment of the area development by countering the number of rig boats to be harbored for the catch. Officials to monitor proper payment of taxes to reduce illegal fishing in the area. Furthermore, specific areas can be selected to construct aquaculture ponds to grow more nurslings of Kapenta under supervised conditions. More livelihood activities should be taught to the people to improve their livelihood and living standards.

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