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Research Paper

Effect of Climate Change on the Fisheries Distribution in Kusalla Dam, Karaye Local Government Area Kano State Nigeria

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This research work develops a frame for the study of climate change on the fisheries distribution in Kusalla Dam Karaye Local Government area Kano State, Nigeria. Stratified sampling techniques were used to select three fishing communities in Karaye Local Government area which are Kusalla Dam, Kumbugawa and Zango in Kano State. A total of sixty five respondents were interviewed using structured questionnaire. Data collected on socio-economic characteristics, Available fish species and impact of climate change. Data were analyzed by using descriptive statistics and SPSS version 20. The result reveals that fishing activities in the study area is carried out by men only, as their primary activities though they also have other activities. There is slightly increase in temperature and decline in rainfall in the study area these show that there is clear evidence of climate change in the area. This has affected the fish species and diversity. There is high catch per unit effort during summer season and having low catch per unit in winter season, so due to this a close season has to be introduced in the fishing system of Kusalla Dam and also extension practice should be introduce to the fishermen on effect of climate change.

Keywords: Climates change, Karaye, effect, fish, Kano State

INTRODUCTION

Climate change is a major and overriding environmental issue of the present time, and the single greatest challenge facing the globe (Mustapha, 2013), Climate change will present fishes with new environment that can affect individual fish by altering physiological functions such as thermal tolerance, growth, metabolism, food consumption, reproductive success, and the ability to maintain internal homeostasis in the face of a variable external environment (Rosen, et al, 2007). Fish population that are faced with changing thermal regimes may increase or decrease in abundance, experience range expansions or contraction, or face extinction (Ficke et al., 2007). These authors further stated that fishes exposed to elevated water temperature (e.g. from climate change) can face an ‘‘oxygen squeeze’’ where the decreased supply of oxygen cannot meet the increased demand. Global climate changes will also affect aquatic systems through changes in the hydrologic cycle; evapotranspiration, and precipitation. Higher temperatures and insulation could increase current water loss rates from these systems because evaporation rates may outstrip input from increased precipitation. In tropical system, evaporation and Evapotranspiration often already exceed precipitation in the dry season (Richardson and Schoeman, 2004); it is also unknown if increased water loss to the atmosphere will be offset by rising precipitation rates. Evaporation rates are driving factors in tropical lakes (Ficke et al., 2007). Small changes in water levels of lentic systems will likely have minimal impacts on freshwater pelagic fishes but could have more serious consequences for species with narrow bathymetric ranges, such as some of the cichlids in the African great lakes (Ficke at al., 2007). The aim of this research is to identify how climate change affects fish distribution in Kusalla Dam.

METHODOLOGY

Study area

Kusalla dam is located in Karaye Local Government area

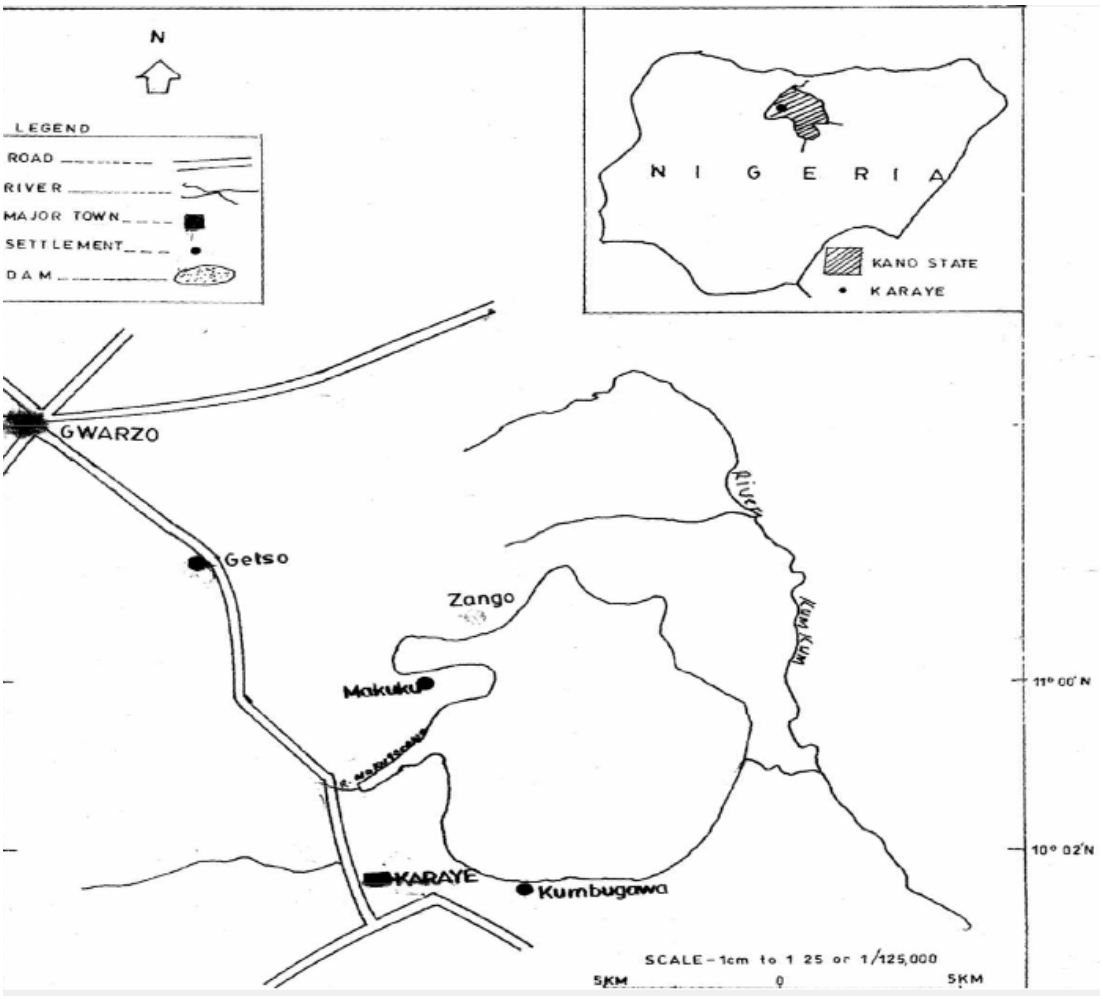

Figure 1. The map showing the study site.

of Kano State Nigeria beside Kano National Youth Service Corps (NYSC) Training Camp, in Sudan Savannah zone of Nigeria on latitude 10º 02' N to 11º 00' N and longitude 11º 42' E to 12º 42' E, with two distinct seasons (dry and wet seasons). The rainy season in Karaye local government area last from April to November. It headquarters in the town of Karaye. Kusalla dam is approximately 90Km southwest of Kano state and about 2Km from Karaye town, 1Km off Karaye-Gwarzo road of Kano State it has an area of 479km^2 and a population of 141,407 at the 2006 census (NPC, 2006) (Figure 1).

Sampling procedure and sampling size

The materials used in carrying out this research are as follow:

Well designed questionnaire were distributed among fishermen in three fishing villages (i.e., Karaye, Kumbugawa and Zango) around the study area that is Kusalla dam Karaye local government area Kano state, Nigeria. Sixty five research questionnaires were administered to sixty five fishermen, in such a way that twenty one questionnaires were allocated to each of the three fishing villages around the study area. Information on demographic profile, fisheries impacts, socio-economic livelihood, craft and fishing gear were collected.

Data collection

Data were collected from August to December 2017, from three different fishing villages which are (Karaye, Kumbugawa, and Zango), the main instrument of the data collection of this study was well structured data questionnaire and data were analyzed using descriptive statistics method to find out the socio-economic live hood, crew, size gear type and number in respect to each

enumerated landing were recorded. Fishermen were interviewed on available fish species, their abundance, possible extinction notice and knowledge about climate change.

Tools of analysis

Data collected on socio-economic status and effect of climate change on distribution of fish in the study areas were analyzed using descriptive statistics (Pie chart, bar chart, histogram etc). While identified fish diversity of the study was presented in a table, with their respective local, common and scientific names.

RESULT AND DISCUSSION

Table 1 shows the distribution of respondents by Age, Household size, and Fishing experience. The table indicated that 43.1% of respondents were between 20-30 years of age range, this indicated that majority were within their productive age which means they were very energetic youth and are likely to work effectively to increase their Catch Per Unit Effort (CPUE), while 24.6% and 29.2% are at the range of 31-40 and above 40 years respectively, while only 3.1% are at the age of less than 20 years. And also the (Table 1) above shows that the result of the study shows that 72.3% of the respondent had household size of between 1- 10, 21.5% had household size of 11 to 20 while 6.2% is above 20. The minimum household size is 1; the maximum is 20 while the mean household size is 4.3 with standard deviation 2.5. This is similar to the findings of Rothschild (1986) which infers that a large family can mean that the fisherman is more likely to work off fishing because relatives can substitute for his labour and supervision and could also suggest that he is more likely to work at home because some relatives might work off the farm to supplement family income. Table 1 also shows that the class interval of fishing experience of the respondent with highest percentage was 11-20 years of experience with about 43.1%, 1-10 years of experience with percentage of 33.8% and lastly above 20 years of experience with about 23.1%. Therefore, respondents with high experience in fishing are more than those with low level of experience in the study area. The low level of fishing experience could negatively influence Catch per Unit Effort of the fisherman. This finding has tallied with the work of M.A. Dambatta (2015) on profitability of fisheries enterprise in Kano state which stated that number of family household increase outings income.

Table 2 Shows that 65% of the respondents are male and there is no female among the respondents. Therefore, this study shows that, significant numbers or all of people engaging themselves in fishing in the study area are males by gender. It was observed that female fisher folks those not engaged in other livelihood activities apart from fishing at a time unlike their male counterparts. This could be largely due to the higher subsistence needs of the women within the household as well as high risk coping strategies imposed on them by their life-style of multiple goals (Squires et al., 2002). Table 2 shows that 53.8% of the respondents in the study area that is Kusalla dam of Karaye local Government Area are married while single and widowed were 32.3% and 13.8% respectively. This result showed that, most of the fishermen in the study area were married and the married fishermen are likely to spend much of their income on their families. Since married fishermen are likely to have higher responsibilities and higher expenses. The single fishermen are likely to have responsibility and expensive of life than married ones. Table 2 also shows that Primary and Secondary Occupation the occupations of the fishermen during the wet and dry seasons and their distribution are presented here 99% of the respondents had fishing as their primary occupation in the wet season while 0.1 % had other activities as their primary occupation while during the dry season, 78.8 % had fishing as their primary occupation and 21.2 % engaged in other activities as their primary occupation. Fishing is the primary occupation in both wet and dry season. The trend however shows fishing as more prevalent in the dry season than in the wet season. This conforms to the findings of Sogard, (1997) that fishing is the predominant activity in marine, lagoon and freshwater water bodies of karaye local government area but more people are involved during the dry season than the raining season. Other activities engaged in as secondary occupation to augment their livelihood and enhance their food security are farming system, trading, livestock production, fish processing, civil service, labour and hunting. This is similar to the finding of Sogard, (1997) which stated that the mean income received and standard deviation of other secondary activities has stated above. Table 2 also shows that the highest proportion of the respondents (33.8%) had secondary education. 35.4% had Qur'anic education, 30.8% had only primary education. These result shows that most of people residing around kusallah dam of about 64.3% of the respondents can read or write either in Arabic or western education. The findings of the socio-economic parameters are similar to the result of the work carried out by Squires et al. (2002).

Figure 2 shows that 62% of the respondent has experience of the extinction of fish species and 38% of the respondent did not experience it. And also the examples of extinction fish species are Carp, *Synodontis robbianus*. Table 3 shows that 100% of the fishermen experience high catch per unit effort during the summer season due to the high prolific and high temperature of the environment and also 100% of the fishermen experience low catch per unit effort due to the low prolific and low temperature of the environment. Table 4 shows the different types of fishing gear that are used before

Table 1. Distribution of respondents by age, household size, and fishing experience.

Variable	Frequency	Percentage
Age		
Less than 20	2	3.1
20-30	28	43.1
31-40	16	24.6
Above 40	19	29.2
Household size		
1-10	47	72.3
11-20	14	21.5
Above 20	4	6.2
Fishing experience		
1-10	22	33.8
11-20	28	43.1
Above 20	15	23.1
Total	65	100.0

Source: Field Srvey, 2017

Table 2. Distribution of respondents by sex, married status, secondary occupation and education status.

Variable	Frequency	Percentage
Sex		
Male	65	100.0
Married		
Single	21	32.3
Married	35	53.8
Widower	9	13.8
Total Secondary occupation	65	100.0
Trading	26	40.0
Farming	28	43.1
Hunting	9	13.8
Others	2	3.1
Educational status		
Qur'an	23	35.4
Primary school	20	30.8
Secondary school	22	33.8
Total	65	100.0

Source: Field Survey, 2017.

Table 3. Periodic distribution of catch per unit effort.

Variable	*Frequency*	*Percentage*
High catch		
Summer period	65	100.00
Low catch		
Harmattan period	65	100.00

Source:Field survey,2017.

Table 4. Availability of gear type fishes found in Kusalla dam.

Period	Variable	Frequency	Percentage
Before	Hooks, pots, net etc	65	100%
After	Traps, gillnets, tackle boxes etc	65	100%

Source: Field survey, 2017

Table 5. Fish species diversity in Kusalla dam of Karaye local government Kano, Nigeria.

Local (Hausa) Name	English Name	Scientific Name
Bali	Heterotis	*Heterotis niluticus*
Buro	Catfish	*Auchenoglanis biscutatus*
Dan sarki	Aba	*Gymnarchus niloticus*
Falia	Moonfish	*Citharinus lates*
Farin wata	Labeo	*Labeo senegalensis*
Giwan ruwa	Niger/Nile perch	*Lates niloticus*
Kawara	African tetras	*Brycinus leuciscus*
Karfasa	Tilapia	*Tilapia zillia*
Kulkula	Spotted tilapia	*Tilapia maria*
Kurungu	Squeaker	*Synodontis robbianus*
Tarwada	Catfish	*Clarias gariepinus*
Dinko	Bayad	*Bagrus bayad*

Source:Field survey,2017.

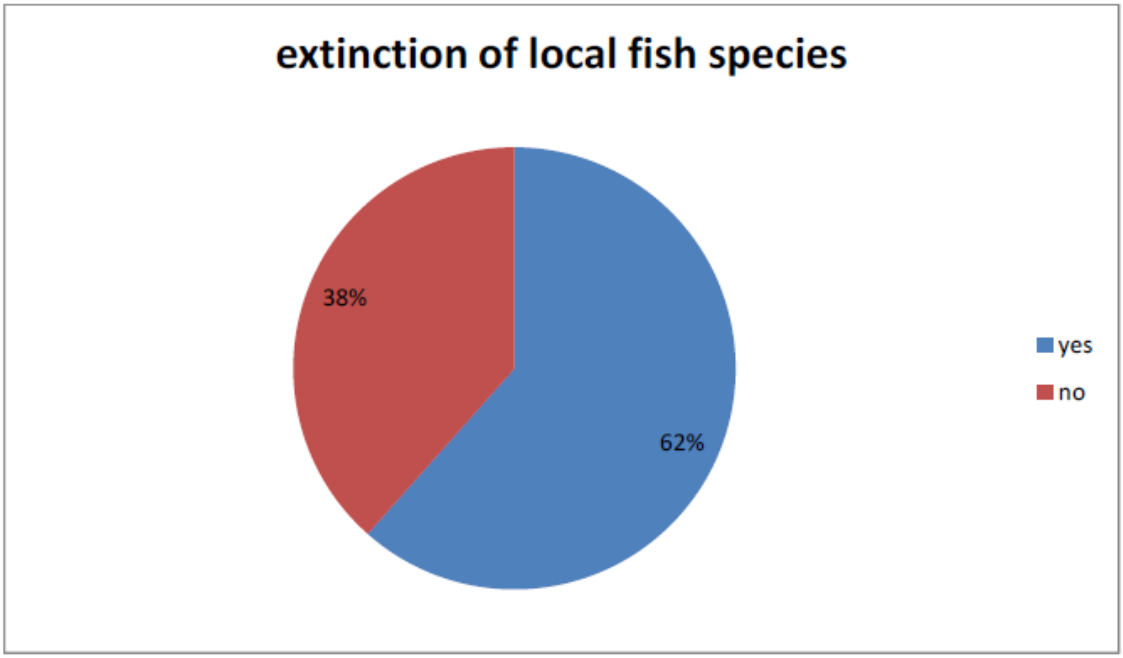

Figure 2. Extinction of local fish species.

and after in karaye local government area, therefore fishing method are classified as either active and passive, passive gears are those which are left in place for a period before retrieval. They may either attract fish using bait, or may passively wait for a fish to swim into a net or trap.

Fish diversity

The trend of temperature pattern for about 30 years clearly showed high fluctuation overtime. Invariably, since fishing depends on wild populations whose variability depends on environmental processes governing the supply of young stock, their feeding and predation conditions through the life cycle; climate change might have had strong implication on fish breeding, egg hatchability, fry survival, food availability and fish distribution pattern. Fish are poikilothermic animals therefore any change in habitat temperatures would significantly influence metabolism, growth rate, total production, reproduction seasonality, reproductive efficacy, and susceptibility to diseases and toxins as observed by Sharp, (2003). Climate change-induced

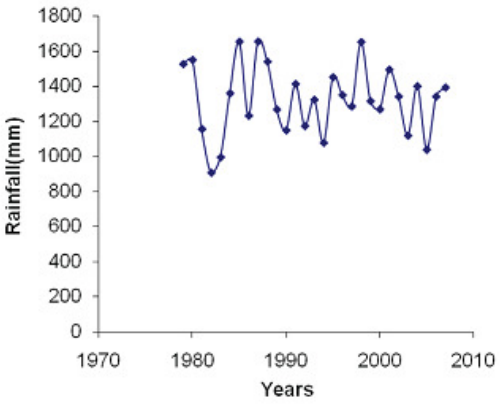

Figure 3. Rainfall distribution in the study area.

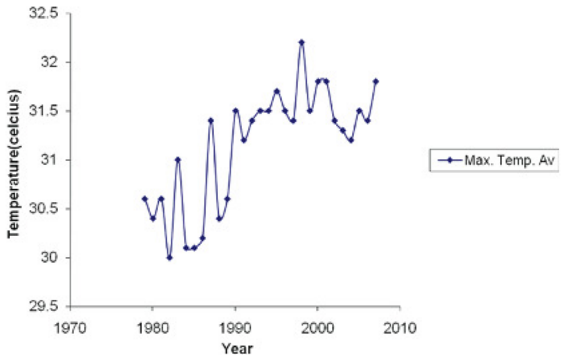

Figure 4. Temperature distribution of the study area.

temperature variations would thus have a much stronger impact on the spatial distribution of fishing activities and on their productivity and yields as observed in (Figure 4 and Table 5). Climate change will have wide-ranging effects on the water resources, Changes in rainfall pattern are likely to lead to severe water shortages and/or flooding. Melting of glaciers can cause flooding and soil erosion. Temperature increases will potentially severely increase rates of extinction for many habitats and species. A rise in extreme events will have effects on health and lives fish.

Conclusion

This research work shows that, the effect of climate change either very high or very low temperature may led to fish mortality, therefore in order to improving food security there is need to put in place strategies that will mitigate the effect of climate change through making better use of the little fish caught by reducing post-harvest losses through effective methods of preservation and value addition to the products thus increasing the percentage of fish used for direct human consumption, improving access to micro-credit to purchase efficient gear so that the same area is not fished over and over again and use of better gear to reduce fish trash and those discarded at sea. Coping strategies which include alternative sources of livelihood and diversification into farmed fish / aquaculture is also been encouraged.

Recommendations

(i) At it is noticed from the data collected it shows that. There is high catch per unit effort during summer season (Bazara) and having low catch per unit in winter season (Rani), so due to this a close season has to be introduced in the fishing system of kusallah dam.
(ii) So also the government has to ensured that it is introducing fish into the dam every pre determined period of time so as to avoid extinction of some species available in the dam.
(iii) Moreover, educational intervention and placement of extension staff may have significant impact on enhancement fishermen ability to develop and use climate change adaptation strategies.

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