Adamawa State University Journal of Scientific Research
Volume 7 Number 2, August, 2019; Article no. ADSUJSR 0702037
ISSN:2705-1900(Online); ISSN: 2251-0702 (Print)
http://www.adsujsr.com

Fish Species Distribution and Abundance in Some Selected Ponds in Mubi North Local Government Area of Adamawa State, Nigeria

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Abstract

Fish species distribution and abundance in Janruwa Maihuda, Wurokye, Papata and Vimtim malacha ponds in Mubi North local government area of Adamawa State, Nigeria were assessed. Data were collected through fishing in each of the ponds once in a week using fishing net of $3cm^2$ sizes for a period of three months. The data were analysed using species richness, descriptive statistics and Post-Hock test of least significant difference. The result showed that, Maihuda pond had the highest with 172 fishes, while the list were Janruwa and Wurokye with 135 fishes each. The investigation identified 8 species of freshwater fishes namely; *Tilapia busumana, Tilapia sparrmanii, Clarias gariepinus, Cithricthys spiloplerus, Synodontis granulosis, Sarotherodon galilieus, Alestes macrelpidotus And Schilbe intermedius* with Janruwa and Wurokye having the highest species richness of 6 each. In line with the distribution of fish species across the ponds, a varied significance ranging from 0.014 to 1.000 was observed. The study showed that, fish productivity could be improved in the area through creation of awareness among the dwellers of the dangers of over fishing and encouragement of fish farming among the local populace as key to increased fish production.

Keywords: Diversity, fish species, species richness, abundance, ponds, fishing

Introduction

Nigeria being a middle–income, mixed economy and emerging market state needs the contribution of every sector of the economy for its economic growth. This makes fisheries resources paramount in achieving such desire. Rabo *et al.* (2014) define fisheries resources as fishery products or output that arises from capture fisheries (fisheries resources caught from open water bodies like rivers, streams, lakes, dams or oceans) and aquaculture (rearing of fish in an enclosed environment such as tanks, reservoirs, ponds etc.), of which Nigeria is endowed with. The present status of Nigeria as a country with growing economy can make effective use of its natural water bodies such as rivers, streams, lakes, natural dams and others to guarantee capture fishery productivity. Similarly, fisheries resources production can be increased through fish farming using ponds, tanks, reservoirs and man–made dams.

Food and Agricultural Organization, FAO (2016) views fisheries resources as an engine or drivers of agricultural growth in Nigeria, a sector that is vital in economic growth and development. This claim is being supported by Fishery Committee for the West Central Gulf of Guinea, FCWC (2016) that fishery sector contributes 0.48% to agricultural gross domestic product of Nigeria out of the 20.24% accrued to agricultural sector in 2012. It is therefore clear that the fisheries resources are important in economic recovery and guaranteeing of food security. Moreover, most of the local residents of the study area are relatively of low economic status, making them perpetual dependence on fish protein as a substitute for other animal protein hence the sustenance of the steams has become necessary

For sustenance of fishery sector, there is need for identification of fish species and to understand their distribution in Mubi North local government area, considering fish as an important menu for most of human populace in the study area. Oladipupo (2011) reported that in most rural areas of Africa, especially in Nigeria, fish accounts for most of the animal related proteins needed by man because of its relative cheapness and availability. It is apparent therefore that there is need to sustain diverse fish species for increased productivity, because Rabo *et al.* (2014) observed that the more diverse the fish species the better the productivity of the fishery sector as to meet the need and aspirations of the increasing human population. Rabo *et al.* (2014) further reported that the sustenance of fish biodiversity has become imperative, because internationally more than 120 million people through out the world are estimated to depend on fish for all or part of their income, making fish an important resource.

Currently, exploitation of the fisheries resources in the study area are done indiscriminately without taking into consideration which of the fish species are still abundant and which ones are threatened. This ugly situation is made worse by the poor fishing practices that are not environmentally friendly. This warrants the need to identify and assess the distribution of freshwater fish species as the freshwater ecosystems are the most threatened ecosystems in the world, with high species extinction rates resulting from human dependence on freshwater resources (Stephanie et al., 2011).

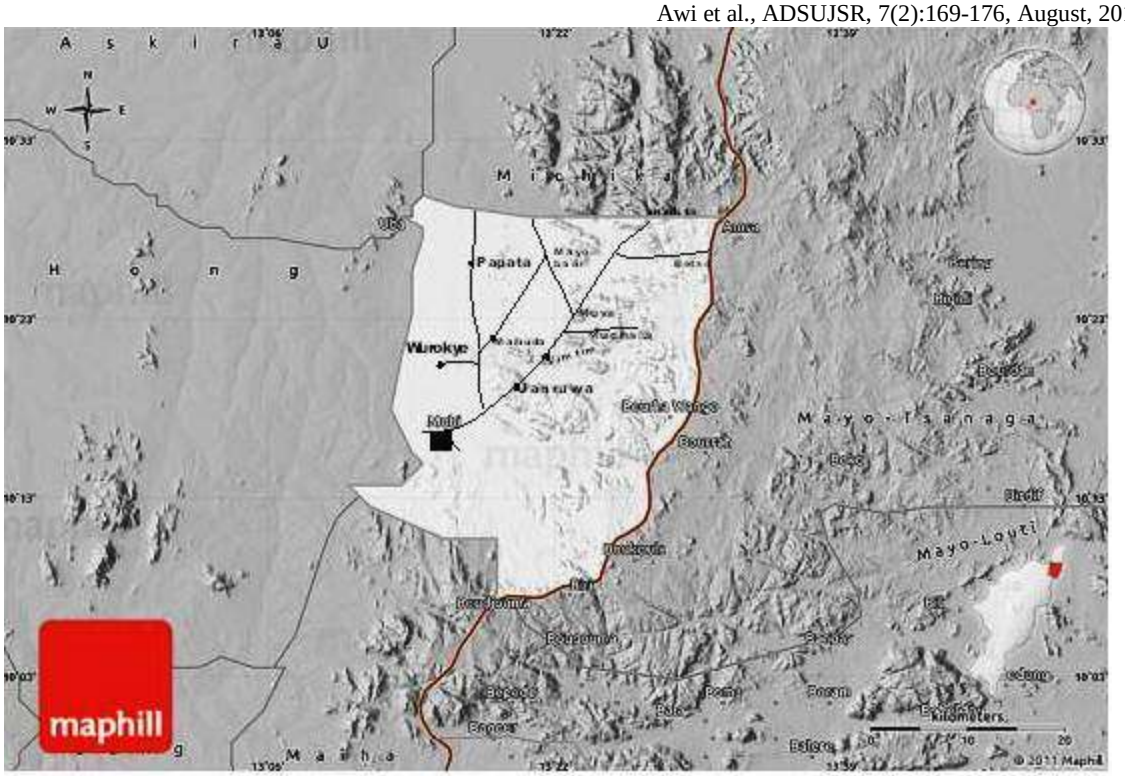
The knowledge of fish species distribution will not only help in conservation but is rather an important step in increasing fish productivity through effective management of water bodies. For the diversity of fish species in the study area as at now remain unknown, such situation is likely to have adverse effect on the local dwellers who are the immediate beneficiaries of such an important resource. The present investigation is aimed at improving the productivity of the fishing sites in the study area through the identification and comparative assessment of fish species distributions in the study area for economic growth and development.

Materials and Methods

The Study Area

The study was carried out in Mubi area of Adamawa North Senatorial District. Mubi lies between latitude 92^{o} 60^{1} and 10^{o} 10N and between longitude 13^{o} 1^{1} and 13^{o} 44^{1} East. The study area is belt by Mandara Mountain to the eastern side, Askira-Uba local government area to the North, Hong local government area to the West, Michika local government area and Cameroon Republic to East with a population of 196,400 (Brinkhoff, 2015).

Mubi has a land area of 506, 408km^2 that is characterized by undulating topography with it's headquarter well watered by river Yedzaram (Adebayo, 1999). The Yedzeram River takes its source from the Hudu hills and flows northwards into the Lake Chad (Adegoke and Bulus, 2015). The study area is located in sudan savanna of Nigeria with daily temperature ranging from 28 – 34^{o}C and mean annual rainfall of 700mm to 1,050mm per year (Adebayo, 1999). Below the map of Mubi North local government area.



KEY:

Represent Ponds

Headquarter of Mubi Local Government

Major road

Rural road

Figure 1: Map of Mubi North Local Government Area Shwoing study locations

Data collection

The investigation involved the service of a research assistant who was also an excellent fisher and a translator. Five historic ponds (Janruwa, Papata, Wurokye, Vimtim Mulacha and Maihuda) were investigated through collection of fish samples using fishing net. Fishing in every pond was done once a week using fishing net of $3cm^2$ sizes, which helped in avoiding the catching of fingerlings. Fish caught were identified using freshwater fish identification guide as earlier used by Ataguba *et al.* (2014). This was then followed by progressive counting and recording of fish species and frequency for each pond during every fishing day.

Data Analysis

Fish species distributions were compared statistically using Post Hoc Test of least significance difference (LSD).

Results and Discussion

Fish Species of the Study Area

The study identified 8 fish species with Janruwa and wurokaye having the highest of 6 while others 5 each. Similarly, the result indicated that *Tilapia busumana*, *Tilapia sparrmanii* and *Alestes macrelpidotus* were recorded across all the ponds studied. The study further showed that *Clarias gariepinus* occurred in four ponds, *Sarotherodon galilieus* in 3 and *Synodontis granulosus* in 2 while *Citharichthys spilopterus* was recorded in only one pond **(**Table 1). The result also revealed that Maihuda had the highest

number of fish caught (172), followed by Vimtim mulacha (160 and the least were Janruwa and Wurokye with 135 each.

Table 1: Fish species of the study area

S/No.	Fish Species	Vimtim Mulacha	Maihuda	Janruwa	Papata	Wurokye
1.	*Tilapia busumana*	92	88	67	69	82
2.	*Tilapia sparrmanii*	36	61	48	50	45
3.	*Alestes macrelpidotus*	30	17	15	18	5
4.	*Clarias gariepinus*	0	5	2	8	1
5.	*Citharichthys spilopterus*	0	1	0	0	0
6.	*Synodontis granulosus*	1	0	0	0	1
7.	*Sarotherodon galilieus*	0	0	2	1	1
8.	*Schilbe intermedius*	1	0	1	0	0
Total (N)		**160**	**172**	**135**	**146**	**135**
Species Richness		5	5	65	5	6

Comparison of Distribution of fish species across the Ponds

The distribution of *Tilapia busumana* was compared across the studied ponds and the results showed that there was no significant difference in terms of their frequency (Table 2), as the significant level ranged from 0.579 – 0.965 at P=0.05. This study indicates that the environmental conditions of the stream seems the same and this confirms the the report of Wurtsbaugh *et al.* (2014) that all things being equal, the environmental conditions for freshwater in tropical areas are similar.

Table 2: Comparative Assessment of the Distribution of *Tilapia busumana* across the Ponds

S/No	Location	1	2	3	4	5
1.	Janruwa	-	0.641	0.579	0.965	0.790
2.	Papata	0.641	-	0.929	0.673	0.841
3.	Wurokye	0.579	0.929	-	0.609	0.773
4.	Maihuda	0.965	0.673	0.609	-	0.824
5.	Vimtim Mulacha	0.790	0.841	0.773	0.824	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the tables represents the 5 locations as they appear in the rows.

The result of distribution of *Tilapia sparmanii* (Table 2) across the ponds showed that there was no statistical difference in terms of occurrence across the ponds, as the level of significance ranged from 0.398 – 0.919 at P=0.05.

Table 3: Comparative Assessment of the Distribution of *Tilapia sparmanii* across the Ponds

S/No	Location	1	2	3	4	5
1.	Vimtim Mulacha	-	0.659	0.684	0.946	0.919
2.	Wurokye	0.659	-	0.398	0.709	0.588
3.	Janruwa	0.684	0.398	-	0.635	0.760
4.	Papata	0.946	0.709	0.635	-	0.865
5.	Maihuda	0.919	0.588	0.760	0.865	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the Tables 3 represents the 5 locations as they appear in the rows.

Assessment of the Distribution of Clarias gariepinus across the Ponds: The result of distribution of *Clarias gariepinus* across the ponds (Table 2) showed a significant difference between Maihuda and Janruwa (P = 0.017) and that of Maihuda and Papata (P = 0.036) at P = 0.05. The differences in the frequency may be attributed to the human activity in and around the ponds. This claim follows the report of Swales (2009) that *Clarias* species are good adaptors of freshwater bodies that cut across lakes, streams, ponds, reservoirs, dams and rivers among others.

Table 4: Comparative Assessment of the Distribution of *Clarias gariepinus* across the Ponds

S/No	Ponds	1	2	3	4	5
1.	Vimtim Mulacha	-	0.360	0.541	0.070	0.759
2.	Wurokye	0.360	-	0.129	0.360	0.223
3.	Janruwa	0.541	0.129	-	0.017	0.759
4.	Maihuda	0.070	0.360	0.017	-	0.036
5.	Papata	0.759	0.223	0.759	0.036	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the Tables 4 represents the 5 locations as they appear in the rows.

Assessment of the Distribution of Citharichthys spiloterus across the Ponds: Investigation carried out to compare the distribution of *Citharichthys spiloterus* across the ponds showed no significant difference (P = 0.120 – 1.000) at P = 0.05 as presented in Table 2.

Table 5: Comparative Assessment of the Distribution of *Citharichthys spiloterus* across the Ponds

S/No	Ponds	1	2	3	4	5
1.	Janruwa	-	0.120	1.000	1.000	1.000
2.	Vimtim Mulacha	0.120	-	0.120	0.120	0.120
3.	Papata	1.000	0.120	-	1.000	1.000
4.	Wurokye	1.000	1.120	1.000	-	1.000
5.	Maihuda	1.000	0.120	1.000	1.000	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the Table 5 represents the 5 locations as they appear in the rows.

Assessment of the Distribution of Synodontis granulosus across the Ponds: Comparison of the distribution of *Synodontis granulosus* across the ponds showed no statistical difference as shown by the significant range of P = 0.268 – 1.000 at P=0.05 as presented in Table 2.

Table 6: Comparative Assessment of the Distribution of *Synodontis granulosus* across the Ponds

S/No	Ponds	1	2	3	4	5
1.	Janruwa	-	1.000	0.268	1.000	0.268
2.	Vimtim Mulacha	1.000	-	0.268	1.000	0.268
3.	Papata	0.268	0.268	-	0.268	1.000
4.	Wurokye	1.000	1.000	0.268	-	0.268
5.	Maihuda	0.268	0.268	1.000	0.268	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the Table 6 represents the 5 locations as they appear in the rows.

Assessment of the Distribution of Sarotherodon galilieus across the Ponds: The result of comparison of the distribution of *Sarotherodon galilieus* (Table 2) across the studied ponds indicated a significant difference between Maihuda and other ponds (Vimtim Mulacha, Papata, Wurokye and Janruwa) as shown by significance values of P = 0.014 – 0.039. However, all other ponds showed no significant difference (P = 0.674 – 1.000) at P= 0.05).

Table 7: Comparative Assessment of the Distribution of *Sarotherodon galilieus* across the Ponds

S/No	Location	1	2	3	4	5
1.	Maihuda	-	0.014	0.014	0.039	0.039
2.	Vimtim Mulacha	0.014	-	1.000	0.674	0.674
3.	Papata	0.014	1.000	-	0.674	0.674
4.	Wurokye	0.039	0.674	0.674	-	1.000
5.	Janruwa	0.039	0.674	0.674	1.000	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the Table 7 represents the 5 locations as they appear in the rows.

Distribution of Alestes macrelpidotus across the Ponds: Comparative study of the distribution of *Alestes macrelpidotus* across the ponds showed no significant difference (P = 0.160 – 0.946) at P= 0.05 (Table 2). The differences in the number of fish caught across the ponds as presented in Table 1 did not affect the statistical test, hence showed no variation.

Table 8: Comparative Assessment of the Distribution of *Alestes macrelpidotus* across the Ponds

S/No	Location	1	2	3	4	5
1.	Wurokye	-	0.892	0.160	0.839	0.500
2.	Janruwa	0.892	-	0.202	0.946	0.419
3.	Maihuda	0.160	0.202	-	0.227	0.040
4.	Papata	0.839	0.946	0.227	-	0.381
5.	Vimtim Mulacha	0.500	0.419	0.040	0.381	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the Table 8 represents the 5 locations as they appear in the rows.

Distribution of Schilbe intermedius across the Ponds: The result of distribution of *Schilbe intermedius* across the ponds showed *no significant difference* (P = 0.268 – 1.000) at P=0.05 as presented in Table 2.

Table 9: Comparative Assessment of the Distribution of *Schilbe intermedius* across the Ponds

S/No	Location	1	2	3	4	5
1.	Maihuda	-	0.268	1.000	0.268	0.268
2.	Papata	0.268	-	0.268	1.000	1.000
3.	Wurokye	1.000	0.268	-	0.268	0.268
4.	Janruwa	0.268	1.000	0.268	-	1.000
5.	Vimtim Mulacha	0.268	1.000	0.268	1.000	-

At P=0.05. **Key:** Columns No 1 – 5 on the top of the Table 9 represents the 5 locations as they appear in the rows.

Conclusion

The study identified 8 species in the area that are representatives of freshwater fish species. Similarly, the result of comparison of fish species distribution across the ponds showed no significant difference for *Tilapia basumana* (P = 0.579 – 0.965), *Tiplapia sparrmanii* (P = 0.398 – 0.919), *Citharichthyes spilopterus* (P = 0.120 – 1.000), *Synodontis granulosus* (P = 0.268 – 1.000), *Alestes macrelpidotus* (P = 0.160 – 0.946) and *Schilbe intermedius* at P = 0.05.

The result of distribution of *Clarias gariepinus* across the ponds showed a significant difference between Maihuda and Janruwa (P = 0.017) and that of Maihuda and Papata (P = 0.036) at P = 0.05. Similarly the distribution of *Sarotherodon galilieus* in Maihuda was significantly different from all other ponds as indicated by significance (P = 0.014 – 0.039). However, all other ponds showed no significant difference (P = 0.674 – 1.000) at P= 0.05. These findings indicate that the productivity of all the species identified can be improved through effective management and conservation.

Recommendations

For improved fish productivity of the ponds the present research recommends the following;

(i) Total avoidance of farming close to the ponds to prevent silt deposit

(ii) Creation of awareness among the local dwellers of the importance of conservation of fisheries resources

(iii) That there is need for effective management of natural water bodies in the study area.

(iv) That fish farming could be encouraged among the local populace.

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