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## A frame and catch assessment of fishes of lake Alau, Borno State, Nigeria

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### Abstract

A frame and catch assessment of fishes of lake Alau was carried out. The aim was to find out the number of fishing vessels, fisherfolks and fishing gears used on the Lake. The study was conducted from January to December, 2012 in six <sup>[6]</sup> landing sites. The data collected were analysed using Descriptive statistics in Microsoft excel. The result shows that 379 fisherfolks, 254 canoes and 6 fishing gears were recorded in all the sampling sites. Catch per trip, per fisherfolk, per boat ranges from 1.0 kg to 12.5 kg among the landing sites. Nine fish families and fifteen <sup>[15]</sup> fish species were also recorded. The family of *cichlidae* dominated the overall catch composition. The Lake is productive as indicated by catch per unit effort. Therefore the lake can be compared with other small but productive African lakes and reservoirs with future prospects. The monitoring, control and surveillance (MCS) system was suggested for proper management consideration with emphasis on registration of fishermen and their fishing gears, enforcement of minimum mesh size of 3" inch.

**Keywords:** Frame and catch, craft, fishing gears, fishers, fish, mesh size, Cichlidae

### 1. Introduction

Nigeria is blessed with over 14 million hectares of reservoir, lakes, pond and Major Rivers capable of producing over 980,000 metric tones of fish annually <sup>[18]</sup>. However, majority of these reservoirs are built on seasonal rivers with paucity of fish species composition, resulting in low fish productivity <sup>[19]</sup>. Statistics have shown that the demand for fish in the country exceeds the supply and also, the domestic production is still very low, considering the increasing human population. The annual fish consumption or demand in Nigeria has been estimated to be over 1.3 million metric tons and the total domestic production is just about 450,000 metric tones per annum.

Odunze and others were the first to report on the fisheries of the lake in 1995, although fishing is not the main reason why the lake was constructed but it serve as additional benefit. The preliminary investigation of the frame and catch assessment of the lake was carried out by Bankole and Adikwu (2003). They reported on the diversity, abundance and distribution of species in the lake.

Artisanal fisheries sector account for major fish supply in the developing world. According to the <sup>[16]</sup> assessment, out of 1.0 million people engage in either fulltime, part time and seasonal fishing about 98% belongs to the artisanal sector. However, artisanal fishery is characterized with non-compliance with Nigerian fisheries regulation on mesh size, low technology, lack of modern equipment. Catch assessment (CA) are conducted to obtain reliable estimates of the total quantity of the fish harvested by fishers folks, species composition and fishing effort involved in the catch. These are considered as secondary objectives while Frame assessment (FA) among other-things provide reliable estimate of change in the structure of the fishing industries over time Bazigos (1972) studied the yield pattern at Kainji lake using (CAS) as well as Moses *et al.* (2002) also used catch assessment method to estimate catches for the artisanal fisheries of south eastern Nigeria. It is based on the above problems that this study was carried out.

### 2. Materials and Method

#### 2.1 Study Area

Lake Alau is one of the numerous small and medium size blessed lakes in the north eastern part of Nigeria. It was constructed in 1987 on the river Nggada for the purpose of supplying

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potable drinking water to Maiduguri metropolis with over 8000hectres of farm land in the catchment area of the lake (CBDA, 1984). It lies on the latitude 11<sup>0</sup>41N and longitude 13<sup>0</sup>16E on the south east (SE) part of Maiduguri town at a distance of 16 KM away from the Borno state capital. The lake has surface area of 56,000.00 hectare and total storage capacity 9.50 million cubic meters active, active storage capacity of 1.12 \*10<sup>8</sup> m<sup>3</sup>. The height of the lake is about 540 metres with crest length and crest elevation of 31.0 metres and 331.50 metres respectively (CBDA, 1987).

**2.2 Method of data collection and analysis**

Six selected sampling stations were used in data collection using the out board engine. Data collection took a period of one year from January to December, 2012. These includes the number of fishing villages, number of fisherfolks operating around the lake, fishing gears and the catches. Fish caught by

the fisherfolks were also identified using Olaosebikan and Raji (2004) [24] method of fish identification. Descriptive statistics in Microsoft excel were use to analysed the data obtained.

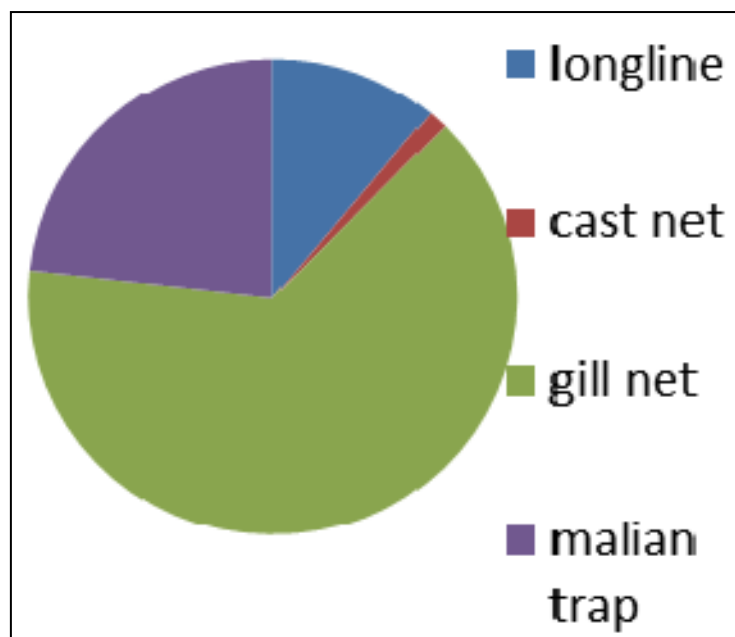
**3. Result**

**3.1 Statistical frame assesment**

The number of fishing villages, fisherfolks, boat and the types of fishing gears used in lake Alau are shown in Table 1. The Type of gillnet fishing gears employed in the lake were the monofilament types,majority of the fishermen used gill net (64.4%) of the various sizes which range between ¼ to 3½ mersh sizes. This was followed by the malian trap with (23.2%), 11.1% of the fishermen used long line and 1.3% of the fishermen used cast net. (Fig 2) shows the percentage contribution of the gear used by the fishermen in lake Alau. Table 1: The fishing villages, number of the fisherfolks and canoes.

**Table 1:** The fishing villages,number of the fisherfolks and canoes

|   | Fishing villages   | Number of fisherfolk | Number of canoes |
|---|--------------------|----------------------|------------------|
| 1 | Daban Alizaki      | 22                   | 17               |
| 2 | Abari              | 300                  | 200              |
| 3 | Daban Yanbargi     | 11                   | 15               |
| 4 | Dam landing site   | 20                   | 17               |
| 5 | Kaderi             | -                    | -                |
| 6 | Alau ngaufate      | -                    | -                |
| 7 | Bayan Gada         | 11                   | 2                |
| 8 | Slope landing site | 15                   |                  |
|   | Total              | 379                  | 2                |



**Fig 2:** Pie chart showing the percentages of fishing gears in Lake Alau.

**3.2 Catch Assessment**

The result of catch assessment is presented in Table 3 and Table 4 which shows the total catch composition by gear and catch composition by fish species for the whole sampling stations. During the catch assessment, nine [9] families of fish species were caught and identified using olaosebikan and Raji (2004) [24] method of fish identification.

The highest catch was 657.5 kg recorded from Abari which form (41.9%) followed by 256.2 kg from Dam site (16.4%)

then 248.1 kg came from Daban alizaki (15.8%) while 229.4 kg, 98.5 kg and 76.6 kg were recorded from Daban yan birge, Slope and Dayan gada landing sites,which forms 14.7%, 6.3%, and 4.9% respectively (fig. 3). *Tillapia* dominated the catches with 820.3 kg that constitutes of 52.4% of the total catch (fig. 4) followed by *clarias* with 468.9 kg (29.9%), *Alestes* 166.9 kg (10.7%) then *schilbe* 50.3 kg (3.2%), *labeo* which is 26.1 kg (1.7%) and 14.8 kg (0.9%) of *synodontis* while other fish species all together form 19.0 kg which is equivalent to (1.2%)

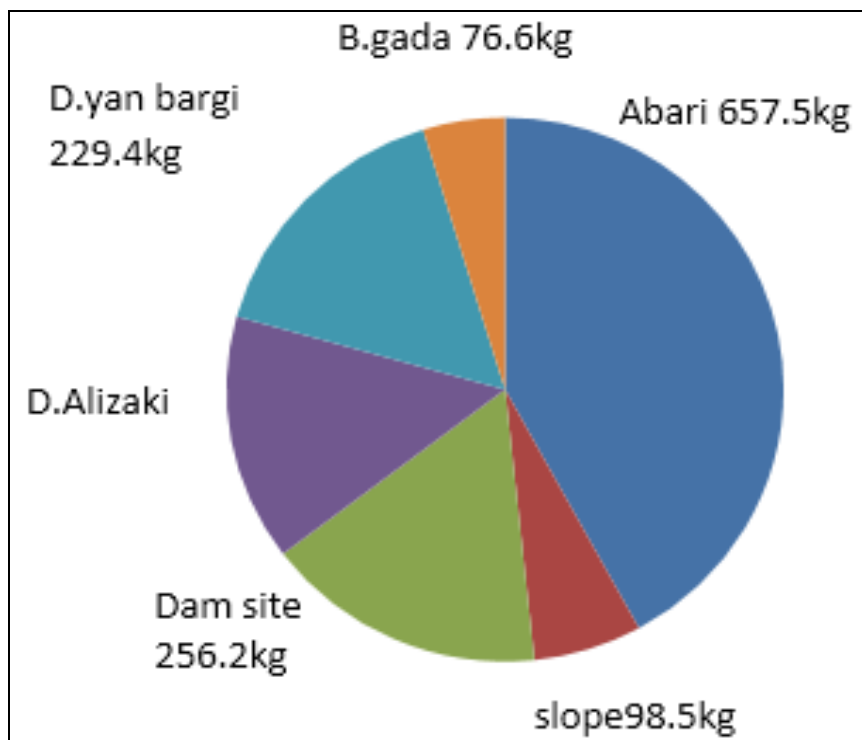
of the catch composition (fig. 5) entails the catch by gear for individual sampled stations. The mean catch per boat at abari was 10.0 kg, 6.5 kg for Dabar alizaki for Damsite is 4.0 kg

while 3.4, 2.0 kg and 1 kg for Daban yan birgi, Slope and Dayan gada respectively

**Table 2:** Fish catch composition by gear for the all sampling stations

| Station    | Gillnet (Kg) | Malian Trap(Kg) | Longline (Kg) | Castnet (Kg) | Total |
|------------|--------------|-----------------|---------------|--------------|-------|
| D.Alizaki  | 87.4         | 93.5            | 45.9          | 21.3         | 248.1 |
| Abari      | 194.7        | 264.7           | 198.1         | 0            | 657.5 |
| D.yanbargi | 51.4         | 62.9            | 115.1         | 0            | 229.4 |
| Damsite    | 124.4        | 105.3           | 26.5          | 0            | 256.2 |
| Bayan Gada | 6.4          | 25.7            | 25.9          | 18.6         | 76.6  |
| Slope      | 29.9         | 27.6            | 22.2          | 18.8         | 98.5  |
| Total      | 494.2        | 579.7           | 433.7         | 58.7         |       |

Overall total of the cath compssition is  $494.2 + 579.7 + 433.7 + 58.7 = 1566.3\text{kg}$   
 Total fish estimated= $248.1+657.5+229.4+256.2+76.6+98.5=1566.3\text{kg}$



**Fig 4:** Estimated fish landed from each of the six sampled station

**Table 3:** Showing the weight of total fish caught by species at all sampled stations.

| Station   | Clarias | Tillapia | Synodontis | Alestes | Schilbe | Labeo | Others |
|-----------|---------|----------|------------|---------|---------|-------|--------|
| D.Alizaki | 55.1    | 172.6    | 2.4        | 4.3     | 5.3     | 7.1   | 4.6    |
| Abari     | 213.1   | 301.5    | 3.2        | 90.4    | 17.2    | 6     | 10.8   |
| D.Y.bargi | 113.3   | 76.5     | 2.1        | 23.5    | 14.1    | 1.9   | 0.7    |
| Dam site  | 30.0    | 182.0    | 2.3        | 30      | 8.5     | 8     | 2.2    |
| B.Gada    | 25.9    | 41.9     | 1.6        | 4.8     | 2.8     | 2.2   | 0.2    |
| Slope     | 31.5    | 45.8     | 3.2        | 13.6    | 2.4     | 0.9   | 0.5    |
| Totale    | 468.9   | 820.3    | 14.8       | 166.6   | 50.3    | 26.1  | 19     |

**Table 4:** Fish species composition in lake Alau

| Fish families               | species name  | Local names         |
|-----------------------------|---|---------------------|
| cichlidae                   | <i>Tillipia zillii, Oreochromis niloticus Himechromis bimaculatus</i>   | Karfasa             |
| Claridae                    | <i>Clarias gariepinus Clarias ngularis</i>                              | Tarwada             |
| Mormyridae                  | <i>Hyperopsis bebe accidentalalis Marcusenius psittacus</i>             | Kuma                |
| Lepidosirenidae Schilbeidae | <i>Protepterus annectens Schilbe intermedius Saratherodan galileous</i> | Maimana Lulu        |
| Characidae Mochokidae       | <i>Alestes nurse Synodontis nigrita Synodontis eupterus</i>             | Kawara              |
| Cyprinidae Osteoglossidae   | <i>Labeo senegalensis Heterotis niloticus</i>                           | Kurungu Bargi       |
| Centropomidae Bagridae      | <i>Lates niloticus Bagrus bayad bayad</i>                               | Giwan uwa Ragon uwa |

### 3.3 Analysis of Water quality

Some of the water quality were surface water temperature ranged from 22.5 to 33.5, pH 6.80 to 8.50, Dissolved oxygen 4.0 to 9.0, Total dissolved solid 4.30 to 56.90 mg/l, Water

transparency 0.40 to 0.99 m, Conductivity 84.5 to 166.30  $\mu\text{mhos/cm}$ . The average depth of the lake was 4.50 m and the lake has surface area of 5602.00 ha.

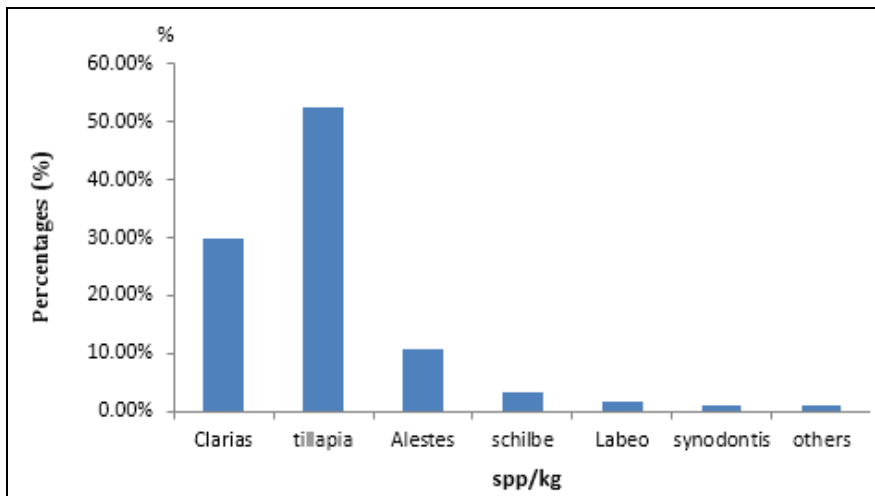


Fig 5: Showing a domination of fish species for the whole catch

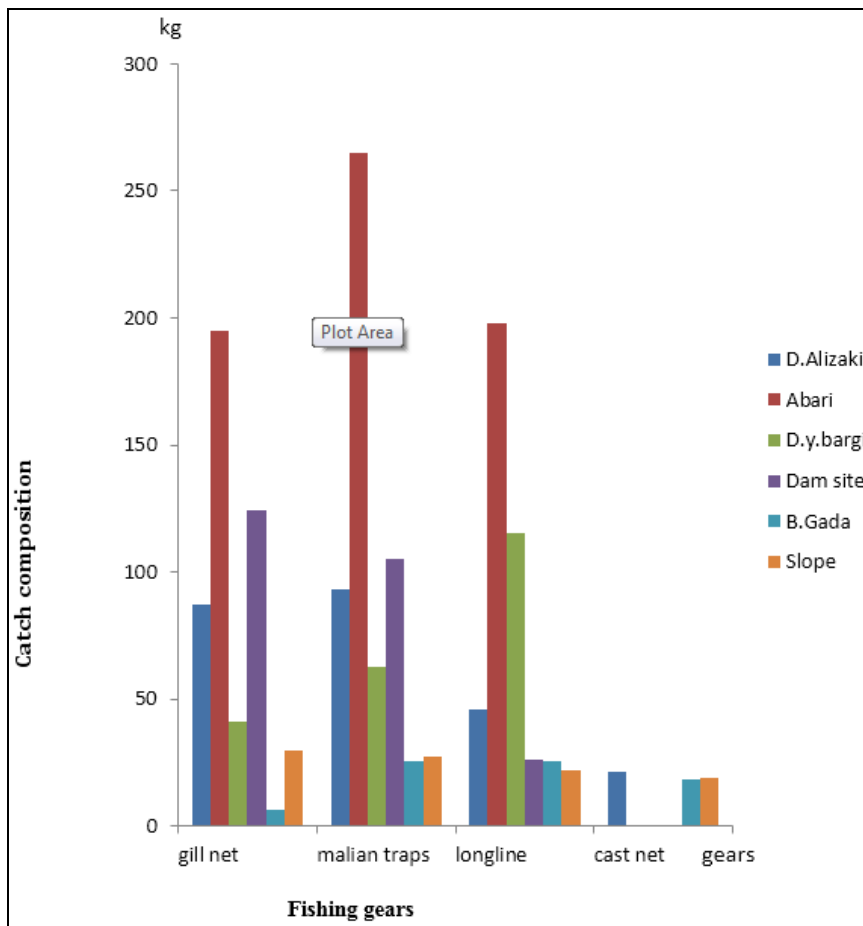


Fig 6: Histogram showing gear catch composition at individual sampling stations

### 4. Discussion

The result of the catches showed a decline trend both quantitatively and qualitatively. Bankole *et al.* 2001 had a similar result in his studies on fish production estimates for Lake Alau. It also tally with the work of Balogun *et al.* 2001 [12] who stated a decreasing number and weight of fish caught by fisherfolks on Zaria reservoir. Majority of this fisherfolks

are part time fishers who also engage in farming activities. The fishing gears recorded includes gill net, cast net, traps, longline, baby hook and hook and line this differs with report by Bolagun and Auta (2001) [12] on lake Kangimi in which gear recorded includes cast net, gillnets, long line and dug out canoe for transportation system. In Lake Alau, majority of the fisher men (64.4%) used gillnet

for catching fish and this correspond to the work carried out by Adeyemi *et al.* 2009; valdez-pizzini *et al.* 1992<sup>[30]</sup> and Solarin *et al.*, 2003<sup>[26]</sup>. The gillnet method is widely used in artisanal fisheries in developing countries because they are efficient, relatively in expensive and capable of catching higher amount of commercially valuable speceis than other peasant gears (valdez-pizzini *et al.* 1992)<sup>[30]</sup>. Although monofilament gillnet is the most common gillnets employed in lake Alau.

Solarin *et al.*, (2003)<sup>[26]</sup>, reported gillnet as as the most common abundaned small-scale fishing gears in Nigeria. Gillnet was the commonest gear in River Niger Delta in Nigeria (Scot, 1996)<sup>[27]</sup>.

Those that used malian traps represent 23.2% it has a catch per unit effort 3.5 kg in this study while (11.1%) of the fisherfolks used the long line with 15 kg/fisherman/canoe as catch per unit effort and (1.3%) of the fisherfolk used the cast net with catch per unit effort of 2 kg/fisherman/canoe while 0% was recorded for both baby hook and hook and line. The unique type of fishing gear was the Heterotis trap only modified for catching only *Heterotis niloticus* and this not reported anywhere except in Lake Alau. The ideal catch per unit effort of the cast net should have been more than this, but due to the less number of fishermen that used it and the part of lake in which the gear was employed contribute to the low catch per unit effort of the cast net in this study and the gear was only recorded in three<sup>[3]</sup> stations out of the six<sup>[6]</sup> sampled stations.

In the catch assesement, the actual weight of the fish caught by the fisherfolks at sellected sampling stations were recorded (Fig 3) shows the estimate of fish caught at the individual landing site by which mean catch effort of fisherfolk/trip varies from 1 kg to 12.5 kg/canoe with a total of fifteen<sup>[15]</sup> differents fish species, belonging to nine<sup>[9]</sup> different families It is also correspond to a total of ninethen<sup>[19]</sup> differents fish species belonging to nine<sup>[9]</sup> fish families were caught from the artisanal fisheries at Lake kingimi Kaduna state by Balogun and Auta (2001)<sup>[12]</sup>. It also corresponds to Balogun *et al.* (2000)<sup>[11]</sup> in a similar study on Zaria reservoir who recorded a total of eighteen<sup>[18]</sup> differents fish speceis from the artisanal fisheries.

Cichlids dominated the catches in Lake Alau from during study period paticularly *Tillapia zillii*, *Oreochromis niloticus* and *sarotherodon galileus*. Although the catches of clarias reflected apromising size, but the catch in general showed a small sized fishes even thought most of the species can attain sexual maturity.

However, with the nine<sup>[9]</sup> fish families and fifteen<sup>[15]</sup> fish species in lake Alau recorded by this present study, the lake is comparable with fish diversity in other small lakes, reservoir as reported by Balogun and Auta (2001)<sup>[12]</sup>, who reported nine<sup>[9]</sup> fish families and ninethen<sup>[19]</sup> fish species in Kingimi lake. They also reported that Cichlids dominated catch. Ita (1984)<sup>[20]</sup> reported a dominance of fish family cichlidae in Tiga Dam. Others who had similar reports were Balogun *et al.* 2000<sup>[11]</sup> in Zaria reservoir; Kingimi lake (Balogun and Auta, 2001)<sup>[12]</sup> and ero reservoir (kester *et al.*, 2007)

## 5. Conclusion

It was learned that the original objectives for the construction of the Dam was to supply a portable water for domestic use to Maiduguri metropolis. Fishing and irrigation farming is an unintended out put of the Lake but has assumed a prominent dimension in the livelihood of all the fishing villages located around lake Alau and preondance of small size net of lessthen 3" inch has widely spread in all the fishing villages around

lake Alau. And fish species, number and weight of fishes are reducing gradually due to overfishing.

## 6. Recommendation

A systematic approach towards management and development of the lake Alau is here by recommended. This system involves appropriate monitoring, control and surveillance (MCS) system (FAO, 1995). The system will focus on registration of fisherfolks and their fishing equipment of minimum mesh size regulation and community based scheme (FAO, 1995). A minimum of 3" inch mesh size has been recommended for all inland gill nets fishing (Ita, 1982). This is to protect the spawning stock of commercially valued species, mesh size regulation prevent over explotation of small fish before they attain sexual maturity. There is also need for intervation through enforcement of the state fishery edict, especially in the area of harvesting small size fish (cichlids) This can be achieve through a community based management approach. FAO (1995) confirmed that fisheries through communal system tend to be both resoure sustainable and economically efficient.

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