

**STUDY OF BURROWS OF THE WEST AFRICAN FRESHWATER CRAB
(*SUDANONAUTES AFRICANUS*, MILNE-EDWARDS, 1869) ON THE BANKS OF
ASEJIRE RESERVOIR, NIGERIA.**

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ABSTRACT: *The experiment was carried out at the banks of Asejire reservoir and seventy five burrows were examined. The sexes were determined and ratio was about 3:2 females to males. Average biggest size was about 14.5cm for females and 14cm for males. The exponential (b) calculated showed a positive allometric growth for the length-weight relationship of S. africanus at the study area. The species make burrows of different sizes which are inclined or straight in shape. About 70% of the burrows were inclined in shape while about 30% were straight. They were all inhabited by one crab at a time. Average depth of the examined burrows ranged between 30cm and 65cm. Positive correlations were established between the burrow diameter and crab weight; between the burrow depth and length of S. africanus also between the weight of the crabs and the type of burrow made in relation to the developmental stage in that adult were seen more in the incline burrows while juvenile in the straight burrows. However some burrows during the wet season had colorless water and the water was odourless. Almost all the burrows had oily surface which were due to activities of crab in the burrow.*

KEYWORDS: Freshwater-Crabs, Burrow, Shapes, Length-Weight, Sexes

INTRODUCTION

Freshwater crabs are the important sources of chitin which is a polysaccharide form by N-acetyl-D-glucosamine units. After cellulose, it is the second most abundant biopolymer and it is present in invertebrates, insects, marine diatoms, algae, fungi and in crustacean like crab, shrimps and lobsters (Synowiecki and Al-Khateeb, 2003). Shell of crab constitutes the 65% of chitosan to be used as food additive due to their low toxicity and digestibility and having the cholesterol lowering ability in human blood (Knorr, 1985) which can be used in pharmacy, the industrial applications and food industry. It has been used as covering material in applications of packing, additives, antimicrobial protector (Shahidi *et al.*, 1999).

A burrow is a hole or tunnel dug into the ground by an animal to create a space suitable for habitat and temporary refuse. Burrow provides a form of shelter against predation and exposure to the elements it also commonly preserved in the fossil record as a type of trace fossils (Varricchio *et al.*, 2007). It also provides a safe refuge for molting and for females while incubating their eggs. The burrow protects the crabs from desiccation during their activity on the surface by offering them access to water, which is needed for respiration and feeding (Zeil and Layne, 2002). Burrow can be grouped into active and inactive burrow. Active burrow are those that crabs still inhabit while the inactive are nest that are no longer inhabited by crabs. The burrow can be divided into entrance, tunnel and nest bottom.

MATERIALS AND METHOD

Study Area

This study was carried out on the banks of Asejire reservoir in Egbeda Local Government Area of Oyo State Southwestern Nigeria (Figure I). Egbeda Local Government is one of the 33 local government areas in Oyo State. The reservoir took its source from Osun river and flows through Oluwo and Alaye- ala down to Asejire. The reservoir supplies water to the Ibadan and Osun municipality for domestic uses. Ibadan is the largest city in West Africa, with a high population of inhabitants cutting across people from different tribes which include Hausas, Igbo, Yoruba and Efiks etc.

The study area is located at the south-western part of Nigeria. It is a man-made reservoir. The reservoir is bi-focated with two unequal arms surrounded by large mass of land the left longer arm is fed by Rivers Oba and Oshun while the right arm is supplied by River Agboiro (Adebisi, 1981). The catchment area in the reservoir is 7800km² and the impounded area is 2,342 hectares. The reservoir has a normal pool elevation (water level) of 150m and maximum flood elevation of 152.4m. The reservoir has an approximate gross storage of 7,403 million litres. The construction of reservoir divides the fishing area into two main zones i.e. the upstream and the downstream (Ogunleye, 1982). It has a rainy season (April-October) with a monthly water mean of 10.3- 15.9mm while dry season is between (November–March) with water mean of 3.78 – 4.2mm.

Asejire reservoir lies between longitudes 4^E and 4⁰⁷^E and latitudes 7^{0N} and 7⁰²¹^N. The total area covered by the study area is about 10,000 hectares from Ibadan along Ibadan –Ife expressway, The reservoir flows approximately 5km from its source before breaking into series of rivers and streams (Anatekahi, 1997), with emerging 20 communities dispersed around the reservoir which traverse different settlements (Adebisi, 1981). The occupations of majority of the populace are trading, fishing and farming. For a longtime, traditional fishing has been known in this reservoir. About twenty –five species were identified in the reservoir by Ogunleye, (1982). Some of the commercial important fish and shell fish found include; *Heterobranchus*, *Hemichromis spp*, *longifilis*, *Clarias gariepinus*, *Clarias anguillaris*, *Oreochromis niloticus*, *Tilapia zillii*, *T. mariea*, *Macrobrauchium vollenhovennii* and *Sudannautes africanus*.



Google map of Asejire dam

Burrow characteristics study and behavior observation of crab

The behavior observation of the crabs in their natural habitat was studied by using the burrow. The burrow of a crab was identified in an environment by having a spongy look when viewed from an aerial point. The burrow is usually surrounded by roundish pellets which are organic residues spit out by the crabs when moving out. Also the working leg and hands patches are seen around the burrow, especially when the crabs are in the burrow.

Mould casting for burrow study:

Candle wax was used for making mould to determine the size and shape of the burrow. Candle was melted and the melted wax was poured into the crabs burrow and allowed to cool and solidify. After an hour, the soil around the burrow was removed and the solidified candle wax in the burrow was gently removed. The length and depth of the burrow was measured using a tape rule, measured to the nearest 0.1cm. The different shape of the burrow was determined as described by Lim and Tan, (2008)

The following parameters were determined:

- i) Diameter of the burrow entrance: This was determined by measuring the entrance with a meter ruler
- ii) Depth of the burrow to the point of crab captured in relation to the sex and size of crab. The burrow was excavated, to the point at which the crab was captured and measurement was taken from the top soil to capture point
- iii) Burrow width was measured to the nearest 0.1cm by carefully excavating one side of the burrow and leaving the other side intact. A tape measure was used laying it along the intact half of the burrow from entrance to the end to measure burrow length, the burrow

- diameter and depth (cm) to the nearest 0.1 centimeter,
- iv) The times and distance covered by *S. africanus* from the burrow was studied using stopwatch as described by Sukumaran and Neelakantan,(1997).
 - v) The size of crabs, sex and the developmental stage of the crabs that inhabit each burrow
 - vi). The type of food available in each burrow was recorded
 - vii) Observation of crab when moving normally and when frightened was studied by using Digital camera (7megapixel) and digital camcorder (Samsung A1020, 10mgpix)
 - viii.) The type of vegetation surrounding the study area was identified.

RESULTS AND DISCUSSION



Plate1:Entrance of juvenile crab burrow during the wet season *S. africanus* crab at study

Table 1: Depth of burrow to point of *S. africanus* captures on bank of Asejire reservoir

Site	Range (cm)	Average (cm)
Northern part	30.2-63	30.5
Southern part	32.5-65	32.5

Table2: Diameter of burrow entrance of *S. africanus* on bank of Asejire reservoir

Season	Range (cm)	Average (cm)
Wet	4.00-10.3	7.40
Dry	4.00-10.6	7.55

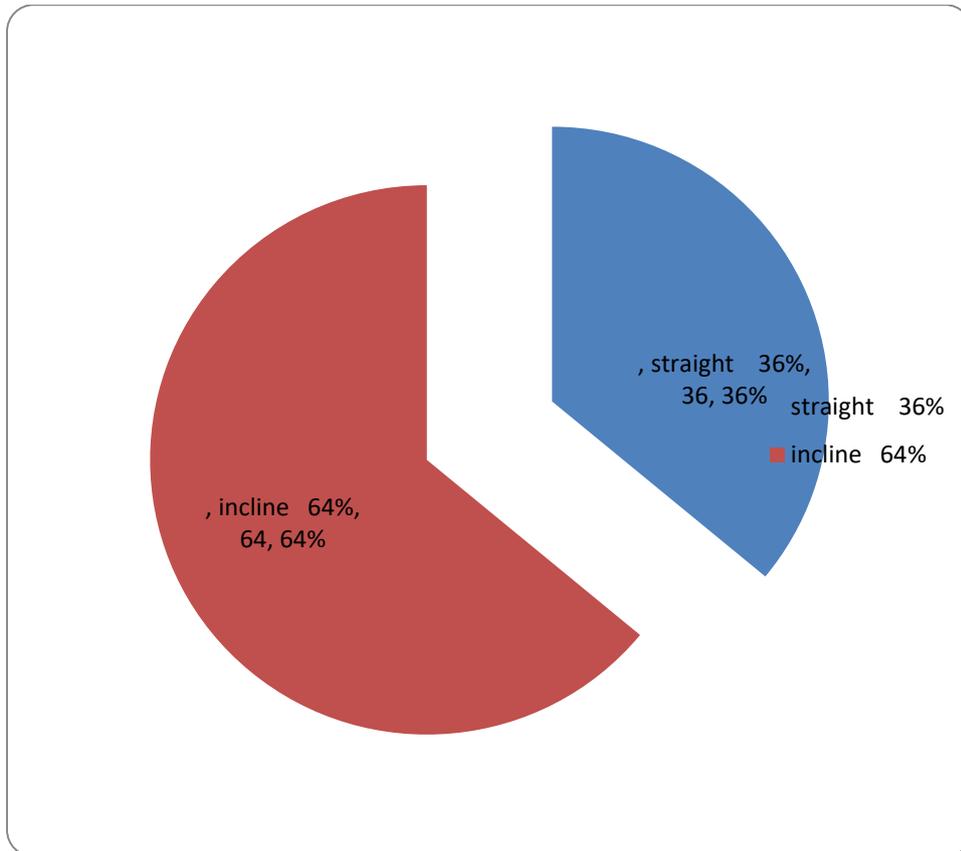


Figure 2: Ratio of *S. africanus* burrow shapes at banks of Asejire reservoir

Vegetation and burrow characteristics description of *S. africanus* at the bank of Asejire reservoir.

Most of the burrows were seen under the big trees. There were also shady and vegetative covered areas under which was observed to have a higher number of burrows of 20 to 40/m between burrow while at the open space of less shady trees and vegetables the distances between burrow from each other is about 6 to 10/m. The results show that there is gentle steep slope at northern part and steep slope at southern part of the study area. There were cases of mortality of crab in the study area, this was high in the wet season than in the dry season. Also more females were found dead in wet season than males. The time of movement of *S. africanus* in and out of the burrow was monitored but the actual time or number of moving in and out of

crabs from burrow could not be ascertained due to their sensitive nature, Result showed that *S. africanus* were usually active at night and out of sight during the day. The average distance away from the burrow recorded was during the day cannot be ascertained but the average distance covered at night is about 10-60cm/second. *S. africanus* crabs are frightened by any strange object, light and noise they will quickly run back into the burrow moving faster than when moving normally and due to the fact that they do not move to much away from their burrow there could easily identified their burrow. Identification of burrows made by crabs were in directed by pellets of soil at the entrance (Plate 5 to 8) and Figure 3 and plate 9 to 10 show *S. africanus* at the mouth of the burrow at the study area.



Plate 2: Straight burrow for Adult *S. africanus* crab on bank of Asejire reservoir



Plate 3: Straight burrow for juvenile *S. africanus* crab on bank of Asejire reservoir



Plate 4: Straight burrow for adult female *S. africanus* crabs on bank of Asejire reservoir



Plate 5: Straight burrow for adult *S. africanus* crabs at bank of Asejire reservoir



Plate 6: Straight burrow for adult male *S. africanus* crabs on bank of Asejire reservoir



Plate 7: Inclined burrow for Adult female *S. africanus* crab at bank of Asejire reservoir



Plate 8: Shape of Inclined burrow for Adult female *S. africanus* at bank of Asejire reservoir



Plate9: Incline burrow with 3 entrances adult gravid female *S. africanus* on bank of Asejire

From the study area burrows were randomly selected and cast was made to identify the different

shapes of burrow. Inclined shapes were 22 with 14 males and 8 juvenile and straight shape was 58 with 37 females and 21males.. Plates 9 to 17 showed the two types of burrow shapes for different developmental stages of crab. The straight burrows were majorly inhabited by males and juvenile crabs while the inclined burrows were mainly inhabited by adult male and female crabs. Also 5 out of the examined burrows were inactive. They were no longer inhabited by crabs. there are different entrance point crated by *S. africanus* this include the two entrance Plate 9 and 16 and the three entrance point plate 16 At adult stage, both male and female crabs create false bottom at times which serves as a means of escape which gives the burrow a catapult shape while the straight shape is like letter J. shows the percentage of the burrow in which inclined is 65% and straight is 35% Figure2

The burrows were well concealed and hidden but exposed or poorly concealed in the less covered or bare area. All burrows dug during this project were inhabited by single inhabitants (crab). There was no record of burrow with two crabs at a time and low incidence of burrow without crabs. The burrows at the study area were interwoven. The burrow of males could be seen beside that of females. They were also found not to be on a straight line but in a zigzag. The burrows of female were more concentrated at the edge of the reservoir than males. Furthermore, the burrow depth in wet season was found to be about 20-40cm and about 30-35cm if it close to the reservoir, but when farther away and in the dry season the depth is 45-65cm. The mean of male burrow depth 35cm while in the female 40cm especially during the

wet season that is used for spawning. Male crab with deepest burrow had a weight of 134.2g and 12.4cm while in female it 165.5g with 13.8cm in the examined burrow.

Also at the bottom of the burrow the water level rose as high as 10-15cm in wet season and dropped as low as 3-5cm in the dry season such that at times, only the basal part of the burrow bottom have water. Only burrows that are very close to the reservoir constantly have water (no total dryness) in both wet and dry season. The mean diameter of the burrow entrance falls within the ranged of carapace length of 7.25-7.4cm while the diameter of the burrow entrance during the dry season 4-10.3cm and 4-10.6cm during the wet season with average of 7.40-7.55cm.

DISCUSSION

Banks of Asejire reservoir was populated of these freshwater crabs. They commonly move sideways when moving fast. Movement of the *S. africanus* outside the burrow at bank of Asejire reservoir in the morning is not ascertained and the distance covered at night is 60cm if not disturbed by any object or light. Identification of crab burrow observed at the study area agrees with the observation of Rosenberg (2001), that the presence of sediments like ball pellets near the entrance to a burrow is a good indication of a crab occupying such burrow. The concentration of burrow mostly under the cover trees and stones at the study area agreed with Bologna and Heck (2002) who reported that crabs after attaining maturity are mostly seen under trees and rocky areas and that burrows can be found in sheltered areas amongst submerged water, plant and leaf liters under stones and rocks or woody debris because they like cool environment (Imran and Lam, 2008).

Most of the burrows observed were found in the muddy area and these were similar to the result of Sernapesca (2008) that the Golden crab *Chaceon chilensis* were seen at Santa Clara Island at Chile inhabiting muddy- sandy bottoms. *S. africanus* freshwater crabs live in burrows and usually stayed at the entrance of their burrows and retreat fast at the slightest disturbance without missing the burrow. This agrees with the observation of Pratt *et al.*, (2003) and Jennions and Backwell (2000) that each crab operates its own burrow alone and defends it vigorously against any other crab or predators. Zeil and Layne, (2002) also reported that crabs can distinguish between resident neighbors and potential burrow snatchers, by not moving very far from its burrow. The entire burrows studied were inhabited by single inhabitants. This is in agreement with the report of Lim and Tan (2008) who stated that only one crab can inhabit a burrow at a time and that burrow inhabited by double inhabitants may be due to mating and spawning, which is usually for a short time.

The shape of each burrow differs from each other among developmental stage and sexes. Straight and inclined types of burrow shapes were identified. This agrees with the report of Lim and Tan, (2008). Straight burrows were mostly inhabited by male and juvenile crabs while inclined burrows were inhabited by all the adult (males and females) crabs. Two entrances to a burrow were observed and occasionally 3 entrances were found (Lim, 2009) from the opening. Sometimes, one of the passages would cut open at the end, giving the effect of a side tunnel. Side passages were infrequently noted at various depths, and they are fairly short. These are in agreement with the result of Lim (2009). The depth of burrow was clearly indicated by the depth of water table. The maximum depth found at the study area was 65cm.

The burrows are connected to open water or water table at the bottom and crabs were seen to stay in their burrows for long period without coming out. The report of (Lim 2009) agrees with this result. Also, burrow bottoms are always filled with water. If the water dries out, the burrows are sealed with mud in the dry season. As habitats dry up crabs construct new burrows in clay soils which they sometimes seal with mud. They spend the greater percentage of their life in water, in that they have gills which must stay wet to function. That is the reason why they cannot stay for a long period on land apart from being a nocturnal animal (Grimes *et al.*, 1989).

CONCLUSION

In this study, the sex ratio of female to male crabs was 3:2. *S. africanus* found living in freshwater at Asejire reservoir has a total carapace length range of 14 - 14.5cm and average weight of 160-165g. During the raining season males were seen outside the burrow than females indicating that males are mostly involved in search food and mating limiting for food as well mating during the onset of rainfall.

The shape and size of each crab burrow differs depending on the inhabitant, location or closeness of the burrow to the reservoir. It also depends on the sex or developmental stage of the crab. Males and juvenile crabs tend to make straight burrows while females are generally seen in inclined burrows this could be due to their long stay in the burrow. The highest depth of burrow at the study area was 65cm and the shortest was about 30cm inhibited by juvenile crabs and adult male crab. All burrow examined were only inhabited by single crab.

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