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Sodamola MY

Department of Animal
Production, Federal College of
Agriculture Moor Plantation,
Ibadan, Nigeria.

Akinbola DD

Department of Animal Production,
Federal College of Agriculture Moor
Plantation, Ibadan, Nigeria.

Adejola YA

Department of Animal Production,
Federal College of Agriculture Moor
Plantation, Ibadan, Nigeria.

Food and feeding habits of freshwater crabs (*Sudanonautes Africanus* Milne- Edwards, 1883) at the bank of Asejire reservoir in South- West, Nigeria

Sodamola MY, Akinbola DD and Adejola YA

Abstract

The food and feeding habits of *S. africanus* was investigated at Asejire reservoir in South West Nigeria over 12 months period (433) specimens of *S. africanus* were examined for food and feeding habits from the reservoir. *S. africanus* is an opportunistic omnivore feeding mainly on fishes, crustaceans, earthworms, ants, insects and sand and some plant materials. It was observed that there was no variation in feed consumed to the size of the crab and also, they did not exhibit variation in their food preferences by sexes (female and male) but little variation occurred based on their age. It was also observed that adult crabs consumed more flesh such as fishes, crustaceans, earthworm ants and insets than the young ones.

Keywords: Crabs, feed, freshwater, season, size and *S. africanus*.

Introduction

Freshwater crabs are found in most tropical and sub-tropical regions of the world and occur in a wide variety of aquatic habitats. It is also present in almost all freshwater bodies from clear, fast-flowing montane, stream, to sluggish lowland rivers and streams as well as freshwater swamps. They complete their life cycles exclusively in the freshwater habitats. They are found on land, in deserts and down the greatest depths of the oceans (Cumberlidge, 1999) [12]. Freshwater crabs belong to infra order that has direct development whereby larval stages are lacking and the eggs hatch directly into juvenile crabs. The biogeographic importance of the freshwater crab has relatively poor powers of dispersal. This is due to the fact that freshwater crabs lack the dispersive planktonic larval stage seen in most marine crabs. They have adapted to living in highly seasonal wet and dry climates.

There are one hundred species of freshwater crabs currently recognized from Africa. They complete their entire life cycle in fresh water, and are found throughout the semitropical and tropical parts of the world *Potamon edulis* is found in the rivers in Italy, Greece and North Africa and a few grapsids such as the *Grapsids metopaulias* and *S. africanus* in freshwater bodies of Africa (Cumberlidge, 1999) [12]. All these crabs are both temporary and permanent residents of brackish and freshwater. They occur throughout the non-arid areas of the continent including the River-Nile as far as its delta in Egypt but the greatest diversity of species occurs in forested areas of equatorial African (Cumberlidge, 1999) [12]. The distributions of freshwater crab are particularly clear in West- African. Species are generally divisible into widespread species, found in the wet savanna zone and normally penetrating into some rainforest area and narrowly distributed rain forest species. The two rainforest blocks of West African the upper Guinea and the lower Guinea- support over thirty species, but only two are known to occur in both regions (Cumberlidge, 1999) [12].

Crabs emerge from their hideout burrows at night (nocturnal) and forage for foods. They are primarily omnivorous; generally scavengers but some are primarily vegetarians. Many are able to capture live prey. A few feed by filtering plankton and feed on slow moving or stationary, bottom dwelling animals such as bivalves, snails, other helminthes, worms and other minute material from the water (Bello-Olusoji *et al.*, 2006) [8]. Freshwater crabs rarely eat fish under natural conditions since they lack the ability to swim for long period and catch fish (Trino and Sarroza, 1995) [20]. The most important nutrient in their food is energy, protein and little essential nutrient. Trino *et al.*, (1999) [21] have reported that formulated diets (with or without vitamin and mineral supplements) is equally good for the production of crab at a low cost.

Correspondence

Sodamola MY

Department of Animal
Production, Federal College of
Agriculture Moor Plantation,
Ibadan, Nigeria.

Also, nature offers a great diversity of food to crabs, large group of freshwater crabs derive their nutrients required from plants and animals. The feeding habits of different species of crabs differ widely. Crab also may show a preference for different types of feeds as it grow at different stages and seasons (Angell, 1992) [5].

Combining several feedstuffs into a ration has a greater nutritional value than when the feedstuffs were fed separately. Chen (1990) [11] has noted that the pelleted feed have higher conversion ratio in crabs when combined with plankton which is another good source of food for crabs in form of phytoplankton and zooplankton. Nature offers a great diversity of food to crabs from different plants and micro animals. Crabs have adapted to a wide variety of foods for growth and upkeep from both plant and animal sources. Some specific crabs such as the blue crab *Callinectes sapidus* live on the oysters as prey, mud crab prey on fishes, grass, zooplankton, clams and *Sudanonautes africanus* lives on natural food such as insects nematodes and plant parts (Bello-Olusoji *et al.*, 2010) [9]. The present study was carried out to know the food and feeding habits of freshwater crabs at the bank of Asejire reservoir in South West, Nigeria.

Materials and Methods

This study was carried out on the banks of Asejire reservoir in Egbeda Local Government Area of Oyo State Southwestern Nigeria (Figure 1). 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 Alayela 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) [2]. 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) [18]. 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) [2]. 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) [18]. Some of the commercial important fish and shell fish found include; *Heterobranchus*, *Hemichromis spp*, *longifilis*, *Clarias gariepinus*, *Clarias anguillar*, *Oreochromis niloticus*, *Tilapia zillii*, *T. mariea*,

Macrobrachium vollenhovenii and *Sudannautes africanus*.

Crabs catch reaches the peak between April and September during the wet season when the reservoir water level is high and low catch is recorded from November to March during the dry season when the water level of the reservoir is low. The study area was selected based on the high activities of aquaculture and accessibility.

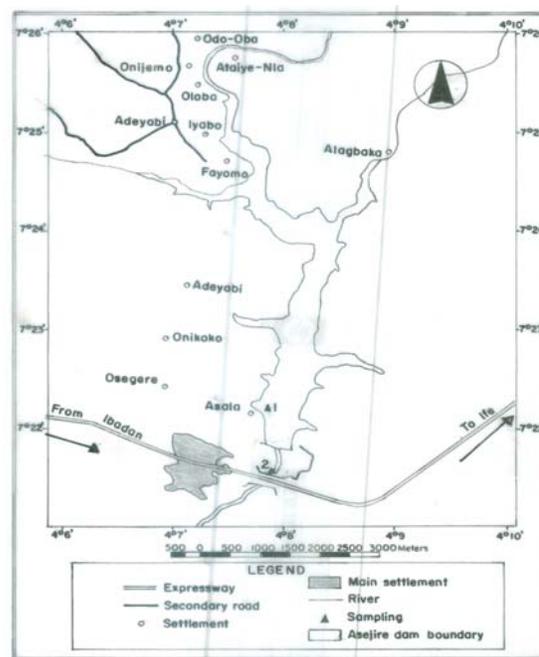


Fig. 3.1: Map of Asejire reservoir showing the sampling areas

Gut Content Analysis of *S. africanus* crab

Crabs were collected bi-monthly from the banks of Asejire reservoir for 12 month. Specimens totaling 433 of various sizes ranged between 4.5cm and 14.5cm were collected for gut content analysis. 40% of the crabs used for this study were collected with the assistance of local fishermen, using locally-made basket traps and palm nut baits to catch the crabs in the evenings and early in the mornings between the hours of 0600-0700 and 1600-1800 because they are nocturnal animals. The crabs were randomly selected to include various sizes and sex (male and female). The weak ones were kept in an ice park and transported to Federal College of Agriculture, Fisheries Department, Ibadan.

The total carapace length (to the nearest 0.1 cm) and total body weight (to the nearest 0.01g) of each specimen were taken, using a micrometer screw gauge caliper and digital Mettler balance (Model, Toledo 320) respectively. The crabs were carefully cut open, using dissecting set on the ventral side. The gut was removed, opened and emptied into a Petri dish filled with water. Each dissected stomach was blotted dry and weighed on a top weighing balance (Mettler Toledo, PB 8001), to the nearest 0.1mg. The volume (ml³) of each stomach was determined. The water was poured into a graduated cylinder measured to the nearest 0.1ml. A drop of the content was examined under a binocular microscope (x 100 magnification). The various food items present were identified and classified to the lowest possible taxonomical level using the method described by Barnes, (1974) [6] and Bello-Olusoji, (2004) [7]. Particulate items, such as detritus, sand and unidentified food items were estimated volumetrically (Barnes, 1979). The number of occurrence of each item was identified to species

level of organisms, using identification chart of Cumberlidge *et al.*, (1999) [12]. The various food items indices was analyzed using.

- a. Frequency of Occurrence (FC)
- b. Occurrence index (CI)
- c. Stomach capacity (%SC)

Frequency of Occurrence: Each food item was expressed as a percentage of stomach with food

$$p = \frac{a}{b} \times \frac{100}{1}$$

Where a = total number of all food items consumed
 b = number of crabs containing food item
 p = percentage occurrence of each food item.

Occurrence Index: This was calculated as the total number of specific individual food items counted in stomach expressed as a percentage of the total number of individuals in all stomachs containing foods items.

Stomach Capacity (%SC): This is the volume (ml³) of each stomach determined, after contents is emptied, to the nearest 0.01ml.

$$\%SC = N/TN \times V_m$$

Where N is the number of individual prey items,
 TN is the total number of all prey items in all stomach examined and

V_m is the volume of water measured to the nearest 10ml

Results

Table 1: Food items in the guts of *S. africanus* (class range 4.5-8.0cm) by number, volume and occurrence on bank of Asejire reservoir.

	Food Volume				Numerical				Occurrence			
	Male	Ranking Index	Female	Ranking Index	Male	Ranking Index	Female	Ranking Index	Male	Ranking Index	Female	Ranking Index
Algae	0.68	32.4	0.96	32.4	2445	32.5	3650	42.9	51	18.7	60	18.8
fish	0.49	28.3	0.78	26.7	2100	27.8	2490	29.3	43	17.3	52	16.3
Insect	0.16	18.3	0.53	18.1	1380	18.3	2905	10.9	40	16.6	51	15.1
Sand grain	0.17	8.1	0.23	8.1	830	11.0	905	6.7	38	14.8	45	14.1
Plants	0.49	7.6	0.19	6.5	520	6.9	570	4.9	34	13.1	42	13.2
Detritus	0.49	4.3	0.15	5.1	178	1.0	420	4.4	30	11.1	38	11.9
Unidentified mass	0.68	1.0	0.78	2.7	78	32.5	380	0.9	27	7.9	30	10.7
Total	2.1	100	2.92	100	7531	100	11320	100	230	100	318	100

Table 2: Food items in the gut of *S. africanus* (class range 8.1-11.5cm) by volume, number and occurrence on bank of Asejire reservoir

	Food Volume				Numerical				Occurrence			
	Male	Ranking Index	Female	Ranking Index	Male	Ranking Index	Female	Ranking Index	Male	Ranking Index	Female	Ranking Index
Plant	2.15	36.3	2.09	31.6	1206	11.7	2400	18.5	62	11.0	72	12.9
insect	1.42	24.0	2.07	31.5	820	7.9	940	7.2	91	17.4	92	16.6
fish	1.01	17.1	1.15	17.0	1002	9.8	1090	8.4	60	11.5	65	11.7
Algae	0.48	8.1	0.38	7.4	1780	17.3	2670	20.6	65	12.4	62	11.1
Detritus	0.44	7.4	0.5	5.5	1350	13.1	1820	14.3	73	14.0	81	14.6
Unidentified mass	0.23	3.8	0.28	4.7	2169	21.1	3020	23.2	83	15.9	89	16.0
Sandgrain	0.18	3.0	0.15	2.3	1940	18.8	1032	7.9	87	16.	93	16.7
Total	5.91	100	6.62	100	1026	100	12972	100	521	100	554	100

Table 3: Food items in the gut of *S. africanus* (class range 11.6-14.5) by volume, number and occurrence on bank of Asejire reservoir.

	Food Volume				Numerical				Occurrence			
	Male	Ranking Index	Female	Ranking Index	Male	Ranking Index	Female	Ranking Index	Male	Ranking Index	Female	Ranking Index
Plant mat	2.17	27.8	2.42	27.5	0	0	310	3.2	0	0	14	4.3
nematode	2.01	24.8	2.15	24.4	940	11.6	1020	10.5	53	17.8	55	16.7
insect	1.28	15.8	1.49	16.9	670	8.2	730	7.5	24	8.0	34	10.3
Algae	0.94	11.6	1.02	11.6	980	12.1	870	8.9	42	14.1	50	15.2
detritus	0.93	11.1	0.85	9.6	1780	22.0	2700	27.8	57	19.1	54	16.4
Unidentified mass	0.71	8.7	0.8	9.1	1011	12.5	1032	10.6	61	20.5	62	18.8
Sandgrain	0.05	0.20	0.8	0.9	2695	33.3	3020	31.1	61	20.5	60	18.2
Total	8.09	100	8.81	100	8076	100	9682	100	298	100	329	100

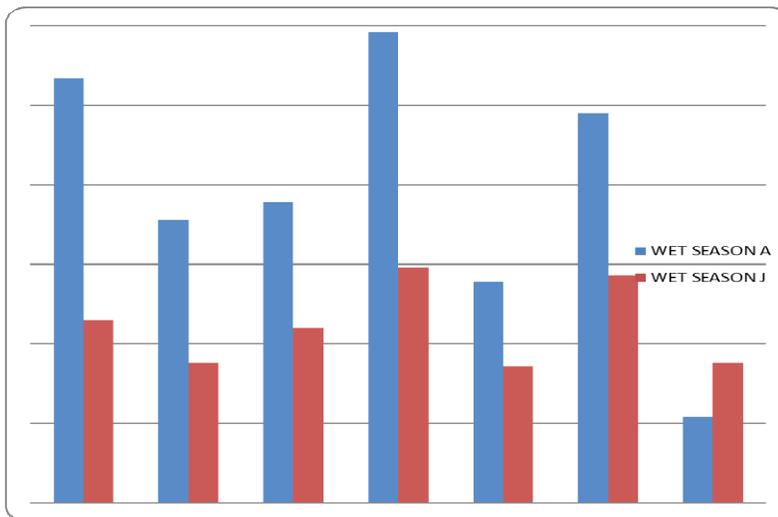


Fig I: Gut content in the *S. africanus* on banks of Asejire reservoir during wet season

Key:
 A-Adult of *S. africanus*
 J-Juvenile of *S. africanus*

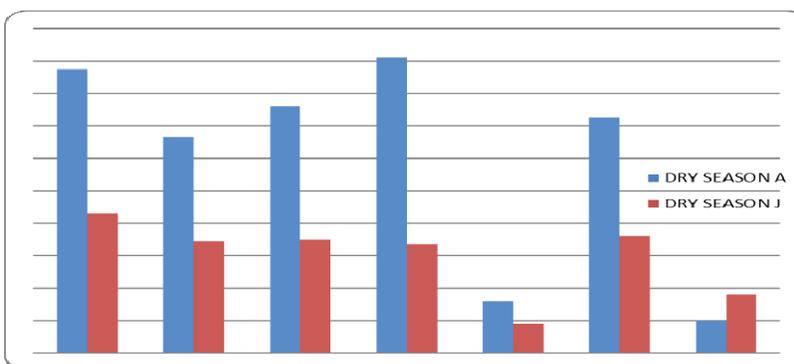


Fig II: Gut content of *S. africanus* on bank of Asejire reservoir in dry season

Key:
 A-Adult of *S. africanus*
 J – Juvenile of *S. africanus*

The vegetation of the studied area showed that, there were many fruit trees; overshadow trees, grasses and legumes and different vegetable covers. The fruit trees available were palm, citrus, mango, and African apple. Fruits around the reservoir bank were: pawpaw, pineapple, and palm kernel. The fruit vegetables were garden egg, egg plant, Okra, jute mallow and spinach. There were also weeds such as *Portulaca oleracea*, *Biden pilosa*, *Tridax procumbens*, *Striga species*, *Lantana camara*, *Imperata cylindrical* and *Eleusine indica*. Majority of the big trees such as *Chlorophora excele* that sometimes serve as shade for the crabs.

Different food items were found in the guts of *S. africanus*, irrespective of size, sex and season. They include insects, plant materials, detritus, algae and sand grains. There was also presence of sand grains in all the guts containing food, the sand grains was probably-ingested along with food items during feeding. Crabs feed by holding their feed by the first two hands (claws). They can chew food especially solid food such as palm nut, coconut, onions etc. The overall food compositions of their gut were similar both in the dry and wet season. There was incidence of high level of ½ full guts (40.5%), which suggested good feeding activity of *S. africanus* crab in Asejire (Table 1). The juvenile takes in more sand grains and algae than the adults. At the adult stage (class range

8.0cmm-14.5cm) *S. africanus* were observed to consume more plant, insect and fish both at wet and dry season at the study area. Also (Tables 1 to 3) shows the number, volume and food occurrence in the gut of *S. africanus*. Class range 4.5 – 8.0cm male and female *S. africanus* consumed algae, fish, insect, sand grain, plants and detritus at different index range. Also, the result shows that the food volume in the female is 2.92 while the male has 2.1. Numerically, the female index is 11320 while the male is 7531 and the food occurrence is 318 in female and 230 in male. All this result shows that the female crabs *S. africanus* consume more food than the male. Table 2 also shows the number, volume and food occurrence in the gut of *S. africanus* (class range 8.1 – 11.5cm). Male and female gut content results show that the food volume in the female is 6.62 while the male is 5.91. Numerically, the female index is 12972 while the male is 1026 and the food occurrence is 554 in female and 521 in male. Table 3 shows result for the class range 11.6- 14.5. Male and female gut content results show the food volume of 8.81 in female and 8.09 in male. Numerically, the female index is 9682 while the male is 8076 and the food occurrence is 329 in female and 298 in male. Figure I and II Show that the adults *S. africanus* crab consumed more food than the juvenile both in the wet season than the dry season.

Discussion

Mature crabs exhibited various feeding habits with all kinds of food item such as detritus, fish, plant materials, algae and sand grains this shows that adult crabs have preference for plant and animal food items. Somers and Neil (1998) [19] have reported that freshwater crabs feed on plant material mainly palm nut and coconut including live invertebrate prey, as well as a variety of vegetable matter. The report of Okafor (1988) [17] also agrees with the result of this present study.

The result on gut content have demonstrated an essential herbivores and detritivorous diet (Hill and O' keeffe, 1992) [14] The high incidence of ½ full guts coupled with low incidence of empty stomachs suggests good feeding activity of *S. africanus*. The sand grains was probably- ingested along with food items during feeding (Abdallah *et al.*, 2004) [1].

The result of *S. africanus* observed at Asejire do not agree with that of Mc Conaugha and Mc Conaugha, (1996) [16] which claimed that the blue crabs *Callinectes sapidus* exhibit seasonal variation in their feeding habit. However, the result agrees with of Lawal–Are, (2009) [15] on *Cannicola* species in Lekki lagoon which reveals that crabs are benthic or bottom dwellers omnivore's predators that feed on nematodes and insects. There are different plants and micro animals found in the studied area which are consumed by *S. africanus*, this result is in agreement with Hill and O' Keefe, (1992) [14] who found that crab could forage and select on the available plant in their habit.

The gut content of *S. africanus* had different types of food items like insects, sand grains, fishes, algae, and plants. The crabs caught during raining season had more food than those caught during the dry season. This coincided with high food availability which enhances growth performance. All food consumed were readily available and these showed that crab were not selective in the consumption of available food in the study area.

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