Natural History Of A Quill Rodent In Ogoni Land

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Abstract: The Ogonis are blessed with natural resources both of minerals and richness of species. The population abundance and feeding ecology of Atherurus africanus, the porcupine species in Ogoni land, was investigated in this research; the scope of the feeding ecology being feed type, feeding rate and length of feeding bout. Inference from crops raided on in farmers and feed presented in captivity was used to get the feed type. Direct observation was used to investigate feeding rate and length of feeding bout. Annual hunt data was used to estimate its population; July 2017 to June 2018 was taken as the annum. The population of Atherurus africanus before harvest commenced in July 2017 was 141. Atherurus africanus is mostly a herbivore feeding on both tubers, fruits and leaves. In captivity, its feed type include breadfruit, soursop, bush kola, palm fruit, guava, apple, pineapple, cassava, potato, banana, pawpaw, three leaf yam, yam, cocoyam, maize, watermelon, cane sugar, melon, tomato and pumpkin; it is feed twice, morning and evening. In the wild, it feeds on cultivated crops like cassava, cocoyam, banana, pineapple, tomato, melon, sugar cane, maize and pumpkin. It is a selective feeder in the wild and has a higher feed type range in captivity than in the wild. A. africanus consume 50 +/- 6.5 grams of feed in 30 minutes and spends 43 +/- 12 minutes to eat to full. The current population of A. africanus in a 1000 Km² Ogoni land calls for concern as it has been listed as Least Concern by IUCN.

Key words: Atherurus africanus; feed type, feeding rate; length of feeding bout; population abundance.

I. INTRODUCTION

The various actions an organism undertake that is directed toward nutrient procurement is its feeding behavior but the several processes by which it gets food, use this food to provide energy and other materials for growth, repairs, replacement, reproduction and other activities is nutrition (Ramalingam, 2012; Leendert, 2015). Although how heterotrophic organisms acquire food it needs is a basic problem, a constant supply of food/energy is needed by organisms to stay alive for which adaptation for food procurement is one important aspect of animal evolution (Taylor, Green and Stout, 1998; Roberts, 2005; Leendert, 2015). *Atherurus africanus*, like other old world porcupines, is typically herbivorous; its diet include fallen fruits, bulbs, root, rhizomes, bark, underground portions of plants and many different kinds of plant materials (Myers, 2001; Atkins, 2004; Kingdon *et. al.*, 2013; Musser, 2016; Huber and Clark, 2017). Crops that porcupine eat include onions, cucumbers, bananas, sweet potatoes, beans, berries, grapes, peanuts, carrots, cassava, maize, sugar cane, mango, melons; they have a fondness for root crops that are cultivated for which they invade farms searching for root crops, leaves and other crops (Atkins, 2004; Chakravarthy and Girish, 2007; African Wildlife Foundation, AWF, 2016; Huber and Clark, 2017). Porcupine diet consists mainly of plant materials but it occasionally eat insects, small vertebrates and supplement its herbivorous diet by gnawing on bones in a bid to source for deficient minerals (Atkins, 2004; AWF, 2016; Musser, 2016; Huber and Clark, 2017). According to Alkon and Saltz 1985, porcupines in captivity ate potatoes at the rate of 0.9 +/- 0.2

grams per bite while fasted animals consumer 530 +/- 37 in 45 minutes and 148 +/- 42 grams per hour.

Atherurus africanus is found only in Africa in the countries of Benin, Cameroon, Congo, the Democratic Republic of Congo, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Nigeria, Sierra Leone, South Sudan, Togo and Uganda (Ellis, 2002; Hoffmann and Cox, 2016). In there regions of occurrence, they can be found in forests; river forest, tropical rainforest, island forest and in forest along the edge of waterways usually at high elevations (Ellis, 2000; Kingdon *et. al.,* 2013). They live naturally in holes and caves; in holes in the roots of large trees, hollow logs, fallen branches, rock crevices, termite mounds and other similar places (Ellis, 2000; Hoffmann and Cox, 2016). *A. africanus* is strictly nocturnal, sleeping in caves and burrows during the day, coming out to roam only when it is completely dark; they will not even leave their den on nights when the moon is too bright (Ellis, 2000; Kingdon *et. al.*, 2013). *Atherurus africanus* reach sexually maturity at two years; has no clearly defined breeding period with a single young or up to four born in two to three litters per year (Ellis, 2000; Hoffmann, 2016). Even in captivity, its current productivity is limited to a single young per birth and two to three births per year per female (Jori *et. al.,* 1998). Females gestates for 100 to 110 days, give birth to well developed young that are only three percent of the mother's body weight (Ellis, 2000). According to Ellis, 2000, *A. africanus* does not seem to be decreasing in numbers or threatened with extinction due in part to their ability to leave their habitat and relocate to a new one if permanent resource scarcity ensues. International Union for Conservation of Nature and Natural Resources in view of wide the distribution of *A. africanus,* presumed large population, and because it is unlikely to be declining fast enough to qualify for listing in a more threatened category has categorized this animal as Least Concern (LC) in 2016 (Hoffmann and Cox, 2016).

II. METHOD

A. STUDY AREA

This research was conducted in the four Local Government Areas of Ogoni; Eleme, Tai, Gokana and Khana all in Rivers State. Traditionally, the Ogoni region is divided into six kingdoms; Babbe, Gokana, Ken-Khana, Nyo-Khana, Eleme and Tai with a population of 850,000 (United Nation Environmental Program, UNEP, 2016; Unprecedented Nations and Peoples Organization, 2017). The relative humidity of the Ogoni region is between 80 - 100% at dawn and 70 - 80% during the afternoon with an annual rainfall of 3000mm, having a typical rainforest with thick mangroves and an annual temperature of 27°C (Offodile, 1992; Amechi, 2010). The people of this region are Christians and are given to crop farming and fishing (UNEP, 2016)

B. FEEDING ECOLOGY OF *ATHERURUS AFRICANUS*

The scope of the feeding ecology of this work is feed type, feeding rate and length of feeding bout. The feed type was gotten from inference of crops raided on in farms and feed presented in captivity. With the aid of questionnaire, information was gotten from one hundred farmers; twenty five from each of the four Local Government Area. The questionnaire particularly sought to know the kind of crops planted and the crops raided on by *Atherurus africanus.* Farmers have knowledge of animals that raid their crops. For instance, *Atherurus africanus* digs methodically with precision to get to root crops and not in an haphazard manner. Feed presented in captivity was gotten from the zoo keeper of the Science Laboratory Technology Department in Kenule Beeson Saro-Wiwa polytechnic Bori where this animal is reared. He was visited and interviewed three time in three months; the collect of feed presented and periods of feeding within these times made up the feed presented in captivity. The feeding rate was determined in a five day period with the help of the zoo keeper. Weighed quantity of feed was presented twice a day to the animal and taken away after thirty minutes and the remnant reweighed. The days & periods of the day, the type of feed presented, quantity of feed presented and the quantity of feed that remained is presented in table 2.1

Day	Period	Plant Species (feed) Presented	Quantity of Feed Presented (in grams)	Quantity of Feed Left (in grams)
Day 1	Morning	*Ipomea batatas* (Potato)	1000	949
Day 1	Evening	*Carica papaya* (Pawpaw)	300	256
Day 2	Morning	*Manihot esculenta* (Cassava)	300	252
Day 2	Evening	*Kola rostrata*(Bush cols)	300	242
Day 3	Morning	*Colocasia esculenta* (Cocoyam)	300	256
Day 3	Evening	*Annona muricata* (Soursop))	300	246
Day 4	Morning	*Dioscorea batatas* (Three leaf yam)	300	258
Day 4	Evening	*Psidium guajava* (Guava)	300	244
Day 5	Morning	*Zea mays* (Fresh corn; without cob)	300	253
Day 5	Evening	*Kola rostrata* (Bush cola)	300	239

Table 2.1: Feed Presentation: Feed Type, Periods of Presentation, Quantities Presented And Quantities Reweighed

The mean of the quantity of feed eaten in thirty minutes and the standard deviation was used to get the feeding rate:
Mean = (51+44+48++58+44+54+42+56+47+61) ÷ 10 = 50.5.
Standard deviation = 6.5

The determination of the length of feeding bout was done in a five day period, each morning 2000 grams of feed was presented to *A. africanus*. After the presentation of feed to the animal in its den, it was closely watched to see when it stop eating. In this research work, seven minutes away from feed/eating is taken as the stop time. Tables 2.2 shows the

days, type of feed presented, starting and stop time for *A. africanus*.

Day	Feed Presented	Start of Feeding Time	End of Feeding Time
Day 1	*Ipomea batatas* (Potato: sweet)	8:40 am	9:18 am
Day 2	*Manihot esculenta* (Cassava)	8:30 am	9:03 am
Day 3	*Colocasia esculenta* (Cocoyam)	8:33 am	9:04 am
Day 4	*Kola rostrata*	8:40 am	9:42 am
Day 5	*Psidium guajava*	8:23 am	9:17 am

Table 2.2: Days, Feed Presented, Start and Stop Time of Feeding for A. africanus

The length of feeding, which is the stop time discounted from the starting time for each day was established. The mean of the length of feeding and the standard deviation was used to arrive at the length of feeding bout: Mean = $(38+33+31+59+54) \div 5 = 43$. Standard deviation = 12.1

C. POPULATION ECOLOGY OF ATHERURUS AFRICANUS

Harvest data is an indirect measure of population abundance and annual harvest data can provide information on population size (Agetsuma, 2018). Annual hunt data was used for the estimation of the population of *Atherurus africanus*. The annum for this research was from July 2017 to June 2018. Hunt data was gotten from Eleme Hunters Association, EHA, Gbinle Kpaalap from Gokana, John Pialu from Tai and Kenule Adokor Associate from Khana on monthly basis. EHA hunt for the study animal at night with gun and dog, Gbinle Kpaalap uses traps and gun to hunt for this animal at night, John Pialu hunts for this animal at night with gun while Kenule Adokor Associate hunt for this animal during daytime using dog and machete. Tables 2.3 show the hunt data by the hunters, hunting association and associate.

Month	Harvest Data Eleme	Harvest Data Tai	Harvest Data Gokana	Harvest Data Khana
July	2	0	0	2
August	1	3	1	0
September	5	1	0	1
October	2	2	1	6
November	0	1	2	2
December	0	1	0	0
January	0	1	3	0
February	2	2	1	9
March	1	2	2	5
April	1	0	0	4
May	0	0	2	0
June	0	0	0	0
Total	**14**	**13**	**12**	**29**

Table 2.3: Annual Harvest Data of Atherurus africanus

Total catch *of Atherurus africanus* is $14 + 13 + 12 + 29 = 68$

The relationship of animal population to annual hunt data will always follow thus; Abundance after harvest equals pre harvest abundance discounted by all mortalities plus all birth and if harvest and natural mortality is not differentiated, the relationship can be represented thus:

$N_{t+1} = N_t + B - H_t$ (equation 1) (Opuogulaya *et. al.,* 2019)

Where N_{t+1}: Abundance in year t + 1: N_t Abundance in year t (pre harvest abundance): B: All births in year t: H_t : Number of animals harvested in year t.

$N_{t+1} = (N_t - H) \times (r + 1)$ (Agetsuma, 2018) (equation 2)

Where **r**: intrinsic rate of natural increase. Equation 2 also expresses the relationship of equation 1.

Equation 2 when rearranged becomes

$N_t = \{N_{t+1} \div (r + 1)\} + H_t$ (Agetsuma, 2018)   (equation 3)

Where: N_t: Pre harvest abundance: N_{t+1}: Abundance in year t + 1 (year after N_t): H_t : Number of animals harvested in year t: r: intrinsic rate of natural increase.

$P_t = H_t (r + 1) \div S_t$ (equation 4) (Opuogulaya *et. al.,* 2019)

Where Pt: Post harvest abundance; H_t: Number of animals harvested in year t: r : intrinsic rate of natural increase and S_t : survival rate.

Since natural mortality and harvest mortality is not differentiated, post harvest abundance is pre harvest abundance the next year before harvest commence that is $P_t = N_{t+1}$ (before harvest commence) (Opuogulaya *et. al.,* 2019).

Survival rate = 1 - mortality rate (Ueno et. al., 2010); (equation 5)

Average mortality rate = 1 ÷ Average lifespan (McCoy and Gillooly, 2008); (equation 6).

The average lifespan of *A. africanus* is 15 years (Ellis, 2000; Bradford, 2012).

Using equation 6,

Mortality rate of *A. africanus* = $1 \div 15 = 0.067$

Using equation 5,

Survival rate of *A. africanus* = $1 - 0.06 = 0.933$

Intrinsic rate of natural increase for *A. africanus* is 0.28 (Robinson and Bennett, 2000)

The annum of this research is July 2017 to June 2018; from June to anytime down is pre harvest abundance while the abundance after harvest is abundance from July 2018.

According to equation 4,

$P_t = H_t (r + 1) \div S_t = 68 (0.28 \div 1) \div 0.933 = 93$

According to equation 3,

$N_t = \{N_{t+1} \div (r + 1)\} + H_t = (93 \div 1.28) + 68 = 141$.

(N_t is per harvest abundance before July 2017 while N_{t+1} is post harvest abundance of the annum and pre harvest abundance before harvest commenced in July 2018).

III. RESULT AND DISCUSSION

A. RESULT

The population of *Atherurus africanus* before harvest commenced in July 2017 was one hundred and forty one (141) while the population before harvest commenced in July 2018 was ninety three (93).

The feed type of *Atherurus africanus* is presented in Table 3.1

Plant (Botanical Name)	Plant (Common Name)	Part Eaten
Atrocarpus altililis	Breadfruit	Fruit
Musa paradisiaca	Plantain	Fingers
Dacryodes edulis	African native pear	Fruit
*Saccharum officinarium**	Cane sugar	Stalk
Carica papaya	Paw-paw	Fruit
Ipomea batatas	Potato	Leaves & tuber
*Manihot esculenta**	Cassava	Stem & tuber
*Musa acuminata**	Banana	Fingers
Psidium guajava	Guava	Fruit
*Zea mays**	Maize	Cob
Dioscorea rotundata	Yam	Tuber
*Cococasia esculenta**	Cocoyam	Tuber
Citrillus lanatus	Watermelon	Fruit
Dioscorea batatas	Three leaf yam	Tuber
Annona muricata	Soursop	Fruit
*Cucumeropsi mannii**	Melon	Fruit
*Telfaria occidentalis**	Pumpkin	Leaves
Kola rostrata	Bush kola	Fruit
Elaeis guinenensis	Palm fruit	Fruit
*Anana comosus**	Pineapple	Fruit
*Solanum lycopersicum**	Tomato	Fruit
Malus pumila	Apple	Fruit

Note: * Plants raided on in farms and presented in captivity.
Table 3.1: Feed Type of Atherurus africanus

The feeding rate of *Atherurus africanus* was found to be 50.5 +/- 6.5 grams per 30 minutes; it is feed twice in captivity spending 43 +/- 12 minutes to eat to full.

B. DISCUSSION

Atherurus africanus is a herbivore; this is in accord with the findings of Myers, 2001; Atkins, 2004; Kingdom et. al., 2013; Musser, 2016; Huber and Clark, 2017. In captivity, *Atherurus africanus* feeds on leaves, fruits and tubers. Fruits include breadfruit, soursop, bush kola, guava, palm fruit, apple, tomato, pawpaw and banana. Tubers include cassava, cocoyam, three leaf yam, potato and yam. Pumpkin is a leaf it eats both in the wild and captivity. Watermelon and sugar cane were also given in captivity. It feeds twice in captivity, morning and evening; consuming 50.5 +/- 6.5 grams in thirty minutes and spending as much as 43 +/- 12 minutes to eat to full. Alkon and Saltz 1985 consumption rate of 148 +/- 42 grams per hour is not too higher than the findings presented here. Naturally, *Atherurus africanus* is a strictly nocturnal and a nervous feeder but the observation was carried out carefully during daytime. In the wild, their feed type consists mainly of underground vegetal organs like cassava tuber and cocoyam which is in accord with the findings of Myeres, 2001; African Wildlife Foundation, 2016 and Mori, Bozzi and Laurenzi, 2017. They also feed on fruits and leaves like banana, tomato, pineapple and pumpkin which is also in accord with the findings of Ellis, 2000. Maize, cane sugar and melon are also

fed on in the wild. Only two farmers reported that their melon was fed on by *Atherurus africanus*. This animal is also selective in the wild as it doesn't raid all planted crops. It has a higher feed type range in captivity than it has in the wild.

The statement credited to Ellis, 2000, that "*A. africanus* does not seem to be decreasing in numbers or threatened with extinction due in part to their ability to leave their habitat and relocate to a new one if permanently resource scarcity ensues" and that of the International Union for Conservation of Nature and Natural Resources that "in view of wide distribution of *A. africanus,* presumed large population, and because it is unlikely to be declining fast enough to qualify for listing in a more threatened category has categorized this animal as Least Concern (LC) in 2016 according to Hoffmann and Cox, 2016" being noted, the population of *Atherurus africanus* in a 1000 square kilometers Ogoni land of 141 before harvest commenced in July 2017 should call for concern. Although most hunters don't make it a practice of venturing regularly into the primary forest to which *A. africanus,* its categorization as Least Concern should be revisited in Ogoni land.

IV. CONCLUSION

Atherurus africanus is the species of porcupine present in the Ogoni land. Its population before harvest commenced in July 2017 was one hundred and forty one (141). In captivity, it is fed twice, morning and evening, the feed type being plant species like breadfruit, soursop, bush kola, palm fruit, guava, apple, pineapple, cassava (stem & tuber), potato, banana, pawpaw, three leaf yam, yam, cocoyam, maize, watermelon, cane sugar, melon, tomato and pumpkin. In the wild, it feeds on cultivated crops like cassava, cocoyam, banana, pineapple, tomato, melon, sugar cane, maize and pumpkin. It is a selective feeder in the wild and has a higher feed type range in captivity than in the wild. *A. africanus* consume 50 +/- 6.5 grams of feed in 30 minutes and spends 43 +/- 12 minutes to eat to full.

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