Insight into the Functional Gross Morphology and Morphometry of the Cerebral Hemispheres and Olfactory Brain, and Sexual Dimorphism of the African Striped Ground Squirrel (*Xerus erythropus*)

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Abstract
This study was undertaken to document the normal features on gross morphology and morphometry of the olfactory brain and cerebral hemispheres of both sexes of African striped ground squirrel (*Xerus erythropus*) and to discuss the structure-function paradigm. The study was conducted by direct observation of ten (10) adult African striped ground squirrels comprising of five males and five females. The main morphological features were: a) a large club-shaped, non-pendulous olfactory bulb projecting from the cerebral hemispheres ventro-rostrally; b) cerebral hemisphere devoid of sulci and gyri; c) a well-developed corpus callosum connecting the cerebral hemisphere; and d.) a fornix which appeared as an arch shaped commissural fiber, consisting of a crus, a body and a commissure. Morphometric data values indicated that the males had statistically significant higher body and brain weights than the females. There was no significant statistical difference between sex in the mean values of the olfactory bulbs and cerebral hemispheres weight and dimensions (length and width). A significant statistical difference between sexes was reported with respect to the weight of the olfactory bulb (0.46 ± 0.03g in males and 0.32 ± 0.01g in females) and cerebral hemispheres width (1.87 ± 0.03cm in males and 1.79 ± 0.01cm in females). The well-developed corpus callosum and fornix, a very crucial organ in the function of formation and consolidation of memory, and the large size of the olfactory bulb, an organ for olfactory acuity supports the use of this rodent model for precise radio-tracking and identification of location.

Keywords: Morphology, Morphometric, Cerebral hemisphere, Olfactory bulb, African Striped Ground Squirrel.

Introduction
The brain controls vital activities necessary for survival. Sensory impulses

are received from sensory organs through the spinal cord and cranial nerves and then processed for initiation of motor output to effector organs. Specifically, the brain coordinates activities in relation to changes in the external and internal environment (Ibe *et al.,* 2014).

The adult brain is divided caudorostrally into the hindbrain (consisting of the myelencephalon and metencephalon), midbrain (also known as the mesencephalon) and the forebrain (consisting of the diencephalon and telencephalon). Of note, the cerebrum is the main constituent of the telencephalon (Delahunta and Glass 2009; Ibe *et al.,* 2014). The telencephalon com-prises an intricate set of structures that are required for some of the most complex and evolved functions of the mammalian brain (Marin, 2015). The macroscopic appearance of the brain (including the telencephalon) differs greatly among mammals and this variation depends on the animals' lifestyles and adaptations (Ibe *et al.,* 2014). For example, in animal species that lack brachiation as a mode of locomotion, such as members of the order Artiodactyla, there is lack of visible olivary body (Adogwa 1985; Ibe *et al.,* 2014).

The African striped ground squirrel which belongs to the order *Rodentia*, family *Sciuridae*, genus *Xerus*, species *Xerus erythropus erythropus* is a diurnal rodent. Adults weigh between 0.5 to 1 kilogram with a sandy-brown to dark brown fur and whitish underparts (Thorington and Hoffmann, 2005). A lateral stripe of pure white fur runs from the shoulders to the hip (Herron and Waterman, 2004). The African striped ground squirrel is considered a model for a devise pest-control procedure and have also been suggested as an ideal model for radio-tracking data collection (Linn and Key, 1996). For a precise radio-tracking and identification of location, this rodent requires a well-developed telencephalon and a high acuity of olfaction; a function of the rhinencephalon. Reports have shown that the African striped ground squirrel bury food (caches) in winter using a method called scatter hoarding and locate these caches using both memory and smell (Joanna *et al.,* 2005). There is however, lack of information on the functional morphology and morphometrics of the telencephalon of the African striped ground squirrel. Therefore, the aim of this research was to study the gross morphology and morphometrics of the telencephalon of the African striped ground squirrel and propose some of its morpho-functional paradigms.

Material and Methods

Ten captive and clinically healthy adult African Striped Ground Squirrel (*Xerus erythropus*), consisting of five male and five females were used for this study. The animals were captured live from the wild in Zaria, Kaduna State, Nigeria using food trap cages which do not cause any injury. The traps were made of galvanised metal and were 1.4 m x 0.3 m x 0.2 m in dimension and were meshed. The African Striped Ground Squirrel were transported by road in ventilated cages to a well-ventilated animal house in the Department of Veterinary Public Health, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria, where they were acclimatized for one month before the commencement of the experiment. During this period of acclimatization, all animals were physically examined in the cage under careful restraint but not with anaesthesia. Only apparently clinically healthy African Striped Ground Squirrel were utilized for this study. The animals were given access to food and drinking water *ad libitum* throughout the experimental period. The animals were fed with commercial rat pellets and fresh sweet potatoes, carrot and maize. This choice of fresh sweet potatoes, carrot and maize was to mimic the natural tuber choice of this rodent in the wild (Usende *et al.,* 2018, 2020). The experimental protocol received approval by the Ahmadu Bello University Committee on Animal Use and Care (ABUCAUC/2021/070), and in conformity with the ethical standards of the 1964 Declaration of Helsinki; National Institute of Health Guide for the Care and Use of Laboratory Animals (NIH Publications No. 80–23) and the European Communities Council Directive of November 24, 1986 (86/609/EEC).

Brain extraction and gross morphological assessment

Gross appearance of all African Striped Ground Squirrels used for the present study was described. The Squirrels were then anaesthetized with an intraperitoneal injection of ketamine HCL (50mg/kg body weight), lateral to the midline next to the umbilicus, as a single dose (Molina *et al.,* 2015). The body weight of each squirrel was measured with a digital electronic weighing balance (G & G Brothers Group Inc., USA) with a capacity of 2kg and sensitivity of 0.01g. The animals were placed on a dorsal recumbency and an incision was made on the ventral midline from the base of the neck down to the xyphoid to open the thorax. A cut was made on the right atrial wall with a scissors to allow drainage of blood. A 22 gauge needle was inserted into the left ventricle and physiological saline was used to wash out the blood cells and immediately followed by 10% buffered formalin fixative solution to fix the brain.

The African Striped Ground Squirrel was then decapitated at the atlanto-occipital joint and the head of each animal was weighed immediately and recorded. The brains were then carefully dissected out following the protocol described by Ibe *et al.,* (2014). The extracted brain was weighed with the digital electronic weighing balance and recorded. Photograph of the dorsal, ventral and mid-sagittal view of the brain were taken using a digital camera (SONY®, Cyber shot, DSC-N570, 16.1 mega pixels, Japan). After gross examination, the telencephalon comprising of the olfactory bulb and telencephalic (cerebral) hemispheres were carefully detached from the brainstem as described by Fletcher (2006) with some modifications. Briefly, the telencephalic hemispheres was lifted at the occipital lobe (caudal end), then a cut was made across the cerebral peduncles using a scalpel and a surgical blade to free the hemispheres. Gross morphological observations of the dorsal and ventral view of the telencephalon were carried out. Furthermore, the olfactory bulbs were detached from the telencephalic hemisphere by making a cut on the olfactory peduncles on the ventral aspect of the brain. The weight of the olfactory bulb and telencephalic hemispheres were measured using a digital electronic weighing balance. All olfactory bulb and cerebral hemisphere measurements were taken using a digital Vernier calliper (Tresna®, 0-150mm) with sensitivity of 0.001mm, protractors, set squares, divider and treads and ruler. The following parameters (Fig 1) as described by Usende *et al.* (2020) were evaluated on the brains, olfactory bulb and cerebral hemisphere with consideration to sexual dimorphism:

- ***Weight of Animal (WOA):*** live animal weight was taken with digital electronic weighing balance (G & G Brothers Group Inc., USA)
- ***Weight of Brain (WOB):*** whole animal brain weight was taken with digital electronic weighing balance (G & G Brothers Group Inc., USA)
- ***Right and left Weight of Olfactory bulb (OBW):*** whole right and left olfactory bulb weight was taken together with digital electronic weighing balance (G & G Brothers Group Inc., USA)
- ***Olfactory Bulb Length (OBL)***: length of the right and left olfactory bulb; taken as the distance from the tip of the right and left bulb to their respective *rhinal sulcus.* The data gotten was divided by two (2).
- ***Olfactory Bulb Width (OBW)***: width of the right and left olfactory; taken as the distance across the right and left bulb from the most lateral aspect
- ***Cerebral Hemisphere Length (CHL)***: maximum length taken from the tip of the frontal lobe to the most caudal portion of the occipital lobe of the cerebrum
- ***Cerebral Hemisphere Width (CHW)***: maximum length across the most lateral portions of the parietal lobes of the cerebrum

Statistical analysis

All numeric data obtain were expressed as mean ± standard error of mean (mean ± SEM), and subjected to one-way ANOVA analysis using the Statistical Software for Social Scientists (SPSS) version 20.0. The significant differences between mean values of the squirrel of different sexes were determined using Student's t-test. Values of $P<0.05$ were considered significant.

Results

Physical features of Adult African striped ground squirrel

The African striped ground squirrel has a dark brown fur colouration on its dorsal surface with little white sparsely fur colouration in its ventral surface. A lateral white stripe, composed of all white fur, runs from shoulder to rump. The tail appeared bushy and covered by long white, brown and black fur. The tail length was about 50% of the entire body length. The African striped ground squirrel studied herein had a long, blunt and well furred muzzle with a projecting nose. The head was relatively large with a small and turgid ear ad pressed it. They have large and black eyes with a whitish line above and below the eye (Fig. 2). The male has higher body weight than the female.

General morphological findings on the brain of Adult African striped ground squirrel

The brain of the African striped ground squirrel was made up of forebrain (prosencephalon), mid-brain

(Mesencephalon) and the hindbrain (rhombencephalon) and this conforms to the basic pattern of brain morphology in mammals. Specifically, the brain of the African striped ground squirrel was cone-shaped dorsally with a rostral projection ending in the olfactory bulbs (Fig. 3)

The Olfactory bulb of Adult African striped ground squirrel

Morphologically, the olfactory bulb of the African striped ground squirrel was club-shaped and non-pendulous, projecting from the cerebral hemispheres ventro-rostrally. Rostro-caudally, the right and left bulbs were attached to the lateral olfactory peduncles and demarcated by the rhinal fissure from the cerebral hemisphere (Fig. 3). The bulbs appear wholly visible dorsally but ventro-rostrally placed forming the rostral extent of the cerebrum. The lateral and medial olfactory tracts are clearly seen from the ventral side, beneath the frontal lobes of the cerebral hemispheres. (Fig. 3 and 4)

The cerebral hemispheres of Adult African striped ground squirrel

Caudally attached to the olfactory bulb of Adult African striped ground squirrel was the cerebral hemisphere, a major part of the telencephalon. The cerebral hemisphere was observed to be the largest part of the brain and located dorsally and devoid of sulci and gyri, making the brain of the Adult African striped ground squirrel a lissencephalic brain. The cerebral hemisphere was narrow rostrally and broad caudally giving an overall cone-shape brain for the African striped ground squirrel. Three major fissures were observed on the cerebral hemisphere: 1) the lateral rhinal fissure which separate cerebral hemisphere from the olfactory bulb. 2) the longitudinal fissure which separate both left and right cerebral hemispheres and 3) the transverse fissure which separate the cerebral hemisphere from the caudally placed cerebellar hemisphere (Fig. 3). The ventral surface of the cerebral hemisphere of the African striped ground squirrel brain appeared irregularly shaped and is where the brainstem lies (Fig. 5). The right and left cerebral hemispheres were connected deep in the longitudinal fissure by a well-developed broad transverse band of nervous fibres, the corpus callosum. The corpus callosum was observed to be white in colour and made up of three (3) parts: a rostral end called the genu; middle part called the truncus and the caudal end called the splenium. Typically, the corpus callosum appeared convex dorsally and form the floor of the longitudinal fissure and the roof of the lateral ventricle with direct relationship with the fornix. The fornix appeared as an arch shaped commissural fiber, consisting of a crus; a body and a commissure. The crus of the fornix was observed to curve directly under the splenium of the corpus callosum and located in the medial aspect of the cerebral hemisphere. Also, a short and wide band of white substance called olfactory tract was observed and it arises from the olfactory bulb and extends caudally into the piriform lobe (Fig. 6). The cerebral hemispheres of the African striped ground squirrel without clear demarcations could be apportioned into four regions, namely frontal, parietal, temporal and occipital regions (Fig. 4).

Morphometric Studies

Table (1) showed the morphometric mean weight values of the body, head, brain, olfactory bulb and cerebral hemispheres of Adult African striped squirrel used for this study. Whereas the mean body weight of the African striped ground squirrel (n=10) was 488.89 ± 7.89 g, the mean weight of the head was 53.54 ± 0.48 g. Also, the mean weight of the brain was 7.32 ± 0.25 g while the mean weight of the olfactory bulb and cerebral hemispheres were 0.39 ± 0.03 g and 4.25 ± 0.07 g respectively. The head, whole brain, olfactory bulb and cerebral hemispheres accounts for 10.95 %, 1.49 %, 0.08 % and 0.87 % respectively of the total body weight. The table also showed that of the total brain weight, the cerebral hemispheres account for 58.06 % and the olfactory bulb accounts for 5.33 %.

The morphometric mean value of brain indices measured herein are presented in table (2) and it showed that the brain length, olfactory bulb length, olfactory bulb width, cerebral hemispheres length and width were 5.93 ± 0.09 cm, 0.52 ± 0.01cm, 0.38 ± 0.03 cm, 3.29 ± 0.04 cm and 1.79 ± 0.01 cm respectively.

Table (3) showed sexual dimorphism in morphometric values of body and brain weight of the adult African striped ground squirrel. The body weight of the male African striped ground squirrel was 500.47 ± 6.97 g and was heavier than that of the female reported as 475.32 ± 10.76 g. The head of the male African striped ground squirrel weighed 54.54 ± 0.30 g and was significantly heavier ($P<0.05$) than that of the female 52.54 ± 0.68 g. The brain weight of the male 7.67 ± 0.24 g was higher than that of the female which weighed 7.02 ± 0.44 g. The male African striped ground squirrel olfactory bulb weight 0.46 ± 0.0 g and was significantly heavier ($P<0.05$) than that of the female which was reported as 0.32 ± 0.01 g. For the weight of the Cerebral hemisphere, 4.32 ± 0.09 g was recorded for the male African striped ground squirrel while a lesser but not statistically significant value of 4.18 ± 0.09 g was recorded for the female.

In table (4) sexual dimorphism in morphometric values of brain indices were presented. Brain length, olfactory bulb length, olfactory bulb width and cerebral hemisphere length and width of the male African striped ground squirrel were higher than the female. Although no statistically significant difference in values was seen comparing the male African striped ground squirrel to the female in terms of brain length, olfactory bulb length, olfactory bulb width and cerebral hemisphere length; a statistically significant higher value ($P<0.05$) was seen in the cerebral hemisphere width comparing the male African striped ground squirrel to the female.

Discussion

The organization and relative development of the different parts of the telencephalon of adult African striped ground squirrel in the present study showed similar general features with those described in other rodents. However, a few variations in the external morphological feature and morphometric data exist were observed herein and are discussed.

Reports have shown that the social life, animal survivability and sexual behaviour during breeding and reproduction is influenced mainly by the olfactory system (Shipley *et al.,* 2004; Amir and John, 2006). Morphologically, the olfactory bulb of all adult African striped ground squirrel studied herein were well developed conspicuous and completely visible in the dorsal view. Similar findings have been reported in the African giant rats (Nzalak *et al.,* 2008; Ibe *et al.,* 2014; Musa, 2015) and in grasscutter (Byanet *et al.,* 2009). Contrary to this present report, the olfactory bulb of man and elephant has been described to be inconspicuous and hence invisible from the dorsal view (Shoshani *et al.,* 2006). Another report has also shown the absence of olfactory bulb in whales (Marino *et al*., 2003). We hypothesize that the largeness in size of the olfactory bulb seen in this present study may facilitate the use of this rodent for experimental procedures involving neurodegenerative diseases such as Parkinson disease. Of note, the size of the olfactory bulb is a good indication of the acuity of olfaction (Rombaux *et al.,* 2006; Ibe *et al.,* 2014). This could be the reason why this rodent is able to use the sense of smell in locating food buried beneath the earth over a long period of time (Joanna *et al.,* 2005), and suggested as an ideal model for radio-tracking data collection (Linn and Key, 1996), similar to the use of African giant rats in landmines sniffing (Ibe *et al.,* 2014; Usende *et al.,* 2017; 2018; 2020). Perhaps, if trained, the African striped ground squirrel could be able to sniff out landmine.

In the present study, the cerebral hemisphere of the adult African striped ground squirrel unlike that of other mammals lacked prominent gyri and sulci. The absence of prominent neocortical sulci placed the African striped ground squirrel brain in the lissencephalic group. A similar lissencephalic brain has reported in the African giant rats (Nzalak *et al*. 2008; Ibe et al., 2014; Musa, 2015) and in hystricomorphs (Dozo *et al.,* 2004). In mammals generally, and in association with increasing brain function, the cerebral cortex presents significant variations across species, ranging from the small and smooth (lissencephalics) cortex of mice, to the large and profoundly folded (gyrencephalic) cortex of humans (Rakic, 1995).

The African striped ground squirrel as reported herein has a large cone-shaped neocortex similar to the earlier report of Ibe *et al.,* (2014) and Musa (2015) on the shape of the brain of the African giant rat. The lobes of the cerebral hemisphere in the present study were not clearly demarcated, but consist of a relatively large occipital lobe, temporal lobe, parietal lobe and an ill-formed frontal lobe. This corroborates well with the findings of Byanet *et al.* (2009) in grasscutter.

The corpus callosum is well known as the principal white matter fiber bundle that connect neocortical areas of the two hemispheres (Gazzaniga, 2000; *Wahl et al.,* 2007). In the present study, we reported that the corpus callosum of the African striped ground squirrel was white in colour, appeared convex in length dorsally and forms the floor of the longitudinal fissure and the roof of the lateral ventricle with a direct relationship with the fornix. We also showed that the corpus callosum consist of 3 parts: a rostral end called the genu; middle part called the truncus and the caudal end called the splenium. Contrarily, Ibe *et al.* (2014) reported 4 parts of the corpus callosum in the African giant rat. Although the corpus callosum have received extensive research, important details about the anatomical and functional organization of the rodents, and especially the African striped ground squirrel corpus callosum still largely unknown. Emphasis on research on the corpus callosum of the African striped ground squirrel should focus on the callosal motor fibres that connects the primary motor cortices in the two hemispheres and seems to be somatotopically organized in rhesus monkey (Schmahmann and Pandya, 2006) which like the African striped ground squirrel are capable of sitting upright, and freeing their hands for many manipulative tasks. Currently, it is unknown if the callosal motor fibers of the African striped ground squirrel are somatotopically organized.

We also reported herein that the crus of the fornix was curved directly under the splenium of the corpus callosum and was located in the medial aspect of the cerebral hemisphere and was well developed. Reports have shown that the fornix arises from output fibers of the hippocampus located in the medial temporal lobe below the base of the lateral ventricle and beneath the splenium of the corpus callosum becomes the crus of the fornix (Liu *et al.,* 2020). The fornix is very crucial in the function of formation and consolidation of memory both in rodents (African striped ground squirrel inclusive) and primates (Thomas *et al.,* 2011; Hamani *et al.,* 2008) as reports have shown that lesions of the fornix lead ultimately to various amnestic syndromes (Sankar *et al.,* 2014). It is important to note that for the African striped ground squirrel to be used as a model for precise radio-tracking and identification of location, it requires a well-developed fornix, as reported herein.

The descriptive morphometric data obtained from this present study showed a reduced mean body and brain weights in female African striped ground squirrel compared to the male. This was similar to the earlier findings of Ajeigbe, (2018). Also, in African giant pouched rat, Nzalak *et al*. (2005), Ibe *et al.* (2010) and Musa, (2015) recorded higher body and brain weights in males than in females similar to what we report herein. Conversely, Byanet *et al.* (2009) recorded a higher body and brain weight in female grasscutter in comparison to the male. The higher body and brain weight reported in this present study and in previous studies (Ajeigbe, 2018; Nzalak *et al*., 2005; Ibe *et al.,* 2010; Musa, 2015) could be due to the increase activity of the males (in search of food) in the wild compare to the females (Joanna *et al.,* 2005).

We also reported herein, a significant increased mean value ($P<0.01$) of the weight of olfactory bulb in male African striped ground squirrel compared to female. This finding agrees with the earlier finding of Byanet *et al.* (2009) in grasscutter. Also, the cerebral hemispheres of the male African striped ground squirrel had higher values in all dimensions measured when compared to the female although no significant difference was seen upon statistical analysis, except in the width of the cerebrum. The significant increase cerebral width in the male African striped ground squirrel reported herein could imply that the male has a better sense of smell and memory than the female. However, this hypothesis remains to be investigated, especially concerning the reports that the male African striped ground squirrel is mostly involved in burying food (caches) in winter using a method called scatter hoarding and locate these caches using both memory and smell after a long time (Joanna *et al.,* 2005), and in difference in smell perception or sensitivity between males and females African striped ground squirrel as reported by Wei *et al.* (2008). Irrespective of sex, the mean weight of the olfactory bulb recorded in this present study was 0.39 ± 0.03g which account for 0.08% of the total body weight of the African striped ground squirrel and this information renders this rodent model idea for experimental procedures involving smell perception such as neurobiology of olfaction.

In conclusion, the present study provided baseline data on the gross morphology and morphometry of the olfactory bulb and cerebral hemispheres of the adult African striped ground squirrel in relation to its functions; which is of great benefit in understanding the behaviours of the rodent. However, we recommend more anatomical research using special stains and immunohistochemistry (microscopy) to be done on the telencephalon (focusing on the olfactory brain, corpus callosum and fornix) of this rodent which will be useful in projecting this animal model for theoretical and experimental studies on olfactory neurobiology, its breeding and domestication.

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Table (1): Morphometric values of the weights of body and brain of Adult African

Structure	Minimum	Maximum	Mean ± SEM	% Total body weight	% Total brain weight
Animal weight (g)	450.10	530.40	488.89±7.89	100	-
Head weight (g)	50.00	55.20	53.54±0.48	10.95	-
Brain weight (g)	5.80	8.20	7.32±0.25	1.49	100
Olfactory bulb weight (g)	0.30	0.50	0.39±0.03	0.08	5.33
Cerebral hemispheres weight (g)	4.00	4.50	4.25±0.07	0.87	58.06

SEM: Standard error of mean.

Table (2): Morphometric values of brain indices of African striped ground squirrel irrespective of sex (n=10)

Brain length (cm)	Minimum	Maximum	Mean ± SEM
Olfactory bulb length (cm)	0.50	0.55	0.52±0.01
Olfactory bulb width (cm)	0.30	0.51	0.38±0.03
Cerebral hemisphere length (cm)	3.14	3.50	3.29±0.04
Cerebral hemisphere width (cm)	1.75	1.85	1.79±0.01

SEM: Standard error of mean

Table (3): Sexual dimorphism in morphometric values of body and brain weight of the adult African striped ground squirrel (n=5)
SEM: Standard error of mean, P<0.05: Statistically significant (*)

Variable	Sex	Minimum	Maximum	Mean ± SEM	P-Value
Brain length(cm)	M	5.80	6.20	5.98±0.07	0.79
	F	5.20	6.20	5.88±0.17	
OB Length(cm)	M	0.50	0.55	0.52±0.01	0.98
	F	0.50	0.55	0.51±0.01	
OB width(cm)	M	0.33	0.51	0.41±0.04	0.54
	F	0.30	0.50	0.36±0.04	
Cerebral hemisphere length(cm)	M	3.20	3.5	3.32±0.05	0.41
	F	3.14	3.5	3.26±0.06	
Cerebral hemisphere Width(cm)	M	1.80	2.00	1.87±0.03	0.04*
	F	1.75	1.80	1.79±0.01	

Table (4): Sexual dimorphism in morphometric values of brain indices of African striped ground squirrel (n=5)

Structures	Sex	Minimum	Maximum	Mean ± SEM	P-Value
Body (g)	M	480.50	520.40	500.47 ± 6.97	0.07
	F	450.10	500.60	475.32 ± 10.76	
Head (g)	M	53.50	55.20	54.54 ± 0.30	0.02*
	F	50.00	54.00	52.54 ± 0.68	
Brain (g)	M	7.12	8.30	7.67 ± 0.24	0.29
	F	5.80	8.00	7.02 ± 0.44	
Olfactory bulb (g)	M	0.35	0.50	0.46 ± 0.03	0.01*
	F	0.30	0.35	0.32 ± 0.01	
Cerebral hemisphere (g)	M	4.00	4.50	4.32 ± 0.09	0.41
	F	4.00	4.50	4.18±0.09	

SEM: Standard error of mean, P<0.05: Statistically significant (*)

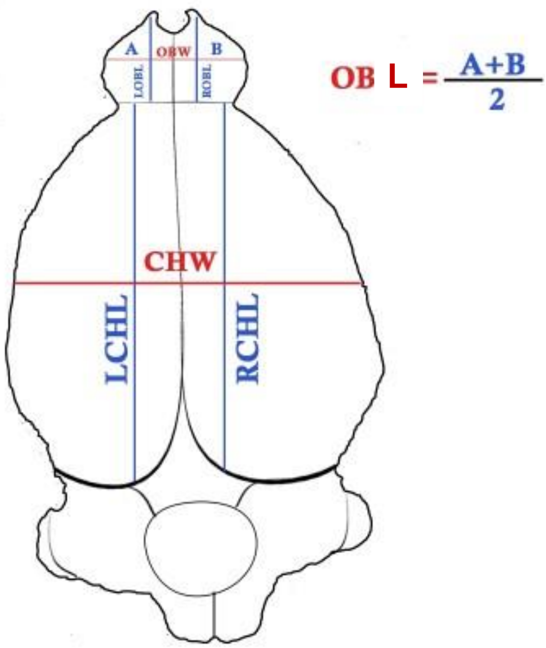

Fig (1): Schematic representation of the measurements of the cerebral hemisphere and olfactory bulb of the Arican striped ground squirrel (*Xerus erythropus*). A: Left olfactory bulb, B: Right Olfactory bulb, LOBL: Left olfactory bulb length, ROBL: Right Olfactory bulb length, OBL: Mean Olfactory bulb length, CHW; Cerebral hemisphere width, LCHL: Left cerebral hemisphere length, RCHL: Right cerebral hemisphere length

Fig (2): Photograph of a mature Arican striped ground squirrel (*Xerus erythropus*)

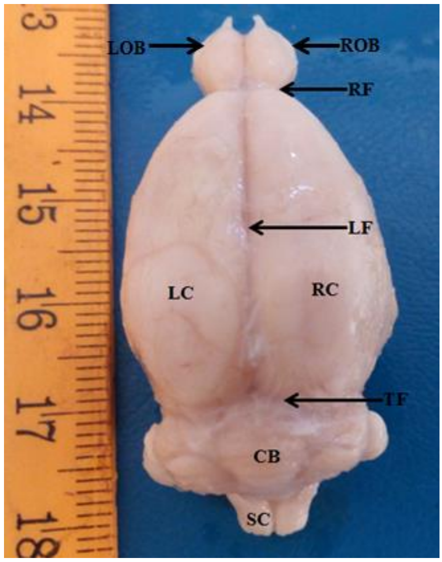

Fig (3): Dorsal view of the brain of adult African striped ground squirrel.
LOB, Left olfactory bulb; ROB, Right olfactory bulb; RF, Rhinal fissure; LF, Longitudinal fissure; LC, Left cerebral hemisphere; RC, Right cerebral hemisphere; TF, Transverse fissure; CB, Cerebellum and SC, Spinal cord.

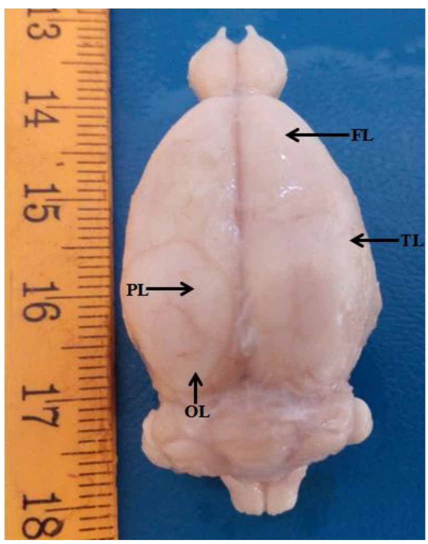

Fig (4): Dorsal view of the brain of adult African striped ground squirrel.
FL, Frontal lobe; TL, Temporal lobe; PL, Parietal lobe and OL, Occipital lobe

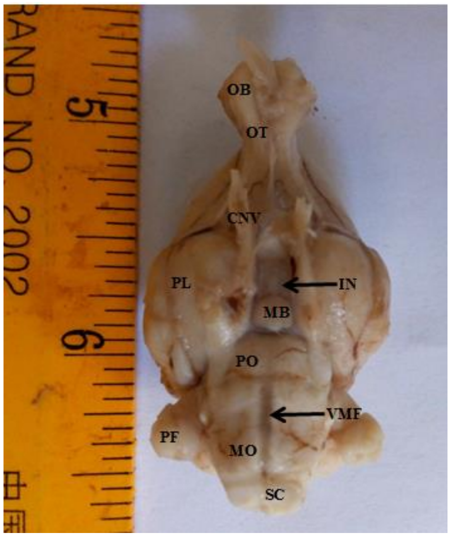

Fig (5): Ventral view of the brain of adult African striped ground squirrel.
OB, Olfactory bulb; OT, Olfactory tract; CVN, Cranial nerve V(Trigeminal nerve); PL, Piriform lobe; MB, Mammillary bodies; IN, Infundibulum; PO, Pons; VMF, Ventral medial fissure; PF, Paraflocculus; MO, *Medulla oblongata*; SC, Spinal cord

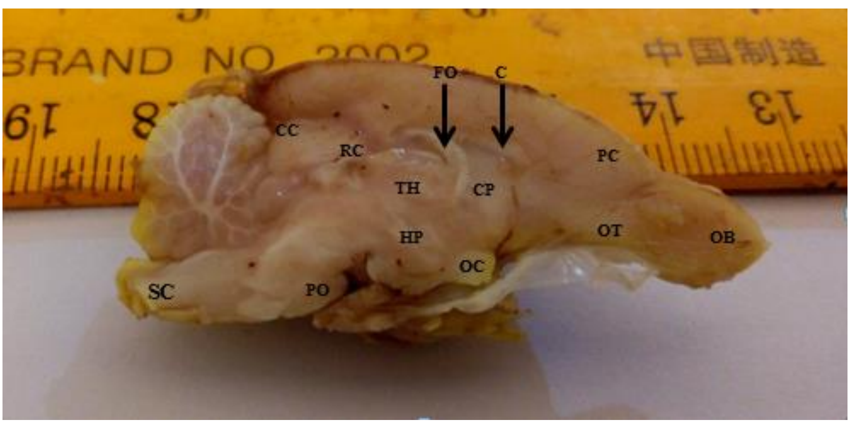

Fig (6): **Mid-sagittal view of the brain of adult African striped ground squirrel.**
OB, Olfactory bulb; OT, Olfactory tract; PC, Prefrontal cortex; C, Corpus callosum; FO, Fornix; CP, Caudate putamen; OC, Optic chiasma; TH, Thalamus; HP, Hypothalamus; PO, Pons and SC, Spinal cord

Animal species in this Issue

African Striped Ground Squirrel (*Xerus erythropus*)

Kingdom: Animalia & Phylum: Chordata & Class: Mammalia & Order: Rodentia & Family: Sciuridae & Genus: Xerus & Species: *X. erythropus*

Striped ground squirrels are diurnal herbivores, and spend almost their entire lives on the ground, although are capable of climbing into bushes to reach food. They eat a range of seeds, nuts, and roots, and can be an agricultural pest, eating crops such as cassava, yams, cotton bolls, peanuts, and sweet potatoes. They may occasionally supplement their diet with eggs, insects, and other small animals. Their predators include servals, jackals, birds of prey, and common puff adders.

They forage throughout home ranges of about 12 hectares (30 acres) in semi-arid terrain, but their ranges overlap and they make frequent forays into surrounding areas in search of food. They mark their territories using scent glands on their cheeks, which they rub onto stones and tree trunks, although they do not appear to defend them from intruders.

The squirrels spend the night in burrows, which they dig with their large claws. Their burrows are usually simple in structure, with a central nest less than a meter below the surface, a single entrance tunnel, and a few blind-ending tunnels that almost reach the surface. The latter are used as escape routes, allowing the squirrel to rapidly break through to the surface; the main entrance tunnel is often also blocked with a temporary pile of dirt at night. Burrows may also contain caches of food, although these are more commonly located some distance away and concealed beneath stones or dead leaves. They also bury their urine, but not their dung.

Source: Wikipedia, the free encyclopaedia