



SHORT NOTE ON OBSERVATION OF BREEDING ACTIVITIES OF THE LANDER HORSESHOE BAT (*RHINOLOPHUS LANDERI*- MARTIN, 1837) WITHIN AN URBAN AREA IN SOUTHWEST, NIGERIA

Adeyanju, T. E.^{1,2*} and Alarape. A.A.²

¹Batlife conservation initiative, southwest, Nigeria

²Department of Wildlife and Ecotourism Management, Faculty of Renewable Natural Resources, University of Ibadan, Oyo State, Nigeria

*Correspondence author: temidayoadeyanju@gmail.com; +234 805 447 6918

ABSTRACT

This study made observations on breeding activities of the Lander Horseshoe bat in southwest, Nigeria. Bats were captured using mist nets placed in the ground storey at the University of Ibadan, southwest, Nigeria. Forty-two per cent of total R. landeri (n=14) captured in March, 2017 and between February-August, 2019 were breeding either pregnant or with pups. Though distribution of the species is believed to range nationwide, the last report on breeding activity was about forty-six years ago and with a data deficient status; this observation is the first record for the breeding activities of R. landeri on the southwest range of the species within Nigeria and therefore provide more information about the species in the region.

Keywords: Bats, *Rhinolophus landeri*, breeding, urbanisation, Nigeria, University of Ibadan

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INTRODUCTION

Bats are keystone species known to influence many ecological and socio-economic processes through involvement in seed dispersal, pollination, suppressant of insect pests, source of monetary income, food, traditional myths and beliefs (De La Peña-Domene *et al.*, 2014). Despite the ecological role of bats for proper ecosystem functioning, there is limited information on bat reproduction and life history trait so as to understand their interactions with the environment, population dynamics and community structure (Zeppelini *et al.*, 2017).

There are over seventy known bat species in Nigeria (Happold and Happold, 2013) belonging to the recent suborder classification of Yinpterochiroptera and Yangochiroptera groups

(Teeling *et al.*, 2005). Recent studies in the region have recorded first sightings/new species of bat, thus providing opportunities to improve information on some aspects of the ecology and population trends (Happold and Happold, 2013; Adeyanju unpub. 2019). The *R. landeri* is an insectivorous bat that belongs to a large family Rhinolophidae in the *R. landeri* group of the subgenus *Rhinolophus* (Csorba *et al.*, 2003; Demos *et al.*, 2019). The family is characteristically distinguished with a striking muzzle processing, and a unique noseleaf typical of a horseshoe shape (Rajlakshimi *et al.*, 2018). The species is currently least concern (Monadjem *et al.*, 2017; IUCN, 2017); however, with rapid loss of habitats due to urbanisation and other landuse changes, it is imperative that information on aspects of its ecology is harnessed. Relevant

and reliable information is required for conservation measures and to prevent species loss. The *R. landeri* has been recorded in rainforest zones (Rosevear, 1965), Shagunu in Niger state (Menziess, 1973); and Guinea, Sahel and Sudan savannah zones (Happold and Happold, 1987; 2013). The sparse report, low captures and poor information on its distribution suggests local data deficiency. Breeding activity of *R. landeri* have only been reported for the savannah area (north) in Shagunu, Niger State and suggested that mating occurs between November and December with a gestation period of about five months while the young are born singly between April and May (Menziess, 1973). Our observation presents the first breeding activities for the southwest region, Nigeria.

MATERIALS AND METHODS

Description of selected landuse within the study site

University of Ibadan (UI) with a total area of 12.07km² is located between coordinates 7°27'3" N, 3°53'30" E and 3°0'53" N, 3°0'54" E at an altitude of 185m asl (Adeyanju and Adeyanju, 2012).

Experimental design

University of Ibadan was stratified randomly into three landuse types to include built up areas characterised living Apartments, Administration to Academic structures and roads that are completely tarred as well as rocky outcrops with the presence of many tree species both indigenous and non-indigenous tree species (Olajuyigbe *et al.*, 2013), the Botanical garden that is rich with a lot of plant biodiversity containing a wide range of orchid and fern collections, economic trees, indigenous, exotic floral species and outcrops of granite-gneiss rocks (Lawal *et al.*, 2020) and farmlands which are mainly vegetable farms usually located close to seasonal waterlogged areas with adjacent woodlands. The farms visited are the old research farms, the Ajibode farms, as well the farm plots around residential areas characterised by plantain stands and non-indigenous tree.

Bats were captured using sets of five Ecotone mist nets of 12 m length and 16 x 16 mm mesh size set at three points separated by at least 200 m during both wet and dry season in each landuse

types. All bat species captured were identified and confirmed to species level based on morphological characteristics described in Mammals of Africa (MoA), Bats of West Africa (Rosevear, 1965; Happold and Happold, 2013) and inaturalist community. All captured individuals were sexed (male or female), aged (adult or juvenile), and assessed for breeding occurrence (breeding or non-breeding). Forearm length (mm) was measured using a venier calliper and individuals were weighed using Pesola scale. Females were classified as breeding if they are found to be gravid (a palpable foetus), lactating (smooth hairless teat) or found with a pup. Individuals were released after recording necessary morphometrics.

RESULTS

In total fourteen individuals of *R. landeri* were captured in the three landuse types selected for the study in the University of Ibadan (Table 1). Four adult males had the auxiliary tufts possessing the reddish (Figure 1A) and the orange colouration (Figure 1B) below the armpits of both wings in March and August, 2019 and forearm length ranging from 42-47 mm (Table 1). The first breeding female with a pup was captured on the 6th of March, 2017 at about 2000 hrs with a naked pup fastened to the nipple of the adult female around the rocky outcrop with active farming activities matrix in residential areas (Figure 1E). The second observation was made in 3rd February, 2019 where a breeding pair with the female pregnant were captured within the Botanical garden adjoining a farmland (Figure 1C) while the third capture was made in 7th March, 2019 within forest relics that is been taken over by *Glicirida sepium* woodland with a few stands of *Ficus spp* and with a flowing stream bordered by active farming activities; it was observed that there was a fresh delivery of pup within the hour left in the extraction bag while awaiting processing which was not there at the point of extraction from the net (Figure 1D&F). The other female individuals of *R. landeri* were captured in the wet season around the rocky outcrops did not show any breeding signs except for two individuals suspected to be pregnant towards the end of 11th August in the Botanical garden.

Table 1: Summary of captures of *Rhinolophus landeri* within the University of Ibadan, southwest, Nigeria

| Season | Year | Month | Habitat Type | Weight (g, accuracy 2g) | FAL (mm, 0.1mm) | Age | Sex | Breeding status |
|--------|------|----------|------------------|-------------------------|-----------------|-----|-----|-----------------|
| Dry | 2017 | March | Residential/Farm | 9 | 44 | A | F | B |
| Wet | 2017 | July | Farm | 8 | 47 | A | M | NB |
| Wet | 2017 | July | Farm | 9 | 46 | A | M | NB |
| Wet | 2017 | October | Botanical Garden | 7 | 43 | A | M | NB |
| Dry | 2019 | February | Farm | 8 | 43 | A | M | B |
| Dry | 2019 | February | Farm | 13 | 41 | A | F | B |
| Dry | 2019 | March | Botanical Garden | 9 | 45 | A | F | B |
| Dry | 2019 | March | Bot.Garden | 0 | 14 | Juv | Nd | NB |
| Wet | 2019 | August | Bot.Garden | 14 | 43 | A | F | B |
| Wet | 2019 | August | Bot.Garden | 7 | 43 | A | M | UN |
| Wet | 2019 | August | Bot.Garden | 14 | 43 | A | F | B |
| Wet | 2019 | August | Bot.Garden | 7 | 43 | A | M | UN |
| Wet | 2019 | August | Bot.Garden | 7 | 42 | A | M | UN |
| Wet | 2019 | August | Bot.Garden | 6 | 42 | A | F | NB |

NB=Non-breeding; B=Breeding; UN=Unknown; FAL=Forearm length; nd= not defined

DISCUSSION

Our report provides evidence of breeding activities for *R. landeri* after forty-six years of the first breeding record observed in Shagunu, Niger state (Menzie's 1973) with a distance of about 426 km northwest between the point of breeding observation and our study. The occurrence of *R. landeri* have been described westwards of some West African countries including Nigeria but to our knowledge, there are no referrals of exact location of occurrence (Smithers 1983, Brown & Dunlop 1997). Captures and observations (extracted for *R. landeri* alone) made at the end of the dry and wet seasons, confirms the breeding activities for this species to be during the end dry season to the onset of the wet season as suggested from previous reports (Menzie's 1973, Happold & Happold 2013). Individuals had been observed to reproduce during the warm wet season, though some females captured November-December did not show any sign of pregnancy nor care of pup; however, sperm maybe stored in the uteri of non-breeding females, delaying fertilization and gestation until later in February-April (Menzie's 1973, Brown & Dunlop 1997). Our study reports active breeding activities in February and March, a breeding pair which is supported by the previous observations from more than 30 to 40 years ago (Menzie's 1973) with suggestions that *R. landeri* possesses ability to store sperm for longer periods of favourable environmental

condition so as to meet need of the young ones (Brown & Dunlop 1997) as it occurs in many wildlife species.

Since breeding activities must synchronise with periods of high food abundance (e.g., insect prey) for the young and to minimise stress on the nursing females; individuals captured from July-August did not show any sign of breeding activities and thus support observation where lactation and fur development was observed to have ended by July (Menzie's 1973) and captured individuals were more of males. This current observation reveals that *Rhinolophus landeri* breeds before the start of the rains probably to synchronize occurrence of young with availability of food resources (insect abundance) as observed in the family Phyllostomidae in the Neotropical forests, with preference for habitats close to riparian areas (Zeppelini *et al.*, 2017). There are reports of bat species which are reproductively active throughout the year especially in the Neotropics (Racey *et al.*, 1987) with high breeding activity peaking at the end of the rainy season, but this has not been observed for *Rhinolophus landeri* that breeds actively during the first quarter of the year in our study area and/or onset of the rains. The timing of breeding in *R. landeri*, *i.e.*, from the end of dry season to the start of the rains, is consistent with that of *Rhinolophus beddomeni* from Sri Lanka

observed breeding between March- April (Edirinsinghe *et al.*, 2016). Most bat species have been reported to produce one young per breeding cycle, though some species such as those in the Family Vespertilionidae show multiple broods with records of twins and some with triple or quadruple pups (Altringham 2011). Members of the Rhinolophidae usually have one pup in a brood or single pup once a year (Korad *et al.*, 2010, Edirinsinghe *et al.*, 2016). Females captured after the rains have established to the end of the raining season did not show any sign of breeding activity. Our observation of females of *R. landeri* to be monoestrous with one pup per brood is consistent with previous reports (Brown & Dunlop 1997) though observations of other species of Rhinolophidae show multiple broods (Edirinsinghe *et al.*, 2016). Brood sizes have been connected with seasonality and experience of older females been able to handle larger brood size (Myers 1977, Tuttle & Stevenson 1982). This study highlights an area of high bat population and other species of wildlife in the past five years but experiencing loss of mature indigenous trees

due to housing expansion and needs of growing human population. We recommend further study on the breeding, feeding and roost ecology to understanding especially with the use of telemetry devices and provide information on conservation of *Rhinolophus landeri* bat in this region.

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Conflict of Interest:

There is no conflict of interest on this publication

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APPENDIX

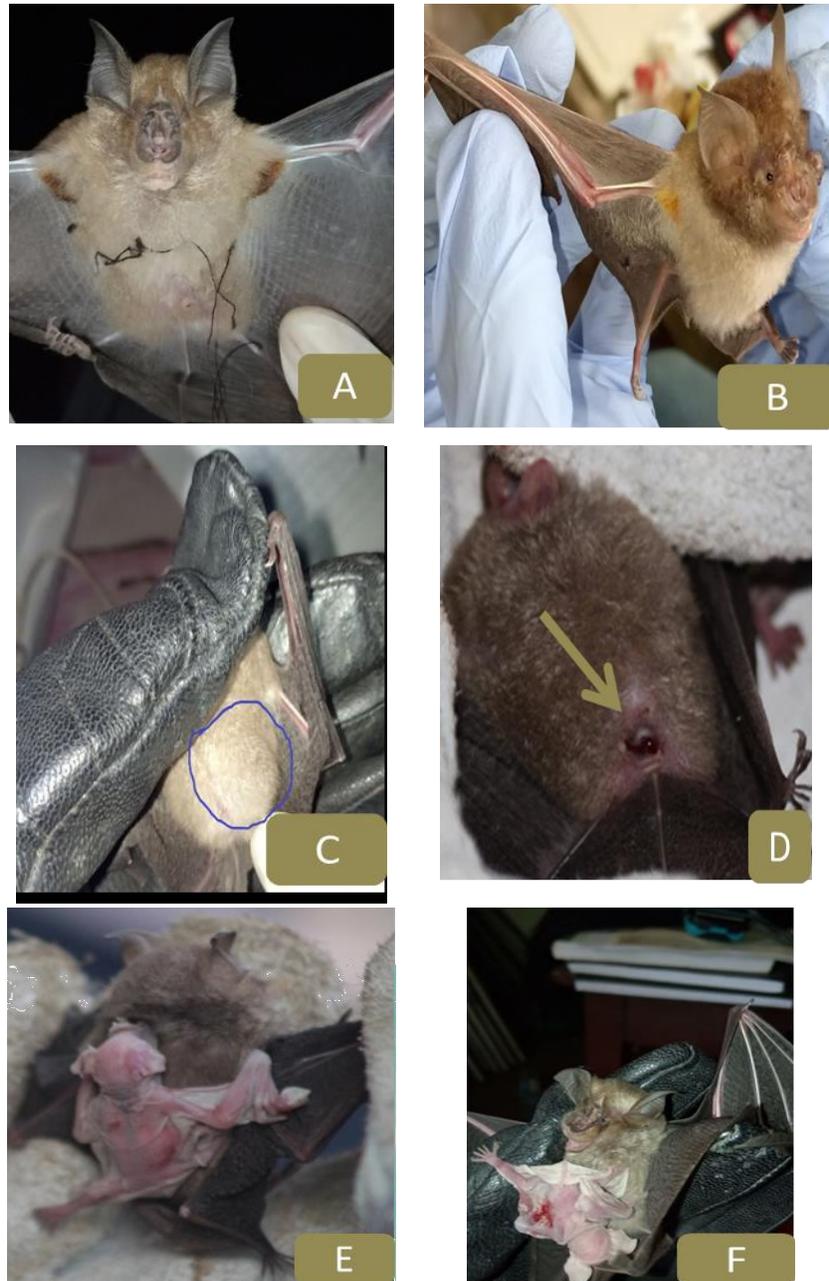


Figure 1:

- A & B = The male *Rhinolophus landeri* with dark red auxiliary tufts around the shoulder region
- C = The female *Rhinolophus landeri* with a palpable foetus around the abdominal region captured in the University of Ibadan, southwest, Nigeria.
- D = The female *Rhinolophus landeri* with a sign that it just delivered a pup, captured in University of Ibadan, southwest, Nigeria
- E = Hairless pup of *Rhinolophus landeri* attached to adult female, captured in the mist net at University of Ibadan, southwest, Nigeria
- F = Hairless pup of *Rhinolophus landeri* delivered within the extraction bag before processing, captured in University of Ibadan, southwest, Nigeria.