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REPRODUCTIVE BEHAVIOUR OF ASIATIC LESSER YELLOW BAT, *SCOTOPHILUS KUHLII* (CHIROPTERA : VESPERTILIONIDAE) IN UTTAR PRADEH, INDIA

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ABSTRACT : Reproductive behaviours are crucial to the stimulation of genital. Aim of this study to access to reproductive behaviours of *Scotophilus kuhlii* including genital grooming, sniff, and licking in Siddharth Nagar. Furthermore, the morphometric variation including scrotum length of male, body mass was access in reproductively and non-reproductively active of Asiatic lesser Yellow bat, *S. kuhlii* at various districts from 2016 to 2018 in Uttar Pradesh, India. Video recorder used for access reproductive behaviour and Mist net used for captured for access the morphometric variation. Our result indicates that a total of 34hours have been observed behabiour of *S. kuhlii* such as genital grooming, urogenital sniffing, urogenital licking by a male were increased in February, after which gradually decreases. While vaginal licking by a pregnant female was maximum performed in April. The body mass of pregnant females was gradually increased until birth while scrotum length of a male maximum length size in February and minimum in November. The females gave birth to two pups in the last week of May. Newborn pups red-brownish in colour back and light pink belly which closed eyes and hairless. We conclude reproductive behaviour was important to make a success of the reproduction.

Key words : Genital grooming, genital sniffing, genital licking, morphometric characters, *S. kuhlii*.

INTRODUCTION

Reproductive behaviour is performed by a variety of physiological, ecological and social interactions. The genetic structure of populations is largely determined by the breeding behaviour of the individuals within them. The high variance in the male reproductive success associated with polygyny can decrease the population size, potentially rapidly genetic drift and selection (Chesser, 1991). Several gregarious species from mammalian taxa including pinnipeds (Boness, 1991), rodents (Hayes, 2000), bovids (Berger, 1992) and bats (Tuttle and Stevenson, 1982; Kunz and Hood, 2000) exposer of environmental factors and social conditions that enhance reproductive success during the breeding season. The effect of seasonally and spatially fluctuation food supplies and climate conditions likely influence the timing and location of reproduction (Kunz, 1973; Hoying and Kunz, 1998). Thus, animal behaviors that enhance an individual's fitness in the context of the group are likely to be favored.

Speakman (2008) reported that reproduction is more costly, required more energy and elements such as protein and calciumduring pregnancy and lactation period.Hence, in small mammals, during breeding period more energy required to generally influence the physical condition and complete the reproductive cycle (Thompson, 1992; Dammhahn, 2008). The energetic cost of reproductive effort such as gametogenesis, courtship, mating is probably sex-dependent and possibly high (Huchard, 2012), but overall poorly quantified (Kenagy, 1987). Eventhough, the critical importance of understanding the mating system function for establishing conservation strategies, unknown of detail mating system function in several animals (Lane *et al*, 2011). Whereas, temperate-zone vespertilionid bats are unique among mammals because of the pronounced temporal asynchrony of primary and secondary sexual functions.

Sperm production by males begins during spring and continues through summer, while females are birthing and raising their offspring during breeding season (Wimsatt, 1960; Gustafson, 1979). This situation bats faced a particular challenge because their mating periods often extend into seasons when food resources become scarce or unavailable (Cryan *et al*, 2012). Hence, mating systems of temperate insectivorous bats delay their reproductive system which both males and females capable of storing sperm for several months, especially seen among the Vespertilionidae bats (Wimsatt *et al*, 1966; Crichton, 2000). These situations occur when food availability and necessary to fuel sperm production, is not available (Cryan *et al*, 2012).

Copulation generally begins in autumn while few species continue mating occasionally through the winter and into spring (Barbour and Davis, 1969; Racey and Entwistle, 2000). The secondary sexual function in vespertilionid bats match with typical externally visible signs of primary sexual function such as maximum testes size, which seasonal increases in resource availability, whereas common in other animals (Cryan *et al*, 2012), however, these are specific seasonal timing and age at which mating initiates in vespertilionid bats can be difficult to determine, because mating might often occur more than half a year before (Cryan *et al*, 2012). Rossiter *et al* (2000) reported that in autumn, females visit males to mate, although copulation can also occur in winter and spring. Therefore, breeding partnerships appear to be primarily determined by female choice. These can be up to more than one female who chose a single male (Ransome, 1991).

Mattings performed in territory sites occupied by single male, which may be small caves, mines or cellars and part of a larger underground system (Ransome, 1991). At the time of mating male reproductive success is determined by female choice (Rossiter *et al*, 2000) then female dispersal during mating will influence spatial differentiation, while the male reproductive life span will affect the extent of temporal differentiation (Rossiter *et al*, 2000). The vast majority of fatalities occur during late summer and autumn a period that matches both autumn migration and the beginning of accepted mating periods in many of the affected species (Arnett *et al*, 2008; Cryan and Brown, 2007; Cryan and Barclay, 2009). Gestation and lactation are critical periods of energy expenditure (Gittleman, 1988) to require extra energy to fetal growth and the development of reproductive organs including the uterus, placenta and mammary gland, entail a drastic increase of energy expenditure. After that birth, lactation is even also more costly (Loudon and Racey, 1987; Rogowitz, 1996; Dammhahn and Kappeler, 2008). Kunkele (2000) reported that in the guinea pig *Cavia porcellus* the daily energy expenditure during gestation is 2.4 times the basal metabolic rate (BMR) and 3.7 times the BMR during lactation. The extent of such costs places reproductive decisions at the core of life-history trade-offs (Stearns, 1992; Williams and Editor, 1966).

They exhibit unusual life histories for small-sized mammals in that they are long-lived develop more slowly and produce few offspring. The mating activity starts in late summer when the animals have increased their body mass or size and improved physical condition such as a genital organ. Although, it is the seasonal variation in body mass and reproductive condition of an adult male seen Daubenton's bats and male young of the year were analyzed in previous studies (Encarnacao *et al*, 2006).

Bairn size at birth and postnatal growth and development could be influenced by biotic and abiotic factors, including food availability, weather conditions, foraging success, metabolic rate, sex, litter size, colony size, and social conditions (Tuttle, 1976; Tuttle and Stevenson, 1982; Kunz and Stern, 1995; Hoying and Kunz, 1998; Baptista *et al*, 2000; Koehler and Barclay, 2000; Kunz *et al*, 2010). Pup size at birth and post-delivery growth also reflects the parental effort during pregnancy and the postnatal period (Read and Harvey, 1989; Promislow and Harvey, 1990). Bats gave birth relatively large young one compared with other similarly sized terrestrial mammals (Chen *et al*, 2016). In general, it's the body mass of offspring is higher in smaller mammal species compared to large species (Chen *et al*, 2016). In terms of bairn mass, which is strongly associated with wing loading in pregnant females, vespertilionids bats that produce twins have the highest body mass as a percentage of maternal mass up to 50 percent (Kurta and Kunz, 1987). Hence, the energetic cost for bats to produce and raise young is relatively high, which may cause a depletion of nutrient reserves in females and constrain the litter size (Barclay, 1994, 1995; Kunz *et al*, 2009). Female bats nurse their young one until the pups have nearly achieved the adult size and are capable of flight, foraging and echolocation (Chen *et al*, 2016).

The female short-nosed fruit bats lick their mate's penis often throughout copulation, and that every second of licking outcomes in almost six extra seconds of copulation (Tan *et al*, 2009). Several animals may lick their reproductively active mate's genitals before and after to judge whether she is in estrous (Koyama, 1988). Grooming behabiour is a crucial and evolutionarily ancient behavior observed across several animal taxa (Terry, 1970; Sachs, 1988). The main reason for hygiene and caring for the body surface, stimulation of the skin, thermoregulation, chemo-communication, social interaction and stress reduction (Terry, 1070; Sachs, 1988; Colbern and Gispen, 1988). The behavior of this type creates 15–50% of waking time and may be generated by swimming, pain, exposure to predators, and sexual behavior (Kalueff and Tuohimaa, 2004; Kalueff *et al*, 2007). The mice and hamsters raise their frequency of sniffing from ''resting'' frequencies near 2 Hz to 4–12 Hz when searching new odor sources during operant tasks (Welker, 1964; Verhagen *et al*, 2007; Wesson *et al*, 2008). The dogs show various sniffing behaviors when tracking a scent in air versus on the ground (Thesen *et al*, 1993) and water shrews change their sniffing behavior

depending on the shape of the objects during searching or hunting of the prey hunting (Catania *et al*, 2008). Therefore, our aim of this study to access to reproductive behaviour including genital grooming, urogenital sniff and urogenital licking and morphometric variation including scrotum length of male, body mass in reproductive and non-reproductive of Asiatic lesser Yellow bat, *S. kuhlii*.

MATERIALS AND METHODS

A total of ten roosts were selected and given a roost ID number to access the reproductive behabiour such as courtship, genital grooming, Urogenital licking, Urogenital sniff, Tooth grooming Approaching, Yawn and copulation attempt, and success in Siddharthanagar district, whereas behaboiur was carried out fifteen days interval from February to June 2018 (Fig. 1). The tagged 20 individuals including 8 males and 12 females from the selected roosts. The tagged individuals were following: (A) roost, two males and three females, (B) roost, a male two females, (C) roost, three female, (D) roost, a male and two female, (E) roost, two males, (F) roost, two males and two females. Self-made metal tags of copper wire with colored beads to identify male and female individuals. The tags were less than 0.5gm of body mass of bats. A maternity roost was never vacated by *S. kuhlii* throughout the breeding season, which was T (Single entrance which inward divide in to both side) shape and higher the cavity or tunnel length. Remaining other roosts occupancy were fluctuating in the breeding season due to less covity or tunnel length and larger size of roost entrance. Therefore, only we chose a roost for behavior observation. End of the breeding season only two tagged males and three females were returned to the same roost was observed in June last. The behviour was observed by CCTV Camera during the breeding season (February to June), the CCTV Camera was fixed by the metal hanger (Self-made) at front of maternity roost. The recording was performed 24 hours observation from 6:00 am to 6:00 am. The whole recording was recorded in a single data card (32GB). When completed 24hr recording, we transfer data in HP Laptop to could pull the behabiour related data. A total of 34 hours behaviour was recorded from 92 videos recording, which average recoding time was 22: 16 minutes.The several types of behaviour including courtship, genital grooming, Urogenital licking, Urogenital sniff, Tooth grooming Approaching, Yawn and copulation attempt and success have been recorded. The successful mating with the tagged female could not confirmed until it gave birth on 28th May 2018.

The bats were captured during emergence time by mist net (Avi net, Dryden, USA) from various places to accesses the morphometric variation of male and female, actual body status of reproductively active individuals during the breeding period (Fig. 1). The mist net was erected exit point of roosts and bank of the pond because *S. kuhlii* often drunk water after emergence in summer when the temperature was high. The Morphological characters such as body mass, head and body length, length of forearms and hind arms, body width, length and width of the ear, tragus width, length and width of stratum, second, third, fourth and fifth metacarpals, maxillary and mandible length, wingspan, thumb, tail length have been measured by using digital venire caliper (Mitutoyo, 500-181,0003472, Japan). Simultaneously, Reproductive status was access by the body condition of the female. Therefore, females were classified as either-visibly pregnant, lactating, or post-lactating. Nipples remained

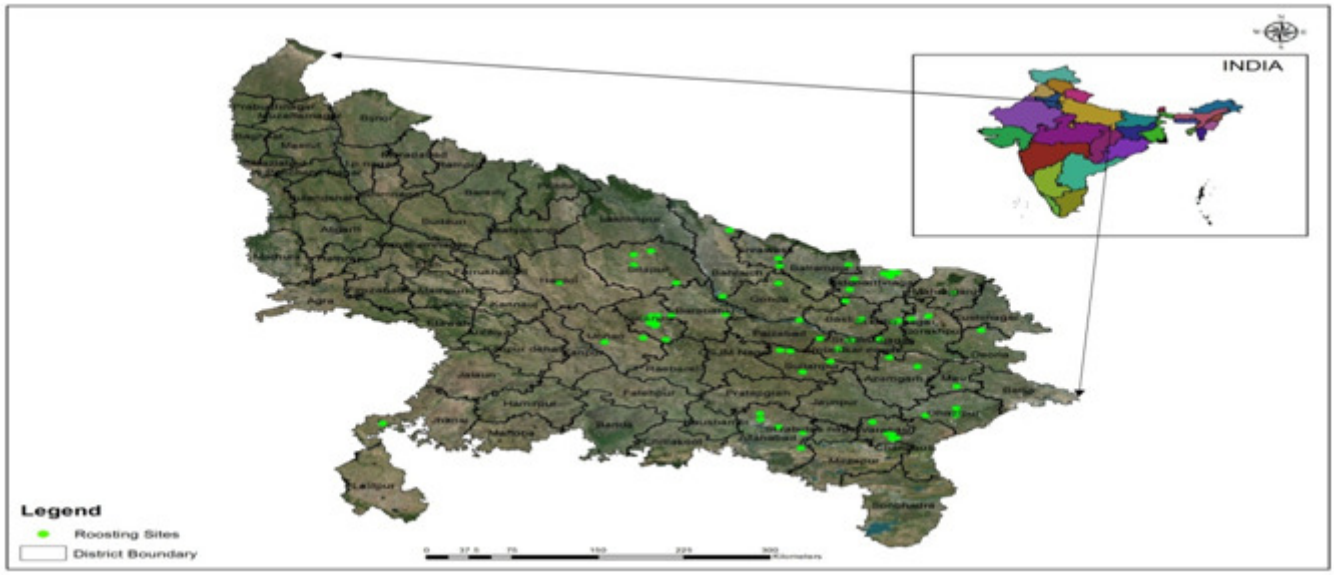

Fig. 1 : Map of study area (Uttar Pradesh). The capture or roosting locations were marked as green circles with the help of GPS.

visible after females gave birth, although they reduced markedly in size after lactation. Females without visible nipples or with nipples with hair grown over them were categorized as non-reproductive. If phalangeal epiphyses had not yet fused or if ringing date indicated they were young-of-the-year, the bats were classed as juveniles.

The weight of the bat has been taken by spring balance. Bats released immediately after taking measurements at the site of capture. The Pearson correlation used to determined of the body mass and body width of female *S. kuhlii* (SPSS, version 20) because data was nonparametric. The map was made by ArcGIS. The whole study was conducted monthly.

RESULTS

A total of 20.87% (n = 57) adult males of *S. kuhlii* were analyzed for access in scrotum length. It was observed that seasonal variation occurred in male scrotum length, which was maximum scrotum length in February (13.14±0.51mm) and minimum in November (10.31±0.49mm) (Fig. 3a). A total of 27.83% (n=76) pregnant females were analyzed to access variation in body mass of pregnant females and body width. We found pregnant females of *S. kuhlii* gained body mass faster throughout the gestation period. The average body mass in January (20.27±0.46gm), pregnant female not found in January but the status of the vaginal swab, consideration reproductive active female and maximum body mass in May (26.33±1.29) which was decreasing in June (Fig. 2c), which begin lactation period. Beside the body width of pregnant females was increasing with increase body mass (Fig. 2d). Pearson correlation analysis showed a significant difference between body mass and body width of pregnant females (r= 0.613**) (** correlation is significant at the 0.01 level). Bodies, body mass of non-reproductively males and females fluctuated throughout the season. The average body mass (21±0gm) of non-reproductive males were observed in November and December, while the maximum in October (23.85±0.89gm) (Fig. 2a). Whereas non-reproductive female's body mass (21±1gm) were minimu in December while maximum (22.4±0.54) in November (Fig. 2b).

A total of 34 hours have been observed behabiour of *S. kuhlii* during breeding season from February to June. In February a total of 6 hours 45 minutes behavior was observed, which only three reproductive behabiour such as male groom their genital organ (15.16time/ hours) was maximum behavior observed (Fig. 3b). While, courting male sniff of the female's vagina (9.13t/hrs) (Fig. 3c) and vagina licks (9.27t/hrs) (Fig. 3d). The copulation attempt (9.29t/hrs) by a courting male was observed. A mating success has been observed in the present study on February 15th 2018. In March a total 6:23:0 minutes

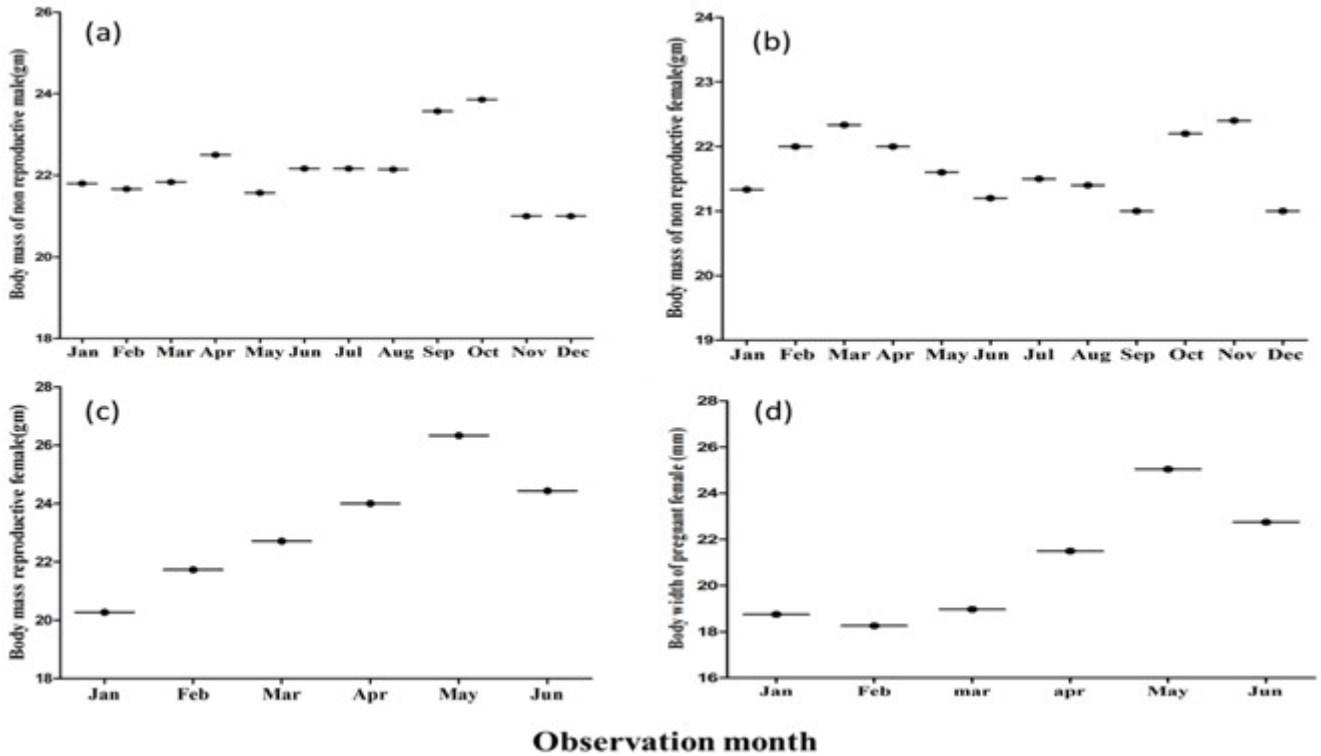

Fig. 2 : Morphomatric variation of non-reproductive and reproductive males and female of *Scotophilus kuhlii* in breeding and non breeding season:(a) body mass of non-reproductive male, (b) body mass of non-reproductive female, (c) body mass of reproductive (Pregnant) female, (d) Body width of pregnant female.

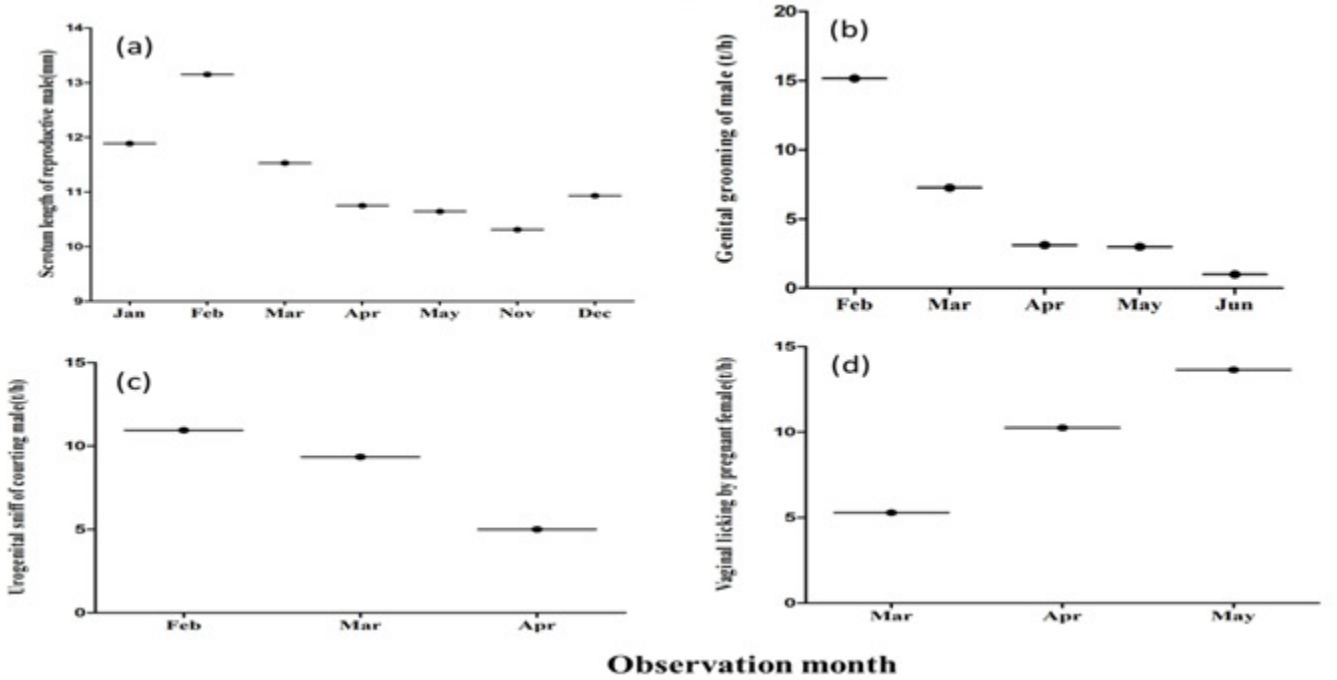

Fig. 3 : Reproductive bahaviour of *S. kuhlii* during breeding season (a) Scrotum length of reproductive male, (b) Genital grooming of male. (c) Urogental sniffing by reproductive male, (d) Vaginal licking by pregnant female.

behavior was observed, which was gradually decreasing such as genital grooming (7.25t/hrs) (Fig. 3b), urogenital licking (8.8t/hrs) (Fig. 3d), urogenital sniff (9.35t/hrs) (Fig. 3c) and copulation attempt (9.03t/hrs). While the first time another behavior was seen pregnant female licking their vagina (5.29t/hrs).

In April a total of 8 hours 3 minutes behavior was observed, which little behaviour was disappeared such as urogenital licking, while remaining behavior gradually decreasing. Whereas vaginal licking (10.25t/hrs) was gradual increases (Fig. 3d). In May a total of 6 hours 21 minutes behavior was observed including, urogenital sniff and urogenital licking were disappeared while vaginal licking by a pregnant female was on the peak (13.64t/hrs) (Fig. 3d). There was the first time observed two pups attached with their mother belly and which first-time infant groom was seen by mother (9.78t/hrs). In June, a total of 6 hours 33 minutes behabiour was observed, only genital grooming (2.63 t/hrs) (Fig. 3b) was seen and all reproductive behavior was disappeared. Besides, few other behavior was also observed in a whole breeding month, such as general grooming (9.86t/h) tooth grooming of male and female the average (5.81t/h) and yawning of male and female average (50.65 t/h) was seen.

We observed that one or two males with more the three females lives in single maternity roosts. While at the time of birth pregnant female lives alone or two females in maternity roost. Whereas courting male life

Table 1 : Morphometric analysis of pups of *Scotophilus kuhlii* bats including a male and a female. Mean ± SD is shown.

Parameter (mm)	Pup		
	M	F	Mean ± SD
Body mass(gm)	3.3	4	3.65 ± 0.49
Body + head length	38.83	40.57	39.7 ± 1.23
Head length	15.54	15.54	15.54 ± 0
Tail length	33.32	32.96	33.14 ± 0.25
Ear length	4.65	4.5	4.575 ± 0.10
Ear width	3.65	3.86	3.755 ± 0.14
Targus	1.57	1.86	1.715 ± 0.20
Forearm	18.86	19.96	19.41 ± 0.77
5th Metacarpal	12.86	14.65	13.75 ± 1.26
First phalanx	3.86	4.65	4.25 ± 0.55
Second phalanx	2.54	2.65	2.59 ± 0.07
4th Metacarpal	11.04	12.93	11.98 ± 1.33
First phalanx	2.65	2.76	2.70 ± 0.07
Second phalanx	2.32	2.6	2.46 ± 0.19
3rd Metacarpal	13.96	13.66	13.81 ± 0.21
First phalanx	4.54	4.54	4.54 ± 0
Second phalanx	3.86	3.65	3.75 ± 0.14
2nd Metacarpal	14.86	14.87	14.36 ± 0.01
Wing span	110.54	110.75	110.64 ± 0.14
Thumb length	3.8	3.87	3.83 ± 0.04
Maxillary length	4.5	4.65	4.57 ± 0.10
Mandibular length	3.65	3.5	3.57 ± 0.10
Hind arm	12.4	10.95	11.67 ± 1.02
Foot	1.85	1.6	1.72 ± 0.176

in the adjacent roost, until pups fly. The gestation period approximately 112 days. Parturition occurred on 28th June 2018. A female gave birth to two pups. Newborn pups red-brownish in colour back and light pink belly which closed eyes and hairless. The average forearm length of pups at birth (19.41± 0.77mm mean ± SD) and body mass (3.65±0.49). Whereas average 5th metacarpals (13.75±1.26mm), 4th metacarpals (11.98±1.33mm), 3rd metacarpals (13.81±0.21mm) and 2nd metacarpals (14.36±0.001mm). While the average wingspan (110.64±0.14mm), maxillary (4.57±0.10) and mandibular (3.57±0.010) (Table 1).

DISCUSSION

Based on the observation mattings performed in territory sites occupied by single males, which may be small caves, mines or cellars or a specie part of a larger underground system (Ransome, 1991). The present study similar to previous work reported by Ransome (1991). Whereas roost mostly in an abandoned building, monuments, tree cavity in the same roost. The gestation period approximately 112 days. Females gave birth to two pups once a year in the last week of May month. Chen *et al* (2016) reported that parturition occurred of *S. kuhlii* on the first to the second week of June. Parturition of *S. kuhlii* may be varied according to a geographical area and roosting sites. Newborn pups red-brownish in colour back and light pink belly, which closed eyes and hairless. A present result similar to previous work reported by Chen *et al* (2016). Pups are always attached to their mother until one week. Gould (1975) reported that mostly newborn bats are not well furred, are weaned at a larger size and completely dependent on their mothers. Mother left their pups in maternity roost during foraging, which forage around the maternity roost to a short time. A present study just opposite to those reported previous study by Hamilton and Watt (1970), Kunz (1974, 1982). Reproductively active male bats may shorten foraging time during the breeding period (Hamilton and Watt, 1970; Kunz 1974, 1982). Males often live in roost adjacent to maternity roost until pup fly. We speculate that males do not involve in parental care. Several previous studies reported that Male parental care is occasional among mammals (Clutton-Brock,1991), while almost absent among bats (Kunz and Hood, 2000).

Body mass of females was higher compare to males because body fat content is more compared to males. A similar study found body mass of female *S. kuhlii* higher compared to males recorded by Zhu *et al* (2012). According to Flux (1967) suggested that females were heavier compared to males according to seasonal variation in the body mass *i.e.* females more body mass and males have low in spring. The pregnant female's body mass increases one fourth from fetal mass alone during pregnancy (Kunz *et al*, 1995b; Kunz and Hood, 2000). Our results showed body mass of pregnant females continuously increases until parturition than again original or reduce their body mass during begging lactation period. Parturition and lactation period are very costly. Therefore, more energy required to maintain a basic metabolic rate. Lactation period is more costly (Loudon, 1987; Rogowitz, 1996; Dammhahn, 2008). Canale *et al* (2012) reported thatduring lactation females frequently reduce their body weight. Increasing the body moss of pregnant females simultaneously increases the breeding season length and gestation period. Pregnant females in early spring, adult males in late spring, juveniles, and postlactating females in early summer, and adult females in late summer had the latest median emergence times (Reichard *et al*, 2009). Our result showed pregnant females were frequently captured in February to May and after that lactation female was captured frequently in June.

Seasonal variation in body mass of Hibernating species (Ransome, 1991) required high energy demands during this period. Hence, the animals build up body-fat reserves after the breeding season (Ewing *et al*, 1970; Kunz *et al*, 1998; Speakman and Rowland, 1999). After these fat reserves gradually decline. In consequence, bats are lightest when they leave their hibernation roosts. Ourresults showed that seasonal variation in body mass of non-reproductive male and female of *S.kuhlii* whichwas a similar result reported by Kunz *et al* (1998), Encarnacao *et al* (2006). When a mating activity starts in late summer thus the animals have again increased their body mass (Encarnacao *et al*, 2006). Our result showed that non-reproductive bats gain body mass in summer and monsoon, when food abundance is more. Juvenile bats in temperate zone store fat in their body before going hibernation in winter (Grindal, 1992). Insect diversity and prey availability is high in summer and monsoon. While courting males lose their energy during mating time. Therefore, more energy required when males pause their mating in early summer.

Our result showed that the male scrotum length of *S. kuhlii* was increased in February and gradually decrease with the end of the breeding season. While disappeared in the non-breeding season. Scrotum size shows males are reproductively active. During the breeding season, clearing visible signs of a primary sexual organ such as testes size of Vespertilionid bats (Cryan *et al*, 2012). Racey (1974) and Krutzsch (2000) reported that, during spring, the accessory sex glands of males initiate to shrink, which the caudal epididymides empty,

and sperm production begins again (Racey, 1974; Krutzsch, 2000).

Ramsey *et al* (2009) suggested that genital hair has been retained to improve the spread of pheromonal secretions, to increase attractiveness to the other sex. Genital grooming is innate behaviour which common during the breeding period. It is played by courting males to attract the opposite sex seen several mammals. The present study showed that, courting male groom their genital organ continuously several second to minutes to stimulation scrotum size and erect penis to complete mate. These are frequently observed in February to the first week of March in the case of *S. kuhlii.* While it may vary species to species. Tan *et al* (2009) reported that the male often groomed himself or licked the inner surface of the genital. The females licked her mate's penis during copulation influence the duration of copulation (Tan *et al*, 2009).

The sniffing is a natural process in animals to respond to identification through the scent of the same or opposite sex. Roeder (1980) reported that estrus females may distinguish their partner by scent marks. This determination of the physiological state of females by courting males is also possible by olfactory cues. Hence, scent marks perhaps allow identifying of estrus females by courting males. During the rutting period, the "hiccup" of the male appears after sniffing and urogenital region a place where an estrus female has just marked (Roeder, 1980). The present study showed that urogenital sniff by the male was maximum observed before mating. It was often seen in the breeding season. Male often sniff of the females genital to know the status of the sexual maturity of females. It may several times in minutes or to several seconds.

Several mammals lick genitals before and after copulation. The present study showed that male bats lick their partner's vagina regularly during the breeding season. We speculate that males of *S. kuhlii* lick the female genital to increase the lubrication and stimulation to copulation. The male of *Lemur catta*, species often licks the genitals organ of the female to judge whether she is in estrous (Koyama, 1988). Tan *et al* (2009) reported that female *Cynopterus sphinx* licks their courting male's penis regularly during copulation and that each second of licking results in influence approximately six extra seconds of copulation. The female *C. sphinx* licks the male penis to increase penile stimulation, rigidness the penis and maintaining the male's erection (Tan *et al*, 2009), at the same time, the female's saliva may increase lubrication, thus facilitating intromission and thrusting (Tan *et al*, 2009).The present study showed that male *S. kuhlii* mating occurs in late winter. Rossiter *et al* (2000) reported that, females visit males to mate in autumn, while copulation can also occur in winter and spring and which determined by female choice.

CONCLUSION

Based on the observation few morphological characteristicsvary between males and female of *S. kuhlii.* While at the time of birth pregnant female lives alone or two females in maternity roost. Whereas courting male life in the adjacent roost, until pups fly. The gestation period approximately 112 days. Birth is occurring around May to June. A female gave birth to two pups once each year. Newborn pups red-brownish in colour back and light pink belly, which closed eyes and hairless. No difference morphological characters between male and females pups at birth. While in adults males and females are different in morphological characters. Pregnant females gain body mass dramatically to parturition than lose their body mass during the lactation period. While body mass of non-reproductively an individual fluctuates when food availability is more than body mass gain. It occurs in summer and monsoon when all insectivorous bat prepared for hibernation. The male sniff and lick vagina of females before mating during the breeding period to assess the status of estrous. The male groom their genital for few seconds to minutes to attract and stimulate females to mating. The males try to several copulation attempts to the success of the mating. The female lick their vagina before birth may enhance to cervix opening could be easily the birth. Besides yawing behaviour is common in the *S. kuhlii.*

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