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STUDY OF SOME REPRODUCTIVE TRAITS IN MABUYA MULTIFASCIATA REGARDING SEXUAL DIMORPHISM

MOUSHUMI HAZARIKA[1] and Dr D K SHRMA[2]

[1]Ph.D. Former S.R.F, Gauhati University
[2]Proffessor, USTM, Meghalaya

Abstract

Mabuya multifasciata, the new world skink of genus Mabuya have unique form of viviparity. It involves ovulation of tiny eggs (2-3mm) and gets nutrients for embryonic development by placental means. The study was dealt with the female reproductive anatomy, male reproductive anatomy, seasonal changes in the gonads and testies, ovarian and testicular development and placental morphology. Oogenesis in lizard Mabuya multifasciata initiated during late March- May. This paper dealt with study of some reproductive traits in Mabuya multifasciata in realation with sexual dimorphism.

Introduction:

Mabuya multifasciata, the new world skink of genus Mabuya have unique form of viviparity. It involves ovulation of tiny eggs (2-3mm) and gets nutrients for embryonic development by placental means. The study was dealt with the female reproductive anatomy, male reproductive anatomy, seasonal changes in the gonads and testies, ovarian and testicular development and placental morphology. Oogenesis in lizard Mabuya multifasciata initiated during late March- May.

Histological studies on reproductive organs:

Materials and methods:

Sample collection and paraffin embedding:

Adult male and female Mabuya multifascita were collected from the sample sites of Darrang District. Total 60 numbers of Mabuya multifasciata were collected during January 2013- December 2014 with the help of collecting net. After collecting the specimen body measurements of all the individual specimen were recorded i.e. SVL (Snout vent length), total body length (TBL), tail length (TL) as well as other characteristics like body color.

The animals were killed and dissected to open the abdominal cavity. The animals were divided into three groups. One in the period of January-April, second group is from May-August and the third group is from September-December. All the external morphology and gross anatomical features were studied, photographs were taken using Canon digital camera. The reproductive organs like ovary, oviduct from gravid and non-gravid female as well as extra embryonic membrane together with ovary, fat

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bodies, stomachs, and embryo were removed carefully along with the required structures of male animals and placed them in 10% formali. One or two ova per female were removed keep it on paper for drying and weighed. Mass of fat body was recorded for approximating lipid cycling (Dessauer 1955; Gorman and Licht 1974). Samples were thoroughly washed in a phosphate buffered saline and rapidly immersed either 10% paraformaldehyde for at least 3 days or Bouin's fixative for 30 minutes. The samples were dehydrated in an ascending graded ethanol series (70, 90, 95 and 100 %) for 30 minutes each and then cleared in 3 changes of xylene for 24 hours. The cleared specimen were than embedded in melted paraffin wax.

Histological staining:

The paraffin embedded specimens were sectioned at 5 µm thickness using microtome. Sections were deparaffinised and stained with hematoxylin and eosin for general morphology.

Result:

Female reproduction, placentation, fat body cycling:

Ovulation occurred during Augus to October. Ova were very minute (1-1.5 mm) in diameter and containing very little am punt of yolk (x' dry mass= 3.5 mg). The dry mass of egg remains constant throughout late of February but development was started. The rapid growth phase began at February to May with the increase in embryonic dry mass occurring over the next three months. In early May, development was going towards completion, increased fetal size in gestation. In the Figure 1, the great increase in the size of embryos is shown by the data of wet mass of embryos throughout the development period. Parturition took place from late May through mid-July. The females of all the mature size colleceded during May through November (except for those October females containing near-term embryos) had tiny oviduct AL ova. Thus it was seen that almost all the females reproduced nearly synchronously. But at any given time consideration variation in the development of their embryos were occurred.

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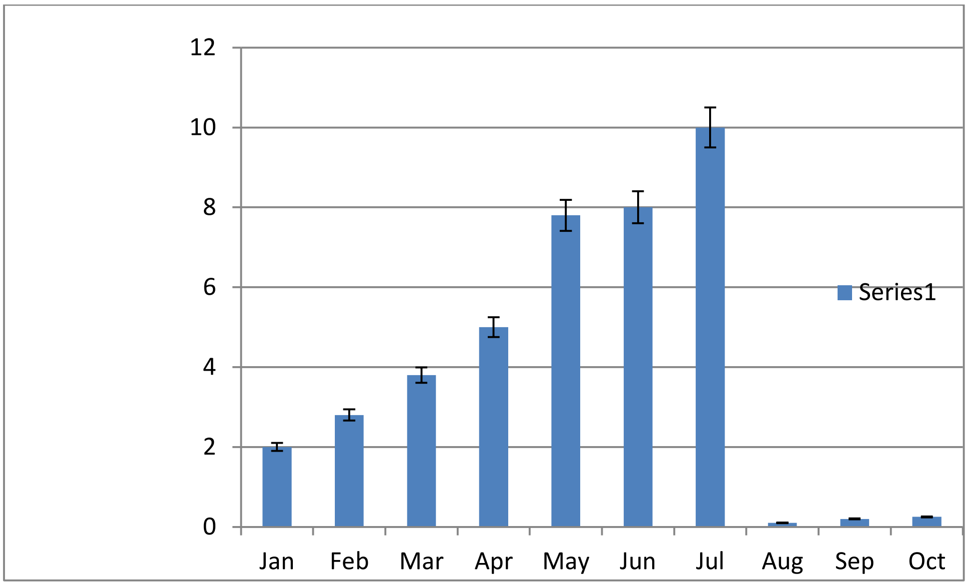

FIG 1: Wet mass of preserved ova(oviductal) or embryos of Mabuya multifasciata. S.D. appeares over each figure.

The smallest size of female with near term embryo was 80- 85 (± 5) mm in SVL collected during late May-June. The average size of reproductive adult in SVL was 100± 5.284 mm.

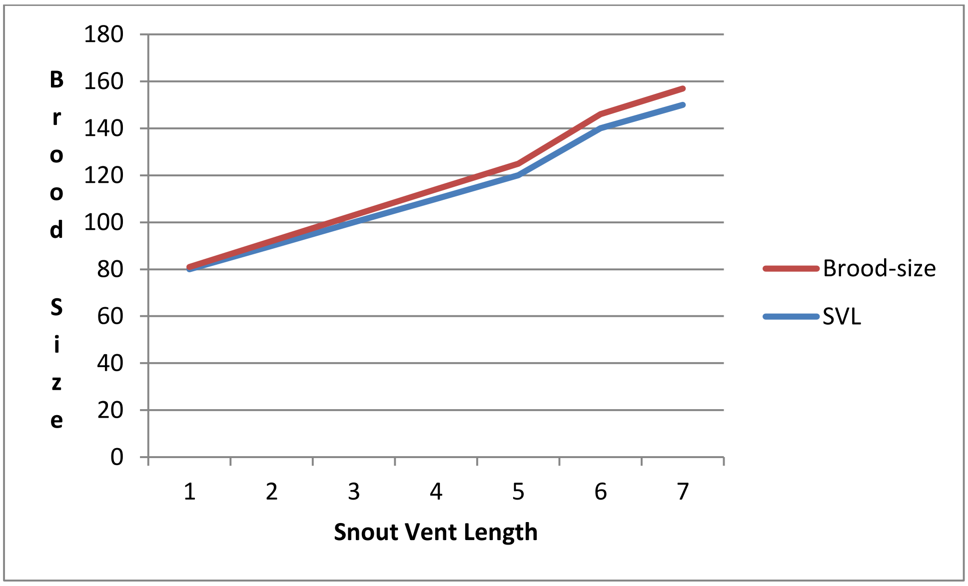

Fig 2: Relationship of brood size to female snout-vent-length in Mabuya multifasciata collected during February to May.

Brood size 3-7 (S.D= ± 2 , N= 33). It was correlated with SVL of female. Brood size is positively correlated with SVL size of female (r=0.98,F 1,31, p< 0.001).

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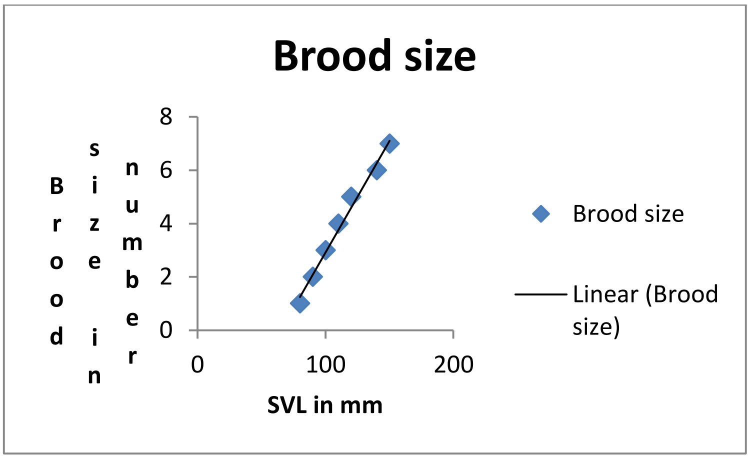

Fig 3: Correlation of brood size and female SVL(in mm) (Pearson correlation) collected during February to May of Mabuya multifasciata. (N=33)

Seasonal cycle of fat bodies :

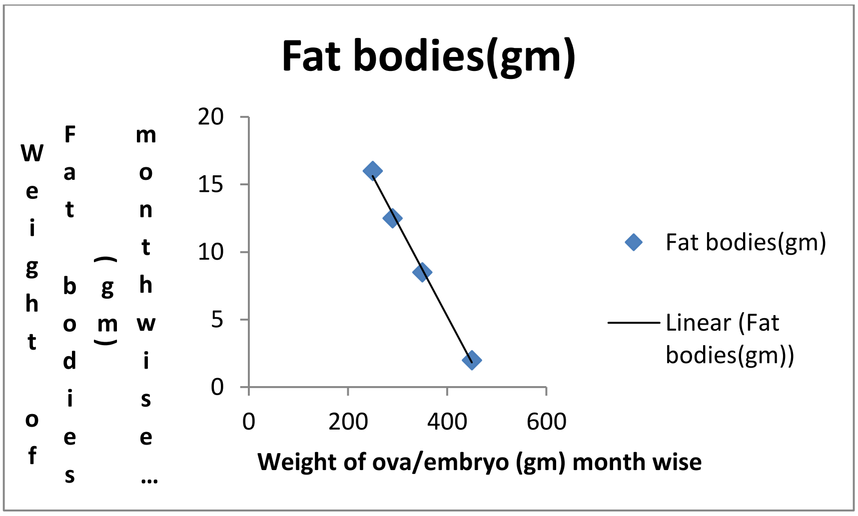

Fig 4: Seasonal cycle of fat bodies adjusted for variation in wet weight of ova/embryo during the month of February-May of Mabuya multifasciata

Table: Month wise fat bodies and weight of ova/embryo in female M.multifasciata ,N=33

Month	Wet weight of ova/ embryo (gm)	Wet weight of fat bodies (gm)
Feb	250± 10	16±5
Mar	290± 10	12.5±5
Apr	250± 10	8.5±5
May	450± 10	2± 0.5

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The fat body masses decreased rapidly in the female during the time of rapid embryonic growth. And again increased in size following the parturition. Both the embryonic growth and decreasing of fat bodies were negatively correlated ($F_{1, 31}=0.998$, $p< 0.0001$).

Discussion:

From the many years lizards have served as important models for the evolution of sexual dimorphism (Valentin et al, 1993; Trivers 1976). It provides an ideal field to integrate broad phylogenetic patterns and genetics of sexual differentiation (Cox et al. 2009; Cox et al 2007; Cox 2005; Hews and Quinn 2003).Studies of sexual size dimorphism (SSD) common (Garcia et al. 2008).

Mabuya multifasciata shows sexual size dimorphism. Here the female is larger than the male. Sexual size dimorphism is highly variable in lizards. Female sometime larger by upto 20% in some polychrotids (Ploychrus) , skinks (Mabuya) and Pygopodis (Aprasia). Within most families variation in the direction and magnitude of SSD is typical within some genera (Mabuya, Anolis, Lacerta, Sceloporus) and in some geographically wide spread species (Cox et al. 2007; Cox et al. 2003; Fitch 1981, 1978). This is opposed to the previous report as adult males are larger in SVL than females (Yu DU, Yanyn SUN, Chixian LIN and Xiang JI; 2012).

The important attribute to consider the interpretation of reproductive data is sexual dimorphism in reptiles. Because the difference between the sexes have some selective advantages of body size and sexual dimorphism may be expressed other than body size (Trivers 1972). Selection of pressure favours large body size or size of structures (ornamentation, heads etc.) where the species involved in competition with males. In case of females larger body size is associated with clutch or brood size (Fitch 1978, 1981; Trivers 1972, 1976; Vitt 1983).

In Mauby multifasciata, the larger body size indicates capability of larger brood size. Associated with viviparity (Shine 2007). In Malaysia, Scicid lizard Mabuya multifasiata having the brood size 3.8± 0.84 having the range of 3-5, n=5 (Ngo Dac Chung, 2015). Thus comparative studies indicates that favorable condition towards SSD in lizards broadly reflects a balance between fecundity selection favoring large females with respect to body size (Olsson et al. 2010).

The suit of reproductive characteristics of Mabuya multifasciata, the combination of viviparity,ovulation of tiny ova, nearly yearlong gestation period, rapid growth in females while carrying embryos,increase in wet mass upto 60000% of embryos from ovulation to parturition placed them in a different reproductive strategy than recognized by Tinkle et al. 1965. Females produces as 3-7 offspring per litter as opposed to the previous reported up to nine offspring’s per litter (Yu DU, Yanyn SUN, Chixian LIN and Xiang JI;2012). Most females gave birth between May to July; earlier

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reported May –June (Ji et al. ,2006) and March- August (LIN et al;2012). Females In the present study having relatively larger value of SVL female produces heavier clutches. Earlier reported in some lizards like oriental Leaf-Toad Gecko Hemidactylus bowringii (Xu and Ji, 2007) where a negative correlation between cluctch mass and female size better explains female smaller SSD in the two oviparopus species, the energy allocation was preferable for production of offspring rather than growth of the offspring.

In this study female ovulated follicles of minimum 1.5 mm in diameter which develop into offspring measuring 240-250 mm SVL. Earlier it was reported that female ovulate follicle of 2mm in diameter which developed into offspring having SVL 29-30mm (Somma and Brooks,1976). The present study found that purturation occurred during May-July. However previous study reported that no Mabuya mabouya were gravid from November to May in Peru. It's suggested that the reproductive characteristics was very different in Peru (Dixon and Soini, 1975).

In time of parturition the most important fact is resources availability. The recorded data shows that broods were produced in the onset of wet season or at the end of dry season. It effects on its food too. The relatively high resources were needed for the rapidly growing embryos (Janzen and Schoener, 1968). It was followed by the depletion of fat mass in the abdominal cavities of the female during the period of rapid growth of the embryo (Fig:4). Abdominal fat bodies lying adjacent to the ovaries along with subcutaneous fat pads were also present as it is present in several species of squamates(Fox 1977, Licht 1984, Sarkar & Shivanadappa 1989). In lizards fat bodies were recoded to serve as nutrient reserve during winter (Bhagyashri A Shanbhag, 2002). Earlier studies shows that an inverse relationship were present between fat bodies and gonadal cycle of many species including Indian lizards M. Carinata (Sarkar & Shivanandappa,1989; Sharma & Shanbhag 1992). It was shown that a significant decrease in the fat body mass during the breeding period. The fat bodies may play a crucial supportive role in reproduction mainly during the period of resource scarcity.

In the conclusion we can say that Mabuya multifasciata is a sexually dimorphic species in body size and shape. The main values are greater mean SVL in female than the male, the greater head size in the female and also the wide abdominal size of the female. The data also confirms that maternal size has a significant role in reproduction in Mabuya multifasciata, with larger SVL female produced larger and more offsprings. So litter mass is most tightly related with female body mass.

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