

# Anatomy and Morphometry of Reproductive Organ of Male Mouse Deer (*Tragulus javanicus*)

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## Abstract

*Mouse deer (*Tragulus javanicus*) is one of endangered animals that are distributed in tropical forests of Southern Asia, including Java, Sumatera, and Borneo Islands. The mouse deer population is predicted to decrease, as a side effect of high conversion of their habitat into human needs land. However, conservation of this mouse deer is urgently required. Unfortunately, we still lack of scientific information relating to its reproductive system, including anatomical and morphological data. Understanding of the reproductive system is required in developing a suitable technology in mouse deer breeding. This technology will be applied in deer conservation and improvement of their population. The aim of this study was to characterize anatomy and morphometry of male reproductive organs of mouse deer. This study was conducted in Field Laboratory Unit of the Faculty of Veterinary Medicine, Bogor Agricultural University (IPB). Growing mouse deer aged 2 to 3 years old and weighed 1.8-2.0 kg were used in this experiment. The reproductive organs of male mouse deer were observed, measured, weighed, and documented. The collected data were tabulated and analyzed descriptively as follow: Penis type of mouse deer was fibroelastic, length of testis was  $12.33 \pm 2.89$  mm and weigh was  $0.81 \pm 0.17$  g, Vas deferens was  $113 \pm 3.60$  mm, Ampula was  $17.33 \pm 2.87$  mm, Vesicularis gland was  $18.00 \pm 3.46$  mm and  $5.7 \pm 1.10$  mm in dimension. The Mouse deer had gland bulbourethralis, with  $8.26 \pm 1.02$  mm in length and  $0.86 \pm 0.04$  g of weight, and length of its free penis of preputium was  $58.33 \pm 10.41$  mm. In conclusion, the male reproductive organ of mouse deer was similar to reproductive organ of other domestic livestock, they had similarity in dimension of various organs, including primary organ (gonad or testis), accessories gland (ampula, gland vesicularis, and bulbourethralis prostate), channel part, which was consisted of epididymus, vas deferens and urethra, and also organ copulatoris or exterior organ, called penis. On the other hand, penis showed different characteristics from other livestock's penis in its morphology. Their penis showed a clockwise turn spiral-like form, with the*

*number of rotations was two and a half and showed branch form, which the function was not yet known.*

*Key words: Male mouse deer, reproductive organ, anatomy*

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## Introduction

Mouse deer (*Tragulus javanicus*) is the smallest ruminant animals in the world. This animal is only found in tropical forests in southern Asia, including the islands of Java, Sumatra, and Kalimantan. The population of mouse deer is thought to decline due to habitat destruction and conversion into agricultural uses and hunting activity as well as the threat of predators that can prey on it.

Natural breeding of mouse deer in captivity has not succeeded yet. Factors causing the failure of mouse deer breeding in captivity are not known, but most likely it is caused by a lack of knowledge or information about the reproductive biology of this animal.

Information about the anatomy and morphometry of male mouse deer reproductive organs has not been widely reported. Male reproductive system is an important factor in the success of animal breeding or animal reproduction technology. Knowledge of such information is one of the important and decisive factors in achieving the success of animal breeding in captivity. The purpose of this study was to examine the anatomy and morphometry of the male mouse deer reproductive organs to support the animal breeding and reproduction for conservation and cultivation.

## Materials and Methods

### *Time and Location*

This study was conducted in May and October 2009 at the Field Laboratory of Reproductive Rehabilitation Unit (URR), Department of Clinic, Reproduction, and Pathology, Bogor Agricultural University.

### *Materials*

Three healthy and mature (had canine teeth) male mouse deer with body weight ranged 1.8-2.0 kg were used in the experiment.

### *Measurement and Weighing of the Reproductive Organs*

This study used three male mouse deer that were not adapt and finally died in captivity. The dead animals were then prepared to obtain their reproductive organs.

These organs were cleaned from fat and laid in its original position in the body. They were observed, documented, measured, and weighed and the data were tabulated and analyzed descriptively according to Toelihere (1993).

**Testes.** The length of the testes was measured by placing a measuring tape at the end of the testes from one side to another with or without the caput and cauda epididymis. Diameter of the testes was measured by using a microcaliper at the largest part of the testes, and then weighed using an analytical balance.

**Vas deferens.** The length of the vas deferens was measured by placing the measuring tape at the end of the cauda epididymis, and the tape was then pulled until it reached the end before the enlargement of the vas deferens to the ampulla. Vas deferens diameter was measured by using microcaliper before it was weighed.

**Ampulla of vas deferens.** Ampulla of vas deferens length was measured from the initial enlargement of the vas deferens to the border with vesicularis gland. The diameter of ampulla was measured at the largest part before it was weighed.

**Vesicularis gland.** The longest part of the vesicularis gland was considered as the length, while the shortest was considered as the width. Diameter of the vesicularis gland was measured with a microcaliper. The two glands had been separated from the main organ before they were weighed.

**Prostate.** Measurement of prostate length, diameter, and weight were similar to those of vesicularis gland.

**Bulbourethralis (Couper).** Measurements of bulbourethralis were similar to those of vesicularis glands.

**Penis.** Measurements of total penis length was started from the base of the penis (the radix) up to the penis free end, and length measurement was also conducted for penis parts such as the penis glans and prepuce. Diameter of the penis was measured at the largest part of the organ.

Data obtained from each measurement were tabulated and the average was calculated and analyzed descriptively.

## Results and Discussion

In general, parts of a male deer reproductive organs were similar to those of other domestic livestock; they were the primary sex organs (male gonads or the

testes), complementary sex glands (the ampulla, the vesicularis gland, the prostate, and the bulbourethralis), and channels consisting of the epididymis, the vas deferens and the urethra, and the external genital organs or copulatoris organ called the penis.

**Testes.** Male mouse deer had a pair of testicles which were wrapped by the tunica albugenia protected by the scrotum on the outside. The testes functions to produce spermatozoa in a process called spermatogenesis and produces testosterone hormone in the interstitial cells (Leydig) (Hafez & Hafez 2000; Toelihere 1987). Mouse deer testes length was  $12.33 \pm 2.89$  mm, diameter was  $8.20 \pm 1.92$  mm, and weight was  $0.81 \pm 0.17$  g (Table 1).

Table 1 Morphometry of male mouse deer reproductive organs

Organs	Remarks	Mouse Deer
Testes without scrotum	Length (mm)	12.33±2.89
	Diameter (mm)	8.20±1.92
	Weight (g)	0.81±0.17
Vas deferens	Length (mm)	113±3.60
	Diameter (mm)	2.0
	Weight (g)	0.48±0.04
Ampulla	Length (mm)	17.33±2.87
	Diameter (mm)	2.0
	Weight (g)	0.07±0.01
Vesicularis gland	Length (mm)	18.00±3.46
	Diameter (mm)	5.73±1.10
	Weight (g)	0.29±0.09
Prostate (body)	Length (mm)	17.33±2.52
	Diameter (mm)	6.53±0.06
	Weight (g)	0.43±0.07
Bulbourethralis gland	Length (mm)	8.27±1.02
	Diameter (mm)	5.47±0.85
	Weight (g)	0.86±0.04
Penis	Total length (mm)	142.33±14.74
	Free-preputium length (mm)	58.33±10.41
	Penis glans (mm)	44.33±2.08
	Diameter (mm)	4.0

**Epididymis.** The epididymis is a structure that is elongated and tightly attached to the testis. The mouse deer epididymis consisted of caput in the anterior, corpus in the dorsal, and cauda epididymis in the posterior.

**Vas deferens.** Vas deferens connected the epididymis with the accessory glands, serves as a channel of transport of spermatozoa from the epididymis to the ampulla. The length of the mouse deer vas deferens in this study was  $113 \pm 3.60$  mm which was shorter than that of timor deer ( $452.0 \pm 0.44$  mm) (Nalley 2006) or sheep (24 cm) (Hafez 1987).

**Ampulla of vas deferens.** Ampulla of vas deferens is the magnification of the end of the vas deferens before vesicularis gland. The length of the mouse deer ampulla ( $17.33 \pm 2.87$  mm) was smaller than that of Timor deer ( $72.53 \pm 2.39$  mm) (Nalley 2006) or sheep (70 mm) (Hafez 1987).

**Vesicularis gland.** There was a pair of vesicularis glands attached to the dorsolateral edge of vesica urinary neck. Mouse deer vesicularis gland length and diameter were  $18.00 \pm 3.46$  mm and  $5.73 \pm 1.10$  mm, respectively. This was smaller than the vesicularis gland of timor deer ( $45.36 \pm 1.42$  mm) or sheep (40 mm).

**Bulbourethralis gland (Cowper).** In the mouse deer, there was a pair of bulbourethralis glands with a length of  $8.26 \pm 1.02$  mm, diameter of  $5.47 \pm 0.85$  mm and weight of  $0.86 \pm 0.04$  g. Bulbourethralis gland is also very clearly seen in horses and pigs. Nalley (2006) reported that these glands were not found in Timor deer.

**Penis.** The penis is a male copulation organ and is established by the erectile tissue. The penis of mouse deer was fibroelastic which is similar to that of cattle, so that the penis corpus and glans were only slightly enlarged during erection.

Mouse deer penis was composed of radix and the corpus had a sigmoid flexura which was similar in general to other ruminants. Free-preputium penis length in mouse deer ( $58.33 \pm 10.41$  mm) was longer than the penis of Timor deer ( $35.38 \pm 0.88$  mm) (Nalley 2006) or sheep (40 mm) (Hafez 1987). Characteristics of the mouse deer penis had the features that could distinguish it from other animals, such as the tip of the penis which form spiral rotation in clockwise direction with two and a half spins. Function of this rotated penis tip is not yet clearly known. The same feature was also found in pig's penis, but opposite direction with a total spin of one and a half.

## Conclusion

Mouse deer penis is characterized by a flexura sigmoidea, fibroblastic type with a very distinctive penis tip, which forms a spiral with a spin number of two and a half in clockwise direction.

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