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Growth and Reproductive Performances of Farmed Timorensis Deer, *Cervus timorensis*

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ABSTRACT

A retrospective study was conducted to evaluate the growth and reproductive performances of timorensis deer, *Cervus timorensis*, that were kept in farm. All 140 animals were allowed to graze at all times while supplemented feed of approximately 1 kg/animal/day was provided except during the rainy season between October and December when supplementation was 2 kg/animal/day. Available farm records between 2011 and 2014 were collected and analysed for growth and reproductive performances. Most fawning occurred between October and December (average rainfall 413 mm) with an apparent peak in December. Average annual fawning percentage for the past four years was 57% while the average rate of mortality for fawns and adults was 5.4% and 13.5%, respectively. The average daily weight gain for up to one year of age was 0.042±0.02 kg but after one year it was 0.052±0.01 kg. The average body weight of adult timorensis at 24 months old was 48.5±1.4 and 44.5±0.9 kg for male and female, respectively. Monthly rainfall showed significant ($p<0.05$) negative correlation with the ADG but showed positive correlation ($p<0.05$) with fawning. Body weight gain was high during the dry months of May and August (average rainfall 150 mm). There seemed to be a clear breeding season for timorensis deer in this study, which was within the moderate months of March to April (average rainfall 236 mm) when body weight started to increase.

Keywords: On-farm evaluation, timorensis deer, growth, reproductive status

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INTRODUCTION

In Malaysia, deer farming was first started in 1977 by farming Sambar deer in Perak and Sabah (Idris *et al*., 1996). This was followed by Selangor in 1987 and Negeri Sembilan in 1988 through integration with oil palm (Idris *et al*., 2000). The deer farm at Universiti Putra Malaysia was established in 1998 as a showcase farm for the public, a model for farmers and a teaching farm for students. Following attempts at farming, deer population has grown rapidly: in 1986 with 300 deer, 1991 with 9,360 deer, 1998 with 10,000 deer and 2003 with 11,000 deer.

Timorensis deer (*Cervus timorensis*) is indigenous to the Indonesian archipelago. It was later introduced to Southeast Kalimantan, New Guinea, the Bismarck Archipelago, New Caledonia, Australia and New Zealand (de Vos, 1982). There are two main subspecies of timorensis deer: the Javan and Moluccan. Timorensis hinds are aseasonal polyestrous breeders (de Vos, 1982). Both hinds (females deer) and stags (males deer) attain sexual maturity at 18 months old and the body weight of hinds at first mating is approximately 46 kg (Van Mourik, 1986).

Growth is an important factor for meat production as it determines the overall productivity of the herd and the economic return from livestock enterprise. Furthermore, birth weight is an important aspect that influences the pre-weaning growth of the young and has a positive correlation with subsequent live body weight development (Le Bel *et al*., 1997). Similarly, weaning weight has strong influence on growth rate, survival and reproductive performance (Sriyanto *et al*., 2010).

Reproductive performance is a necessity for any successful livestock production programme (Woodford & Dunning, 1992). Reproductive rate can be influenced by conception rate, litter size, young mortality and interval between parturitions. Currently, there is a lack of documentation on the growth and reproductive performance of farmed deer in Malaysia. Therefore, efforts should be made to highlight current deer performance in Malaysia and recommend possible suggestions to improve performance. This paper describes the growth, mortality and reproductive performance of timorensis deer, *Cervus timorensis*, kept in farm.

MATERIALS AND METHODS

Study Farm

A deer farm was selected for the study. At the time of study, there were 140 timorensis deer that ranged between 2 months and 17 years old. Total land area was approximately 20 hectares but was divided into several grazing plots in which the shrubs were left intact. The animals were left grazing in the paddocks at all times but were provided supplemented feed during the rainy season between October and December.

Feeding and Breeding Protocol

The deer were reared using an extensive system where they were allowed to graze on *Bracharia decumbens* and *Setaria*

splendida. Cut and carry Napier and guinea grass was provided in the paddock at approximately 1 kg/deer/day. Goat pellet was also provided in the paddock every two days at the rate of 1 kg/animal/day, and the amount was increased to 2 kg/animal/day during rainy season. Body weight was measured three times a year: in April, August and December.

Disease prevention activities included quarantine, mass immunisation and herd health. All newly arrived animals were quarantined before being introduced into the farm proper. All deer were vaccinated against foot and mouth disease (FMD).

Breeding protocol involved natural breeding at stag to hind ratio of 1:4-5. The stag was allowed to run with the breeder hind at all times. Similarly, fawns were allowed to run with their mothers until weaning at three months old. In this farm, breeding seasons were between February and April and between June and August. Animals were only culled following disease problems.

Study Parameters

The reproductive and fawn growth parameters were calculated using the following formulas (Dryden, 2000):

Reproductive parameters

1. Fawning percentage =

   $$\frac{\text{Number of fawning}}{\text{Number of breeder females}} \times 100$$

2. Monthly fawning percentage =

   $$\frac{\text{Number of fawn born in the month}}{\text{Total number of fawn born in the year}} \times 100$$

3. Mortality percentage =

   $$\frac{\text{Number of deaths}}{\text{Total number of animals}} \times 100$$

Fawn growth performance parameters:

1. Weaning weight (kg)

2. Average daily gain from birth to weaning (kg/day) =

   $$\frac{\text{Weaning weight – Birth weight (kg)}}{\text{Weaning days (days)}}$$

Data Collection and Processing

Analyses were made on 130 births between 2011 and 2014. Data were collected from personal observation, previous survey results and secondary data from the Taman Pertanian Universiti. Case histories and records were analysed to obtain information on the study parameters such as age at first parturition, parturition interval, abortions and udder problems and breeding performance.

Collected data were organised, summarised and analysed using SPSS statistical package method and presented in tables and graphic forms. Data on growth parameters (body weight and ADG) were analysed using an independent t-test to detect differences between the genders. Reproductive performance records were analysed to calculate mean and range values

of fawning percentage and fawn sex ratio. Correlation between risk factor and farm performance was analysed using Pearson's correlation.

RESULTS

Growth Performance

The average weaning weight of male fawns was 20.67±1.0 kg (ranged between 9 and 31.5 kg) and the female was 20.29±0.8 kg (ranged between 12.5 and 36.5 kg). There was no significant ($p>0.05$) differences between the weaning weight of both sexes.

At six months of age, the average body weight of the fawn was 23.52±1.0 kg while at 1 year old the weight was 36.23±0.9 kg. Therefore, the average daily weight gain for up to one year of age was 0.042±0.02 kg while the daily weight gain after one year of age was 0.052±0.01 kg.

The average body weight of the adult timorensis at 24 months old was 48.5±1.4 and 44.5±0.9 kg for males and females, respectively. The overall mean body weight was 45.2±1.2 kg. The heaviest stag was 96.5 kg and the heaviest hind was 91.0 kg at 120 months old.

Significantly ($p<0.05$) higher daily gain was recorded between May and September, when the average rainfall was low (142 mm) while rainy months between October and April revealed low daily gain. There was significant ($p<0.05$) negative correlation ($r= -0.74$) between the monthly rainfall and daily weight gain (Fig.1).

Mortality

Within the study period, 7 (5.38%) fawns below 1 year old died. There was no fawn mortality in 2011 and 2014 but the mortality rate was 2% in 2012 and 26.8% in 2014. Mortality was markedly higher during the monsoon months of October, November and December. The main causes of mortality among deer in this farm were dog attack (57.14%) and traumatic injury (28.57%).

Mortality among adults of more than 1 year old revealed an increasing pattern from 2010 to 2013, mainly due to dog attack and traumatic injury. A total of 74 deer (average 19 animals/year; 13.5% anually) were reported dead over the four-year study period. Other causes of death included post-capture myopathy, suspected urea poisoning, tuberculosis and old age.

Reproductive Performance

The gestation period was estimated to be between 8 and 9 months and the age at first fawning was between 2 and 3 years old. The average annual fawning percentage was 57% (ranged between 50% and 70%). Fawning was significantly ($p<0.05$) high during the rainy season between October and December when average rainfall was 390 mm. Back calculation revealed that the breeding season started between March and April when the average rainfall was 237 mm when the animals started to gain body weight (Fig. 1). In fact, between 2011 and 2014 all fawning was within those months. There was moderate positive correlation ($r=0.54$) between rainfall and fawning percentage (Fig. 2).

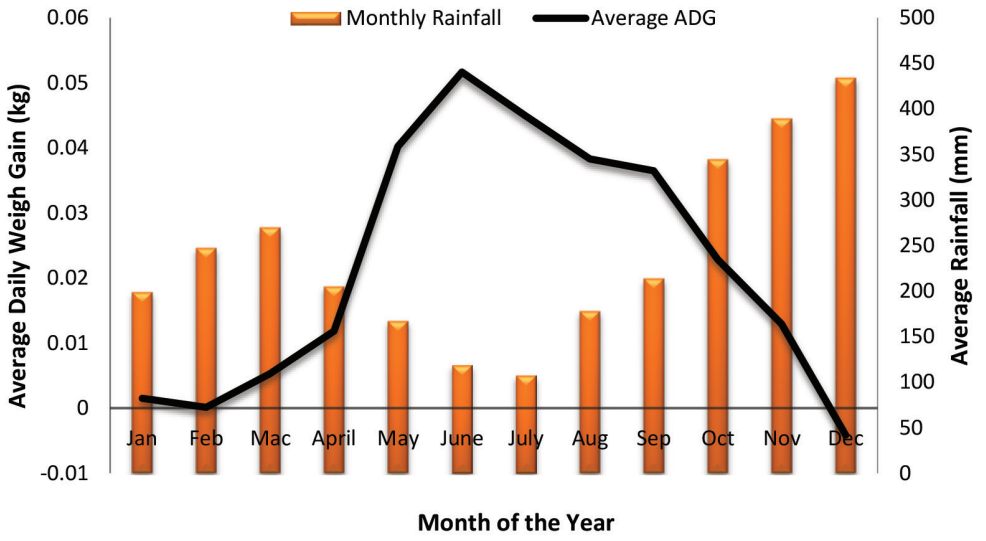

Fig. 1: Correlation between monthly rainfall and average daily gain showing moderate negative correlation (r=-0.74)

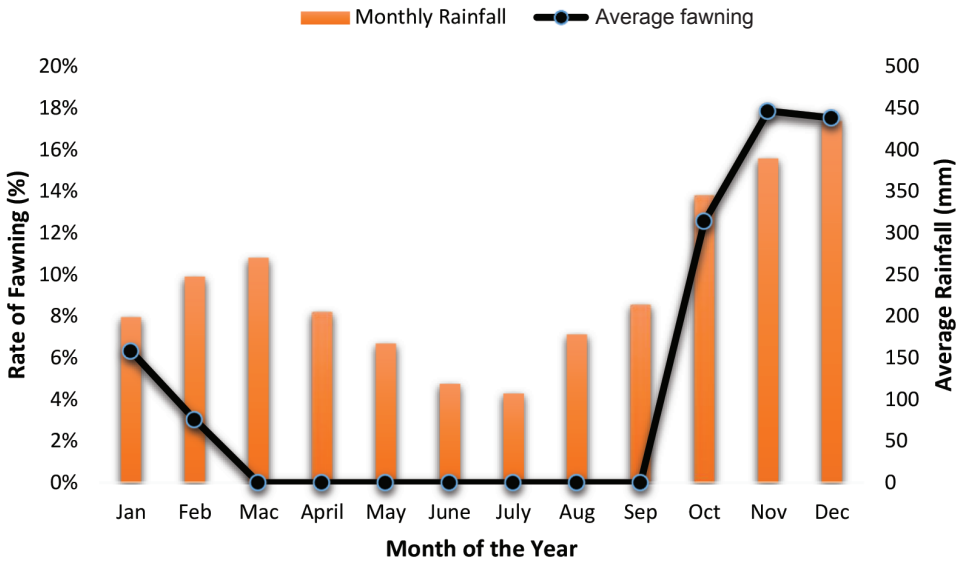

Fig. 2: The pattern of fawning according to monthly rainfall showing moderate positive correlation (r=0.54)

DISCUSSION

Weaning weight is an important economic trait in meat production since it has a strong influence on growth rate and survival (Moore *et al*., 1988) while growth traits are strongly associated with reproductive performance (Mohammadi *et al*., 2013). Since seasonal variation in growth rate has been reported in the tropics, as observed in this study because feed supply varies remarkably (Barry *et al*., 1991), the reproductive performance might be affected according to the season (Mohammadi *et al*., 2013).

Previous studies showed that growth rate was predominant during the early stages of growth and is strongly influenced by breed, milk yield of the hind and the environment under which the animals are maintained including the availability of adequate feed supply in terms of both quantity and quality (Decruyenaere *et al*., 2009). However, sex and birth type showed no significant effect on the post-weaning weight as observed in this study (Moore *et al*., 1988). Nevertheless, in temperate countries, an adult stag can achieve an average weight of 100-140 kg while the females weigh 50-90 kg (Reyes, 2015); these are much higher than those observed in this study. Modification in the feeding management of the farm might improve the body weight (Dahlan & Iskandar, 2013).

Fulbright and Ortega (2006) reported mortality rate between 10 and 15% among white-tailed deer, which is similar to the results of this study. Predatory attacks by dog was the most common (57.14%) cause of deaths in this study. Similarly, Ballard (2011) reported that 58% of the mortality of white-tail deer was due to predatory attacks by wolves. Therefore, the death rate and cause of mortality among deer in this study were within the parameters observed elsewhere.

First fawning in this study ranged between 2 and 3 years old, thus maturity was calculated to be between 22 and 28 months old. This is slightly later than reported by Van Mourik (1986), who found that both hinds and stags attain sexual maturity at 18 months old. However, this study revealed that the fawning percentage was 57%, while the white-tailed deer recorded an average of 41% fawning rate (Fulbright & Ortega, 2006). Similarly, estrous synchronisation efforts in this farm resulted in 50% pregnancy (Mahree *et al*., 2015).

The fawning season in this study was in December while Schmidly (2002) reported the fawning season for Texas deer as being in May. Seasons for breeding and subsequent fawning are related to the feed intake that changed partly due to seasonal differences in the types of plant that can be grazed (Masuko & Souma, 2009). It is believed that the period of moderate rain between March and April in this study enhanced the growth of grass (Thorvaldsson *et al*., 2005; February *et al.,* 2013) and provided opportunity for the breeder deer to consume enough dry matter. With supplementation, provided at the rate of 1 kg/animal/day in this study, the body condition of breeders was enhanced to made them ready for breeding and they eventually fawned 8 to 9 months later

in October to December. Therefore, it is suggested that March to April be recognised as the breeding season for deer in this farm even though de Vos (1982) concluded that timorensis hinds are aseasonal polyestrous breeders. The breeding behaviour of captive timorensis deer was reported to be similar to that of deer in the natural environment (Samsudewa & Capitan, 2011) while estrus behaviour remained similar to other deer species (Mahre *et al*., 2013). Furthermore, there are no differences in size, shape and surface structure between spermatozoa of different stages and different months of the fertile seasons to influence the stag reproductive performance (Mahre *et al*., 2014). This suggested breeding season resulted in a fawning season between October and December, during which time control of predators, particularly stray dogs, and records can be updated.

CONCLUSION

This study revealed that both male and female timorensis showed equal fawn growth performance, as sex difference was not significant. Furthermore, the reproductive and growth performances of timorensis deer obtained in this commercial farm were comparable while a few other parameters were lower than those of other studies.

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