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Some Physical Characteristics of Sambar Deer (*Cervus unicolor*)

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ABSTRAK

*Berat badan dan ukuran badan bagi 115 rusa sambar (*Cervus unicolor*) daripada tiga negeri di Malaysia telah dianalisis. Rusa-rusa tersebut mempunyai umur di antara tiga minggu dan tujuh tahun. Ternakan ini dibahagi kepada beberapa kumpulan dan dibiarkan meragut di dalam petak-petak ragutan dipagar. Rusa-rusa yang dipelihara dalam persekitaran sama seperti kawasan semula jadi mereka mempunyai berat badan yang tertinggi (100.18 kg). Terdapat kesan lokasi, tinggi badan, panjang badan dan lilitan dada ke atas berat badan yang sangat bererti (p<.001). Koefisien regresi bagi tinggi badan, panjang badan dan lilitan dada ialah 0.91, 0.84 dan 1.00.*

ABSTRACT

*Weights and body measurements of 115 sambar deer (*Cervus unicolor*) from three states of Malaysia were analysed. The deer range in age from three weeks to seven years old. They were divided into groups and allowed to graze the fenced up paddocks. The deer which were raised in an environment similar to their natural habitat had the heaviest body weight (100.18 kg). The effects of location and partial regression of body height, body length and heart girth, had highly significant (p<.001) effects on body weight. The partial regression coefficients for body weight, body length and heart girth were 0.91, 0.84 and 1.00, respectively.*

INTRODUCTION

There are some 20 species of large herbivores in the world which have been domesticated for meat production (Clutton-Brock 1981). The concept of sustainable use of wildlife has become policy to some world bodies which reassess the true potential of the wild species as meat producers (Kyle 1994). The deer family has been domesticated in large numbers, principally in the developed world. Several Asiatic forms of deer were introduced into Britain and Europe at the end of the nineteenth century and the beginning of the twentieth century (Banwell 1993).

Recently, Malaysian importation of venison has increased rapidly, and with the present interest and awareness for deer meat, deer farming in the country is increasing in popularity (Vidyadaran 1993). Rusa deer *(Cervus timorensis)* accounts for 25.6% of the total deer population in Malaysia. The sambar deer *(Cervus unicolor)* is indigenous to Malaysia. However, the wildlife ordinance of the country prohibits the farming of this species of deer. Thus this species of deer is confined to the wildlife sanctuaries, zoos and parks.

The most extensive studies conducted to date with tropical species have been with rusa deer *(Cervus timorensis)* and chital deer *(Axis axis)*. There is a lack of biological data on sambar deer *(Cervus unicolor)*(Semiadi et al. 1994). The objective of this study was to compare some of the physical characteristics of the sambar deer in three different locations of Malaysia.

MATERIALS AND METHODS

This study was conducted on deer in three states of Malaysia, namely Perak in Peninsular Malaysia, and Sabah and Sarawak in East Malaysia. In Perak, the study was carried out in the National Park and Wildlife Department deer farm in Sungkai. In Sabah it was done in the Livestock Breeding Station, Department of Veterinary Services and Animal Industry, Sebrang, Keningau, while in Sarawak it was carried out at the Sabal Agroforestry Centre of the Sarawak Forestry Department.

A total of 115 animals were utilized in the three locations, with 44 *Cervus unicolor equinus* in Perak, while 25 animals in Sabah and 46 animals in Sarawak were of the *Cervus unicolor brookei.* The animals ranged in age from three weeks to about seven years old. The animals were divided into groups and put into different paddocks. Data gathering was carried out in 1997 and 1998.

Sungkai Deer Farm, Perak

The deer were divided randomly into four groups and put into different paddocks of varying sizes, ranging from two to six hectares. Each group comprised different numbers of stags, hinds and fawns, in accordance to the size of the paddocks they were put in. The stags within each group were at different antler development stage, thus indicating that they were at different sexual dominance level. The paddocks were generally fenced up jungle areas with some cleared parts cultivated with improved grasses, such as guinea *(Panicum maximum)* and setaria *(Setaria kazungula).* A flowing stream meanders through the paddocks providing fresh water for the animals to drink.

The animals were allowed to graze the grass and shrubs freely. Cut leaves of some jungle trees *(Trema spp. and Sapium spp.)* were provided daily. Supplementary feeding of cattle pellets at the rate of 1.0 kg per head per day was given. Mineral blocks were given free choice.

Sebrang Livestock Breeding Station, Sabah

The deer were allowed to graze in fenced up grass paddocks which comprised mainly guinea grass. Very few shade trees were available to the animals during the hot days. However, in almost every paddock there were puddles of water where the animals wallow and cool themselves during the day. Supplemental feeding of cattle pellets was given at the rate of 1.0 kg per head per day. Mineral blocks were given free choice.

The drought from February to June 1998 had affected the growth of grass very severely. Almost the entire pasture areas were devoid of grass during that time. This has led to all the deer losing their weights and body conditions.

Sabal Agroforestry Centre, Sarawak

The deer were kept in semi-extensive system similar to their natural habitat, that is, within the secondary forest. The animals browsed on a wide range of feeding stuff, as forest shrubs and undergrowth. However, due to the deer's intense grazing habit, the paddocks within the fenced up areas were depleted of undergrowth. Freshly cut green herbage were given to the deer at the rate of 6-7 kg per head per day, besides the supplementation of 1.0 kg per head per day of cattle concentrate.

Data Collection

The measurements taken were body weight, height at withers, heart girth and body length. The body weights were taken either immediately after immobilization in the case of the Perak farm, or when they pass through the chute and the weighing scale, for the Sabah and Sarawak farms. Body height was taken as the vertical measurement from the ground to the shoulder. The heart girth was measured immediately behind the shoulder (Rabinowitz 1993 and Sharples and Domelow 1990), while the body length was measured horizontally, from the tip of the nose to the dock of the tail. These activities were done in the mornings in order to avoid the animals from being exhausted under the heat of the sun.

Yerex (1987) indicated that to get the best results out of the deer, it was important that they were not subjected to stress. The deer were very temperamental and easily excitable (Semiadi et al. 1994). Thus, at the Sungkai farm, measurements of the physical characteristics of the deer were taken after they were immobilized by using chemical restraints, with the aid of high velocity dart guns, administered by trained personnel from the National Park and Wildlife Department. A successful immobilization depended upon the right technique (Keep 1984). The target area for the dart was generally around the upper area of the hind leg, or over the shoulder and in the neck, as recommended by

English (1984). Excessive stress may result in the death of the deer.

Once the deer was immobilized, its body weight was immediately taken, using a mobile platform mechanical weighing scale that was moved as close as possible to the place where the deer fell. The animal height, was measured by using a cattle measuring tape. Subsequently the body length, and the heart girth, were also measured. After all the measurements were taken, the deer was given the antidote and it was standing again within a few minutes. The antidote was generally administered intravenously.

At the Sebrang Livestock Station and the Sabal Agroforestry Centre, the deer were herded through holding yards into the dark house where the measurements of the physical characteristics were taken while the animals were standing. This was possible due to the availability of chutes and squeezes which were used to restrain the animals. The body weights were taken using the mechanical or electronic weighing scale located within the holding yard. Although the deer in these two locations were considered docile, there were instances when they jumped and ran away once they were excited. Heart girth measurement was not recorded for the deer in Sarawak.

RESULTS AND DISCUSSION

The body weights and body dimensions were analysed using the General Linear Model procedure (SAS, 1994). The data were analysed across locations and within location, to determine the effects of various factors on live weight of the deer.

Table 1 shows the mean squares for body weight of deer adjusted for sex and location. There was no significant effect of sex on body weight although the males were slightly heavier than the females (86.59 kg vs. 81.83 kg). Locations had a very highly significant ($p<.001$) effect on body weight. The highly significant effect of location on weight could be due to different management systems of the deer. The deer at the Perak farm, with a mean height of 100.18 ± 1.64 cm and a mean weight of 97.39 ± 4.58 kg, had the largest body size compared to the deer from Sabah and Sarawak.

The deer from Sabah had a mean height of 87.00 ± 1.75 cm and a mean weight of 79.08 ± 5.17 kg, while the deer from Sarawak had a mean height of 82.33 ± 2.04 cm and a mean weight of 70.51 ± 5.29 kg. In the Perak farm, the paddocks had more natural shade, thus giving an environment similar to their natural forest habitat. In Sabah, the paddocks were more open and had very little shade for the deer. The presence of shrubs and undergrowth for browsing for the deer in Perak may be the cause of better body growth and weight gain, and this was supported by the report by Semiadi et al. (1995). The weight to height ratios of the deer in the three locations also suggested that the animals in Perak had the heaviest weight per unit height.

The partial regression of body height and body length had very highly significant ($p< .001$) effects on body weight of the deer in the three locations (Table 1). The partial regression coefficients for body height on body weight was 0.91

TABLE 1
Mean squares from the analysis of covariance for body weight of deer from three locations

Source	df	MS
Sex	1	391.8889
Location	2	2619.2934***
β_{Height}	1	4664.2357***
β_{Length}	1	14528.3401***
Residual	101	244.3393

*** $p<.001$

and for body length on body weight was 0.84.

The mean and standard error for various characteristics of the deer is presented in Table 2. The deer had an overall mean weight of 82.98 ± 3.14 kg, with a maximum weight of 164.0 kg. This mean value fell within the weight range for adult Australian Fallow deer (English 1984), even though they were much lighter than the weight of full grown wild Australian Sambar stag or hind (Slee 1984). Although the deer in Sabah were exposed to severe drought and lack of forage, they were able to maintain their body conditions (weight loss ± 10 kg). With the availability of good feed and conducive environment for the deer in Perak, they exhibited the heaviest mean weight, followed by the deer in Sabah, while the lightest were the deer in Sarawak. Under normal conditions, deer of similar age from Sabah and Sarawak will be slightly smaller than those from Peninsular Malaysia (Whitehead 1972). This was probably due to the subspecies difference that existed between them.

Table 2
Mean and Standard Errors for various characteristics of the deer

		Height (cm)	Weight (kg)	Length (cm)	H. girth (cm)
Overall	n	115	112	110	68
	Mean	90.17	82.98	133.40	108.65
	S.E.	1.33	3.14	2.57	2.05
Perak	n	44	44	44	44
	Mean	100.18	97.39	153.28	113.45
	S.E.	1.64	4.58	3.41	2.61
Sabah	n	25	25	25	24
	Mean	87.00	79.08	130.68	99.83
	S.E.	1.75	5.17	3.10	2.46
Sarawak	n	46	43	46	-
	Mean	82.33	70.51	118.02	-
	S.E.	2.04	5.29	3.79	-

The overall mean height for the deer was 90.17 ± 1.33 cm, with 100.18 ± 1.64 cm being the mean height for the deer in Perak. The tallest deer which came from the Perak herd had a height of 121.0 cm. This height was between that for the full grown wild sambar stag and hind (Slee 1984). The deer had an overall mean body length of 133.40 ± 2.57 cm, with those in Perak having the mean of 153.28 ± 3.41 cm. The larger size of the deer in Perak is attributed to the larger number of mature animals. The mean heart girth of the overall deer was 108.65 ± 2.05 cm. This measurement is indicative of the body condition of the deer. The deer in all locations, although were fed free choice, have quite limited natural resources. This, in part, was due to the limited areas available which encouraged the grazing pattern of the sambar deer to modify the forage nutritive value of the area, as was indicated by Semiadi et al. (1993). This was demonstrated by the rate of prehending biting of the sambar deer which was 35% faster than that of other species of deer.

The mean squares for body weight of deer from Perak and Sabah, adjusted for sex and location, is presented in Table 3. A separate analysis of covariance for the animals in these two locations was performed in order to include the effect of heart girth. Sex and animal height did not contribute significantly to the difference in body weight. Location had a significant ($p<.05$) effect on body weight of deer with those from Perak being 18.31 kg heavier than those from Sabah. Body length had a significant ($p<.05$) effect on body weight, with a regression coefficient of 0.43. This indicated that for the deer in the two locations, for every one cm increase in body length there was an increase of 0.43 kg of body weight. Heart girth had a very highly significant ($p<.001$) effect on body weight, with a regression coefficient of 1.00. This showed that for every one cm increase in heart girth there was an increase of 1.0 kg of body weight. This situation was very evident in the animals. The deer with a small frame would weigh very light as compared to those which were well built and had a large frame.

TABLE 3
Mean squares from the analysis of covariance for body weight of deer from two locations

Source	df	MS
Sex	1	235.7274
Location	1	935.2422*
β_{Height}	1	422.2526
β_{Length}	1	989.9446*
$\beta_{heart\ girth}$	1	3814.2381***
Residual	57	175.9373

* p<.05
*** p<.001

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