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Abstract

In this experiment housing, feeds and feeding, vaccination, deworming, production and reproduction profile and herd management of spotted deer were studied in captive condition at various zoo, safari park and farm. Data collection from 569 spotted deer at various captive areas consisting of adult male, adult female, juvenile and infant were studied 10th March to 10th November 2015 for period of eight months. Housing mainly intensive, semi intensive, scavenging were practice in there .Available feeds supplied to the spotted deer were maize fodder, Napier, yard long bean, Para and Bermuda grass, vine spinach, red spinach ,ash gourd leaves ,cabbages, carrot, pawruti, papaya, gram, wheat barn and soybean meal, amla, bit salt. The average CP and ME were 9.8% and 14.24 MJ per day, respectively The average birth weight of males and females were 3.0 and 2.5kg, adult males and females were 80.44 and 57.6kg, males and females weaning weights were 19.98 and 18kg, respectively. It also observed that average weaning age, length of estrus, first fawning and gestation lengths were 5.0months, 17.74day, 14.32 months and 230.74days respectively. From the study it may suggested that keeping nutritive status the reproductive and reproductive parameters of the spotted deer , recommended rations needs to be followed similarly efficient management systems needs to be developed.

Key words: Feeds and feeding, management, spotted deer

Chapter 1

Introduction

1.1 Management Practice

The act, manner, handling, supervision, and the technique, practice or science of managing or controlling, the skillful use of use of resources and time, the specific treatment of a disease or disorder is the literal meaning of management practices .The social, economic and landscape impacts of wild deer and the management of the wild deer population in the Bangladesh have not previously been the subject of sustained social science research and analysis. However, in recent years the challenges surrounding the management of deer have begun to attract the attention of academics (Bharat khadka *et al.*,2015).Using the integrated management of deer in the Bangladesh as a case study. This study reflects a growing concern on the ground about how to manage the increasing deer populations in a way which recognizes different legitimate interests. This study provides a social science perspective on deer management based on the case study of Bongobundhu Sheik Mujibur Rahman Safari Park, Chittagong Zoo, J.N dairy farm, National zoo. It focuses in particular on what kinds of individual and collective action is needed to improve the current situation.

In Bangladesh the following deer species occur:

1. Spotted deer or Chital (*Axis axis*)
2. Hog deer or Laguna (*Axis porcinus*)
3. Musk deer or Kasturi (*Moschus chrysogaster*)
4. Swamp deer or Barahsingha (*Cervus devaucelli*)
5. Sambar or Jarayo (*Cervus unicolor*)
6. Barking deer or Ratuwa(*Muntiacus muntijak*)

Here, I would like to discuss more about spotted deer.

1.2 Scientific classification

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Artiodactyla

Family: Cervidae

Genus: *Axis*

Species: *Axis axis*

The chital (*Axis axis*) also known as chital deer, spotted deer or axis deer is a deer which commonly inhabits wooded regions of Bangladesh, Bhutan, India, Sri Lanka, and Nepal and in small numbers in Pakistan. However it occupies a wide range of habitats from mainly grass, shrub vegetation in Wilpattu National Park, Sri Lanka (Esinberg *et al.*, 1972) to denser areas in the Gir forest of India (Berwick *et al.*, 1974). Although the deer is mainly a grazer in lowland Bangladesh, fruits, leaves and seedlings from a wide variety of tree, shrubs and forbs species are also utilized (Dinerstein *et al.*, 1982). The spotted deer is found in large numbers in dense deciduous or semi-evergreen forests and open grasslands. They do not occur at higher elevation forests where they are usually replaced by other species such as the Sambar deer.

Chital are primarily grazers and feed on short, sprouting grasses. However, they will also browse as well as eat forbs, fruit and branches of trees, especially when they are thrown down by monkeys. Chital prefer to be near water and will drink mornings and evenings in hot weather. Predators of the chital include tigers, Asiatic lions, leopards, dholes and mugger crocodiles. Red foxes also sometimes prey on chital fawns. The chital can run up to 40 mph (65 km/h) to escape his predators. Axis deer most commonly occur in herds of ten to fifty individuals of both sexes. Chital hinds have three week long estrous cycles. A stag will follow and guard a hind in estrous. During this time the stag will not eat. The pair will do several bouts of chasing and mutual licking before copulation. Stags guarding estrous females will make high-pitched growls at lesser stags that hung about. When alarmed, chital will bark. These barks usually occur among females and juveniles and are repeated back and forth. Fawns that are separated from their mothers will squeal. When in danger, they run in groups. They will make bursts of high-speed running and then soon tire and dive into heavy cover to hide. The Chital is listed by the IUCN as Least

Concern "Because it occurs over a very wide range within which there are many large populations". However population densities are below ecological carrying capacity in many places due to hunting and competition with domestic livestock. Two primary reasons for its good conservation status are its legal protection as a species and a network of functioning protected areas. It seems success in rearing Chital in many parts of the country. In Private farm of Bohaddarhat in Chittagong district it was very successful. Although they have no formal record they had increased about three times in number of Chital within six years i.e. from 15 to 20. It is also in good condition in Bongobundhu sheik mujibur Rahman safari park, Dulahazara, Cox's bazar. Breeding in captivity at the center seems to be satisfactory (Gairhe *et al.*, 1988). So, Chital is suitable species for breeding and farming in Bangladesh.

1.3 General Objectives

- To study the management practices

1.4 Specific Objectives

- To find the feeding schedule (feeding schedule and materials, security)
- To find the habitat situation
- To find the security situations
- To examine what practical action could be taken to improve their management.

Chapter 2

Materials and Methods

2.1 Study period

The study was conducted in various captive, zoo, and safari park in Dhaka, Chittagong and Cox's bazaar from 10th March to 10th November in 2015.

2.2 Study area

Captive area for spotted deer mainly Chittagong, Cox's-bazar and Dhaka. At Chittagong study was conducted at J.N. Dairy farm, Bohardarhat and Chittagong Zoo, Foy's-lake. Bongobondhu Sheik Mujibur Rahman safari park, Dulhazara and Bangladesh National Zoo, Dhaka was included in this study.

2.3 Collection of Data

Data was collected from Md. Hossain, Shahed and Aatur Rahman at J.N Dairy Farm. At safari park data is collected from d. Mujtafizur Rahman, veterinary surgon, B.S.M.R safari park .At Chittagong zoo, DR. Shahadat Hossain, Shuvo and at Bnagladesh National zoo from Dr. Anower Shahadat, Scientific officer, Bangladesh National Zoo.

2.4 Study methods

- Direct Observation.
- Questionnaire to the management head and workers and,
- Data collected from J.N, Dairy farm, Chittagong Zoo, Bhongobondhu Safari park, National zoo.

Information about the management practices of Spotted deer were taken from field study and record from Md. Aatur Rahman, manager J.N Dairy Farm, DR Anowar Shahadat in National Zoo, DR. Shahadat Hossain Shuvo in Chittagong Zoo and Veterinarian Mustafizur Rahman, in Dulhazra safari park. Cost of expenditure was put according to the market rate in Chittagong.

Bongobondhu Sheikh Mujib Safari Park, Dulhazara, Cox'sbazar is the first Safari Park in Bangladesh. The nature of the forest is tropical evergreen and rich with Garjan, Boilam, Telsur and Chapalish along with herbs, shrubs and creepers.

Safari Park is a declared protected area where the animals are kept in fairly large area with natural environment and visitors can easily see the animal whenever they visit by bus, jeep or on foot. This park was established on the basis of South Asian model, with the major goal of serving the national need of biodiversity conservation education, research, recreation and in-situ and ex-situ conservation of the threatened, extinct and endangered animals. The park was established in 1998 the goal of conservation breeding, rescue and rehabilitating endangered wildlife species, enhance and provide conservation education to raise public awareness for the protection of wildlife, conducting research of flora and fauna for conservation and management, having successfully bred various exotic and indigenous wildlife including Indian Lion, Fishing cat, leopard cat, Palm and small Indian civet; Hippopotamus, Wildly beast, Wild Boar, Sambar deer, Barking deer, Hog deer and Spotted deer; Estuarine crocodile, rock python, reticulated python and Indian flap shell turtle; Indian pea fowl and jungle fowl etc in enclosures. Natural population of different endangered species increasing here day by day as a result, the park become a sound conservation breeding ground of endangered species in the country and planned to encounter the depletion of natural population and will rehabilitate the bred animal natural forest especially in protected areas.

In 1988 The Deputy Commissioner, Chittagong, Mr. M. A. Mannan and some other elites of Chittagong, primarily took initiative to establish a private Zoo at Foy's lake, Chittagong for the purpose of Recreation, Education and Research on zoo animals which ultimately came into being on the 28th days of February 1989 and thereafter it was opened for the visitors.

Dhaka Zoo is a Zoo located in the Mirpur section of Dhaka, the capital city of Bangladesh. The Zoo contains many native and non-native animals and wild life, and hosts about three million visitors each year. In 26 December of 1950, then agricultural, cooperation and aid ministry officially declared to establish a zoo in Dhaka. The zoo is currently home to 2,150 animals from 134 species. The zoo exhibits 58 species of mammals, including elephants, cheetahs, rhinos, zebras, waterbucks, otters, hyenas, deer, giraffes, impala, black bears, tapirs, hippos, lions, many

species of monkeys, chimpanzees, baboons, and Bengal tigers. The aviaries at the zoo house more than 1500 birds representing 91 species, including peacocks, rhea, African gray parrots, cassowary, owls, ostrich, emus, teals, finches, babblers, owls, vultures, and eagles. The two lakes at the zoo also host migratory water birds each winter. Visitors can also see 13 species of reptiles including snakes and crocodiles, and 28 species of fish.

J.N. Dairy is mainly a dairy farm that's located at Bohaddarhat region in Chittagong .The owner of the farm Md. Hossain rear 10 more deer for exhibition purpose .The owner start his deer farm with three female and one male deer. The deer brought from Sundorbon with the proper approval of forestry department. After two years they add another four deer.

Chapter 3

Results and discussion

In Bangladesh, mainly in four places viz. Central zoo, Chittagong Zoo, Dulhazara safari park, and private farm (J.N dairy farm) in Boharadarhat, Chittagong for rearing Chital in enclosure.

Housing that's proved the deer are different in different place. At J.N Dairy deer are rear at a fully confined area where as Chittagong zoo provide partially semi intensive, National Zoo provide semi intensive and Dulhazara safari park provide free range.

Feeding mainly grain and grass, Sometime vegetables, fruits are offered .In private farm, works used to mix. The mineral mainly NaCl with water, at Chittagong Zoo provide Bit salt. Other feeding materials were given in table.

Table 1: Feeding practice (in gram) per at J.N Dairy Farm at Bohardarhat, Chittagong

SL No	Item	Dry season	Amount(Rs)
1	Gram	150	3.5
2	Wheat barn	150	3.5
3	Gram barn	200	10
4	Mineral	010	0.005
5	Green grass and vegetables	40000	10
6	Amla, Banana and other fruits	100	6

Table2: Feeding practice (in gram) per deer at National Zoo, Dhaka

SL. No	Item	Dry season	Amount (Rs)
1	Maize fodder	3000	9
2	Para grass	3000	9
3	Cabbage	250	4
4	Poi Shak	250	5
5	Carrot	300	5
6	Papaya	200	3
7	Soybean meal	300	15
8	Wheat bran	700	20
9	Common salt	50	0.5
10	Vit. premix	1	1

Table 3: Feeding practice (in gram) per deer at Bongobondhu sheikh Mujibur rahman safari park, Dulhazara, Cox's Bazar.

SL. No	Item	Dry Season	Amount(Rs)
1	Wheat barn and other Conc.	1000	28
2	Green grass	4000	12
3	Vegetables	2000	15
4	Mineral	55	2

Table4: Feeding Budgeting of Spotted deer (Azad *et al.*, 2005)

Period of the year					
Dry Season	Corn	Gram	Soybean	wheat bran	Min. Mix
Scale/day(gm)	250	250	100	400	20
Qty. /month (kg)	7.5	7.5	3	12	0.6
Qty. /6 month (kg.)	45	45	18	72	3.6
Green Season					
Scale/day (gm)	225	225	75	300	15
Qty. /month (kg)	6.75	6.75		2.25	0.45
Qty. /6 month (kg)	40.5	40.5		13.55	42,7
Total qty/year (kg)	85.5	85.5		31.5	1266.3
Rating (NRs/kg)	23	75		582195	
Rating (NRs/kg)	22137245	2064		2989675	

Total cost/animal/year: 15,186(approx.)*VAT

In above calculation of feeding budgeting, it is assumed that dry and green season consists of the equal halves of the year. Feeding budget was calculated according to the local price in Chittagong. Scales haven't been differentiated as per age, sex and status of the animal. All deer are given same diet.

This feeding practice prefer to the green fodder than other. In dry season, other diet will be increased due to the shortage of green fodder. Mostly local fodder will be provided. Fodder trees within in the enclosure must be wired because it checks the debarking by antler, when it became hard. It may better if we construct cement posts within the enclosure to rub the antler. Deer are feed daily two times a day during the time between 10:30-11am to 3:30-4:30pm. The diet which are given in wet form are soaked a day before feeding. The diets are half feed in the morning and half at the daytime.

An adult spotted deer require only for maintenance energy was 16-18 MJ where as a protein diet having 13-16% range is required for the successful growth, antler development and reproduction. A high level of crude protein (approximately 16%) is advantageous for fallow fawns to achieve their target live weights. In calves, hinds and stags for the season of autumn, winter, spring and

summer CP is required as 17, 10, 12-17; 10, 14, 17 and 10, 12%, respectively. Estimates of dietary crude protein requirements for optimum growth vary within the range of 13 to 15%. Young male fawns (white-tailed deer) required 13 to 16% crude protein. Obtaining maximum growth on diets of 13% crude protein required for female fawns (white-tailed deer). The energy concentration for empty body weight is 17.5 and 21.7 MJ kg⁻¹ and protein content is 150 and 146 g kg⁻¹. The standard of nutritional requirement of spotted deer, it was observed that crude protein deficiency was 4.2% and the ME deficiency was 2 MJ per day that were supplied to the deer. There is an imbalance of crude protein and energy supply to the deer of Dhaka zoo. Proper growth and development of both productive and reproductive parameters were retarded due to insufficient protein supply and an imbalance of CP and ME.

Table5: Recommended feed items for spotted (Azad *et al.*, 2005)

Name of feeds	Botanical Name	Amount supply(kg)	DM(kg)	%CP intake	ME (kcal /kg)
Maize fodder	<i>Zea mays</i>	2.50	0.45	3.44	575.00
Para grass		2.50	0.38	2.94	500.00
Cabbage	<i>Brassica oleracea</i>	0.25	0.03	0.05	65.00
Poi Shak	<i>Brasella alba</i>	0.25	0.02	0.07	68.00
Carrot	<i>Daucus carota</i>	0.20	0.03	0.03	114.00
Papaya		0.30	0.04	0.08	126.00
Soybean meal		0.25	0.22	1.60	625.00
Wheat bran		0.25	0.22	0.50	350.00
Protein concentrate		0.05	0.44	4.61	1250.00
Common salt		0.50	0.05		
Vitamin- mineral premix		0.002			
Total		7.051	1.867	13.33	15.35MJ

DISEASES

Deer at low population densities on natural range are generally not affected by disease to any significant extent. Deer in their first 12-15 months of life are more susceptible to disease than adults. Treatment of sick deer is analogous with that of domestic animals. Prevention of diseases by nutritional management, testing, vaccination, drenching and dipping, is more important than treatment. The deer in safari park, Chittagong zoo and National Zoo, veterinary facility is provided periodically or when necessary. So, cost of veterinarian services is no regular or uniform and it is mentioned under the heading contingencies. Any unwanted situation if seen is quickly reported by the security person recruited there. At the National Zoo, during 8-10am in the morning, the person recruited for management should look at the cleanliness and situation of deer in the cage. A vaccine is given which contains BQ, HS, and FMD within 3-4 days of newly born deer.

Table 6: The no of the male and female ratio

Name of farm/institution	Male	Female	Total
J.N Dairy Farm	3	4	7
Chittagong Zoo	5	4	9
National Zoo	55	95	150
Safari park	80	220	300

Table 7: Schedule of day-to-day operation on spotted deer premises (Azad et al, 2005)

Approximate time(h) Farm operation

- | | |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.00-9.00AM | <ul style="list-style-type: none">• Check all fences surrounded by deer premises• Count the total numbers of deer and adjust previous numbers• Find out or observe if any mortality occurred• Inspection within the area if any hazard happened at sight• Clean out the dumping wastage material such as cans, bottles or any plastic products• Cleaning the equipment's such as feeders, waterers |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- 9.00-12.00AM
 - Cleaning farm premises
 - Feeding of concentrate feed to deer herd
 - Feeding of dry/green fodder
 - Isolation of sick deer
 - Treating sick deer
- 12.00-3.00PM
 - Lunch-cum-rest period for laborers
- 3.00-4.00PM
 - Miscellaneous jobs of deer premises such as periodical vaccinations, repair of farm fences, fittings and repair of equipment, weekly scrubbing and washing of drinking water tank, attending to sale of deer and their transportation, periodical spraying of deer premises with suitable pesticides
- 4.00- 5.30 PM
 - Feeding of concentrate feed to deer herd
 - Feeding of dry/green fodder
- 5.30PM-7.00AM
 - Night watchman duty

Herd management

Deer rapidly adapt to the presence of man and machinery when they are enticed with palatable feeds. When deer are confined, they should not be over-crowded, allowing the handler to easily move amongst them and carry out drenching, ear tagging, vaccination and pour-on dipping. Normally a supervisor of the deer section maintains the following activities.

Chapter 4.

Conclusion

Spotted deer farming is growing industry in Indian subcontinent. Venison which having low calories ,fat, cholesterol ,high protein and iron, attractive skin and its esthetic velvet antler make the spotted deer more demandable to human. The acceptance of venison is much more than other meats .Only hygienic practice, proper management, skilled supervision and control monitoring can make farm profitable .If the govt. policy favor this farm, it will become high productive farm within 10years and also help to regulate the population, prevent damage and prevent the exploit the deer resource.

Chapter 5.

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Chapter 6.

Photo Gallery



At B.S.M.R Safari Park, Cox's Bazar



At Bangladesh National Zoo, Dhaka



At Chittagong Zoo Foy's-Lake



At J.N. Dairy Farm, Bohardarhat, Chittagong

8. Biography

The author is a intern student of Chittagong Veterinary and Animal Sciences University, Origin from Kalipur, Banskali Chittagong. By this December. He will receive my Doctor of Veterinary Medicine (DVM) degree, during this period of time. He attends so many training programme, seminar and conference in home and abroad related his degree for better exposure knowledge and experience. He finished his primary, secondary and higher secondary education from Chittagong Board and belonging within top five top students in my class. He is personally self dependent one, like to do his work with due response, active, punctually and dutifully.