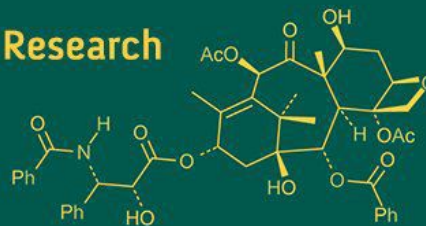
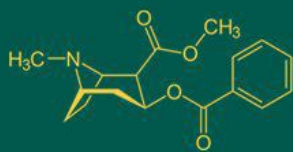


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Health status assessment of wild ungulates based on body condition evaluation technique in Muthangha wildlife sanctuary, Wayanad, Kerala, India

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Abstract

Under veterinary and wildlife morphometrics, body condition scoring is one of several techniques for assessing the health of ungulate species. It helps assess and judge the animals' physical appearance condition by visually examining the degree of protuberance of bony processes on the body surface and the condition of the skin. This study is being conducted at Muthangha Wildlife Sanctuary to evaluate the health of three ungulate species using a body condition evaluation technique while keeping a safe distance and causing minimal disturbance to the animals. Then, using a point system based on how their bodies look, Ungulates are rated as having good (0-5), average (6-8), or bad (9-12) body condition. The body condition of all 57 ungulates is assessed, and the results show that the majority (49.12%) are in average condition, followed by good (38.59%) and bad (12.28%). A decrease in body condition appearance may result from the greater quantity of ungulate species in that area, as well as from a shortage of species that provide fodder within the sanctuary. Planting of fodder species inside the sanctuary can help in improving the body appearance of the ungulates and also can minimize the human wildlife conflicts.

Keywords: Body condition scoring, evaluation techniques, point scale, minimizing and planting

Introduction

The physical condition of an animal is a vital indicator of its health, survival prospects, and overall fitness. One of the most reliable ways to assess this condition is by examining the reserves of fat and muscle that the animal maintains, which are strongly influenced by the quality and availability of nutrition in its habitat (Kie, 1988) [6]. Thus, the body condition of an individual not only reflects its internal physiological state but also provides insights into the type and adequacy of fodder available within a given ecosystem.

Over the years, a variety of techniques have been developed to evaluate body condition with precision. Traditional approaches include indices such as the kidney fat index and the bone marrow fat index, which serve as direct measures of stored energy (Jakob *et al.*, 1996; Cook *et al.*, 2007) [5, 4]. More advanced methods, such as bioelectrical impedance analysis, have allowed researchers to estimate body composition by measuring electrical conductivity through tissues, offering a relatively accurate but minimally invasive tool (Pitt *et al.*, 2006; Barthelmess *et al.*, 2006) [10, 1]. Alongside these, morphometric measurements—such as body weight, body length, chest or abdominal circumference, and proportional ratios derived from these values have proven to be practical indicators of condition in both wild and captive settings.

One of the key advantages of body condition assessment lies in its ability to provide information on the health status of animals without causing them undue harm or stress. Non-invasive methods, including visual scoring systems, allow ecologists to monitor wildlife from a distance. For instance, visual body condition indices developed for deer assess fat and muscle coverage at easily observable skeletal landmarks such as the ribs, the lateral vertebral processes, the pelvic girdle, and the tuber ilium (Chitariya *et al.*, 2018) [3]. Despite the inherent subjectivity of ocular assessments, these scoring systems have been successfully applied in a variety of habitats, yielding consistent results across populations (Riney, 1960; 1982; 1995) [11].

Such scoring approaches often employ standardized point scales to evaluate the nutritional and health status of free-ranging herbivores (Singh *et al.*, 2009) [14]. These systems are especially valuable in ecological research, where understanding population health is closely tied to broader questions about resource limitation, habitat quality, and the impacts of environmental change (Lane *et al.*, 2014; Carpio *et al.*, 2015) [18, 2]. Moreover, the concept of “condition” itself is not merely a static measurement but rather reflects the short-term physiological capacity of an animal to cope with external challenges, including fluctuations in diet, exposure to diseases, and environmental stressors (Pedrotti & Fraquelli, 2001) [9].

In this way, body condition scoring emerges as a powerful tool that bridges individual health assessments with population-level ecological insights, making it indispensable in wildlife biology, conservation management, and ecological monitoring.

Material and Method

Study area

Muthanga Wildlife Sanctuary is a sprawling rainforest located in the Wayanad district of Kerala, India. The sanctuary is part of the Nilgiri Biosphere Reserve, a UNESCO-designated biosphere reserve that encompasses a significant portion of the Western Ghats. The sanctuary is renowned for its rich biodiversity and diverse ecosystems, including semi-evergreen, moist deciduous, and dry deciduous forests. This varied landscape provides a haven for a wide array of flora and fauna. The sanctuary is home to a diverse range of animal species, including elephants,

tigers, leopards, deer, monkeys, and a variety of bird species. Muthanga is recognized as a Project Elephant site, emphasizing the importance of elephant conservation in the region.

Climatic condition

The Muthanga Wildlife Sanctuary in Kerala, India has a variety of climate and is home to a rich diversity of plant and animal life:

Climate

The sanctuary experiences a range of climate, including:

Summer: From April to June, the sanctuary is extremely hot, with temperatures reaching up to 32°C. This is a good time to see wildlife as animals come out to drink water. However, the heat can be unbearable and forest fires may occur.

Monsoon: From July to September, the sanctuary is extremely humid and visibility is low. This is not a good time to visit.

Winter: From October to March, the sanctuary is comfortable with flowers in full bloom. This is a good time to visit for birdwatching, but sightings may not be as good.

Rainfall

The sanctuary receives about 2,200 mm of rainfall, with heavy rains occurring from June to August.

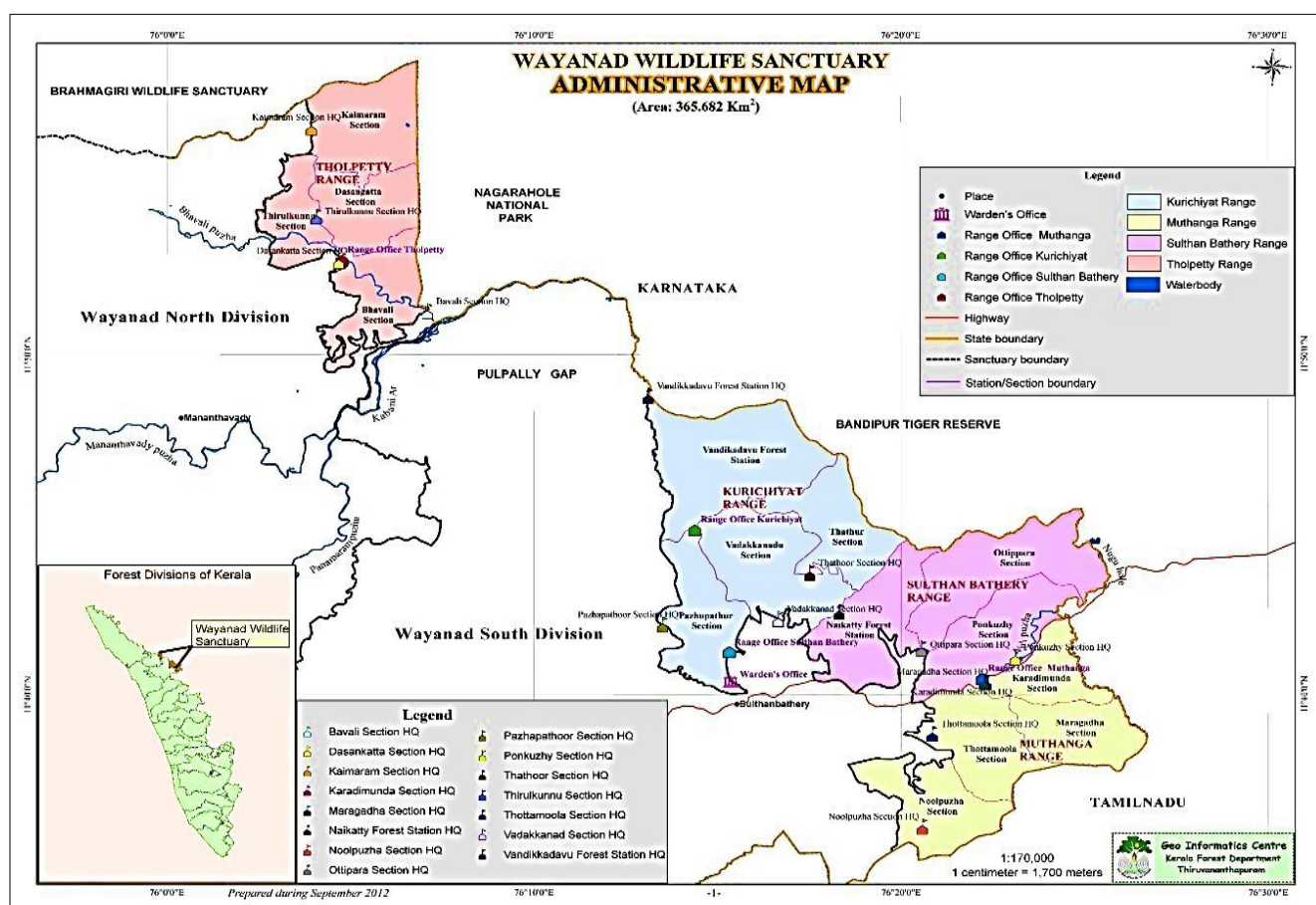


Fig 1: Geographical map view of Wayanad wildlife Sanctuary with the Muthanga Range, Wayanad, Kerala, India.

Methodology

The current study was conducted in the Sanctuary from 7 a.m. to 10 a.m. The ungulates' health status was assessed using the Body Condition Evaluation approach (Table 1) while they were kept at a safe distance and not disturbed. The wild herbivores' body condition will be assessed using a point system, as recommended by Riney (1960) ^[11] and updated by Shrivastav and Sharma (2000) ^[17]. The assessment of an animal's bodily condition entailed determining its physical appearance by visually examining the degree of bony process protuberance on its body surface

as well as the state of its skin coat. Each animal will receive a point based on the examination of its main features, including its skin coat, flank, ribs, pelvic girdle, spinal column, and lumbar shelf. Table 2 lists the suggested scores for each bodily part's related condition quality. Animals receiving a score of 0-5 were classified as poor, those scoring 6-8 as fair, and those scoring 9-12 as good. Secondary data were also gathered. Additionally, the study included normal statistical procedures (Snedecor & Cochran, 1994) ^[16].

Table 1: Ungulate body condition evaluation score with respect to their body part:

Body Part	Point = 0	Point = 1	Point = 2
Skin coat	Rough and thick with folds	Dull, without or with lustre	Smooth with lustre
Flank	Depression concave and tucked in	Slightly concave and outline visible	Depression is barely visible, outline is distinct
Ribs	Ribs clearly visible within coastal depression	Ribs are visible but all are not countable	Thoracic surface is smooth, ribs not visible
Pelvic girdle	Bony projection are clearly visible	Slightly visible	Bony projections are barely visible
Vertebral column	Lateral processes prominent	Lateral process of the lumbar are visible	Laterally it is smooth without any break, lumbar process visible
Lumbar shelf	Depression deep and concave	Slight depression on either side	Areas almost round from behind without any depression

Result and Discussion

Table 2: Body condition evaluation of the wild ungulate species of Muthangha Wildlife Sanctuary

Sl. No.	Names of the Species	Number of animals evaluated	Body condition		
			Good	Average	Poor
1	Sambar (<i>Rusa unicolor</i>)	14	3 (21.42%)	9 (64.28%)	2 (14.28%)
2	Spotted deer/Chital (<i>Axis axis</i>)	31	11 (35.45%)	16 (51.61%)	4 (12.90%)
3	Barking deer (<i>Muntiacus muntjak</i>)	12	8 (66.66%)	3 (25.00%)	1 (8.33%)
Total		57	22 (38.59%)	28 (49.12%)	7 (12.28%)

The assessment of body condition among wild ungulate species in Muthangha Wildlife Sanctuary provides valuable insights into the overall health and nutritional status of these populations. Table. 2 presents the evaluation of three representative ungulate species: sambar (*Rusa unicolor*), spotted deer (*Axis axis*), and barking deer (*Muntiacus muntjak*). A total of 57 individuals were examined, and their body condition was categorized as good, average, or poor. This categorization serves as an indirect indicator of habitat quality, food availability, and environmental pressures that shape the wellbeing of herbivores within the sanctuary.

Among the three species, the sambar population displayed a predominance of animals in the average body condition category, with 64.28% of individuals falling into this group. Only 21.42% were recorded in good condition, while 14.28% showed signs of poor body condition. This distribution suggests that although most of the sambar are surviving adequately, a significant proportion may not be attaining optimal nutritional intake. The lower percentage of individuals in good condition may reflect seasonal fluctuations in forage availability, competition with other herbivores, or anthropogenic pressures such as habitat disturbance.

The spotted deer, which comprised the largest sample size with 31 individuals, exhibited a relatively balanced distribution between good and average categories. Over half of the population (51.61%) were in average condition, while 35.45% were in good condition and 12.90% in poor condition. This pattern indicates a moderate health status, with a considerable fraction of individuals maintaining good

body condition despite environmental challenges. Being a generalist feeder, spotted deer may have greater adaptability in exploiting available resources, which could explain their relatively higher proportion in the good condition group compared to sambar.

In contrast, the barking deer showed a more favorable condition profile. Out of the 12 individuals assessed, two-thirds (66.66%) were classified under good condition, with only one individual (8.33%) falling into the poor condition category. This indicates that barking deer are maintaining a comparatively healthier status than the other two ungulate species. Their solitary habits and preference for dense understory vegetation may reduce competition for food resources, enabling them to sustain better body condition. However, the smaller sample size should be interpreted with caution, as it may not fully capture the variability within the population.

Figure. 1 provides a visual representation of these findings, highlighting the overall distribution of body condition categories across species. The pooled data show that nearly half (49.12%) of the ungulates fall under the average body condition category, while 38.59% are in good condition, and 12.28% are in poor condition. This trend underscores that while the majority of the population is coping adequately, there is a need for continuous monitoring to detect early signs of nutritional stress or habitat degradation. Such evaluations are crucial for wildlife managers in devising effective conservation measures, ensuring that ungulate populations remain resilient within the sanctuary's ecosystem.

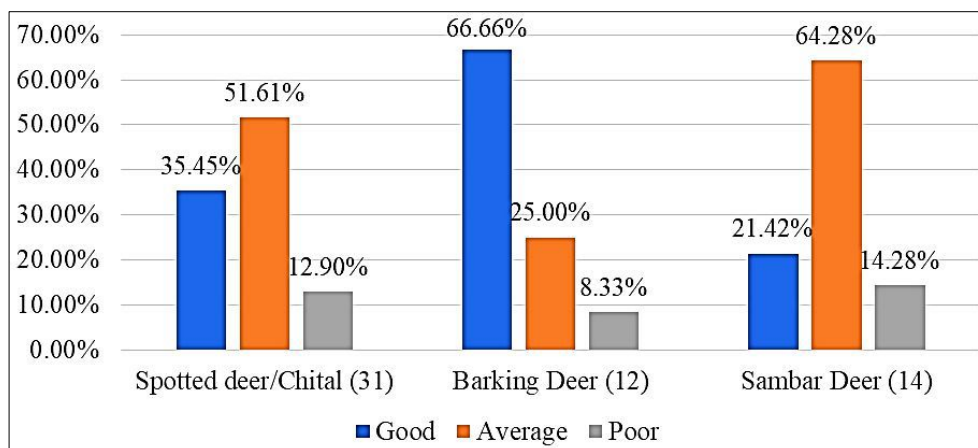


Fig 1: Body condition Evaluation of wild ungulate species in Muthangha divisions of Wayanad Wildlife Sanctuary

Conclusion

According to the current research on the health status assessment of wild ungulates in Muthangha Wildlife Sanctuary, Wayanad, Kerala, India, using the body condition evaluation technique, the two ungulate species found there had average body conditions. This could be because there were more deer in the area, which could have led to competition for food, or because there were fewer fodder species and shed trees within the sanctuary. More plant saplings that can serve as a supplemental food source and enhance the physical condition of ungulate species can be planted inside the forest area to improve the sanctuary's upkeep.

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