

Evidence-based practice

Bear weight management: a diet reduction plan for an obese spectacled bear (*Tremarctos ornatus*)

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Abstract

Spectacled bears (*Tremarctos ornatus*) are agile climbers and many aspects of behaviour in the wild are related to procuring food. In captive situations obesity can result from reduced activity and offering food in excess of energy requirements if food is not presented in a way that encourages increased foraging time. In December 2006, a fifteen-year-old male spectacled bear was received into quarantine at the Smithsonian Institution's National Zoological Park. During the quarantine examination, nutrition staff manually assessed body condition and at 222.5 kg, the animal was deemed grossly obese with a body condition score of 9 on a 1–9 point scale. A weight reduction plan was developed with a goal of gradual and continual weight loss at a rate of 1.0% of initial body weight (BW) per week, with a maximum of 2.0% and a minimum of 0.5% of initial BW/week to reach an initial summer target BW of 170 kg in 6–8 months. Once the initial goal was achieved, seasonal target BW ranges were further refined over the following 12 months, resulting in a total weight loss of 77 kg (35% of initial BW). Throughout the process keepers noted a marked positive increase in physical activity and associated behaviours. The male was successfully introduced to a newly acquired female spectacled bear and mating occurred during June 2009, with two genetically valuable cubs born in January 2010.

Introduction

The last of the lineage of short-faced bears (subfamily *Tremarctinae*), the Andean or spectacled bear (*Tremarctos ornatus*), is endemic to the tropical Andes and the sole extant bear species in South America. Much of spectacled bear behaviour is related to food selection and abundance, and this species is known to move significant latitudinal and altitudinal distances and across several types of vegetation in search of food and in response to seasonal ripening (Nowak 1999; Rios-Uzeda et al. 2006). In the wild, spectacled bears demonstrate a preference for terrestrial and epiphytic bromeliads; these plants are available year round and thus provide a staple diet item when ripe fruit is unavailable (Nowak 1999; Troya et al. 2004). Spectacled bears are also the main mammalian fruit and berry consumer within their range and serve as extremely valuable seed dispersers (Clark 2004; Rios-Uzeda et al. 2006).

Spectacled bears are agile climbers with non-retractable, thick, hook-like claws to assist in digging up and tearing apart

food items. Similar to other bear species, spectacled bears rely heavily on an acute sense of smell to find food (Peyton, 1998). Highly developed radial sesamoid bones, or 'false thumbs', aid in manipulating vegetation and arboreal locomotion (Salesa 2006) while enlarged molar grinding areas and strong jaw muscles assist in mastication of vegetation (Sacco and Van Valkenburgh 2004). In addition to a wide range of plant material, an estimated 4% of the diet consists of animal matter (Peyton 1980). Spectacled bears do not hibernate due to year-round food availability throughout their range (Paisley and Garshelis 2006).

Diet formulation in zoological collections involves an understanding of general feeding ecology, gastrointestinal tract anatomy, nutrient content of foods consumed in the wild, nutrient requirements, husbandry and behavioural factors, and assessment of food items and ingredients that are available. Obesity can result from a number of factors, including (1) offering food in excess of an individual's energy requirements; (2) offering food items of poor nutrient quality and/or items

Table 1. Smithsonian National Zoological Park (NZIP) Department of Nutrition clinical record: male spectacled bear quarantine examination.**History**

1. Specimen received into NZIP quarantine, December 2006.

Subjective

1. Immobilized for physical exam.
2. Body condition evaluated in both lateral and sternal recumbency.
3. Smooth transition from neck into shoulder.
4. Visual evidence of any skeletal landmark lacking throughout.
5. Ribs palpable with heavy pressure. Unable to palpate spine of scapula, spinous processes, tuber ischii, or tuber coxae due to thick layer of subcutaneous adipose tissue.
6. Head of tail difficult to locate due heavy fat layer adjacent to this anatomical landmark.
7. Oral health is compromised, and follow-up procedures are indicated to address.

Objective

1. Tip of nose to base of skull = 34 cm; base of skull to head of tail = 152 cm; tail = 9.5 cm.
2. Right fore leg circumference at elbow = 52.5 cm.
3. Right fore foot length = 19 cm; right hind foot length = 23 cm.
4. Neck girth = 76.5 cm; chest girth = 132 cm; abdominal girth = 177 cm.
5. Axial skin fold thickness = 11.8 mm; inguinal skin fold thickness = 7.5 mm.
6. Bioelectrical impedance analysis (BIA) was measured: Resistance = 122.
7. Total body fat, % = 48.2.
8. Body weight recorded = 222.5 kg.

Assessment

1. Specimen is grossly obese (30% over target BW) (BCS = 9 on a 1–9 scale).
2. Total body fat measurements (48.2%) exceed those of temperate species bears (*Ursus americanus*) during early winter (31–45%) (Farley and Robbins 1994, 1995; Lundbery et al. 1976).

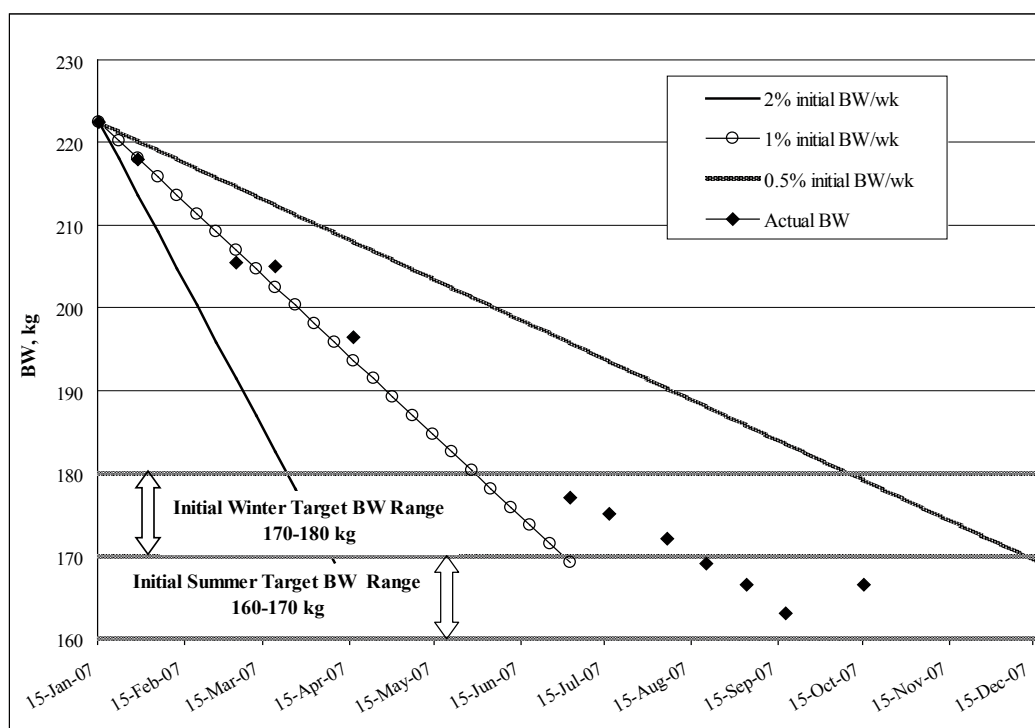
Plan

1. Diet modifications required to facilitate weight loss, as well as address oral health issues.
2. Initial target BW = 170 kg.

inappropriate for an animal's gastrointestinal tract anatomy; and (3) lack of emphasis on diet presentation – it is very beneficial to present diet and enrichment items in ways that encourage natural feeding behaviours and increase activity level through increased foraging time.

Case report

In December 2006, a fifteen-year-old male spectacled bear (*Tremarctos ornatus*) was received into quarantine at the Smithsonian Institution's National Zoological Park (NZIP). As part

**Figure 1.** Weight reduction plan for male spectacled bear, with initial seasonal target body weight ranges.

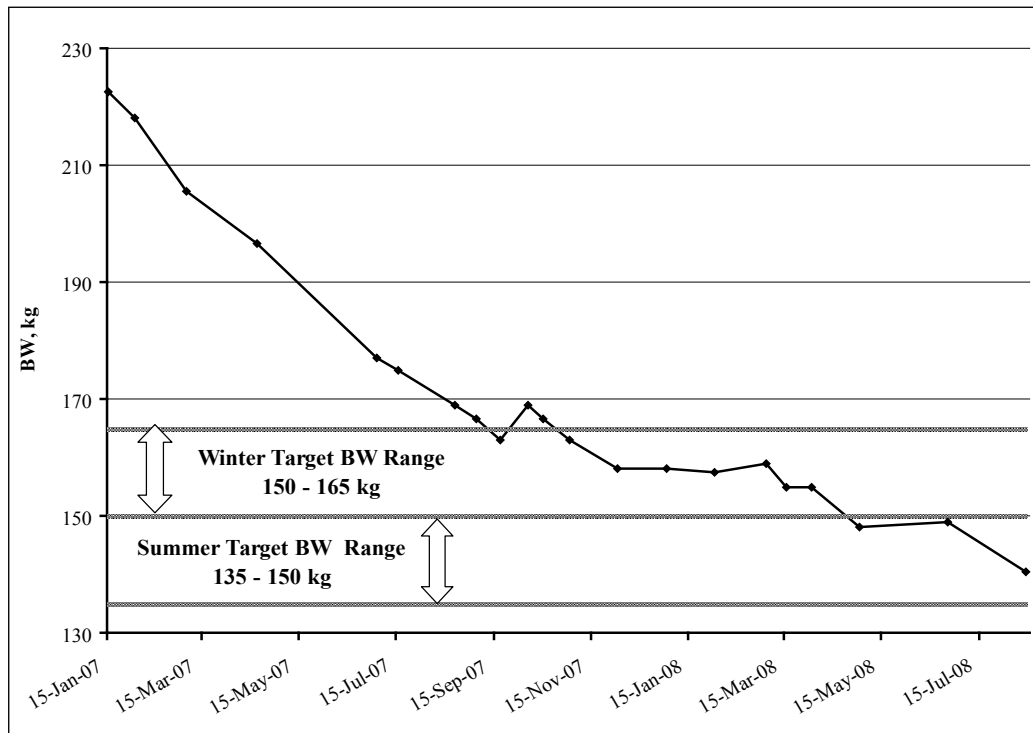


Figure 2. Revised seasonal target body weight ranges for male spectacled bear.

of collection planning and species management the animal was transferred to NZP for breeding purposes. Diet information from the sending institution was analysed, and although components and nutrient content of the base diet were appropriate for the species, the quantity of food was excessive, providing 31,694 kJ metabolisable energy (ME) per day. This determination was based on historic diet and body weight (BW) records for male spectacled bears, as well as the estimated ME requirement of adult inactive dogs: $\text{kJ/d} = 397.7(\text{BW, kg})^{0.75}$ (NRC 2006). Using this equation, the ME requirement for a 170 kg bear is 18,724 kJ/d. The National Research Council equation provides a frame of reference; however, given species and seasonal variability, the authors do not suggest that it be used as a definitive tool for calculating the ME requirement of bears. Additionally, the above calculations did not include a wide variety of food-based enrichment offered to the animal on a daily basis. Furthermore, due to poor oral health, the animal had been prescribed long-term medications, which were noted to be well accepted with vehicles such as honey, molasses, syrup and fruit preserves.

As part of the quarantine examination, nutrition staff manually assessed body condition, recorded physical measurements, and determined total body fat content by bioelectrical impedance analysis (Farley and Robbins 1994; Lintzenich et al. 2006). The detailed clinical record is provided in Table 1. At 222.5 kg, the animal was deemed grossly obese, with a body condition score (BCS) of 9 on a 1–9 point scale. Total body fat (48.2%) exceeded that of a temperate species of bear (*Ursus americanus*) during early winter (31–45% body fat) (Lundbery et al. 1976; Farley and Robbins 1994, 1995). As noted previously, *Tremarctos ornatus*, a South American species, does not hibernate.

A weight reduction plan with a specified timeline was developed and presented to NZP veterinarians and animal care

staff. The overall goal was gradual and continuous weight loss over a 6–8 month period at 1.0% of initial BW/week, with a maximum of 2.0% and minimum of 0.5% of initial BW/week (Burkholder and Toll 2000), to reach an initial summer target BW = 170 kg (Fig. 1). The plan also coincided with a period of seasonal weight loss characteristic of the species. Fish was found to be an adequate vehicle for medication, and all sugar-based foods were eliminated.

The base diet was reduced sequentially (approximately 10% of average daily kJ at each step) in conjunction with regular weighing, visual assessment of body condition, maintenance of detailed food consumption records and ongoing communication with primary keepers. Food-based enrichment was initially removed from the diet and later reintroduced in defined types and quantities to provide 1250 kJ ME/d. Keepers made valuable use of their knowledge about the natural history and feeding behaviours of this species, and presented the base diet and food enrichment in interesting ways to encourage increased activity. Throughout the series of diet reductions, the animal was monitored for behavioural changes such as aggression, difficulty shifting, and development of stereotypic patterns – none were noted. Seasonal target BW ranges were further refined over the following 12 month period (Fig. 2), resulting in a total weight loss of 77kg (35% of initial BW). Sequential diet records are maintained, providing a framework for standardised seasonal diets for this individual.

Upon arrival into the collection the male spectacled bear reportedly exhibited little interest in daily routines or novel food presentation, and even minor movements were laboured. Health and well-being benefits of weight reduction were clear, but there were also concerns about this animal's ability to breed. Keepers noted a marked positive increase in physical activity and interaction with enrichment items throughout the weight reduction period,

and this activity level has been maintained to the present. NZP has since received a female spectacled bear. The pair was successfully introduced, many mating bouts were observed during June 2009, and two (1.1) genetically valuable cubs were born in January 2010.

Conclusions

1. Communication, education, and setting distinct achievable goals, while meeting the animal's husbandry, behavioural, and nutritional needs, were key components to successful weight reduction in this individual.
2. Detailed record keeping is an integral component of animal care.
3. Prevalence of obesity can be greatly reduced through objective assessment of body condition, setting target body weight ranges, and recording body weights on a regular basis.

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