DETERMINING THE RELATIONSHIP BETWEEN BIOMASS CONSUMED AND SCATS PRODUCED IN CAPTIVE ASIATIC LIONS (*PANTHERA LEO PERSICA*) AND LEOPARDS (*PANTHERA PARDUS*)[1]

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Feeding trials on captive adult Asiatic Lion (*Panthera leo persica*) and Leopard (*Panthera pardus*) were conducted at the Sakharbaug zoo, Junagadh (India) to establish a relationship between the amount of food consumed and the scats produced. Lions (ave. body mass = 100 kg.) and Leopards (ave. body mass = 50 kg) fed *ad libitum* on buffalo meat consumed an average of 6% and 8% of their total body mass respectively. Biomass ingested by Leopard was significantly correlated with the total dry weight of scats ($p = 0.01$, $r^2 = 0.75$), but not with the number of scats produced ($r^2 = 0.028$). However, a relationship was noted between the amount given and biomass consumed per scat ($p = 0.04$ $r^2 = 0.53$). For lions, no significant correlation was seen, either in the number of scats produced or the dry weight of scats, with the amount consumed. Also, the biomass consumed per scat was not correlated with the amount given.

Key words: Feeding trials, scat weight, scat number

INTRODUCTION

Calculating the percentage of scats containing different prey items, or percent occurrence of prey items is the most commonly used method for quantifying diet from scat. This method has several limitations. It tends to over-represent larger prey, as they induce the production of a greater number of scats (Jones and Smith 1979; Weaver and Hoffman 1979; Ackerman *et al.* 1984; Reynolds and Aebischer 1991). However, Floyd *et al.* (1978) concluded that smaller prey would be over-represented in terms of weight, but under-represented in numbers, as small prey species are known to produce more indigestible matter, such as hair, due to a higher surface to volume ratio than larger prey species. Nevertheless, frequency or percent occurrence of prey species in scats alone may not be a reliable method to quantify predator diet (Floyd *et al.* 1978; Weaver and Hoffman 1979; Ackerman *et al.* 1984). To overcome this problem, as well as to estimate fresh-weight intake, feeding trials on captive wolves (Floyd *et al.* 1978), coyotes (Weaver and Hoffman 1979) and cougars (Ackerman *et al.* 1984) were conducted and correction factors were obtained from regressions of food consumed to scat produced. This can be applied to the data obtained as percentage of scats having a prey item, to obtain reliable estimates of biomass consumed by the predator (Floyd *et al.* 1978; Weaver and Hoffman 1979; Ackerman *et al.* 1984).

We conducted feeding trials to establish the relationship between biomass consumed and scat produced in captive Asiatic Lions and Leopards.

METHODS

Feeding trials were conducted during August 1993. Eight captive adult Lions and Leopards each were chosen for the feeding trials at the Sakharbaug zoo in Junagadh, Gujarat and each animal was housed in a separate cage. Food was withdrawn for 48 hours before commencing the feeding trials to remove the effect of the previous diet, and the scats from the earlier diet were rejected. As buffalo meat was the regular diet of the cats at the zoo, the experimental animals were also fed buffalo meat along with skin and hair. The Lions were given 6 to 20 kg meat and Leopards 3 to 10 kg. The animals were randomly fed 3/6 kg to 10/20 kg of meat for one day. Water was provided *ad libitum*. After 24 hours, the unconsumed meat was weighed to determine the amount consumed by individuals. Food was again withdrawn until scat production ceased. All scats produced during this period were collected, and oven dried at 70 °C for a week, and weighed to the nearest 0.1 gm.

RESULTS

The captive Asiatic Lions and Leopards which had been unfed for 48 hrs consumed a mean of 6.1 kg (Range: 1-15 kg) and 4.3 kg (Range: 1.5-6.5 kg) respectively. This amounts to 6% and 8% of the body mass of the lion and leopard respectively per day. The maximum meat consumed by both cats equals 10% to 12% of their body weights, per day.

Meat consumption was proportional to the amount available (Fig. 1). This relationship was stronger in case of

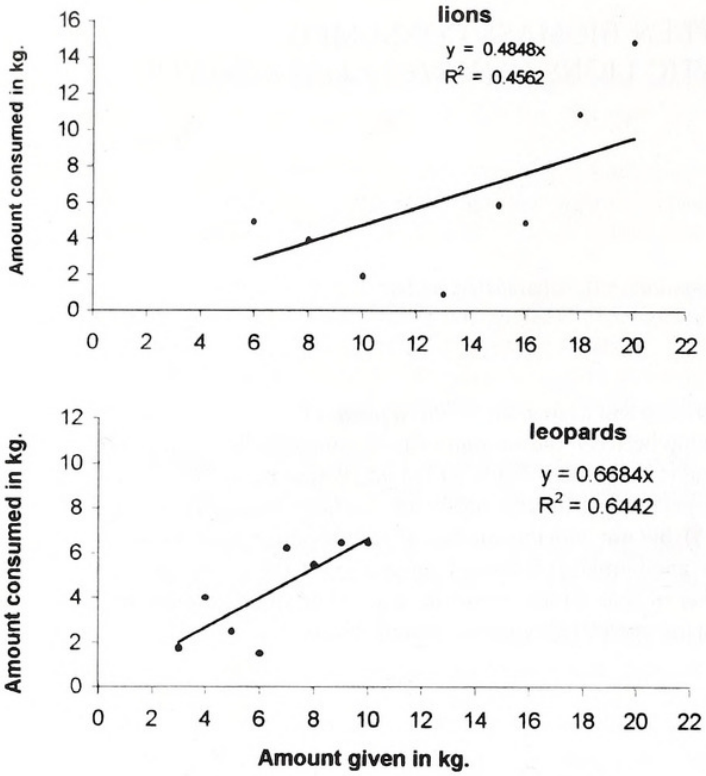

Fig. 1: Relationship between the amount of food given to Asiatic Lions and Leopards and the amount consumed by them

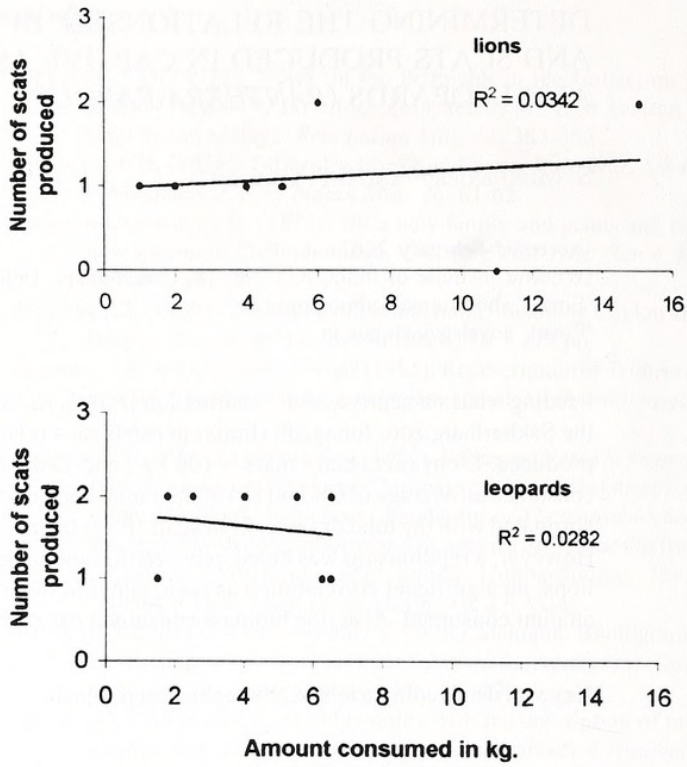

Fig. 2: Relationship between amount of meat consumed by Asiatic Lions and Leopards and the number of scats produced

leopards (Fig. 1) ($r^2 = 0.64$, $p = 0.01$) than in lions ($r^2 = 0.45$, $p = 0.05$). However, consumption seemed to stabilize around 6 to 6.5 kg for leopards when given more than 8 kg of meat. In case of lions, some individuals consumed less meat irrespective of the amount supplied, making the relationship weaker.

In both the cats, the relationship between biomass ingested and the number of scats produced did not yield much information, as the maximum number of scats produced was two for 2 kg as well as 6 kg of meat consumed (Fig. 2). However, for leopards, biomass per scat was related to amount given by the equation $y = 0.6533x - 1.1994$ ($r^2 = 0.53$, $p = 0.04$) (Fig. 3). This was not seen in lions. The biomass ingested by leopard was significantly correlated with the total dry weight of scats produced (Fig. 4), but lions did not show a correlation between biomass ingested and total dry weight of scats.

DISCUSSION

The amount of food consumed by captive large felines agrees with other studies in the wild where felids and canids consumed on an average food 7% to 10% of their body mass (Golley *et al.* 1965; Kolenosky 1972; Nellis *et al.* 1972; Johnsingh 1983; Caro 1989; Aldama 1991; Jhala 1991; Stander *et al.* 1997).

Studies on wolf, coyote, and cougars have shown a significant relationship between biomass ingested and the number of scats produced when given wild prey (Floyd *et al.* 1978, Weaver and Hoffman 1979, Ackerman *et al.* 1984). However, the slope for the regression of biomass per scat and amount given in leopards was steeper than estimated for cougars (Ackerman *et al.* 1984) and wolves (Floyd *et al.* 1978). This suggests that leopards produced fewer (maximum two), but heavier scats than cougars and wolves. Ackerman *et al.* (1984) observed that wolves produced approximately four times more scats than cougars, but the scat weight was higher in cougars than wolves. However, Ackerman *et al.* (1984) and Floyd *et al.* (1978) estimated only wet weight of scats while we estimated dry weights, these could not be compared. The difference between the equations generated for cougars and leopards could also be due to the fact that we could give the cats only one prey type, while the other studies (Floyd *et al.* 1978; Ackerman *et al.* 1984) gave several wild prey types. Hence, this trend with leopards needs to be validated by providing them with natural prey.

Lions showed a greater amount of grooming as indicated from remains of self-hair in the scats of non-experimental animals (which were given dressed meat). This could be the reason for the lack of correlation in the case of lions.

Some major problems that can be expected during feeding trials with zoo-bred animals are:

1. Animals may not feed on meat other than the type they are used to.
2. Animals may reject skin and hair totally.
3. Consumption of self-hair by predators while grooming could lead to erroneous results from scat analysis.

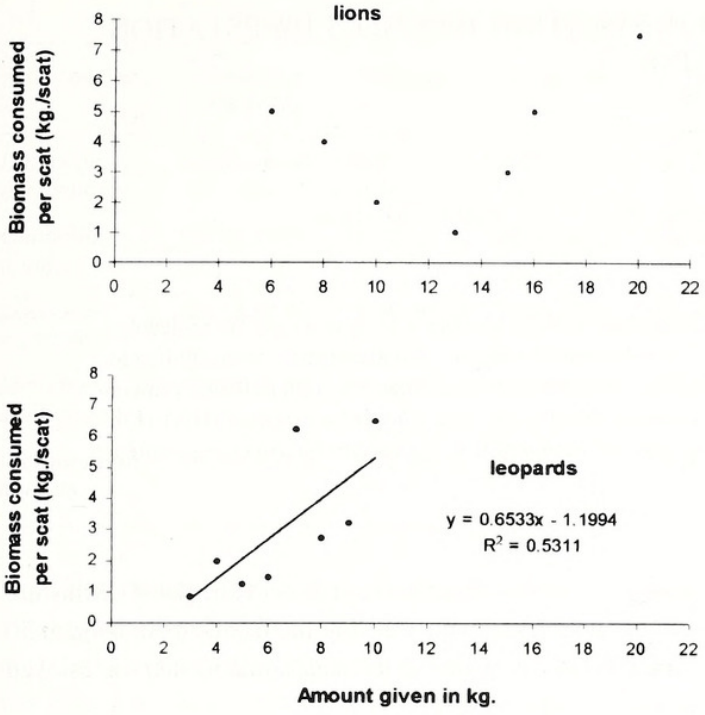

Fig. 3: Relationship between the amount of food given to Asiatic Lions and Leopards and the biomass consumed per scat

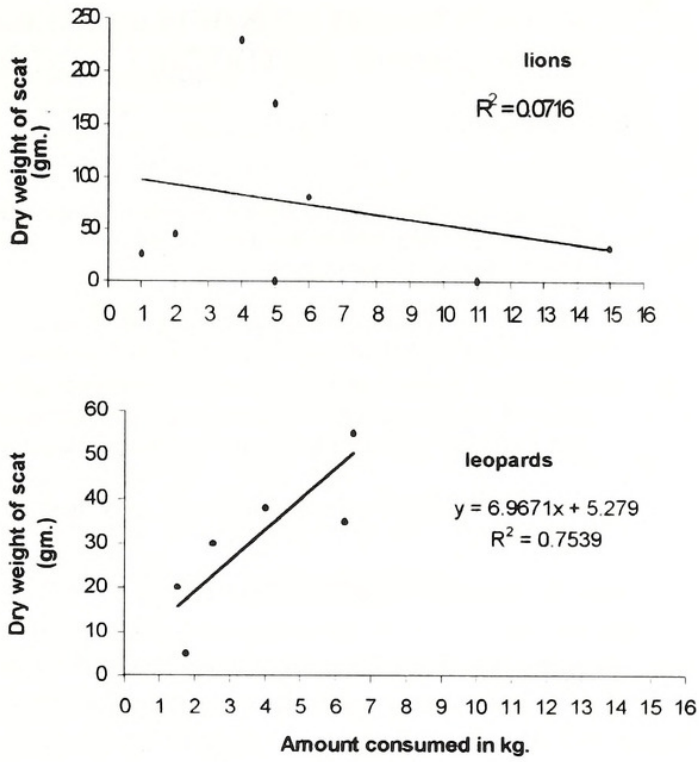

Fig. 4: Relationship between amount of meat consumed by Asiatic Lions and Leopards and the dry weight of scats

CONCLUSIONS

1. Captive Asiatic Lions and Leopards consumed food between 5% to 10% of their body mass.
2. Leopards consumed food in proportion to availability. This was not seen in Asiatic Lions.
3. Total number of scats produced is not a good indicator of the amount of food consumed for both Asiatic Lions and Leopards.
4. The dry weight of scats showed a strong relation to the amount of food consumed, in case of leopards but not lions.
5. Biomass per scat was related to the amount of food given in the case of leopards but not in lions. This trend for leopards needs to be validated through feeding trials with natural prey.

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