

MS Thesis Defense

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Title: Gonadal and Adrenal Hormone Patterns in African Lions (*Panthera leo*) of Diverse Age and Reproductive Success

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ABSTRACT

This study sought to gain a more thorough understanding of male and female African lion (*Panthera leo*) reproductive biology through non-invasive means. Compared to other felids housed in captivity, lions historically bred very well. However, a six-year period of low fecundity in the U.S. population was observed after the cessation of a breeding moratorium and the North American African lion Species Survival Plan (SSP) requested assistance in identifying the cause. However, there is a dearth of basic information on lion reproductive and adrenal hormone patterns and little is known about puberty onset in this species which led to this biomedical survey of animals of varying ages and reproductive success within the captive population. Specific objectives of this study were to 1) utilize non-invasive hormone monitoring to identify age and seasonality-related changes and assess fluctuations related to reproductive events such as pregnancy and estrus, and determine reproductive life history stages in captive lions 2) examine puberty onset using variation in hormone concentrations, reproductive events and body weight measurements in females and changes in hormone concentration, body weight measurements and sperm presence in urine samples in males, and 3) obtain hormonal substantiation of contraceptive effects in female lions.

Hormone patterns in males suggest that there is an increase in fecal androgen metabolites (FAM) at 2.0 yr, indicating a shift from a peripubertal FAM overall mean concentration to a subadult FAM concentration. While subadults had similar FAM to adult males, they were not yet full adult weight.

Puberty occurs at an early age in male lions; urinalysis for the presence of spermatozoa showed positive results in 83% of samples collected from males as young as 1.2 yr and body weight measurements in captive individuals showed a faster growth rate compared their wild counterparts. For females, longitudinal assessments showed that there were few age-related and no seasonality-related changes in hormone production starting at 0.9 yr. In observing fecal estrogen metabolites (FEM), 95% percent of individuals not treated with contraception were cycling normally; estrous cycle length averaged 17.5 ± 0.4 d, estrus was 4.4 ± 0.2 d and silent estrus was observed in 82% of females where behavioral observations were available. Pregnant luteal phases averaged 109.5 ± 1.0 d while non-pregnant luteal phases lasted only 46.0 ± 1.2 d. In 11 females treated with contraception, the return to cyclicity was variable; individuals treated with deslorelin averaged ~ 4.0 yr. Puberty onset occurs early in female lions as well, estrous cycles were observed as early as 1.1 yr, and this may be related to a faster rate of growth in captive compared to wild cubs. Fecal glucocorticoid metabolite (FGM) concentrations did not vary by age or season in males or females however females that were treated with contraception during the study showed significantly lower mean FGM during treatment compared to before treatment or after the implant was removed. As a result of this study, it appears that the decrease in reproductive output seen in the years following the breeding moratorium was not related to gonadal or adrenal hormone production, but for some females may have been linked to previous hormone contraception treatments.