

Non-invasive reproductive monitoring in female sand cats (*Felis margarita*) by analyzing fecal estrogen and progesterone metabolites

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Fecal progesterone and estrogen metabolite profiles

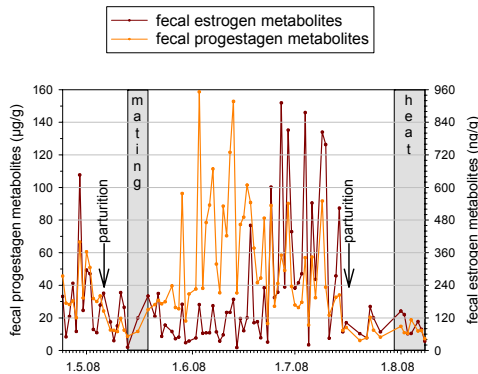


Fig. 1. pregnant female sand cat (after both parturitions she lost the kittens)

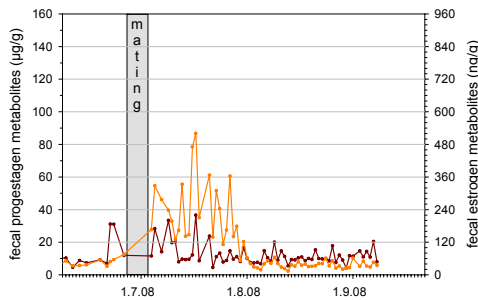


Fig. 2. pseudopregnant female sand cat

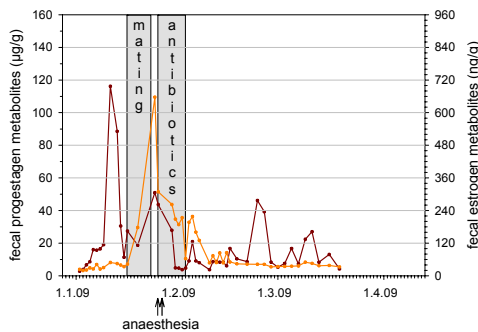


Fig. 3. female sand cat exhibiting a severe illness post-mating, which had to be treated with antibiotics and anaesthesia

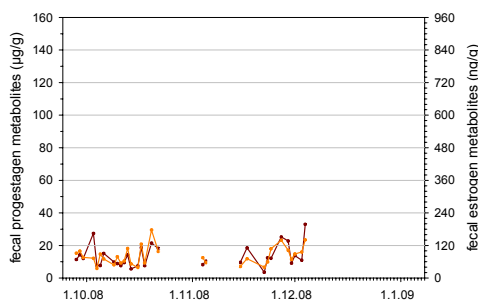


Fig. 4. female sand cat permanently kept together with a male (does not show any signs of estrus in behavior)

Introduction

Since the majority of the 37 species of the felidae family is recorded on the IUCN Red List as at least "near threatened", zoos commit themselves to the conservation of the endangered felids. However, several small cat species like the sand cat (*Felis margarita*) are highly stress sensitive and do not regularly reproduce in captivity. Even if they do, the mortality rate of kittens and incidence of infanticide is high.



So far only little is known about the reproductive biology of this species. Thus practical methods for monitoring endocrine activity are essential for assessing the reproductive potential of individual animals. We selected the non-invasive approach based on fecal steroid metabolite analyses, that already has been shown to be convenient to obtain endocrine data concerning estrus, pregnancy and pseudopregnancy in several felids.

Methods

- Fecal samples were collected from female sand cats in the zoos of Ebeltoft (Denmark), Berlin (Germany) and Poznan (Poland) and stored at -20°C . Two females reproduced regularly, one failed to become pregnant despite repeated matings, one did not show any reproductive activity despite housing her with a male and one reproduced successfully in the past, but is now kept solitary.
- Samples (0,5 g) were extracted with 4,5 ml 90% methanol.
- Measurement of progesterone and estrogen metabolites was performed using competitive enzyme immunoassays (EIA) based on polyclonal antibodies directed against 5α -pregnane- 3β -ol-20-one-3-HS-BSA (5α -P) and 1,3,5(10)estratrien-3,17 β -diol-17-HS-BSA, respectively

Results

Eight to 13 days after mating the level of fecal progesterone metabolites increased, remaining on a high level with distinct day-to-day fluctuations throughout gestation before decreasing again to basal levels shortly before parturition (58-65 days post-mating, Fig.1). In contrast, during pseudopregnancy the progesterone metabolite concentrations already dropped to basal levels 31-32 days after mating (Fig.2). Thus discrimination between pregnancy and pseudopregnancy is possible by means of the analysis of fecal progesterone metabolites about 30 days post-mating.

A severe illness, suffered soon after mating, seemed to interrupt luteal function inhibiting implantation of a potential embryo (Fig.3).

Contrariwise fecal estrogens did not seem to follow follicular activity and reliably indicate the presence of estrus. However, there were elevated estrogen levels during the second half of gestation, probably caused by placental estrogens. Furthermore we found an indication for the dependency of the estrogen concentrations on the number of cubs.

In one female, permanently kept together with a male, reproductive activity seemed to be suppressed (Fig.4).

Perspective

Detection of pregnancy and its discrimination from pseudopregnancy enables zoos to keep the cats under surveillance during the prognosed period of parturition to prevent infanticide. Apart from that, presumably, poor reproductive success may not only be related to physiological infertility, but may also be caused by stress or anatomical problems. As a perspective, assisted reproductive technologies need to be developed to enhance conservation efforts.