

## PhD Dissertation Defense

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**Title:** Studies on the reproductive biology of the critically endangered Addra gazelle (*Nanger dama ruficollis*)

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### ABSTRACT

The Addra gazelle (*Nanger dama ruficollis*) is one of the most critically endangered antelope species. Population size has plummeted, particularly over the last few decades, leaving fewer than 250 individuals in the wild distributed within small and segregated populations. The species faces a number of challenges that threaten its survival including habitat loss and poaching. In contrast, there are several hundreds of this species managed in captivity world-wide (zoological organization and private ranches) but these populations continue to experience a declining trend. Therefore, there is an urgent need to develop assisted reproductive technologies (ARTs) to facilitate genetic management of this species. However, there is very little known about their basic reproductive biology. Therefore, the main focus of this research was to characterize reproductive biological traits of both female and male Addra gazelle and use this information to develop ARTs. **Study 1** utilized non-invasive fecal metabolite monitoring to characterize the estrous cycle, pregnancy, and seasonal anestrous in the female Addra gazelle. Estrous profiles and length were similar to data reported in related species, though fecal progesterones increased and plateaued during gestation allowing for non-invasive pregnancy diagnosis. This study also revealed a seasonal anestrous that resulted in birth peaks occurring during months corresponding to maximal rainfall in Addra gazelle's historical habitat. In **Study 2**, Addra gazelle ejaculates were characterized following collection and the effect of cholesterol-loaded cyclodextrin (CLC) on sperm cryosurvival was evaluated. Data demonstrate

that pre-treatment with CLC (0.5 mg/ml) prior to cryopreservation protects sperm from cryo-damage, as indicated by improved post-thaw motility and viability. **Study 3** characterized the proteome of Addra gazelle sperm and evaluated the impact of freezing, as well as CLC treatment on protein expression. In total, 287 proteins were identified and 85 were found to be differentially expressed in frozen-thawed samples. The decline in expression of a large number of proteins involved in metabolism may help explain the significant decrease in sperm motility following cryopreservation. CLC treatment specifically mitigated the loss of three proteins, possibly explaining the recovery of motility in samples exposed to CLC prior to cryopreservation. Data resulting from these three studies may be used to recommend changes in management protocols, to facilitate the development of ARTs including the establishment of a sperm genome resource bank, and to establish self-sustaining populations to ensure continued survival of the Addra gazelle.