

several feeding sites should be offered to captive giraffes in outdoor enclosures, not so much to decrease intraspecific competition but to increase the feeding time of the animals. This arrangement is to bring about a wider use of the enclosure and to improve both the animals' physical condition and the visitors' acceptance. Efforts should be made to provide natural feeding opportunities. In this study, a diet rich in concentrates,

fruits and vegetables had increasing effects on abnormal oral activities. On the other hand, large amounts of natural browse may facilitate natural feeding activities. Frustrations in feeding behavior due to unsatisfied motivational states and consummatory acts may increase oral disturbances in captive giraffes.

Behavioral patterns in the reproductive cycle of the black rhinoceros (*Diceros bicornis*) (proposal)

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Due to the encroachment of habitat and, most importantly, poaching, the black rhinoceros has become an extremely endangered animal. The total population has dropped in the last 10 to 15 years by 85% in the wild (IRF, 1996). Through anti-poaching efforts over the last two years the numbers have stabilized at around 2400 animals in the wild (IRF, 1996). Four recognized subspecies exist: *D.b. bicornis*, *D.b. longipes*, *D.b. michaeli* and *D.b. minor*. Most *Diceros bicornis* can be found in the south Chad through to South Africa in small populations that are increasingly isolated and fragmented. The danger the black rhino faces is a loss of genetic variation through an ever-decreasing gene pool. For this reason the captive population of black rhinoceroses plays an important role in conservation efforts today.

Most of the 200 black rhinos in captivity can be found in North America and Europe, of which most are of the subspecies *Diceros bicornis michaeli*. This population is of itself large enough to be viable, however, the challenge facing conservationists today lies in finding a breeding plan that optimizes genetic variation (Smith & Read, 1992). In hopes of increasing breeding success, many zoos are trying to recreate an environment for the animals, which resembles that found in the wild.

For the black rhino this means keeping the animals separated until shortly before the female's peak estrus, at which time the male is introduced. At zoos with sufficient funds this is possible through monitoring the hormone levels in the female, either through blood or urine samples. In zoos where such costly methods are not available the animals are usually kept in pairs. This, however, can lead to undue stress for the female through constant contact with the male, which may disrupt her natural cycle, making breeding difficult if not impossible. The reproductive cycle of the female has been stated to be between twenty-five and thirty days in the wild (Goddard, 1967) [the time between calves is between 2.5 and 4 years]. Pairs come together during this time and show an overt courtship, with the male following the female closely. If the female urinates the male will test her reproductive status through tasting her urine and exhibiting the flehmen. Finally, the female stands in front of the male and he will rub his chin against her flank. If she is reproductive the male will attempt to mount and copulate with her (Estes 1991, Goddard 1966, Hitchens & Anderson 1983, Joubert & Eloff 1971, Kingdon 1979, Owen-Smith 1988). It has been proposed that behavior exhibited by the

female may coincide with her reproductive cycle (Mills 1995). The aim of this study is to determine a possible correlation between a female's reproductive cycle and her behavior (activity level).

Methods: Over a period of a minimum of 90 consecutive days, the activities (eating, resting, drinking etc.) of female black rhinos is observed. If the rhinos are kept in pairs the behavior of the male and the female, and the behavior between the individuals is noted (i.e. aggression / affiliation). The data is collected by scan-sampling with an interval of one minute. If the females are kept individually (without the presence of the male) all occurrences of the described behavior and the length of said behavior are noted. Observations are made in such a way, that a time series can be established. This means that data must be compiled at constant time intervals, for example one day. The length of daily observations should be at least four hours, however, will be determined by circumstances at the zoo.

The collected data will be analyzed with the "program package for the non-parametric and parametric uni- and bivariate timeanalysis" developed by BILO and MÖRZ. Overall at least two females will be observed with a known reproductive cycle (through hormone tests) and

one female which does not show a reproductive cycle (after having given birth recently). Additionally the weather is noted for its possible influence over the observed behavior.

Expectations: Since the reproductive cycle of the black rhinoceros is estimated at approximately thirty days, the length of the behavioral observation should allow any repetitive behavior to become evident. It has been proposed that the female urinates more frequently and is increasingly more restless when she is nearing her estrus peak. Any repetitive behavior shown by the female should therefore coincide with the data collected on her reproductive cycle (hormone tests). If males are present there should be a marked difference in the attention the animals allot each other. Nearing the estrus peak the male should seek the vicinity of the female more often, and she should become less aggressive towards his advances until copulation. Ideally, the male will show courtship behavior starting about six days before the female's estrus peak.

The Behaviour and the Vocalisation of the Crowned Crane, *Balearica regulorum gibbericeps*, in free-living and captive birds.

by Christa Budde, Museum Koenig

Wetlands, where Crowned Cranes, *Balearica regulorum gibbericeps*, live and breed, are among the most threatened habitats of the world. Crowned Cranes are large birds and show conspicuous behaviour (e.g. the dancing, the loud calls) which makes them easy to locate and observe; they are thus an ideal indicator species for wetland evaluation. Another serious threat is the capturing of Crowned Cranes for domestication and for export. The Crowned Crane is not yet severely endangered (ranked vulnerable by IUCN, in appendix II

by CITES), but the population is surely declining. Africa has a very high population growth with much hitherto unused land being transformed into agricultural land. Wetlands are considered to be "wastelands" in many countries. It is therefore likely that species, which are depending on wetlands, including the Crowned Crane, are facing accelerating decline of their populations or, in the worst case, even extinction. It is absolutely essential to be able to monitor a threatened species without