

**Demographics of Sumatran Rhinoceros
(*Dicerorhinus sumatrensis harrissoni*) in Sabah, Malaysia:
Correlation to Food Distribution in Tabin Wildlife Reserve**

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The Sumatran rhinoceros (*Dicerorhinus sumatrensis*) is the most primitive and smallest species in *Rhinocerotidae* family (Groves, 1967). This animal is included in one of the 12 most endangered species in the world according to the 'International Union for Conservation of Nature and Natural Resources' (IUCN) data. Sumatran rhinoceros in Sabah are fully protected under the Wildlife Conservation Enactment 1997. The Borneon subspecies of Sumatran rhino can be found in several locations principally in the east of Sabah, Malaysia (Payne, J *et al*, 1985). Their distribution was focused around two residencies which are the Residency of Sandakan and Residency of Tawau especially in the Kinabatangan district in Sandakan and Lahad Datu district in Tawau. Recent reports from the 'Asian Rhinoceros Specialist Group of SSC (Special Survival Committee)' from IUCN in 1989 believe that the population in Sabah may be as low as 30 individuals (Yasuma & Andau, 1999). This species is becoming extinct because of poaching activities for their valuable horn, believed to have medicinal value. Their future survival is also in jeopardy due to habitat loss and disturbance. This species may only be found currently in protected areas such as Tabin Wildlife Reserve. The 1998 Tabin scientific expedition reported that at least three individuals were found in their study area consisting of 8000 ha. of primary rainforest. Jomitin (1999) reported that one of their survey groups were face to face with Sumatran rhino, which very rare occurrence. Unfortunately, the animal fled prior to being photographed. According to the size, age of and foot print location, 3 individuals could be confirmed in their study area. Due to the elusive nature of this animal, the dense vegetation and relief of their habitat, most estimates of population size are based on the presence of footprint or dung samples and very rarely on actual animal sightings. Information on the demographics of these animals in the wild and home ranges of individuals is therefore very limited. Using new tools such as camera traps, GPS systems, vegetation evaluation, genetic analysis and GIS mapping, we hope to acquire additional information to help determine the composition of the remaining wild population of rhino in Sabah. Hence, in the future we hope to predict the carrying capacity of the various habitats for Sumatran rhino based on food supply. The results from this survey will produce objective data used to assess the status of these animals and make well-planned future wildlife management decisions to assure their survival into the next millennium.

**An Overview of Pathological Alterations of Hooves and Soles
of Captive Indian Rhinos (*Rhinoceros unicornis*)
and a Comparison of Anatomical Foot Structures
of Captive and Wild Indian Rhinoceroses**

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Introduction

Indian rhinos (*Rhinoceros unicornis*) suffer from numerous pathological alterations on their feet structures under captive conditions. A study was set up to investigate the causes and pathological findings on the feet, to look at the macroscopic and microscopic anatomical structures and to compare the findings with the feet of wild Indian rhinos.

Study

Between 1998 and 2000 the feet structures of 32 (13/19) Indian rhinoceroses (*Rhinoceros unicornis*) were evaluated in 11 European zoological gardens. For the anatomical research the feet of 4 captive rhinos (which died during the study period) were dissected. In addition, horn samples were taken from the pad, the transitional area between the pad and the sole, the sole, and the horn wall from 11 animals (8 zoos) over a period of one year.

Results

Four different pathological alterations of the feet structures were found:

1. Cracks between the central sole and the adjacent pad. All breeding bulls (n=11) and more than half of the breeding females (n=8) suffered from these cracks with various degrees of severity.
2. Abraded side horn walls, associated with inflammatory processes were seen in at least 69% (n=22) of all captive animals.
3. Vertical and/or horizontal cracks were noticed in at least 13 animals (41%).
4. Fistules and ulcers in the pad were found in 5 animals (16%).

Histology revealed that the area between the central sole and the adjacent pad is predisposed to traumatic changes due to the difference in composition of the two horn structures. A dark rim, with hard exterior and soft interior horn structures, surrounds the sole. The horn of the pad of captive animals is very soft and thin. Microscopic alterations were found even in macroscopically unaffected footpads.

The Comparison of wild and captive Indian Rhinos showed the following differences:

Wild Indian Rhinos have grey, hard pad structures. The hooves are long and the soles elongated and concave. There is an elevated rim in the central sole adjacent to the pad, surrounding the whole sole.

Captive Indian Rhinos have smooth, whitish looking pad surface. The hooves are

Conclusion

Wild rhinos are by nature 'sole-walkers', captive animals show abraded horn structures and turned under the current zoological husbandry conditions into 'pad-walkers'. These abraded hoof structures are prone to acute or chronic trauma such as the high weight, twisting of the feet, and others.

Discussion

Most outdoor and indoor enclosures consist of abrasive material such as concrete, marl, sand, and stones. During the wintertime the animals stay indoor for most of the day. The access to an indoor pool is often limited.

In contrast, wild animals live and thrive in and around riverine areas, swamps, grass-, and woodland. One should try to transmit this knowledge to the captive husbandry conditions. Therapy has not been successful in severely affected animals and is in addition very difficult to carry out.

My advice is to change the current husbandry conditions with regard to flooring substrates and water access. Our aim should be to prevent that the next generation of Indian rhinoceroses will be faced with these problems in the future.

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