Faecal particle size in captive rhinoceroses

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Background/Aim

- Particle size is an important factor influencing the fibre digestion of herbivores.
- In captivity browsing ruminants excreted larger faecal particles than grazing species, indicative for a lesser chewing efficiency (Clauss et al. 2002).
- Rhinoceroses can be classified into two different nutritional groups, with black rhinos belonging to the browser, white and Indian rhinos belonging to the grazer.
- Can the pattern found in ruminants also be demonstrated in rhinoceroses?
- Particle length reduction due to fermentative process during digestion is negligeable, thus faecal particle length is representative for the extend to which food is processed by mastication.
- By wetsieving the average sieve hole size through which the particles pass is measured, and thus actual particle length is described.

Material and Methods

Animals

8 white rhinos (*Ceratotherium simun*), grazer
12 black rhinos (*Diceros bicornis*), browser
6 Indian rhinos (*Rhinocerus unicornis*), grazer

Origin: Zoo Dvůr Králové, Czech Republic
Health status: healthy
Diet: mainly gras hay, some pellets and vegetables
Bodyweight: measured by weighing

Particle size analysis

Wet sieving
Analyser: Retsch® AS 200 digit, Haan, Germany
Duration: 10 min
Water throughput : 2l/min
Vibration intensity: approx. 2 mm
Mesh size of sieves: 0.063, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16 mm

Description of particle size

Geometric mean (numerically calculated)
Software: TableCurve® 2D v5.01, Systat Software UK Ltd., London, UK
Statistics: Kruskal-Wallis-Test, SPSS Inc., Chicago, Illinois, USA

Results

- Indian rhinos had significantly smaller faecal particle sizes (4,16 ± 1,24 mm; p=0,005) compared to the black and white rhinos (9,28 ± 3,35 mm respective 9,78 ± 3,00 mm). Difference between black and white rhinos was not significant (p=0,019) (Fig. 1).
- Within the three different rhino species there is no evidence of a relation between body mass and mean faecal particle size (Fig. 2).

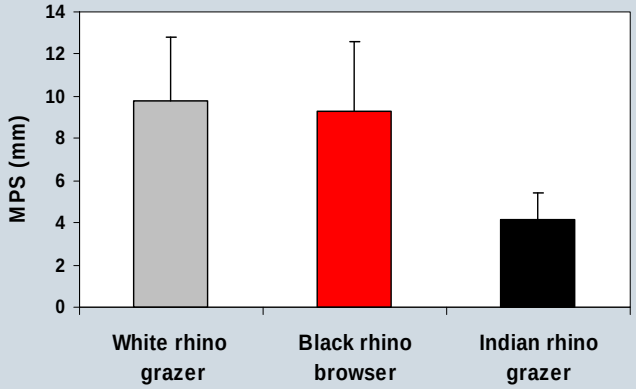

Fig. 1: Geometric mean faecal particle size (MPS; mm) of captive white rhinos (n= 8), black rhinos (n=12) and Indian rhinos (n=6), expressed as average per species with SD

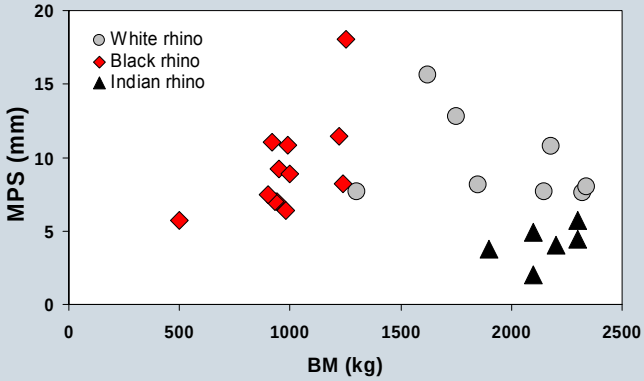

Fig. 2: Geometric mean faecal particle size (MPS; mm) in relation to body mass (BM; kg) within captive white rhinos (n= 8), black rhinos (n=12) and Indian rhinos (n=6)

Discussion

- The pattern previously found in ruminants could be found between black and Indian rhinos, but not between black and white rhinos.
- Neither inter- nor intraspecific an allometric effect of body mass on mean faecal particle length could be noted.
- Phylogenetically black and white rhinos are closer related to each other, the Indian Rhinocerotidae separated earlier from the African Rhinocerotidae, therefore Indian rhinos might generally be different.
- Results might reflect subtle differences in tooth morphology between the rhinoceros species, and therefore should be verified with faecal samples from free-ranging animals.

References
Clauss M, Lechner-Doll M, Streich WJ (2002) Faecal particle size distribution in captive wild ruminants: an approach to the browser/grazer-dichotomy from the other end. Oecologia 131: 343-349